

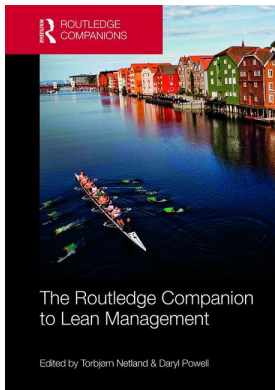
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LEAN PRINTING

*Ken Macro***Introduction**

The printing industry has experienced great disruption over the past 500 years. Since around 1440, when Gutenberg invented the highly durable and moveable type, composed of lead, tin, and antimony, the world of communication has progressed exponentially. Gutenberg—as we think in the printing industry—was one of the first adopters to apply lean principles unknowingly. He devised a way to mass produce letters, symbols, and numbers by developing a matrix in to which he poured type metal to create fonts. These metal types could then be stored and sorted into boxes for each retrieval and replacement. Although moveable type had been invented hundreds of years earlier in China (made of clay and later weaker, less durable metals), he was the first to experiment with metals that could be easily mixed, poured into a form, cooled, and hardened quickly. This invention could be seen to have sparked the Reformation, educating communities and enhancing literacy across the globe. He was the father of printing and the first entrepreneur to launch a manufacturing industry.

In the late 1860s, Ottmar Mergenthaler, a watch maker from Germany, took note of the fact that the process of picking individual type from a drawer to form sentences and, consequently, pages for books, newspapers, ephemera, and the like, was painstakingly slow. He thought that the process would work better if there was a device that could gather matrices (forms) into one lot, which then, in turn, could generate one full line of type into one sentence that would produce a lead slug. This invention, called the Linotype, revolutionized the book and newspaper publishing industry because it significantly increased productivity and enhanced quality due to the reduction of variation. Mergenthaler's Linotype machine set the standard for productivity and utilization.

Although the Linotype machine, a marvel unto itself, was a major contributor to enhanced productivity, the process itself only produced one sheet/copy at a time. Alois Senefelder discovered that petroleum-based inks and water tend to separate. Therefore, if an image is inscribed on the surface of a stone, ink will adhere to it, and, where there is no image, water will remove the remainder of the ink from the stone. This process, known as stone lithography (or planographic process), would later evolve into the use of metal (special coated aluminum) plates that could be wrapped around a cylinder. Using the same basic principles as stone lithography, offset lithography sparked an even more efficient process for set-up (the first true attempt at set-up reduction in the printing industry). Plates with images representing four process colors (cyan, magenta,

yellow, and black) on four separate units could be registered as such so that a photo-realistic rendering of an image could be registered and printed on continuously fed sheets of paper at one time. Offset lithography requires the use of three cylinders. First, a plate cylinder to hold the imaged metal plate. Second, a blanket cylinder to receive the printed image (ink) in order to make it “right side” (not reversed). And, third, an impression cylinder to apply pressure to the paper as it hits the blanket cylinder in order to pick up the printed image and transfer it to the paper. Sheet-fed offset lithography has truly become the staple in technology for commercial printers in the world and this remains true to this day.

In the 1960s, the first Xerox 914 was launched to the printing community: the first machine to utilize electro-photographic technology (also known as xerography). Chester Carlson had perfected a way in which to electrostatically charge a photoreceptive belt to attract pigmented plasticized capsules of toner particles to form the image captured through a photograph. The toner particles were then offset on to a piece of paper and fused permanently on to the surface of the substrate through pressure, heat, and an oil-based affixer.

Through the advent of xerography, originals could be made into many copies at the push of a button. Additionally, the digital printing market, as it has become known, has also evolved inkjet technology where molecular size droplets of ink can be extracted through large print heads with precise accuracy providing an opportunity to mass-produce customized one-to-one collateral known as variable data printing or imaging.

Throughout all of the innovative printing technologies made available to the commercial printing and packaging markets, the *massive push to do more, better, cheaper, and faster has never been more prevalent*; not to mention the devastating (or disruptive) effect that the Web has had on the reduction of and reliance on printed materials. The newspaper business alone has had significant decreases in readership, which in turn has decreased advertising revenue, and thus reduced print volumes. With the paradigmatic shift to view material online, printing volumes as a whole have dropped, leaving a rather large and looming surplus of equipment and an industry that is overcapacitated.

Much like many manufacturing industries, the recession of 2008 took its toll on the commercial printing industry, especially in the United States. Unfortunately, however, the concepts and tools of lean have been slow to be adapted by this industry, mostly because of its inability to move quickly in developing strategic initiatives, and its inability to direct financial sources to such initiatives. The good news is that lean is prevalent today and printers are cognizant of the shift that is required for them to remain nimble and reactive to market influxes. Moreover, they are open and dedicated to identifying waste in their production milieu and executing processes that assist in enhancing efficiencies. They are further dedicated to reducing this waste in order to improve quality and increase profitability from the center of their shop floors.

As the graphic communication industry continues to develop taxonomies of printing and imaging technologies (today it consists of planographic, porous, flexographic, relief, intaglio/gravure, and digital), more and more opportunities for variance become ever more prevalent. As Steven Spear (2009) observes in his book *Chasing the Rabbit*,

The common problem these organizations [lagging companies] face is that they produce complex products or provide complex services; requiring many varied forms of skill and expertise. Their operations, the “systems of work” involve many people of many disciplines using equipment of various types, are correspondingly complex, requiring that the efforts and contributions of many specialists be integrated and coordinated in a harmonious fashion.

(p. xx)

At any given time in any graphic communication enterprise, there is a cacophony of sounds emanating from the hundreds of varying printers and production equipment representing multiple technologies, all in the name of output and hard deliverables, under intense deadlines with unparalleled quality. This is precisely what the leaders of graphic communication organizations must understand with regards to *lean printing*, that the sounds must weave a fabric of harmonies in an orchestrated and flawless matter. Employing the concepts and tools of lean, coupled with the evolution of a culture that is fully committed to continuous improvement that identifies waste, optimizes processes, and empowers employees, will only ensure confidence that productivity, profitability, and its people will emerge triumphantly.

What is Lean Printing?

Lean printing is more than a set of processes, standards, or tools. It is more than an ideal. It is, however, a philosophical foundation or, in the eyes of the author, a cultural imperative. Lean printing is a great call to action that requires organizations within the graphic communication industry to reflect, analyze, research, strategize, plan, experiment, and execute concepts relating to lean manufacturing (Cooper et al., 2007). Table 35.1 highlights how lean tools are used to assist with a specific identifiable problem within the confines of a graphic communication-based manufacturing facility:

Most commercial printers do not have a long-run continuous product that they produce daily, weekly, or yearly that requires minimal to no set-up or make-ready. There are some facilities, such as Bible printers, that print only one product all year round. But most printers, by and large, print multiple products with varying degrees of complication, and specifications that have

Table 35.1 Typical problems in a printing facility and lean tools and methods to fix them

<i>Usual printing facility problems</i>	<i>Lean tools and methods</i>
Paper and ink mislabeled and misplaced. Issues with press set-up and cycle time.	5S, work standards, <i>kanban</i> , A3. <i>Kaizen</i> events, cycle time analysis, set-up reduction, value stream mapping.
Pre-press, press, and post-press equipment downtime and malfunction.	Total productive maintenance, A3 problem solving, 5S.
Variance with operator production and output.	Work standards.
Images not aligned properly because of printing plate registration.	<i>Poka yoke</i> , work standards, visual workplace management.
Mislabeling of chemicals and improper disposal of chemicals.	Environmental health and safety initiatives, work standards, visual workplace management, 5S.
Underutilization of equipment.	OEE (overall equipment effectiveness), <i>heijunka</i> , WIP (work-in-process) planning, workflow analysis.
Product production and delivery time fluctuates.	Value stream mapping, <i>takt</i> time analysis.
Printed stock on skids marked incorrectly and delivered to wrong production process on the floor.	WIP analysis, visual workplace management, work standards, cellular flow analysis.
Lack of experience on equipment operation.	Knowledge management initiatives, training, work standards.
Forklift and transportation accidents.	<i>Kaizen</i> events, visual workplace management, work standards, 5S, A3.

a standard set-up for one piece of equipment are traditionally rare. Within the printing production stream there is a multitude of equipment required for the completion of the product. For example, a customer orders 25,000 brochures on a certain text weight of paper. The pre-press department impositions the image on the printing plate in order to maximize coverage and eliminate waste (paper, ink, labor). The plate is specifically formulated and sized for one kind of printing press. Each company may own 5 to 50 printing presses of varying sizes. The paper or substrate chosen for the job has to be gauged and the press adjusted to accommodate the throughput and printability of the paper. It also, at times, must be cut to the desired size prior to printing on a large flatbed cutter. Once the job is printed it is sent to post-press where it is cut to finished size prior to finishing (embossing, die-cutting, gluing, mailing) and/or binding (stitching, adhesive binding, poly-bagging, wrapping, bundling, crating).

Each one of these activities (or production processes) also requires specific set-up instructions for handling the throughput of the job. Therefore, in the printing and packaging manufacturing world, variance is a multifaceted concept and often an obstacle in preparing for a successful lean experience. With regards to the 25,000 brochure order above, the standard lead time for the production of this job would take (in a lean and efficient facility) one or two days and it would require the set-up and operation of a plate imaging machine, a four-color (4C) printing press with possible coater, a cutter, a folder, a stitcher, and an inkjet addressing system. With such a vast array of equipment requirements and processes embedded, there are increased probabilities of errors and malfunctions along the production stream. Therefore, a lean approach to eliminating variance through the use of 5S, total productive maintenance (TPM), A3, work standards, visual workplace management, set-up reduction, cycle time, and takt analysis all generate great relevance on the manufacturing plant floor. However, it requires a concerted effort that is well planned and understood by every employee in the company.

Many organizations within the graphic communication industry have placed great commitment and diligence into developing lean initiatives. As a result, there have been great milestones and rewards. As many who have consulted within this industry have experienced, lean implementation planning generally launches into three distinct phases of execution. The first phase is education about lean and the creation of the “low hanging fruit” plan which looks at implementing 5S, developing a comprehensive *waste identification* initiative, and training the workforce on WIP standards. The second phase is the analysis of a job workflow using swim-lane diagrams to identify duplication of effort and possible constraints. The third phase is the development of a TPM plan, calculation of takt time, and the creation of work standards for varying equipment on the production floor. An interesting note with regards to the use of *swim-lane* diagrams: the author has discovered that because of the intensified processes associated with print production, the exercise of constructing a swim-lane diagram that outlines the meticulous stages in job completion for one product (such as a brochure, for example) provides invaluable insight to any evolving or newly developed lean team. The ability to see duplication and compounded non-value-added workflow is thus providing additional fuel for moving the lean implementation process forward.

As we have experienced these phases, Netland and Ferdows (2014) have discovered that there are four stages of performance improvement that act as a classification of manufacturing industries as they experience progress through lean implementation: 1) beginning plants, 2) in-transition plants, 3) advanced plants, and 4) cutting-edge plants (pp. 85–88). In the correlation of the two, it would be a correct assessment that most commercial printing and packaging manufacturing plants (in North America) would fall under the auspices of the beginning or in-transition stages. Again, because of the complicated nature of customized products and the multitude of equipment required to complete them, streamlining processes take time and money

(the number one barrier to lean implementation, according to Jadhav et al., 2014). There are, however, a few larger corporate printing and packaging companies that have developed into the advanced stage—that is, with enhanced production efficiencies through automation, optimal OEE, and reduced lead time rates—but not always with a culture that is open and supportive to the likes of Toyota.

Fortunately, there exist educational institutions across the globe that instruct in graphic communication and have—over the past 10 years—integrated lean concepts within the classroom either through applied practices or in the development of formal production management or quality management courses. US and Canadian institutions include the California Polytechnic State University Graphic Communication program, Clemson University Graphic Communications program, Ferris State University Graphic Communications program, Rochester Institute of Technology Imaging Sciences program, and Ryerson University Graphic Communications program (Toronto, Canada), to name a few. Additionally, there are examples throughout Europe and Asia: Helsinki Metropolia University of Applied Sciences, Aalto University, Hochschule Der Media, Obuda University, Moscow University of Printing Arts, Kiev Polytechnic Institute, Artevelde Hogeschool, Beijing Institute of Graphic Communication. Furthermore, many of the supporting industry organizations such as Printing Industries of America (PIA), Epicomm (formerly NAPL), Specialty Graphics Industries Association (SGIA), and others have crafted special conferences dedicated to continuous improvement, created and offered special one-day seminars to local organizations, and developed webinars and online tutorials on various concepts and tools for their constituencies to access. The good news is that the awareness of lean printing has become more prevalent as organizations explore ways in which to eliminate wastes, enhance quality, and improve process efficiencies.

Challenges and Opportunities

In their report entitled “Exploring barriers in lean implementation,” Jadhav et al. (2014) identify 24 barriers that inhibit or derail lean implementation initiatives. The top barriers “are the lack of resources to invest, the lack of top or senior management involvement and workers’ attitude or resistance to successful implementation of the lean system” (p. 133). Given these common barriers, CEOs, managers, and supervisors alike must tackle these higher-level issues prior to launching any initiative that involves such a magnitude of change and individual participation. That said, there are some obstacles/barriers that are unique to the printing and packaging industry.

Manufacturing Verses Service

There remain many challenges and as many opportunities for integrating lean printing into the graphic communication industry. Obviously, the higher-ranging challenges predominately lie in the area of cultural acceptance. As with any industry, teaching management about lean concepts is counterproductive if the workforce is not also taught about lean and how it will affect each and every individual on the production floor. Additionally, many graphic communication organizations must come to terms with the fact that printing production is actually a manufacturing process. Dr. Andrew Paparozzi of the Epicomm (formerly National Association of Printing Lithographers, NAPL) writes,

No result of our research is more significant than the growing number of companies that view print as a form of distributing communication . . . that needs to be viewed

as one source among many options, rather than a standalone service defined by how it is manufactured. The companies see themselves in the communications business rather than the ink-on-paper business.

(2015, p. 31)

For the past 20-plus years, the graphic communication industry has considered itself a service industry, one that services clientele in facilitating marketing initiatives. As printing companies (also known as “marketing solutions providers”) attempt to generate new revenue and expand into new markets, their reliance on output technology is still imperative. To generate output without efficiencies, however, is counterproductive and unsustainable. Until the printing industry and the graphic communication industry collective agree that the output generated from their service renderings is—in fact—through a manufacturing process, many firms will still fail to see the value in initiating lean incentives.

According to Paparozzi (2015), discussions within the industry have propelled questions involving the dissemination of the revenue generated currently from lithography printing. One question posed by an industry representative was “What kind of a company wins this business?” In an online forum, there were several answers submitted: “1) The fastest because the turn times continue to shrink,” and “2) The most efficient because any printer caught with old technology in the pressroom is doomed” (p. 31). This means that reliance on older technology or technology that is considered “inefficient” would be catastrophic to a printing organization of the future. However, if lean concepts such as TPM were to be analyzed, implemented, and executed, this technology would never become obsolete or ineffective. Many companies within the graphic communication industry see new technology as the answer. Had they rather just analyzed their existing processes and effectively maintained their existing technology, they would be quite competitive.

Similarly, in a recent survey conducted by Epicomm (Paparozzi 2015, p. 16), the top five concerns of CEOs and executives of printing companies in the United States (in descending order) were:

- 1 the ability to increase sales,
- 2 maintaining profitability,
- 3 rising cost of healthcare benefits,
- 4 uncertainty about where the industry, economy, and nation are going, and
- 5 economy and general business conditions.

The top “must-do” for executive leadership to emerge from the survey is to “be as lean as possible in order to do more with less, streamline workflow, and reduce steps” (Paparozzi, 2015). This at least shows that CEOs of graphic communication firms are beginning to see the need to ingest lean.

Utilization Rates

Another challenge is for graphic communication firms to research, calculate, analyze, and act upon utilization rate determination. In the United States, the capacity utilization for non-durable manufacturing classification of printing and support for 2015 was reported to be 63.1 percent. With such low utilization rates and overcapacity with regard to equipment and technology, this industry needs to look more inwardly and reflect upon initiating processes that enhance

utilization and reduce over-capacity. As printing companies rely heavily on the news and communication sector, much disruption has been experienced in the significant decrease in printed newspaper distribution and magazine printing. As a result, press equipment is sitting idle, thus contributing to greatly affected utilization rates and OEE. As a result, companies are selling equipment or placing it in surplus as they busily scramble to identify new technologies and ancillary products that can supplement the loss of income. Others are investing time into developing new and innovative products that can be produced on the same equipment but yield new and interesting target markets.

Second, with the manufacturers of equipment that have slowly evolved automation into the newer technological products that they bring to market, efficiencies experienced from streamlined, in-line automation will also rear their heads into the conversation. Unfortunately, lots of excess printing equipment sitting in warehouses today cannot be retrofitted with automation updates because of the expense. This requires innovative companies to relinquish capital for new equipment acquisition but not without the high scrutiny of return on investment (ROI). Therefore, great effort will be needed in comprehensive strategic planning to evolve lean efficiencies through equipment and technology acquisition. Regardless, this will be a primary challenge for printing companies for the next three to five years.

Profitability

Currently, according to several estimates, the printing industry (graphic communication industry) generates \$640 billion in revenue that, in turn, drives \$3.8 trillion worth of related services (Keen Systems, 2012). This includes magazine and periodical publishing, book publishing, finance and insurance, professional-scientific-technical services, the paper and ink industry, packaging, and equipment manufacturers. Furthermore, as logic dictates, *profit leaders* (printing companies that are financially successful) have both higher profits and fewer employees compared with *profit challengers* (firms that struggle financially) according to Dr. Ronnie Davis (2015) of the Printing Industries of America. Profit leaders utilize fewer employees per \$1m in sales than do profit challengers, which equates to roughly \$108,350 per employee versus \$92,690 per employee working in a profit challenged company (p. 6).

It is not as great a time for newspapers and newspaper publishers, however. Sales for US newspaper publishers were at \$30bn in 2013 compared with \$49bn in 2005 (Statista Dossier, 2015, p. 8). The source of revenue for US newspapers is split as follows: print advertising \$17.3bn; digital advertising \$3.42bn; direct advertising \$1.4bn; niche/non-daily advertising \$1.4bn; circulation \$10.87bn; and other revenue \$3.15bn (Statista Dossier, 2015, p. 9). Revenue for magazine and periodical publishing in 2014 was at \$38bn, down from \$41bn in 2009 (Statista Dossier, 2015, p. 12).

In addition, of course, the packaging market continues to grow. As more and more products are being launched and packaged to grab the attention of the everyday consumer, the more elaborate the package, the more opportunity to increase sales. According to Marketsan Markets Strategic Analysis Services (2015), the global market for packaging printing is projected to grow to \$587bn by 2020. This air of optimism is creating a great rush for printing firms to transition underutilized technology and convert it into packaging technology to enter this rather unique—yet highly competitive—market. Additionally, printers and graphic communication firms are—albeit slowly—making capital investments into newer technology that enters the packaging production space. This market would be considered an opportunity for many. However, it will require great strategy and understanding of a developed market that includes

pharmaceuticals, cosmetics, and food, which will require an expedited learning curve to make the competitive edge.

The Future of Lean Printing

The graphic communication industry (for the sake of this chapter referring to the sector that represents printing manufacturing) is large, diverse, mature, lacking confidence, and unsure of the future. Inevitably, something will always need to be printed. The need will never go away. It may change drastically and may require less technology to produce it, but there will always be a need for a book, a publication, a journal, a billboard, a building wrap, a bus sign, a printed map, and printed packaging. As the web continues to house more electronic documents and generate billions and billions of pages of content, then, yes, the reliance on print will dissipate. This was said of the letterpress prints, and as of late more and more consumers are seeking out letterpress printed books and ephemera at a premium to display as craftwork and art. The same was said about vinyl records, yet there is an upsurge of interest in finding and obtaining used and new vinyl records to be played on old needle turntables.

Of course it is not healthy to reminisce of times long ago, but the lessons of the past should not be lost on the paradigmatic changes afforded to an industry in flux. For printing manufacturing—a \$580-billion-dollar industry—there is profit to be had. The revenue stream may not be seeking exponential gains, but through the analysis, understanding, and application of lean principles, healthy profits are to be discovered, thus allowing for capital reinvestments into newer innovative technology responsible for creating newer markets within undiscovered industries. The future of lean printing is an imperative of the industry and is most effective when immersed slowly and simply. Based on the author's experience as a consultant in the industry, the best results have been received when a company trains on one or two simple concepts (i.e. 5S and product swim-lane diagram) and initiates a plan to execute events in which to analyze and review for further improvement.

When positive results are witnessed, there is inevitably more buy-in from management, staff, and employees alike. This has been seen in numerous small and mid-sized printing companies throughout western Canada and western United States first-handedly by the author. Since the individual impact that a lean initiative has is on everyone on the printing manufacturing floor, simplification and the building of trust have greater results than a massive push down from executives and management from the top floor. The results yield a more solidified, understanding, and collective culture of employees who are willing to engage in lean experimentation and learn more about the benefits of making their jobs safer, more productive, and contributory toward the general health and welfare of the organization.

Ingenuous inventions from Gutenberg, Mergenthaler, and Senefelder were primarily developed to make a process more productive and to yield better efficiencies using technology. In the graphic communication industry, developing a lean culture and starting an implementation plan using the many concepts and tools encouraged will only supplement the scaffolding for building a lean philosophy. Once established as a philosophy, organizations will exert less energy on "asking why" and more energy on "doing how." According to Martin Joyce of Lockheed Martin, "Toyota's competitive advantage comes from educated, involved workers who are the envy of the industry because they can implement change while they do their daily jobs" (cited in Jadhav et al., 2014, p. 136). Therefore, as a philosophy, lean thinking will generate significant rewards. Print manufacturing firms dedicated to and reliant on printing technology, executing lean initiatives, will secure at least another 100 years of profit generation and quality output for future clientele.

Case Study: Lean Printing in Wayside Press, Vernon, British Columbia, Canada

Wayside Press is an established commercial offset lithography printing company of 90 years that resides in the city of Vernon in the Okanagan region of the Southern Interior of British Columbia, Canada. It has provided printing services for customers throughout western Canada. Considered a small mid-sized printing facility (fewer than 50 employees), its equipment ranges from large offset lithographic printing presses to digital presses. Over the past several years, it has also developed expertise in the area of integrated marketing communication and cross-media design. This transition required purchase, installation, and training on various ink-jet wide-format equipment and further expertise in customized mailing and targeted multichannel digital marketing execution and analysis (direct mailing, personalized email, landing pages, mobile marketing, and appropriate marketing analytical services).

As a result of attending a lean printing workshop in Edmonton, Alberta, Canada in September of 2009, Neil Perry, President and CEO of Wayside Press, decided that the company should embark on its own lean journey. As a result, he attended numerous lean training functions, viewed online tutorials, purchased several books, and contracted with Josh Ramsbottom, a consultant through the Landmark Group Center for Value Improvement at NorQuest College, Edmonton. Over a six-month period, Mr. Ramsbottom visited the facility once a month to conduct a three-day training program and to have each lean team member (nine in total) report on their individual progress on tasks they were assigned. The final deliverable of the program—the result of six months of training—was to develop, write, and sign an official *contracted lean implementation plan* (a.k.a. CLIP) for the entire company. The CLIP is a comprehensive plan authorized and written by the lean team that requires a signature and a finite timeline for accomplishing goals and charting progress.

The six-month (three-day) program consisted of three phases of lean training and application. *Phase I:* Introduction to lean fundamentals and tools such as *muda*, non-value activities (NVAs), 5S, audit zones (geographically assigned 5S checklists for supervisors on floor), voice of the customer (VOC), *gemba* walking, plan, do, check, act (PDCA), and development of a lean culture. *Phase II:* Understanding how to see problems, using A3, why-why analysis, swim-lane analysis, and understanding non-value-added processes. *Phase III:* Creating a culture of *kata* (routine): understanding a *kata* culture, creating work standards, evaluating lead time effectiveness, calculating cycle time, developing takt time standards, analyzing and understanding OEE and utilization rates.

Team leaders were assigned projects to manage or experiments to facilitate which they would report on each month. As a result of the team's engagement, Wayside Press was able to report the following: 1) a 20 percent reduction of the NVAs as a result of the swim-lane analysis and the elimination of duplicative processes within its production stream, 2) a 15 percent improvement in process flow (through cycle time analysis), 3) a decreased overall lead time throughput by 10 percent through process evaluation and savings of over 41,345 minutes of lost production time in one year—a total of 689 hours, 4) a trained workforce of eight employees (in addition to the nine managers on the lean team) in application of lean concepts, and 5) an improved general environmental health and safety of employees due to the newly implemented 5S audit zone program.

In addition to the savings that have been calculated from its progress thus far, Wayside Press has also accomplished several technical achievements of which it is proud: 1) created a visual management campaign that included a kanban system for replenishing boxes for paper, ink, plates,

and other press supplies, 2) created audit zones and assigned personnel accordingly, 3) calculated utilization rates on equipment and analyzed effectiveness, 4) calculated floor usage costs and value, 5) engaged in A3 problem-solving activities, 6) developed applicable SMART (specific, measurable, achievable, result-oriented, and timely) statements for future planning, 6) generated fishbone diagrams for various projects, 7) created an online customer portal for business card ordering, and 8) created, authorized, and signed a CLIP.

According to Joshua Bartholomew, Controller at Wayside Press Ltd.:

The impact of this project has been very significant for Wayside Press and the benefits have been recognized by both employees and management. We are all committed and excited to continue our lean journey in optimizing our order and production processes to eliminate waste and create efficiencies.

Through practical planning and pragmatic exploration, Wayside was able to create a company culture that accepted lean concepts but became more intrigued as it began to see results as rewards were generated. Although this was an arduous endeavor, Wayside Press has planted seeds of lean that seem to be rooted into its culture. Only time will tell of its progression; however, only this educated and committed group of people can harvest from what has been nurtured and grown.

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