THE IMPACT OF TECHNOLOGY ON TRAINING IN THE PRINT INDUSTRY IN OHIO

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A Thesis
Submitted to the Graduate College of Bowling Green State University in partial fulfillment of the requirements for the degree of

MASTER OF EDUCATION

December 2011

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ABSTRACT

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Various print media companies implement training within their company to improve their employees’ efficiency, productivity and skills. The purpose of this study was to understand how this industry adapted to the influence of technology as well as the changes in technology to conduct training.

This study attempted to identify the status of employee training in the Ohio print industry as related to changes in technology, equipment, software and processes. The objectives of this study were to: 1.) Identify what segments of the print industry that use training most often; 2.) Identify the most common topics in training in the print industry, whether they are soft skills, hard skills, hardware, software, and so on; 3.) Identify the employee areas who receive the most training, that is, management, prepress, and so forth; 4.) Identify the most common methods/implementations of training in the print industry; 5.) Identify whether the training provided is developed, implemented, or both, internally or externally; and 6.) Identify future trends regarding the amount of training required in the print industry.

Technological advances have made a significant impact in the print industry; including how employees are trained. The current common training methods in the print industry include lectures or courses, podcasts, webcasts or webinars, workshops, seminars and conferences, and tutorials or interactive modules. Some of these methods are accessible because of the advances of technology.
The study indicated not only the need for training but also the need to provide alternate methods for training. The most common training methods being currently used in the print industry are a course or lecture, and an interactive module or tutorial.

The study indicates the need for alternate methods for training that are ultimately less costly. This will increase the employees’ efficiency and create an effective way for each individual to learn. Because of the ongoing development of new or improved technology within the print industry, there will be an ongoing need for training.
I would like to dedicate this thesis to my parents, Jack and Fran, for always giving me love and support throughout my educational journey.
ACKNOWLEDGMENTS

I would like to thank my advisor, Dr. Donna Trautman, for her encouragement and dedication throughout my graduate program. I would also like to thank my committee for their inspiration and my family and friends for their support.
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Chapter I: Introduction

Context of the problem

It was predicted that print media of all kinds would decline rapidly during the past 20 years, being replaced by electronic media. The reasons this may not be the case is that the print industry (according to other sources) has been predicted to either stay stable or even grow during the next five years (Industry and Company Research Reports and Information, 2010). However, the most important reason is that printed materials can be both looked at and held. This impresses most people. Books, magazines, posters, newspapers, brochures, leaflets, and other printed materials continue to be popular communication media. This is a $74.2 billion industry as of 2010 (Industry and Company Research Reports and Information, 2010). Why does print continue to be popular? For many reasons, including that print materials do not have software crashes (although it can be on the way to becoming the printed piece), system failures, or a power supply in order to view it. Advertisers often choose a printed advertisement versus an email, web, television, or cell phone advertisement, because it cannot be turned off or deleted in less than a second (Bann, 2007).

Technological changes have made a significant impact within the print industry; this includes advances in computer systems and the Internet, which are resultant processes and have had an impact on how work is performed. For example, in the prepress stage of printing, processes that were usually completed by hand now are automated, that is, done via machines. Because of such advances, workers should be trained in the computer software and graphic arts in order for this type of work to be produced correctly and sufficiently (U.S. Bureau of Labor Statistics, 2010).
For students, there are many career opportunities within the printing industry. Students who study in print-related programs in either high schools or universities typically are attracted to the advancing technology of the digital print world, including high-speed presses, digital imaging, and the overall production phase (Adams & Dolin, 2002). The print industry will evolve because of the greater use of digital printing and shorter-run print jobs. In 2008, the print industry employed about 594,100 workers. These positions were in segments ranging from commercial to digital to book printing (U.S. Bureau of Labor Statistics, 2010).

As a result of the continuing influence that technology has had on the printing industry, the demand for educated and creative people is high. It is essential that workers have not only an interest in the printing field but also the motivation to learn new graphic communication processes, software, and equipment. “The printing companies that are successful today are the ones who realize that their role is to keep an eye on technological breakthroughs and evaluate how they can apply specifically to direct marketing strategies.” (Weishaar, 2010, p. 01) It is obvious that individuals in the industry need training for these cutting-edge technologies throughout their careers. This point leads one to question how such a task is efficiently and effectively accomplished.

**Problem of the Study**

The problem of this study was to identify the status of employee training in the Ohio print industry as it related to changes in technology, equipment, software, and processes.

**Objectives of the Study**

The following objectives were used to address the problem of the study.

- To identify what segments of the print industry that used training most often.
- To identify the most common topics in training in the print industry, whether they are soft skills, hard skills, hardware, software, and so on.
- To identify the employee areas that received the most training, that is, management, prepress, press operation and postpress.
- To identify the most common methods/implementations of training in the print industry.
- To identify whether the training provided is developed, implemented, or both, internally or externally.
- To identify future trends regarding the amount of training required in the print industry.

**Significance of the Study**

This study provided information that could be used by suppliers and production companies to make future training decisions. It also could help members of companies make decisions on how to conduct training more efficiently and effectively, which may lead to more productivity. This study also helped training professionals and educators understand the unique print-related technologies needed to further educate employees. It was also important to understand how this industry adapted as a result of the influence of technology and the changes in technology used to conduct training. To increase revenue within the print industry, companies must use new technology to improve internal training (IBISWorld USA, 2010).

**Limitations/Delimitations**

The following limitations were identified:

- The data was collected from a sample of members of the Printing Industries of Ohio and Northern Kentucky (PIANKO).
- The data was gathered from the most appropriate person in the company, not necessarily a training expert.

Assumptions

For the purpose of this study, the following assumptions were identified:
- All data collected reflect honest responses.
- Most employees currently working in the print industry must update their skills and knowledge.

Definition of Terms

Printing: Duplicating multiple copies of graphic images (Adams & Dolin, 2002)

Electronic media: Any daily form of communication involving the computer, the Internet, the television, or the phone (Brown & Marin, 2009)

Prepress services: All steps carried out before printing a document, which can include image scanning, retouching, print adjustment, creating of PDF files, etc. (Johansson, Lundberg & Ryberg, 2007)

Thermography: A combination of ink, powder and heat creates a raised finishing effect on a substrate, also known as die stamping (Bann, 2007)
Chapter II: Literature Review

Status of Print Industry

The printing industry has seven main printing processes: Flexography, Gravure, Screen, Offset Lithography, Digital, Xerography, and Inkjet printing. These can be grouped in the following way: those that produce products (e.g., newspapers, magazines, books, brochures, labels, newsletters, postcards, memo pads, business order forms, checks, maps, T-shirts, and packaging). The printing industry executes embossing, binding, finishing and prepress services (U.S. Bureau of Labor Statistics, 2010). The print industry can be described as including six types of businesses: (a) commercial printing; (b) form, label and tag printing; (c) greeting card printing; (d) specialty printing; (e) packaging printing, and (f) trade services. Each category of printing leads to various print products. For example, regarding commercial printing, most of the products can be placed into the following categories: general commercial, quick, magazine, newspaper, book, financial/legal, screen, and thermographic printing. Regarding trade services printing, most of their products include prepress services, trade binding, and other finishing services (Printing Industries of America, 2010).

The print industry also includes the corrugated industry, which has manufactured more than 345.6 billion square feet of material in the late 2000s. This equated to be a $23.6 billion industry (Careers in Corrugated, 2010), another booming part of the commercial printing industry that has increased from 2005 through 2010. According to First Research, the commercial printing industry comprises 35,000 companies that have $100 billion in annual revenue. First Research also predicted a 2%-3% increase in the revenue growth for the printing industry by 2012 (Research, 2009).

“Printing as a method of production cannot be considered a ‘stand-alone’ process. It is
linked to the other processes within the value chain of print media production. All of these processes are interdependent, and they often depend on each other to create added value and revenues.” (Institute of Technology, 2007, p. 4) This is shown in Figure 1. Various products and careers are incorporated into this model because of the involvement each of them have within the printing industry.

![Figure 1 – Interdependent value chain activities (Romano, 2001)](image)

Many widely known trade associations support the print industry including, the Printing Industries of Ohio and the Northern Kentucky Organization (PIANKO), the Screen Printing Technical Foundation (SPTF), the Specialty Graphic Imaging Association (SGIA), the Packaging and Label Gravure Association (PLGA), the Flexographic Technical Association
(FTA), the National Association for Printing Leadership (NAPL) and the Printing Industries of America (PIA).

PIANKO, a regional association for Ohio, focuses on their members’ programs and services to improve the profits in their company. The organization provides brochures, career guides, college guides and videos to students in order to raise awareness of the print industry. They also provide research to a given company to better educate its employees on a specific area of the print industry. Conferences and workshops can be set up for companies, and current industry statistics can also be supplied if they are requested (Printing Industries Association, Inc., 2010).

The main purposes of SPTF are to accelerate and to shape the screen-printing industry, making it more cost efficient. The Foundation offers hands-on workshops, innovative training resources and provides research, which creates more knowledgeable and efficient employees. This makes a business more productive and profitable. (Specialty Graphic Association, 2010)

The SPTF also provides research concerning guidelines for specific production concerns.

“The Packaging and Label Gravure Association (www.PLGA.com) Global was founded to advance the technology and utilization of gravure printing in such areas as folding cartons, flexible packaging, label printing, and other specialty applications. It is the leading packaging, label, and product printing/converting educational association for promoting the gravure printing process and educating its target audiences.” (Promoting the Power of Gravure Around the World, 2010, para. 01)

(A relevant quotation about another trade organization follows) “Internationally, SGIA is the only known association for specialty imaging. This association uses digital printing, screen printing, embroidery, sublimation and pad printing to create new products or add value to
existing products. Members of the association could create such graphics as point of purchase displays, banners, signs or advertisements. Being a part of SGIA, members share ideas, insights and innovations throughout the print industry through workshops and seminars.” (Specialty Graphic Association, 2010, para. 3)

GATF is another trade organization that was created for both the graphic arts and the print industry. The GATF, which was founded in 1924, began as the Lithographic Technology Foundation. The main focuses of this organization have been lithographic printing, mechanical press technologies, and digital printing. In 1999, Graphic Arts Technical Foundation merged with the Printing Industries of America (PIA) and together they were combined to create the Graphic Arts Information Network (GAIN) (Printing Industries of America, 2010).

The largest graphic arts association in the world is the PIA; it represents an industry that employs approximately one million people. Ten thousand companies are members of the PIA. This organization conducts research and supports different members who handle printing techniques (i.e., lithographic printing, mechanical press technologies, digital printing, and more). Members of PIA share knowledge, advocacy, education, research, and technical information (Printing Industries of America, 2010).

Because of the various printing methods that are still active today, trade associations continue to grow with new members and up-to-date knowledge of printing. These printing methods include Flexography, Gravure, Screen, Offset Lithography, Digital, Xerography, and Inkjet printing.

Flexographic printing is the least expensive and simplest printing process in the industry. If used, it offers good quality imprints on different substrates. Flexography presses are mainly used in the production of newspaper, comics, directories, newspaper inserts, and catalogs.
Flexography is also used for the packaging industry for the production of folding cartons, labels, and packaging materials (Environmental Information for the Printing Industry, 2010).

Gravure printing consists of a printing cylinder, an impression roll (made of rubber), an ink fountain, a doctor blade, and a means of drying the ink. “Gravure presses show great variation in size, ranging from presses with cylinders two inches wide, designed to print wood grain edge trim, to cylinders 20 feet wide, designed to print paper towels” (Environmental Information for the Printing Industry, 2010, para. 03). Most gravure printing done today uses engraved copper cylinders protected by a thin electroplate of chromium (Environmental Information for the Printing Industry, 2010).

Screen-printing is the most versatile of all printing processes. Various substrates can be used in screen-printing, including paper, paperboard, plastics, glass, metals, fabrics, and many other materials. There are various products that are printed from screens, some of which include posters, labels, and decals. Screen-printing can use substrates of any shape, thickness, and size. A big factor of screen-printing is the use of ink. Any thickness of ink can be applied to the substrate, which is not possible in other printing processes (Environmental Information for the Printing Industry, 2010).

Offset Lithography is based on the principle that oil and water do not mix. It is the most common printing process, and it prints from an image carrier. There are two types of offset printing: sheet fed (single sheets) and web fed (rolls of paper). Web fed is most suitable for larger print jobs, while sheet fed is most suitable for shorter runs, about 50-50,000 copies. Inside the offset press, there are different cylinders: impression, blanket, and plate cylinder. Depending on how many colors are in the specific project will result in how many cylinders are in the press.
Each cylinder can hold one color. An offset press can hold up to eight colors at a time (Johansson, Lundberg & Ryberg, 2007).

Digital printing offers variable data printing, fast turnaround time with each job, easy to update products/layouts, and the ability to print and deliver the job to the customer. The most widely talked about feature of digital printing is the ability to produce short run jobs at a low price. These kinds of characteristics are not available with other printing processes (Romano, 2000).

Xerography printing is a photocopying process in which the toner (liquid or dry) replaces the ink. Once the image is formed it is sealed or dried by heat (Xerography - Printing Glossary, 2007). The process of Xerography became available in 1950 by the Xerox Corporation (Tyson, 2010).

The last printing technique discussed is Inkjet printing, which places extremely small dots (usually between 50 and 60 microns in diameter) on paper to create an image. The dots are multicolored with such resolutions as 1440x720 dots per inch that are combined together to create a good quality image (Tyson, 2010).

Each type of printing technique within a company has a unique set of employees that bring its own revenue and wages to the industry such as prepress production, design, print production, manufacturing, etc. (U.S. Bureau of Labor Statistics, 2009). For example, in 2008, production workers in the print industry earned a weekly average of $643, compared with all production workers in manufacturing who earned $724 weekly (U.S. Bureau of Labor Statistics, 2009).
**Training in Industry**

There are many ways an employee can be prepared, trained, or educated in the print industry. Before entering the industry, employees have skills that are the result of experience, training or formal education. Whatever level of training a person has completed will help to determine the amount of training that he or she will need when entering a specific position.

For instance, high school or vocational school graduates entering the print industry are typically trained informally and on the job. This level of training will allow them to be trained for a “helper” position. After training and gaining experience, those workers may advance to more responsible positions such as skilled craft jobs or even supervisors (U.S. Bureau of Labor Statistics, 2009).

In production occupations, employees must have at least vocational degrees or associate degrees; they are then informally trained on the job. Employers prefer employees to possess graphic design/communication educational backgrounds, particularly for prepress technicians. It can take several months to be fully trained to operate complex machinery like a printing press (U.S. Bureau of Labor Statistics, 2009). Production workers also need to be detail oriented, have communication skills, be computer savvy and be able to work under pressure because of the tight deadlines (U.S. Bureau of Labor Statistics, 2009).

In professional and administrative occupations, most employers prefer a bachelor’s or associate’s degree for entry-level design or administrative positions. Graphic designers and desktop publishers usually complete a two or four year program in graphic communications or graphic design. They also complete on-the-job training. Within the first 1 to 3 years, workers may learn new skills before being qualified for supervisory positions (U.S. Bureau of Labor Statistics, 2009). The employees need to possess computer skills, design software knowledge, be
detail oriented and creative, and possess the ability to meet deadlines (U.S. Bureau of Labor Statistics, 2009).

According to the Bureau of Labor Statistics, professions in the print industry can include the following: prepress technicians, “preflight” or prepress workers, printing machine operators, job printers, bindery machine operators, book binders, desktop publishers, illustrators, graphic designers, customer service representatives or production coordinators, truck drivers, cost estimators, and sales representatives.

**Training Methods in Print Industry**

In the print industry, companies use a variety of training methods for both current and newly hired employees. These training methods include lectures or courses, podcasts, webcasts or webinars, workshops, seminars and conferences, and tutorials or interactive modules (Printing Industries of America, 2010). The increased competition in the print industry and advances in technology often create diverse backgrounds and knowledge for the staff in a particular company. This creates a challenge within the print industry because of the critical need for organized, structured, and consistent training (Printing Industries of America, 2010).

The Printing Industries of America offers courses/lectures that include both knowledge concepts and operational procedures demonstrated in industry (Printing Industries of America, 2010). These courses include: Sheet-fed Offset Press Operating, Web Offset Press Operating, Bindery and Prepress Skills. The Printing Industries of America curriculum focuses around training and re-training staff quickly and effectively (Printing Industries of America, 2010). The Printing Industries of Minnesota Education Foundation offers specific courses to train their employees (PIMN.org Printing Industry Minnesota, 2009). The classes include training in
printing, binding, communication, software (Illustrator, Indesign and Photoshop), marketing, and sales. It also offers webinars and podcasts for these same types of skills.

Because of a high demand of customized training for individualized needs, Heidelberg’s Print Media Academy (PMA), which is partnered with Heidelberg USA’s North American Print and Packaging Technology Center, has increased the training and techniques needed for increased efficiency and profitability.

There are 12 full-time trainers within the Heidelberg USA’s Technology Center who can conduct up to five training classes per day. These classes range from prepress to press to postpress offering a wide range of services combining the experience of the trainers and experts (Druckmaschinen, 2010).

Webcasting is defined as “the broadcasting of news, entertainment, etc., using the Internet, specifically the World Wide Web” (Dictionary, 2011, para. 01). Many organizations offer webcasting as a part of their training options. Currently, SGIA offers webinars (webcasting) titled, “Stop Losing Jobs to Lower Prices,” “Ten Essential Graphics Production Trends for 2011,” “Ten Essential Garment Decoration Trends for 2011,” and “Controlling Three-Dimensional Ink Deposition for Demanding High-Performance Screen Printed Applications.” SGIA webinars present essential information about the most current industry topics. These topics include anything from imaging technologies to business management issues. A few examples of the upcoming webinars include: wide-format digital imaging, screen graphics, finishing techniques, graphics installations, and business management (Specialty Graphic Association, 2010).

Workshops and/or seminars are other training methods used in the print industry. There are many workshops and seminars that are offered to train employees. The Printing Industries of
Northern Kentucky and Ohio (PIANKO) offer high quality, printing-related workshops and seminars such as color management, special press problems, process controls, safety issues, sales and customer service, etc. PIANKO develops their seminars to be more efficient, productive and knowledgeable toward each employee training method (Printing Industries Association, Inc., 2010). The Printing Industries of America (PIA) conduct training workshops to increase skill sets in pressroom crews, improve workflows in both prepress and the pressroom, help implement new, productivity-enhancing technology, and an introduction to graphic arts reproduction for those who want to update their knowledge of the printing industry. The workshops are developed to go beyond classroom and theory training; they are designed to use demonstrations and hands-on experience to increase employees’ skill set. This includes the latest software, prepress, pressroom, and bindery equipment training (Printing Industries of America, 2010).

The Specialty Graphic Imaging Association (SGIA) guarantees a personal learning environment for their trainees. The trainees receive hands-on training because of the small class sizes and personal attention they are given. The current workshops SGIA offer include “Graphics Four Color Process” and “Textile Printing” (Specialty Graphic Association, 2010).

Heidelberg offers workshops that cover prepress, pressroom, and bindery press check essentials. Prepress topics include the prepress process, color management, hard proof vs. soft proofs and what to look for in a proof and the process of computer to plate. The pressroom workshop trains in the areas of how to conduct a press check, press check etiquette, what to expect of a press check crew, and proof vs. press sheet matching. The session on bindery press check essentials covers the press check procedures, finishing processes, and the opportunity to view samples of folding and finishing techniques. (Druckmaschinen, 2010).
Interactive modules or tutorials are also used for training purposes. NAPL offers their employees or other companies business modules that include information regarding assessment, financial performance, leadership and governance, NAPL tools, operations, marketing and sales, and strategic planning. In these categories, various modules are offered such as “Press Sheet Quality Assessment”, “Training Account Executives to use Marketing Materials”, “General Workflow Audit”, etc. (NAPL - National Association Printing Leadership, 2010). The training modules SGIA produces include a series of videos and quizzes for each topic. After each topic is introduced, the trainee will take a quiz to see how much information he/she retained. At the end of the module, the trainee’s name, type of module, date of completion and the quiz score is presented on a Certificate of Completion if the trainee receives a 90% or higher on the quiz. The current modules include color management, mesh, frames and tensioning systems, stretching a static frame and stretching a retensionable roller frame (Specialty Graphic Association, 2010).

Heidelberg’s Print Media Academy offers the trainers a certification program using demo equipment, models, simulations, and video presentations. These classes within the program explain how adults learn, designing high-impact learning, and the delivery of technical training of Heidelberg software and equipment (www.us.heidelberg.com, 2010).

The Effect of Technology in the Print Industry

The digital age has facilitated various improvements and upgrades to transform the print industry. These new innovations have affected the prepress, press and post press of the industry. Digital printing has become the new standard. The traditional preparation of images (type, line drawings or continuous tone images) used to be done by hand but almost all of them have been completely replaced by digital technology (Adams and Dolin, 2002).
**Prepress printing.**

Prepress is a collective name for all of the steps taken before the actual printing is done (Johansson, Lundberg and Ryberg, 2007). In prepress, a computer can generate, manipulate, edit, and output monochrome or color images. It can also “assemble full pages of type and graphic images, separate complex images into primary colors, scan and digitize type and images prepared by hand, and receive information from telephone lines, cable and satellite.” (Adams and Dolin, 2002, p. 141) There has also been advancement in transferring this content from one place to another. The content can be sent to the same facility in a different department or across the world. The computer allows the access to publish projects on the Internet; can track the project’s progress, compile work standards; and deliver data that was not possible a decade ago (Adams and Dolin, 2002).

Other components of prepress are page layout and the many variables needed in the layout to provide a press ready file. These variables include page layout software, drawing or illustrating software, fonts, preflight, digital halftones, color management, and digital trapping and imposition.

Page-layout software allows for the page elements to be assembled before being sent to the specific output device. One file could include text, line art, and photography. Software programs such as Adobe InDesign and QuarkXpress allow designers, layout artists, advertisers, and anyone who needs page layout programs to create print products. It was not until the 1990’s that hardware and software integrated text and graphics. This includes high-resolution line art, gray scale images and 24-bit special effect color images (Adams and Dolin, 2002). Ten years ago, “Digital prepress page layout has become the standard for the graphic communicator for the following reasons: ability to produce design variations, ability to make changes to the final
layout, local control or image input and manipulation, inexpensive and low-resolution proofing, film and/or plate output directly from computer, quick turnaround on customer alterations, proof films and overall production and the ability to keep the entire production cycle in-house.” (Adams and Dolin, 2002, p. 186)

Drawing or illustrating software creates vector objects or object-oriented type. These kinds of software programs such as Adobe Illustrator use what is called the PostScript language to manipulate art and type. A mathematical equation is assigned to each line or curve of the image, which is then computed by the software to create vector points. Because of this, the images can be enlarged, reduced or manipulated without losing detail or quality. These postscript images need to be converted to bitmaps, also known as rasterizing, in order for them to print. To accomplish this, a raster image processor (RIP) is used to convert the object-based graphics to bitmapped images so the output device understands the image (Adams and Dolin, 2002).

Image-editing software such as Adobe Photoshop creates raster images that are made up of pixels and are already considered bitmapped. Photo manipulation such as cropping, sharpening, hue, color balance, saturation and contrast adjustments, special effects, and restoring damaged or incomplete image sections are a few processes that are possible in a digital workflow. The manipulated images are then ready to be saved in their proper format and placed into a page layout program (Adams and Dolin, 2002).

There are two basic font types that are in use today: PostScript Type 1 fonts and TrueType fonts. PostScript Type 1 fonts has a screen font and a printer font. TrueType 1 fonts include the display font (on screen) and the output font in a single file. Even though the TrueType 1 seems more convenient, it can cause problems when outputted on high end
PostScript devices. Because of this, OpenType, which is considered a PostScript Type 1, are more commonly used in page layouts to avoid preflight problems (Adams and Dolin, 2002).

Preflight is a process by which a file is reviewed, proofed and adjusted to correct any errors using special preflight software before printing on a plate or film (Johansson, Lundberg and Ryberg, 2007). “Some of the most common things that good preflighting prevents are the following problems: corrupt or missing fonts, missing images, improper trapping, wrong page sizes, incorrect color designations, inadequate bleeds and unusable media.” (Adams and Dolin, 2002, p. 190) This digital technology not only alerts the user about the problem but also lists suggestions to help guide the user to a solution.

Digital halftones are generated for output devices such as laser printers, computer-to-plate and image setters. These output devices print spots or dots to make up the image on the substrate. All of the dots cannot be the same size or there couldn’t be any kind of variation of tone. A halftone cell, which is made up of a certain number of spots, was created to avoid such an occurrence. This creates the corresponding halftone dot that can now appear as varying tones. “The greater the amount of spots contained within a cell, the greater the levels of gray that can be achieved.” (Adams and Dolin, 2002, p. 191)

With color management, the colors that are on screen will match a printed proof and ensure an exact match to the printing press. “Digital prepress changed everything, with color decisions and choices being made far earlier in the process and less highly trained individuals being able to output proofs on relatively inexpensive proofers.” (Adams and Dolin, 2002, p. 199)

The concepts of digital trapping and imposition have not changed over the years but in fact the location of where they occur has changed. The process of trapping has been incorporated into either the design phase or the output phase of the production cycle, using such software
programs as Adobe Illustrator and QuarkXpress. “Imposition is the correct positioning of pages on a press sheet so that, when folded into a signature and cut, the sequence of pages will be correct. Traditionally, this was not a concern of the designer, but, once again, digital prepress has allowed for the movement of processes to earlier points in the workflow.” (Adams and Dolin, 2002, p. 200)

Press.

In 1444, Johannes Gutenberg invented the first movable type printing press. He immediately started working on printing a bible (called the Gutenburg bible), which was published in 1446 (Bann, 2006). “Since Gutenberg developed his first printing press, major improvements have been made in press design. These improvements increased both the speed and the quality with which work can be printed. Modern press designs are the result of changes in the method used to move paper through the press and in the method used to transfer an image.” (Adams and Dolin, 2002, p. 224)

If Gutenburg’s press were still in operation, it would be labeled as a platen press. On this type of press, the paper is placed in between the platen (flat surface) and the type form. The image is transferred to the paper when the platen and type form are brought together. By this time, feeding, registration and delivery units have been automated but the platen press still holds the problem of being a very slow process. The paper is held in the same position during the printing process until the platen opens, which is when the paper is removed by hand. Other problems include the limited size of paper the press can hold and the pounds of pressure the transfer of an image takes to print. For example, an 11x14 inch image needs 26,950 pounds of pressure to produce the prints (Adams and Dolin, 2002).
Because of the multiple problems from the platen press, the flatbed cylinder press was constructed to increase the production speed and quality of the prints. The flatbed press has one cylinder inside so that as the press sheet comes in contact with the type form, a cylinder moves across the press to ensure accuracy and stability. To ensure position of the press sheet, grippers or mechanical fingers hold the press sheet in place until they release at the end of one rotation. This process repeats for every sheet that is fed through the press (Adams and Dolin, 2002).

The third type of press is called a rotary press in which two cylinders are used. One cylinder holds the type or the image (plate cylinder) and the other cylinder (impression cylinder) pushes against the press sheet to the plate cylinder. As the cylinders rotate in opposite directions, a press sheet is placed between them so the image is transferred in the same position on every sheet. Ink rollers continually replace the ink for every sheet that passes through (Adams and Dolin, 2002).

The inventions of these types of presses make three out of the seven printing processes possible. These include offset lithography, gravure and flexography. Each of the processes has their own unique niche to ensure their presses productivity. Three other processes, xerography, inkjet and digital printing, are categorized under digital printing. Each of these processes also possess their own factors to continue their productivity.

Xerography is based upon toner being transferred onto the image and is used in laser printers, copiers and digital printing. The factors that enable this process are the charging of the photographic conductor (rotating drum), the laser beam exposure and the transfer of the toner particles and heat application. Through the rotation of the drum and an octagon shaped mirror, the electrically charged laser is given the space it needs to print each line of the image (Johansson, Lundberg and Ryberg, 2007).
“Digital printing is a method of printing that is ideal for shorter runs or color and black and white work. Unlike most of the other printing processes, it does not require film or a plate to be made. Instead, it takes a file (PDF, PostScript, or other suitable file) and transfers the image digitally to the printing device.” (Bann, 2006, p. 96) Since there is not any printing plate, the impression on each sheet can change allowing the recipient to receive a “personalized” product. This process has also enabled there to be short run printing and print on demand. There are two ways an image can be transferred to the press sheet: Xerography or electrophotography, which was explained earlier and magnetography. Magnetography has a magnetic coating on its printing drum. It uses tiny electromagnets to be exposed to magnetic toner particles, which are then transferred to the paper to create the image (Bann, 2006).

Inkjet printing also prints an image from a digital file. Droplets of ink, called a dot matrix, produce the printed image and text on the paper. Inkjet presses can create small, large or very large format jobs. Large format inkjet presses can print on a variety of substrates such as plastic, posters, metal or wood (Bann, 2006).

The last of the seven processes that has advanced due to technology is screen printing. Screen printing is categorized in its own process because of the versatility and unique variables it needs to produce products. Instead of a cylinder or a drum, screen printing uses a thin, fine cloth stretched across a wood or metal frame. Its own screen separates each color that is used in screen printing. This process’ advantage is the diverse range of products it can be printed on such as porcelain, fabric, metal, cardboard, etc. Over time, screen printing has become more digital in that the emulsion and the spreading of the ink through the screen are automated. It can now be done by hand (manually) or by machine (automated) to produce screen printed products (Johansson, Lundberg and Ryberg, 2007).
Postpress.

Each job that is printed from any of the printing processes rarely gets sent to the customer straight off the press. The majority of printed products need additional work to meet the requirements of the job or end product. The processes performed after the job are called finishing or postpress. These processes include cutting, folding, assembling and binding. Specific techniques are considered finishing as well such as embossing, perforating, scoring and die cutting.
Chapter III: Methodology

The following research processes were identified to carry out this study. This chapter includes the restatement of the problem, research design, general characteristics of the study populations, data collection instrument, data gathering procedures, pre-testing the data instrument, procedures of data analysis, protection of human subjects, the timeline, and the budget.

Restatement of Problem

The problem of this study was to identify the status of employee training in the Ohio print industry as related to changes in technology, equipment, software and processes.

Research Design

A descriptive study was used to implement the objectives of this study. This research captured information regarding employee training from appropriate printing company representatives and described the status at this point in time.

General Characteristics of Study Population

The population of this study was Ohio printing companies. The sample used for this study was 200 members or clients of the Printing Industries of Ohio and Northern Kentucky Organization (PIANKO). The training directors or administrators of each company who were in charge of facilitating the training were used for this study. Currently there are 450+ member companies.

PIANKO’s mission statement states that the organization “will provide programs, offer services, and promote an environment which assists members to improve profitability, adapt to the future and support the printing industry.” (Printing Industries Association, Inc., 2010, para. 01) The organization offers its members a resource network, member-to member networking,
employee education and motivational programs, training conferences, industry financial studies, access to industry information and statistics, trade shows and exhibits, and technical, production and efficiency consulting services.

A second survey of this study was sent as a Portable Document Format (PDF) to collect data from an expert in industry. This expert was an Education and Employment Coordinator. The questions included information regarding the methods of training, the importance of training, concerns for training, etc.

**Data Collection Instrument**

This study used SurveyMonkey, which is an electronic survey to disseminate the study instrument. An electronic survey was used because the sample population could be contacted through their email. The email addresses were requested from PIANKO. There are two reasons why an electronic survey was chosen to complete this data: lower cost and convenience for the respondents. The survey questions consisted of multiple-choice questions, rating scale, and open-ended questions.

SurveyMonkey (surveymonkey.com) allowed the researcher control of the survey design and included responses with a range of file formats. It also provided analyzed results. This electronic survey has been operating since 1999 and has used its 11 years experience to make their web survey tools strong enough for researchers yet easy enough for amateurs. There are 15 question types that are ready to use as well as formatting options to randomize the questions, add comment fields or changing size and placement. To collect responses from the survey, the user can create a link to send in every email message, upload the email addresses so that SurveyMonkey can send an invitation, or create a pop-up invitation for a company’s web page.
To analyze the results, charts, graphs and a survey report are sent to the creator (SurveyMonkey, 2010).

The data collected was not used for SurveyMonkey’s own use, only for this study. The information was guaranteed to be safe, private, confidential and is always to be up and running. There was an enhanced security option with every survey to secure the information or private documents that was sent via the Internet. This also allowed the creator to download the analyzed results over a secure channel. The data was backed up within SurveyMonkey every hour and backed up every night externally to a centralized backup system.

The survey instrument utilized the objectives stated to carry out the study. (Appendix A) It contained open-ended questions, multiple choices, and range scale questions. In section one of the survey, the representatives were asked to provide demographic information about their company such as the number of employees, training resources, training topics, print categories, etc. Section two of the survey gathered information regarding their training methods. These questions addressed the methods of training used in each print-related area. Section three of the survey collected information regarding internal or external training, print-related training topics, hours of training conducted, future trends, etc. Another focus for the survey was about how new technology had affected the content and delivery of the training. The data was collected to evaluate how technology had affected the employee training in the print industry. All data collected was held confidential and all data was reported as group data only by the researcher.

**Data Gathering Procedures**

The sample of this study was asked to complete an electronic survey included in an email, which was the primary means of communication. The survey, and the invitation letter (Appendix B) were sent (via email) to a representative from The Printing Industries of Ohio and
Northern Kentucky Organization to randomly send to 200 of the member companies. After initially sending the survey and invitation to participate to the sample, a reminder email was sent to those in the sample that had not responded. The participants were given one more week following the reminder to complete the survey. The researcher had access to the data on the SurveyMonkey site utilizing a password. All data was confidential and was presented to the researcher on a spreadsheet.

Another survey was sent to an industry expert as a Portable Document Format (PDF). (Appendix C) This industry expert holds a position as an Education and Employment Coordinator. The researcher collected the responses from the expert then reported them anonymously.

**Pre-testing the Data Instrument**

A pilot test of questions included in the survey was administered to three professors in the College of Technology at Bowling Green State University. The professors were all in the technology field and had undergone additional printing-related training at least once in their career. This aided in any issues with uncertainty or insufficiency in the survey. These professors were asked to review and complete the survey. The survey was edited based on their expertise.

**Procedures of Data Analysis**

SurveyMonkey allowed for the data collected from the electronic survey to provide graphs, charts, a data report, and an Excel document of the data. The data SurveyMonkey cannot compile into a chart or graph will be analyzed from Microsoft Excel as descriptive statistics. The data analysis also included the open-ended questions from the survey.

**Protection of Human Subjects**
All of the research that included the involvement of human subjects was within the guidelines set by the Human Subject Review Board (HSRB) at Bowling Green State University. The HSRB Application and approval included the use of clients from PIANKO, BGSU professors and the electronic consent and instrument needed for the study. (Appendix D)

**Timeline**

The following was a timeline used over the course of the study from September 2010 to July 2011.

- September – November: Proposal Development
- November 24: Proposal to Committee
- December 2: Proposal Defense
- December 8: Develop Survey Instrument
- January 3: Develop Survey Instrument
- January 10: Develop Pilot Test Survey
- January 17: Implementation of Survey
- February 7: HSRB Survey Approval
- February 14: E-mail Survey to Professors
- February 21: Survey due; Send reminder email
- February 28: Survey due (after reminder email sent)
- March 7: Compile Survey Results
- March 14: Complete Chapters 4 and 5
- April 27: Thesis to Committee
- May 4: Thesis Defense
- August 15: Thesis uploaded/Submitted to Graduate College
Budget

The following was identified as the budget for the survey instruments used in this study.

- Electronic Survey from SurveyMonkey
  - Billing for month of March: $23.99
  - Billing for month of April: $23.99
  - Content Editor: $102.02
  - Total: $150.00

Summary

A descriptive study was used to research the status of employee training in the Ohio print industry. The population used was the members of the Printing Industry of Ohio and Northern Kentucky Organization listed in the general characteristics of the population section. The data was collected using an electronic survey called SurveyMonkey and analyzed by SurveyMonkey and Excel. The Human Subject Review Board guidelines at Bowling Green State University were followed.
Chapter IV: Findings and Analysis

The following chapter contains the analysis and results of this study. The findings of the impact of technology on training in the Ohio print industry are provided.

Background Information

A survey including multiple choice, multiple answer and open-ended questions were developed for this study. (Appendix A) A panel of three faculty members with experience with both the printing industry and survey development reviewed the survey questions.

Based on the panel’s feedback, the questions were modified to improve the survey. The questions included demographic information regarding the respondent, methods of training and training administration. The last question of the survey was intended to help predict future training trends for further use in education and in the print industry.

Survey: Return Rate

The Printing Industries of Northern Kentucky and Ohio Association (PIANKO) agreed to help identify the random sample for the study and send the survey out to those selected. The survey was sent to a random sample of 200 individuals. These individuals are representatives of the companies who are members of the Printing Industries of Northern Kentucky and Ohio. The membership is comprised of 450+ member companies. The 200 individuals selected to complete the survey were sent the initial email consent letter including an electronic survey link. A reminder email was sent five business days later to the recipients who did not respond to the first email request for participation. The electronic survey was split into three sections: basic information, methods of training and training administration. It was separated into three sections to give the respondent an outline of the next questions to be answered and also, to give the survey organization and structure throughout.
Four individuals of the 200 in the sample responded to the survey and the response rate was 2%.

A second set of survey questions was sent to an Education and Employment Coordinator to supplement the data collected from the initial survey. This data was strictly opinion based and was answered based on the person’s knowledge and experience with the print industry. The responses from the expert are included at the end of each relevant section.

**Survey Section 1: Basic Information**

The basic information questions included the employee demographic of their position in the print industry, number of years worked in industry and current position, the primary printing process, company employment, the education of the employee and the areas of training conducted in the industry.

The individuals responded to their company’s primary printing process(es). One hundred percent or four of the participants specified that their primary printing process was offset lithography, 75% or three specified digital printing, 25% or one specified Xerography, and 25% or one specified Inkjet. There was also one of the participants who specified “other” as their primary printing process and indicated letterpress (this is not shown in the provided graph). The question asked, “Which is your company’s primary printing process(es)? Select all that apply.” Figure 2 shows the responses of the primary printing processes.
The participants responded to their specific job title. One hundred percent or four of the participants specified their job title as the CEO/President. The job titles that were not chosen in the question were training director, manager or human resource manager. The question asked to identify the job title of the participant.

The participants responded to whether training was their primary or secondary responsibility. They also could have chosen “none of the above.” One hundred percent or four of the participants specified training as their secondary responsibility.

The participants responded to the question regarding the degree they have obtained in higher education. Three of the four respondents specified their degree as a Bachelor of Science. One respondent also selected the “other” option and specified they received a Certified Public Accountant degree. The next question asked, “If you have completed higher education, what degree(s) did you obtain? Select all that apply.” One respondent did not choose to answer this question.
Two participants responded to the fill-in question that asked of the name of their undergraduate major, if they had completed higher education. One participant responded that they had an engineering degree; a second participant provided a Bachelors of Arts degree. Two respondents of the survey skipped this question.

The participants responded to the number of people currently employed at their company. The question asked how many people does your company (at your site only) currently employ. Twenty five percent or one of the participants specified his/her company employs 26-50 people. Twenty five percent or one of the participants specified his/her company employs 51-75 people and 50% or two of the participants specified their company employs 76-100 people. Figure 3 shows the responses of the number of people employed by the respondents company.

![Figure 3: The Current Number of People Employed at the Respondents Company](image)

In response to the question, “How many years have you been at your current position,” the participants responded. Twenty five percent or one of the participants worked at his/her current position for 3-5 years, 25% or one of the participants worked at his/her current position for 6-10 years and 50% or two of the participants specified working at their current position for
16-20 years. Figure 4 shows the responses of the number of years the participant have worked at their current position.

![Bar chart showing the number of years respondents have worked in their current position.](image)

**Figure 4: The Number of Years the Respondents have worked in their Current Position**

The participants responded to the question regarding the number of years they have worked in or related to the print industry. Twenty five percent or one of the participant’s specified working in the print industry for 16-20 years and 75% or three of the participants specified working in the print industry for 20+ years. The question asked how many years have you been working in or at a position related to the print industry. Figure 5 shows the responses of the number of years the participant has worked in or related to the print industry.

The print industry expert indicated working in the print industry for 17 years. The expert response is not included in Figure 5.
One hundred percent or four participants responded to the employee areas of training their company conducts for their company regularly. The question asked to select all the areas that apply. Seventy five percent or three of the responses specified prepress as their regularly conducted training, 50% or two of the responses specified press/operating technicians, 25% or one of the responses specified postpress/finishing, 50% or two of the responses specified business/customer service/sales and 50% or two specified management. Figure 6 shows the responses of the employee areas that training is conducted for regularly.

The expert response specified all of the employee areas needed training regularly. The expert response is not included in figure 6.
In response to the question, “In the most recent training you have implemented and/or conducted, what were the topic areas presented in the training, Select all that apply,” the participants responded. Seventy five percent or three specified prepress/preparing documents to be print ready, 25% or one specified press operation, 25% specified or one specified postpress, 100% or four specified software skills, and 50% or two specified hardware skills.

The participants responded to the areas of training implemented in the past month. The question asked to select all that apply to the topic areas conducted and/or implemented in their company in the last month. Fifty percent or two of the participants specified conducting training in prepress/preparing documents to be print ready, 50% or two of the participants specified press operation, 25% or one of the participants specified post press, 75% or three of the participants specified software skills and 25% or one of the participants specified hardware skills. Figure 7 shows the responses of the areas of training conducted or implemented in the past month.
One hundred percent or four of the participants responded to the question asking if their company’s new employees receive orientation training. Seventy five percent or three of the participants selected yes and 25% or one of the participants selected no. The participants who selected yes were asked to then specify the topics that were covered in the orientation training and to select all that apply. One hundred percent or three of the four participants specified software, company policy, benefits and product information were all covered in the new employee orientation training.

**Survey Section 2: Methods of Training**

The second section, methods of training, included questions relating to the various training methods in the print industry. The methods include a podcast, webcast, workshop or seminar, course or a lecture, interactive module or tutorial and video. This section illustrates which training method(s) are effective in specific areas of training such as prepress, press operation, post press, software, hardware and management based on the respondents.
The participants who took the survey responded to the methods of implementation used in their training. The question stated to select all that apply. Fifty percent or two of the participants specified using a webcast as their method of training, 75% or three specified a workshop or seminar, 100% or four specified a course or a lecture and 25% or one specified an interactive module or tutorial. Figure 8 shows the methods of implementation used in training.

The print industry expert specified a webcast, podcast, workshop or seminar, and an interactive module or tutorial are all methods of implementation used to conduct training in the print industry. The expert response is not included in figure 8.

![Bar Chart: What methods of implementation have you used in your training? (n=4)](chart)

**Figure 8: The Current Methods Implemented in Training**

Based on the methods implemented in training, the participants specified the most effective for training in prepress. The question stated to select all that apply. Twenty five percent or one of the participants specified the question was not applicable, 25% or one specified a webcast, 25% or one specified a workshop or seminar, 50% or two specified a course or a lecture and 50% or two specified an interactive module or tutorial. Figure 9 shows the effective training methods in prepress printing.
Based on the methods implemented in training, the participants specified the most effective for training in press operation. The question stated to select all that apply. One hundred percent or four of the participants specified the question was not applicable. Two respondents selected “Other” and filled in “Sent to Press Mfg School” and “Hands on Training.”

Based on the methods implemented in training, the participants specified the most effective for training in post press. The question stated to select all that apply. One respondent skipped the question. Two of the three participants specified the question was not applicable. One of the three participants specified an interactive module or tutorial. One responded with “other” and specified, “Hands on Training.”

Based on the methods implemented in training, the participants specified the most effective for training in software. The question stated to select all that apply. Fifty percent or two of the participants specified a webcast, 25% or one of the participants specified a workshop or seminar, 75% or three of the participants specified a course or a lecture, 75% or three specified
an interactive module or tutorial and 25% or one specified a video. Figure 10 shows the effective training methods in software.

Figure 10: The Effective Methods of Training in Software

Based on the methods implemented in training, the participants specified the most effective for training in hardware. The question stated to select all that apply. Twenty five percent or one of the participants specified the question was not applicable, 50% or two of the participants specified a workshop or seminar, 75% or three of the participants specified a course or a lecture and 25% or one of the participants specified an interactive module or tutorial. Figure 11 shows the effective training methods in hardware.
Considering all of these methods, which did you find to be effective for training in Hardware? (n = 4)

Figure 11: The Effective Methods of Training in Hardware

Based on the methods implemented in training, the participants specified the most effective for training in management. The question stated to select all that apply. One respondent skipped the question. One of the three participants specified the question was not applicable, one of the participants specified a webcast, one of the participants specified a workshop or seminar, one specified an interactive module or tutorial and one participant specified a video. Two of the participants selected “other” to fill-in “On the job training” and “All of the above – hands on too.” Figure 12 shows the effective training methods in management. The “other” fill-in responses are not shown in figure 12.
Based on the methods implemented in training, the participants responded to the question regarding the methods to be used in the future. The question stated to select all that apply. Twenty five percent or one of the participants specified a webcast, 75% or three of the participants specified a workshop or seminar, 75% or three of the participants specified a course or a lecture, 50% or two of the participants specified an interactive module or tutorial and 50% or two of the participants specified a video. Figure 13 shows the methods of training the participants believe will be used in the future.

*Figure 12: The Effective Methods of Training in Management*
Survey Section 3: Training Administration

The third section, training administration, included questions relating to the training and how it is developed. The questions specify the triggers of print-related training; the training is developed for employees, how often training is conducted, on-demand training and the future trends regarding the amount of training required in the print industry.

The participants responded to what typically triggers the print-related topics of training. Twenty five percent or one of the participants specified improving on existing skills/refresh memory, 75% or three of the participants specified new equipment/software/hardware/etc. Figure 14 shows the opinion of the participants on what triggers the print-related topics of training.

The print industry expert responded to the typical triggers of print-related topics of training and specified new equipment/software/hardware/etc. The expert response is not included in figure 14.
In response to how training is developed, one hundred percent or four of the participants responded. Two of the participants specified training was developed internally, one of the participants specified the training was developed externally and one of the participants specified the training was purchased “off the shelf” from an outside source (software, tutorials, podcasts, etc.). The print industry expert specified training was developed external to the company and/or purchased “off the shelf” from an outside source.

The participants responded to the number of hours of training are conducted per month. Fifty percent or two of the participants specified 1-5 hours of training, 25% or one of the participants specified 6-10 hours of training and 25% or one specified 11-15 hours of training. Figure 15 shows the number of hours of training conducted per month.
Figure 15: The Hours of Training Conducted per Month

Four of the participants responded to the training “on demand” within the company. Seventy five percent or three of the participants specified there is training “on demand” and 25% or one of the participants specified there is not training “on demand” within the company. The three participants who selected “yes” were then asked to list the topics offered. These topics include, “Internal software training by IT” and “We have a leadership development program that is very comprehensive, etc.”

The participants who took the survey responded to the prediction of future trends regarding the amount of training required in the print industry. One participant skipped the question. The question asked, “In your opinion, what future trends do you predict will arise regarding the amount of training required in the print industry?” Three participants specified the following responses:

- Increase needed
- More frequent training in demand with the fast pace of ever changing and improvements of technology based prepress, print, and post press
- Trends towards more technical pre-media needs, digital multi-sourcing...less mechanical processes.

The print industry expert responded to the prediction of future trends regarding the amount of training required in the print industry with, “New Technologies lead training needs, digital printing, web design, sales changing from PSP to MSP.”

**Additional Expert Responses**

The print industry expert also responded to four other questions regarding training in the print industry.

**Question 1: What has been the major concern for printing companies to training their employees?**

“Cost and time. Printers spend at most 2% of their budget on training. They spend more on their machinery than their employees training needs. Because new technologies are coming fast and they need to be quickly added and up and running, this is a natural outcome. Printers' employees don't have time to train away from the office and hourly employees often believe they should be paid while away. Printers are also leery of employees being stolen by other companies.”

**Question 2: How important is training to the print industry? Explain.**

“While I think printers really believe it's important, too often some see only the cost and not the outcome of the investment. Even when they believe in the training there are not a large number of affordable options. In addition many printers have difficulty finding training that is more focused on their company's needs.”

**Question 3: As a whole, are training employees a high priority for companies in the printing industry? Explain.**
“YES. The issue is where the training comes from, how much it costs, will it be able to be applied in the company, and how much time it takes. Also will employees be blended together with other firm's employees (is there a chance for the employee to be "stolen")? These issues lead to a low usage of training despite the company's belief in it.”

Question 4: Please provide any other insight into training in the printing industry.

“Training in the industry is difficult because it is often technology specific, even equipment specific so the right training is difficult to find, costly, and difficult to apply. This is also an industry where people are incredibly busy because they often wear many different hats. So it's difficult to find time. In addition, technologies are growing so fast that it's difficult to keep track let alone find proper training. Now that being said, you will find a much different perspective with large printing companies, comprising 20-25% of the industry. They are able to afford proper training in time and money and industry trainers will tell that training is alive and well in the industry. So if you're talking about small printers, there is difficulty. If you're talking about large printers, much more training is done.”
Chapter V. Summary, Recommendations and Conclusions

In Chapter IV, quantitative, qualitative and open-ended results were reported. This chapter analyzes and provides a summary of the results of the study. It also includes the recommendations and conclusions of the study to provide the current status of the impact of technology on training in the Ohio print industry.

Summary

The problem of this study was to identify the status of employee training in the Ohio print industry as related to changes in technology, equipment, software and processes. There were six objectives that were used to address the problem of the study. These objectives are stated and summarized within this chapter.

Survey participants.

The participants of the survey all specified being the CEO/President of their company. The responses indicated the participants working in the print industry 16-20+ years. The following statements are provided to help clarify the survey return rate:

- There were no clear indication as to the low response rate of the survey,
- The electronic survey was sent through email by a representative from PIANKO,
- There was no indication to the researcher of non-deliverable emails that resulted from incorrect or non-existent email addresses, and
- There was no indication that emails were forwarded to the appropriate person

Objective 1: Identify what segments of the print industry that use training most often.

There are seven segments associated with the print industry, which include offset lithography, digital, xerography, inkjet, flexography, gravure and screen. According to the data
collected from the survey, 100% of respondents specified offset lithography as one of their companies printing segments, 75% specified digital, 25% specified xerography and 25% specified inkjet. There were no responses for flexography, gravure and/or screen. These four segments used training and based on the responses, one segment did not stand out using training most often.

**Objective 2: To identify the most common topics in training in the print industry whether they are soft skills, hard skills, hardware, software, etc.**

The topic areas in training were addressed in the survey sent out to companies in the print industry. The results of the topic areas implemented or conducted in training included 75% in prepress/preparing documents to be print ready, 25% in press operation, 25% in postpress, 100% in software skills and 50% in hardware skills. In relation to the topic areas, the training provided in the past month was also addressed. Fifty percent of the participants indicated prepress/preparing documents to be print ready, 50% specified press operation, 25% postpress, 75% specified software skills and 25% specified hardware skills. Based on the results of the training implemented, the topics addressed in the survey are needed to enhance the performance of the employees within the print related company. The results from the “training implemented in the past month” show the training topics presented need to be implemented more often to increase/improve the employee’s knowledge and skills. For example, 75% or three of the participants indicated training was implemented/needed in prepress/preparing documents to be print ready. However, there were 50% or two of the participants that indicated training in prepress/preparing documents to be print ready was conducted or implemented in the past month. The industry expert confirmed the participant’s responses identifying the most common topics.
Objective 3: To identify the employee areas that receive the most training, i.e. management, prepress, etc.

In the literature review, sources reported that the access to training in the print industry was to be determined according to the specific position of the employee. Skilled craft jobs or supervisor positions are trained informally on the job after gaining knowledge and experience. High school or vocational school graduates are usually included in the informal training for multiple positions in the print industry. In production occupations, employees are also trained informally on the job but employers prefer the employees possess graphic design/communication educational backgrounds, particularly for prepress technicians. Professional and administrative occupations need to acquire a related associate or bachelor degrees for entry-level positions. These workers, such as desktop publishers and graphic designers, complete 2-4 year training programs as well as on the job training (U.S. Bureau of Labor Statistics, 2009).

The employee area that training was found most regularly conducted for was addressed in the survey. Seventy five percent of the participants indicated that prepress was not regularly conducted, 50% specified press/operating technicians, 25% specified postpress/finishing, 50% indicated business/customer services/sales, and 50% indicated management. No training was indicated for specified for creative workers (designers, illustrators, photographers, etc.)

Objective 4: To identify the most common methods/implenentations of training in the print industry.

The methods of implementation of training were separated into six different categories: podcast, webcast, workshop or seminar, course or lecture, interactive module or tutorial and
video. To identify the most common method, each category was separated into various questions comparing the printing areas. These include prepress, press operation, postpress, software, hardware and management.

In prepress, the most common training methods used were a course or a lecture and an interactive module or tutorial. A webcast and workshop or seminar was also used for prepress training, which indicates new training technologies are being implemented into the print industry for training.

The table below shows the results of the survey participants’ responses for the most common training methods in prepress, press operation, postpress, software, hardware and management. Each number represents the number of participants responding to the particular training method (n = 4).

<table>
<thead>
<tr>
<th></th>
<th>Podcast</th>
<th>Webcast</th>
<th>Workshop or Seminar</th>
<th>Course or Lecture</th>
<th>Interactive module or tutorial</th>
<th>Video</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Prepress</strong></td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>0</td>
</tr>
<tr>
<td><strong>Press Operation</strong></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Postpress</strong></td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td><strong>Software</strong></td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>3</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td><strong>Hardware</strong></td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td><strong>Management</strong></td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

*Table 1: The Most Common Training Methods in the Various Print Areas*
Objective 5: To identify whether the training provided is developed and/or implemented internally or external to the company.

According to the survey, all participants responded to the development of employee training. Fifty percent of the respondents specified internal training, 25% specified external and 25% specified training to be purchased “off the shelf” from an outside source (software, tutorials, podcasts, etc.). The print industry expert indicated that training was both developed external to the company and/or purchased “off the shelf.” The survey results indicate that half of the respondents’ training was developed within the company and the other half of the training was outsourced. This result seems to conflict with the industry expert indicating that training is developed completely from external sources.

Objective 6: To identify future trends regarding the amount of training required.

Future trends were identified within the survey. The participants responded with the following trends:

- Trends toward more technical pre-media needs, digital multi-sourcing… less mechanical processes;
- More frequent training in demand with the fast pace of ever changing; and improvements of technology based prepress, print, and post press
- Increased need.

The print industry expert responded with the following:

- New technologies lead training needs, digital printing, web design, sales changing from PSP to MSP.
- Based on the results of the survey, all trends for training are a result of new technology and fast-paced change.
Recommendations for Future Study

The following recommendations are offered based on the results of the study:

- Future research including the priority or need of training in the industry including the various methods, development, effect on employees performance and skills and/or the common topics implemented in training
- The data collected from a larger sample and/or from a different group of training directors/CEOs/Presidents/Managers
- Results from the future trends from the survey and the print industry expert should be used for further use in print industry training.

Conclusion

Print companies are implementing various methods of training including interactive modules, tutorials, videos, webcasts, lectures or courses, and workshops or seminars. Since new and existing training methods are applied in the industry, the process of implementing the most effective training method for each print-related area is ongoing.

However, this study suggests various points to assume that technology will provide future trends in regards to training. The use of new technologies within the industry increases the need for training. Advances in technology will influence more frequent training because of the fast paced and ever changing industry. The print industry has been evolving into a digital based industry that includes the digital aspect of prepress, press and postpress. Therefore, training in the print industry should parallel the new and improving technology.

The survey results taken from the print industry show all of the respondents to be a CEO/President of their current company. Because of the similar job titles of the respondents, the study results can assume the participating companies include a larger set of employees within
each company. The number of employees concluded from the results range from 26-100 employees. Since the respondents of the survey were CEO’s/Presidents, the results can assume the accuracy of the information. The CEO/President of each company has access to information regarding training within the company. These results correspond with the print industry expert regarding the ability for larger companies to implement training in their company. The expert describes training to be costly and time-consuming; this allows bigger companies to conduct or implement training over smaller companies.

However, the number of employees or the size of the company shows no relevance on the training need in the print industry. The respondents of the survey indicated all of the employee areas that need training on a regular basis. In relation to the employee areas, all of the topic areas are also specified as being implemented into the training. These include topics from prepress/preparing documents to be print ready to software/hardware skills. The various topics presented in the training and the employee areas are both factors that need to be addressed in small and large companies to increase the overall training in the company.

The study indicates not only the need for training but also the need to provide alternate methods for training that are less costly. This will increase the employees’ efficiency and create an effective way to learn. Because of the ongoing development of new or improved technology within the print industry, there will be an ongoing need for training.
References


Retrieved October 6, 2010, from www.sgja.org/index.cfm?


# Appendix A: Electronic Survey to Participants

## The Impact of Technology on Training in the Ohio Print Industry

### 1. Basic Information

Thank you for agreeing to participate in this study. Please answer the following questions with your best knowledge or please pass this on to someone else at the company that may have the information needed to complete the survey.

This survey is completely voluntary. The data gathered and your identity will be kept confidential. Any question can be left blank if there is any uncertainty or doubt. The following questions are multiple choice or fill-in-the-blank. Thank you in advance for your assistance!

1. Which is your company’s primary printing process(es)? Select all that apply.
   - Flexography
   - Gravure
   - Screen
   - Offset Lithography
   - Digital
   - Xerography
   - Inkjet
   - Other (please specify)

2. Please identify your job title.
   - Training Director
   - CEO/President
   - Manager
   - Human Resource Manager
   - Other (please specify)

3. Training is my...
   - Primary responsibility
   - Secondary responsibility
   - None of the above
   - Other (please specify)
### The Impact of Technology on Training in the Ohio Print Industry

4. If you completed higher education, what degree(s) did you obtain? Select all that apply.

- Bachelor of Arts
- Bachelor of Science
- Masters of Education
- Masters of Science
- PhD

*Other (please specify)*

5. If you completed a degree in higher education, what was your undergraduate major?

6. How many people does your company (at your site only) currently employ?

- 1-10
- 11-25
- 26-50
- 51-75
- 76-100
- 100+

7. How many years have you been at your current position?

- 1-2
- 3-5
- 6-10
- 11-15
- 16-20
- 20+
The Impact of Technology on Training in the Ohio Print Industry

11. Of these topic areas for training, which have you conducted and/or implemented in the past month? Select all that apply.
   - Prepress/Preparing documents to be print ready
   - Press operation
   - Postpress
   - Software skills
   - Hardware skills
   Other (please specify)

12. Does your company have orientation training for new employees?
   - Yes
   - No

13. If yes, what topics are covered? Select all that apply.
   - Software
   - Company policy
   - Benefits
   - Product information
   Other (please specify)
### The Impact of Technology on Training in the Ohio Print Industry

3. Considering all of these methods, which did you find to be effective for training in Press operation? Select all that apply.
   - Not Applicable
   - Podcast
   - Webcast
   - Workshop or Seminar
   - Course or Lecture
   - Interactive module or tutorial
   - Video

Other (please specify)

4. Considering all of these methods, which did you find to be effective for training in Post press? Select all that apply.
   - Not Applicable
   - Podcast
   - Webcast
   - Workshop or Seminar
   - Course or Lecture
   - Interactive module or tutorial
   - Video

Other (please specify)
### The Impact of Technology on Training in the Ohio Print Industry

5. Considering all of these methods, which did you find to be effective for training in Software? Select all that apply.

- Not Applicable
- Podcast
- Webcast
- Workshop or Seminar
- Course or Lecture
- Interactive module or tutorial
- Video

Other (please specify)

---

6. Considering all of these methods, which did you find to be effective for training in Hardware? Select all that apply.

- Not Applicable
- Podcast
- Webcast
- Workshop or Seminar
- Course or Lecture
- Interactive module or tutorial
- Video

Other (please specify)
The Impact of Technology on Training in the Ohio Print Industry

7. Considering all of these methods, which did you find to be effective for training in Management? Select all that apply.
   - Not Applicable
   - Podcast
   - Webcast
   - Workshop or Seminar
   - Course or Lecture
   - Interactive module or tutorial
   - Video

Other (please specify)

8. Which of these methods do you believe you will be using in the future? Select all that apply.
   - Podcast
   - Webcast
   - Workshop or Seminar
   - Course or Lecture
   - Interactive module or tutorial
   - Video

Other (please specify)
3. Training Administration

1. In your opinion, what typically triggers the print-related topics of training?
   - Lack of skills
   - Improve on existing skills/Refresh memory
   - New equipment/software/hardware/etc.
   Other (please specify)

2. How is the training you utilize for employees developed?
   - Internally
   - Externally
   - Purchased “off the shelf” from an outside source (software, tutorials, podcasts, etc.)
   Other (please specify)

3. As an estimate, how many hours of training do you or your staff conducts per month?
   - 1-5
   - 6-10
   - 11-15
   - 16-20
   - 20+

4. Do you conduct training “on demand” within your company?
   - Yes
   - No

5. If yes, please list topics that are offered.

6. In your opinion, what future trends do you predict will arise regarding the amount of training required in the print industry?

Thank You!
Appendix B: Email

February 23, 2011

Dear Training Director or Administrator:

Hello. My name is Jennifer Walker and I am a Learning Design graduate student in the College of Technology at Bowling Green State University. I am currently researching the impact of technology on training in the Ohio print industry. This is an invitation and request for members of the printing industries in Ohio to participate in this research study.

The purpose of this descriptive study is to identify the status of employee training in the Ohio print industry as related to changes in technology, equipment, software and processes. This study will provide information that can be used by suppliers, educators, training directors and production companies to make future training decisions and to conduct more efficient and effective training.

The data collection method used for this study will be an online survey at [survey link]. The survey should take 5-10 minutes to complete. Your response is appreciated by March 3, 2011. A reminder email will be sent 5 business days after the initial survey.

The information provided from the survey results will remain private and the participant’s identity will be kept confidential. Your participation is completely voluntary. You are free to withdraw at any time. You may decide to skip questions (or not do a particular task) or discontinue participation at any time without penalty. Deciding to participate or not will not affect your relationship with Bowling Green State University.

The data will be gathered and analyzed by SurveyMonkey, an electronic survey service, and will provide me with graphs, charts, an excel document and a data report. It will be analyzed into group data and will only be reviewed by the researcher. The data will be stored in the SurveyMonkey database protected by a password known only by the researcher. Completing the survey will be your consent to participate in the study. You must be at least 18 years of age or older to participate. The benefits of this study includes helping make decisions to conduct training more efficiently and effectively that may lead to more productivity. There are no risks associated with your participation in this study. After completing the survey, be sure to please clear the browser cache and page history to remove any data related to the survey from your computer.

If you have any questions or comments regarding the survey or study, you can contact me at jenniwlw@bgsu.edu or by phone at 937-269-1110. You may also contact my advisor Dr. Donna Trautman at dkttraut@bgsu.edu or by phone at 419-372-7613. If you have any questions concerning the conduct of the study or rights as a research participant, please contact the Chair of the Human Subjects Review Board at hsrb@bgsu.edu or by phone at 419-372-7716. Thank you for your participation in advance.

Sincerely,

Jennifer Walker
Graduate Student, Learning Design
College of Technology
Bowling Green State University
E-mail: jenniwlw@bgsu.edu
Phone: 937-269-1110

By clicking next, you give your consent to participate. [Link to Survey]
Appendix C: Survey to Expert

1. How many years have you been working with the print industry?
   17 Years

2. In your opinion, which employee areas need training regularly? Select all that apply.
   - Prepress
   - Press/operating technicians
   - Postpress/Finishing
   - Business/Customer Services/Sales
   - Creative Workers (designers, illustrators, photographers, etc.)
   - Management

3. What methods of implementation have been used to conduct training in the printing industry? Select all that apply.
   - Podcast
   - Webcast
   - Workshop or Seminar
   - Course or Lecture
   - Interactive module or tutorial
   - Video
   - Other (please specify)

4. In your opinion, what typically triggers the print-related topics of training?
   - Lack of skills
   - Improve on existing skills/Refresh memory
   - New equipment
   - New software/hardware/etc.
   - Other (please specify)

5. How do you believe most print-related training is developed?
   - Internally
   - External to the company
   - Purchased “off the shelf” from an outside source (software, tutorials, podcasts, etc.)
   - Other (please specify)
6. What future trends do you predict that will arise regarding the amount of training required in the print industry?

New Technologies lead training needs, digital printing, web design, sales changing from PSP to MSP.

7. What has been the major concern for printing companies related to training their employees?

Cost and time. Printers spend at most 2% of their budget on training. The spend more on their machinery than their employees training needs. Because new technologies are coming fast and they need to be quickly added and up and running, this is a natural outcome. Printers' employees don't have time to train away from the office and hourly employees often believe they should be paid while away. Printers are also leery of employees being stolen by other companies.

8. How important is training to the print industry? Explain.

While I think printers really believe it's important, too often some see only the cost and not the outcome of the investment. Even when they believe in the training there are not a large number of affordable options. In addition many printers have difficulty finding training that is more focused on their company's needs.

9. As a whole, are training employees a high priority for companies in the printing industry? Explain.

YES. The issue is where the training comes from, how much it costs, will it be able to be applied in the company, and how much time it takes. Also will employees be blended together with other firm's employees (is there a chance for the employee to be "stolen")? These issues lead to a low usage of training despite the company's belief in it.

Please provide any other insight into training in the printing industry. Thank you.

Training in the industry is difficult because it is often technology specific, even equipment specific so the right training is difficult to find, costly, and difficult to apply. This is also an industry where people are incredibly busy because the often wear many different hats. So it's difficult to find time. In addition, technologies are growing so fast that it's difficult to keep track let alone find proper training. Now that being said, you will find a much different perspective with large printing companies, comprising 20-25% of the industry. They are able to afford proper training in time and money and industry trainers will tell that training is alive and well in the industry. So if you're talking about small printers, there is difficulty. If you're talking about large printers, much more training is done.
March 2, 2011

TO: Jennifer Walker
   College of Technology

FROM: Hillary Harms, Ph.D.
      HSRB Administrator

RE: HSRB Project No.: H11T165GE7

TITLE: The Impact of Technology on Training in the Ohio Print Industry

You have met the conditions for approval for your project involving human subjects. As of February 28, 2011, your project has been granted final approval by the Human Subjects Review Board (HSRB). This approval expires on February 17, 2012. You may proceed with subject recruitment and data collection.

The final approved version of the consent document(s) is attached. Consistent with federal OHRP guidance to IRBs, the consent document(s) bearing the HSRB approval/expiration date stamp is the only valid version and you must use copies of the date-stamped document(s) in obtaining consent from research subjects.

You are responsible to conduct the study as approved by the HSRB and to use only approved forms. If you seek to make any changes in your project activities or procedures, send a request for modifications to the HSRB via this office. Those changes must be approved by the HSRB prior to their implementation.

You have been approved to enroll 200 participants. If you want to enroll additional participants you must seek approval from the HSRB.

Good luck with your work. Let me know if this office or the HSRB can be of assistance as your project proceeds.

Comments/ Modifications:
Please add text equivalent to the HSRB approval/expiration date stamp to the “footer” area of the electronic consent form (see attached for specific text).

C: Dr. Donna Trautman

Research Category: EXPEDITED #7