ANALYSIS

MANAGING TRANSITIONS: LEARNING FROM THE PAST

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Introduction

We are in the midst of a massive social and economic transition due to the Coronavirus epidemic. A global health crisis might feel like uncharted waters for many of us, but this is not completely unlike other transitions that humans have witnessed in the past. This time, we are being pushed further toward electronic, no-touch interactions and transactions. This reliance on electronic media in all parts of life was already occurring, but it has been greatly accelerated with the onset of the pandemic. In addition, other changes are happening at the same time that make us question our social habits of the past. Will we ever feel comfortable shaking hands again? Will we consider it absolutely necessary to climb on an airplane to do a face-to-face sales call?

Some might be wondering what we can learn from previous technological transitions that can apply to our current situation. This white paper contemplates the answers to this question.

Historic Technological Transitions

Over the centuries, technological developments within the printing industry have had a huge impact on how people communicate with one another. We could go all the way back to the development of language or the creation of written word via alphabets, but we will start our exploration with paper and move forward from there.

Paper

Some of the earliest surviving paper fragments were created well over 2,000 years ago. Content creators of the time were faced with an interesting challenge—you could certainly chisel your message in stone or paint it on walls, but that severely limited its portability.

Writing or painting on silk, paper, or papyrus made your message easy to move from one place to another. This method also opened up the possibility to create multiple copies of the same document for wider distribution with minimal effort.

Figure 1: Museum of Printing President Frank Romano Holds a Piece of Papyrus

Source: WhatTheyThink video entitled "The Elephant in the (Bath)room?"

Gutenberg and Moveable Type

By now, most of us know that Johannes Gutenberg did not invent the printing press. He did not even invent the concept of moveable type (i.e., individual raised characters for use in letterpress printing), though he was the first European to use it. What was revolutionary about Gutenberg's work is that he combined multiple techniques into an economical system for the mass reproduction of books. This made books and other printed information easily accessible to a much broader audience.

Figure 2: Gutenberg Bible Display and Individual Gutenberg Bible Page

Source: Museum of Printing, Haverhill, Massachusetts

Among Gutenberg's inventions were a process for mass-producing type that could be positioned effectively and a formula for oil-based printing inks. His use of a screw-based wooden printing press was innovative, but together with the other pieces it facilitated an entirely new way of graphic reproduction. As is frequently true of technological

developments, simultaneous advancements in different areas often contribute to completely new processes.

The Linotype Machine

Hand setting of type for letterpress printing proceeded in fairly similar fashion for nearly four hundred years after the time of Gutenberg. It was a laborious process that required a skilled eye and a dexterous hand. An immigrant watchmaker from Germany thought that he might be able to automate the process, and this he did. In fact, American inventor Thomas Edison called Ottmar Mergenthaler's Linotype "the eighth wonder of the world."

Figure 3: A Linotype Prototype Called the 1883 Second Band Machine (left);
October 1924 Cover of *The Inland Printer* magazine (right)

Source: Museum of Printing, Haverhill, Massachusetts

You simply must see a Linotype machine in operation to fully appreciate it. It hums and clanks and whirs as individual type matrices are chosen and circulated into place where hot lead is squirted into them to form a line of type. After use, the matrices are recirculated back into the magazine that they came from. These magazines can be exchanged for different sizes and fonts. With his invention, Mergenthaler not only automated typesetting, but he also provided users with an unlimited supply of type. It is not an underestimation to say that the Linotype and its competitors revolutionized the newspaper and book industries.

Offset Lithography

The concept of lithography dates back to a 1796 invention by Alois Senefelder. Senefelder discovered a multi-step process in which (1) an image is drawn with oil, fat, or wax on a flat

limestone surface; (2) the stone is treated with a solution of acid and gum arabic to etch the non-image areas into the stone (i.e., the portions not protected by the oil, fat, or wax); (3) the stone is moistened and the etched areas retain some water; (4) an oil-based ink is applied to the stone and only adheres in the non-etched image areas; and (5) the ink is transferred to a blank sheet of paper.

Lithography thrived as an effective reproduction method for art prints, greeting cards, and other applications, but it was not until the 1960s that it also became the dominant process for commercial printing. What took it so long to catch on in this area? The first offset presses appeared around the turn of the 20th Century, but it took longer for suitable inks to become available. By the 1930s, standardization of films, plates, inks, and processes was well underway. At that time, offset printing was seen as a low-quality alternative. In fact, small-format offset duplicators for quick printing were the first offset presses to find market success, but there was much more to follow.

Figure 4: A Lithographic Stone
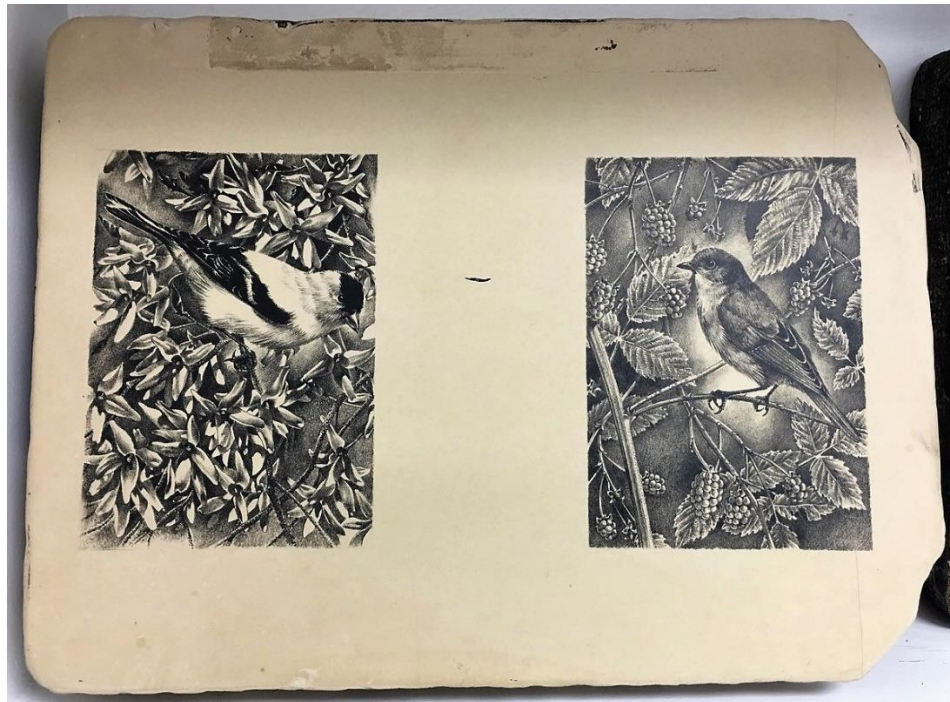
Source: Museum of Printing, Haverhill, Massachusetts

Heidelberg introduced its first offset press in 1962, and it wasn't long before print service providers began making the shift. In the end, it was about economics. By simplifying the process and getting rid of their hot-metal typesetting infrastructure, sites could virtually cut their costs in half. Offset was a cheaper, more efficient, and higher quality print option.

Analog to Digital

Another trend that swept through the graphic arts in the mid-to-late 20th Century was the digitization of the printing process. This happened across all areas of the graphic arts workflow and had a huge impact on typesetting, scanning, photography, platemaking, and digital printing. This evolution was made possible by sensors that could be used to record image information in digital form as well as lasers that were used as part of printing and imaging systems to create the output on photographic material (film), printing plates, or the final substrate (such as paper). It was at this point that terms like scan and print resolution became an important part of our lexicon.

There were many advantages to a full digital workflow. These varied by area. For example, once the text of a book has been typed, it does not have to be rekeyed for output on a typesetting system. An image that has been captured digitally by a scanner can be easily resized and modified (within the bounds of the image's resolution). It doesn't matter to a digital printing system how many copies will be printed as there is no need to create a new set of physical printing plates for any document printed.

**Figure 5: Apple's Lisa Desktop Computer with Printer**

Source: Museum of Printing, Haverhill, Massachusetts

Desktop Publishing (DTP)

Desktop publishing took advantage of the advancements in digital and made them available on a broad scale. The fusion of Adobe's PostScript page description language, an Apple computer and printer, and fonts from Linotype caused a revolution in the graphic arts industry.

Figure 6: Wolfgang Kummer of Linotype, John Warnock of Adobe, Steve Jobs of Apple, and Aaron Burns of the International Typeface Corporation (ITC) in the Early Days of DTP
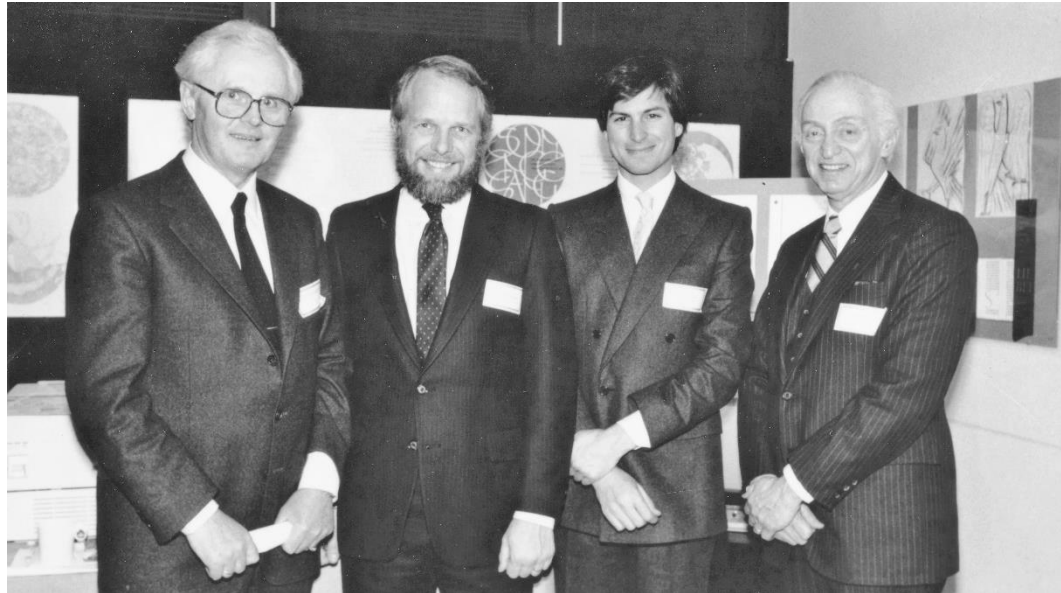
Source: History of Desktop Publishing, Frank Romano

e-Commerce for Print

Another aspect of the analog to digital transition, and one that followed the expansion of digital workflows in printing facilities, was the use of e-commerce for business transactions. In addition to supporting job submission, pricing, and tracking, it created a new kind of service provider—the Internet printer—whose physical location is less important than its ability to print and deliver materials on demand.

What These Historic Transitions Tell Us

As we consider these foundational events in the history of printing, we can see that each provided a move toward ease of use, convenience, improved communication, automation, and ultimately profitability for the print service provider. In some cases, these events were also the death knell for existing industries. Desktop publishing alone had a severe impact on typesetters, film strippers, and paste-up artists but also created new industry classifications like PostScript output bureaus. What is also clear is that inventions usually don't stand alone. They are influenced, and often enabled, by other social and technological advancements. As shown in the Table below, there are often additional benefits that were not initially anticipated but turn out to be massively important.

Table 1: Challenges and Solutions

The Challenge	The Solution	Added Benefit(s)
Portability	Paper and other lightweight substrates like papyrus and silk	The ability to make multiple copies
Onerous print production	Moveable type	Type can be reused
Tedious manual labor	Linotype and other hot metal typesetting machines	An unlimited supply of type
The cost-structure required by letterpress printing	Offset lithography	Improved quality; ability to print color more effectively
Complex and time-consuming reproduction processes	Analog to digital	Flexibility to reuse content; miniaturization
Fully leveraging digital technologies	Desktop publishing (DTP)	The power of publishing is now in the hands of virtually anyone
Paper-based, error-prone processes for print purchasing	e-Commerce for print	Work can be consolidated by application and across geographic boundaries

Opinion

The thread running through all of these industry transitions is automation. For each, a new technology eliminated process steps and enabled work to be completed more efficiently. This is why a constant focus on removing workflow and application bottlenecks must be the primary goal of any print service provider. The other overwhelming transition that overlays the ones discussed here is how the central role of print on paper has moved from the middle of the target to being only one of many possible outcomes. The lesson here is that future growth depends on recognizing clients' needs for non-print services while also demonstrating how print can be an effective and pivotal part of an overall marketing plan. It is also worth noting that each of these transitions brought key benefits beyond what was initially anticipated. You may find that the added benefits of a new technology are key factors in enabling you to expand your service offerings and to differentiate yourself competitively.

One lesson we have learned during the pandemic is that electronic methods of communication and commerce have received a boost (consider Zoom and DoorDash.) For print service providers, this underscores the value of effective electronic job submission and job tracking tools. The pandemic has also shown us that lean manufacturing and automated workflows are well-suited to social distancing and safety. For production digital printing, this means that though economic short runs, quick turnaround time, and personalized messaging may have been initially the most important business characteristics, it is likely that two other factors will gain in value in the future: ease of operation and the ability of a single operator to run multiple devices.

Note: Check out the Appendix for a list of printing museums and typographic archives where you can continue to learn about the relevance of the past to what is happening in our industry today.

appendix

Appendix

Residents of North America have a wide range of opportunities to visit printing or typography museums and archives to learn more about the rich history of the graphic arts. Here is a short list of places to consider visiting:

- The Cincinnati Type & Print Museum (Cincinnati, Ohio), www.facebook.com/CinciTypePrint/

- International Printing Museum (Carson, California; south of Los Angeles), www.printmuseum.org

- Hatch Show Print (Nashville, Tennessee), www.hatchshowprint.com

- Hamilton Wood Type Museum (Two Rivers, Wisconsin; north of Milwaukee), www.woodtype.org

- Howard Iron Works (Oakville, Ontario, Canada; southwest of Toronto), www.howardironworks.org

- Letterform Archive (San Francisco, California), www.letterformarchive.org

- The Minnesota Newspaper Museum (Minneapolis, Minnesota), www.mnstatefair.org/location/minnesota-newspaper-museum/ (this one is only open during the Minnesota State Fair)

- Museum of Printing (Haverhill, Massachusetts; north of Boston), www.museumofprinting.org

- The Printing Museum (Houston, Texas), www.printingmuseum.org

If you get the chance, check out one of these locations near you… you will certainly learn something new!

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Jim Hamilton is a well-known industry analyst who serves as Consultant Emeritus for Keypoint Intelligence's Business Development Strategies and Production Printing consulting services. In this role, Mr. Hamilton supports the areas of production digital printing, wide format signage, labels & packaging, functional & industrial printing, production workflow & variable data tools, document outsourcing, digital marketing & media, customer communications, and business development.

Comments or Questions?

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