ABSTRACT

Title of dissertation: A DOUBLE-CIRCUIT MODEL FOR UNDERSTANDING TECHNOLOGICAL CHANGES IN MASS MEDIA: CASE STUDY OF THE PENNY PRESS

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Traditional histories of evolving new media have included consideration of such factors as the famous inventors, external social forces and economics, but those studies have largely neglected another key aspect of media evolution: the technological sphere. That sphere includes the technological decisions surrounding the new medium and the participants who made those choices – including the inventors, entrepreneurs, marketers and, ultimately, the consumer. To adequately understand this sphere, this dissertation develops a new theoretical approach for explaining the technological evolution of media: the "double-circuit model," and then applies this model to the first mass medium, the 1830s penny press in New York City.

The two circuits of the model are: First, the earliest technological participants that include the creator/inventor and the entrepreneurs (media producers) who are willing to take necessary risks to build content for the new

medium. Many of the key technological decisions are made in this first circuit and persist into the second circuit – largely because of "path dependence." The second circuit involves the media producers, marketers and the consumer. While the consumer has the ability to accept or reject the new medium and its content, these participants have difficulty drastically altering, or even understanding, the technological decisions made in the first circuit.

In the case of the 1830s penny press, the crucial decisions made in the first circuit included the adoption of faster, high-tech printing presses with ever higher capitalization costs and the rejection of stereotyping which would have permitted the use of multiple, low-cost printing presses. Those decisions encouraged a concentration of ownership because of the capital costs and a centralized production system because of the emphasis on a single set of presses. In the second circuit, readers could make choices about the kinds of content they preferred and could influence, through their purchases, the need for even faster printing, but they could not be aware of the earlier choices that ultimately would encourage fewer and fewer newspapers. The penny press greatly expanded the availability of newspapers to a broader audience, but by its dependence upon high-speed presses, it diminished the number of newspaper voices.

A Double-circuit Model for Understanding Technological Changes in Mass Media: Case Study of the Penny Press

by

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Chapter 1: Introduction, Literature Review and Outline

At the beginning of the 21st Century, communications practitioners, entrepreneurs and scholars struggled to make sense, and success, out of the technological advances in communications technologies crudely called "new media" – in this case meaning the collection of communications tools associated with the Internet, the World Wide Web and converging media technologies that blended pre-existing media with computers.

Those of us who were in the midst of this struggle generally fell into one of two camps: (1.) The traditionalists, represented by old, established enterprises (such as *The New York Times*, television and cable as well as companies dependent on mass media marketing, including mainline retailers and well-regarded Blue Chip companies). And, (2) the upstarts, represented by new, quick-acting enterprises (such as America Online, Internet startups, eBay and Amazon.com). I was in the traditionalist's camp – trying to keep up with the upstarts – and was repeatedly struck by the power and influence of these new entrepreneurs who talked in gigabytes not megahertz and knew only that Pulitzer was some sort of prize.[1]

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[1] From 1993 to 1996, this writer was president, editor and publisher of *The Washington* (D.C.) *Post*'s new electronic subsidiary, called Digital Ink Co., later called washingtonpost.com.

The revenue stream of America Online, at that time, paled by comparison to *The Washington Post*, CNN or *Time* magazine. However, when it came to these new Internet endeavors, the upstarts – actually, the technologists – had a dominating influence on business models, technological design, customer control and the generation of new ideas. New paradigms for mass media were being created and the older, entrenched forces were having little influence.

Traditional media businessmen were puzzled: Older methods of devising economic success for a time seemed irrelevant.[2] Companies, it seemed, were valued based on their losses not profits. In the long run, of course, innovators struggled with meager adoption and profitability of specific new media products – leading to what was called the Dot-Com collapse. Curiously, the collapse occurred as overall adoption of the new media continued to rise.[3]

During that thrilling time of rapid-paced successes and failures, we interlopers from print and television made a disconcerting observation: In this new media world, it looked like the equivalent of the printing press or the broadcast tower would no longer be owned by the media company but would be owned by AT&T, Microsoft,

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[2] Bill Gates, Nathan Myhrvold, and Peter Rinearson, *The Road Ahead* (New York: Penguin Books, 1996), xviii, 332 p. :; John Hagel and Arthur Armstrong, *Net Gain: Expanding Markets through Virtual Communities* (Boston: Harvard Business School Press, 1997).

[3] Internet penetration in U.S. households moved from near zero in 1992 to more than 50 percent in 2001, according to *U.S. Online Users* [Web site] (Media Metrix, 2002 [cited July 20 2002]); available from http://www.jmm.com/xp/jmm/press/industryProjections.xml.

America Online or some other technology company. We declared that these technologists and technology companies were surely in no position to manage century-old principles of objectivity, fairness, service to the public good and reportorial excellence. The "front page" of an Internet news product would certainly look different if the newsroom were owned by Bill Gates. America Online was not prepared to give us our nightly news.

Newspaper and magazine executives negotiated with the then-existent Prodigy online service owned by Sears and IBM, America Online, Compuserve, AT&T and others in an attempt to own the electronic printing press or at least to have a direct connection to our readers if someone else owned the press. We tried to make our brand dominate over the technology brands, to influence what our customers would pay to use our information, to control the look and feel of our information products and to dominate the advertising revenue.

Ultimately, a tentative social construction of the new media began to take form – reflecting some influence from all the participants. The potential of paid subscriptions for Internet news services was largely pre-empted by the pricing structure of the technology intermediaries – where information was free but access came at a price. The dominant brands became the technology brands – though partnerships developed with other brands (Microsoft and NBC television, for instance). The technologists accepted some of the design suggestions from old media journalists. Revenue streams became fragmented with no clear path to profitability except for the technology companies.

Most importantly, within 10 years the new media environment became a world where the electronic newspaper company couldn't deliver the *electronic* paper to your door and where the Internet television station didn't own the *signals* into your home. This segregation of delivery technology from content was, perhaps, merely a transition stage: At the beginning of the 21st Century, technology-centric America Online bought the traditional media company Time Warner – which had previously acquired cable technology. And, thus, over time media could evolve back to the old model where the company that owns the "printing press" also owns the "newsroom" – only the names would be different. [4]

Even if the technologists eventually blended in with existing media, it was certainly clear, however, that any adequate understanding of this new medium (or media) would require considerable attention to:

- The controlling technologies and technologists in those developmental stages,
- The attempts by non-technologists, including those in traditional media, to shape the medium.
- And, perhaps most interestingly, the largely unconscious decisions made by early technologists and how they shaped the medium.

My first-hand experience with 20th Century media raises similar questions about old media when they were new. For instance, does the current historical

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[4] Even though television is increasingly delivered via cable and satellite, local stations maintain clout through the potential of a direct broadcast link.

perspective on the creation of the 1830s penny press – arguably the first mass medium – place too little emphasis on technologists and technologies? Indeed, how did the technologies and the technologists influence the shape of all earlier mass media? What were the other contributors to shaping content and finances of these media? How were issues of control resolved? These questions in the context of the 1830s require consideration of printing press innovators and manufacturers as well as New York *Sun* founder Benjamin Day and in the case of radio, for example, consideration of Frank Conrad, the radio engineer who first played music on his amateur radio station in Pittsburgh, as well as RCA's David Sarnoff.[5]

The complexities of the new technologies of the late 20th Century often frustrated traditional scholarship: Previous explanatory models and theories, ranging from the great-inventor model of earlier historians to more recent social models and critical theories, seemed insufficient to explain this new media evolution. The earlier model was long considered too simplistic, and the later models entailed the exhaustive, post-facto understanding of broad social forces – an understanding that is

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[5] With credit for the phrase to Carolyn Marvin, *When Old Technologies Were New : Thinking About Electric Communication in the Late Nineteenth Century* (New York: Oxford University Press, 1988). Notably, some technology histories of radio and television have examined the interplay of content, media ownership and distribution, such as: Hugh G. J. Aitken, *Syntony and Spark : The Origins of Radio, Science, Culture, and Society* (New York: Wiley, 1976); Susan J. Douglas, *Inventing American Broadcasting, 1899-1922, Johns Hopkins Studies in the History of Technology* (Baltimore: Johns Hopkins University Press, 1987); Susan J. Douglas, *Listening In: Radio and the American Imagination* (Times Books, 1999).

impossible when in the midst of rapid change. Some scholars have made the technologies their sole focus while others have largely ignored this dimension.

Writing about new communications media, past and present, Patrice Flichy, describes his view of the problem:

> Numerous historical works on the subject [media technologies in the 19th and 20th Centuries] all but ignore the uses to which technologies are put; in fact, they implicitly assume that the utilization of machines is a natural result of their technical characteristics. In contrast, certain sociological studies of technology focus solely on the diffusion of a tool and tend to consider it as a "black box."[6]

The failure to put technology in its rightful place – where it is neither the sole focus of attention nor denied attention at all – has consequences, perhaps damaging consequences, when society develops new media. Without adequate reflection, inventors of new communications systems typically think in terms of substitution when they might better be examining a shift in uses of new technologies, and governmental policymakers may narrowly view their role as containing today's controversies rather than shaping the direction of a medium. Unless the black box is penetrated, the evolution of old media may be misunderstood and the creation of new media may be dominated by unintended consequences.[7]

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[6] Patrice Flichy, *Dynamics of Modern Communication: The Shaping and Impact of New Communication Technologies*, trans. Liz Libbrecht, 1st ed. (London: Sage Publications, 1995), 2-3.

[7] James A. Dewar, *The Information Age and the Printing Press: Looking Backward to See Ahead* [Internet document] (Rand Corp., 1999 [cited Aug. 18 2002]); available from http://www.rand.org/publications/P/P8014/.

Entrepreneurs will eventually figure out how to resurrect the Dot-Com world after its near-collapse at the beginning of the 21st Century, but that will take some time. What we also need to do now is work on methods and theories to better understand the technological aspects of media evolution. Then, as we can add perspective, we will be able to make sense of what happened and why.

Thus, this broad goal is operationalized by asking four questions in connection with an evolving technology, past or present:

1. What was the broader context of the technological change? Including relevant technical, social and economic factors.
2. What was the technological frame for key decisions in the early evolution of the new media technology? Including the source of innovation, the specific new technologies pursued and the initial efforts to move from novelty to implementation or innovation.
3. As the medium moved into the developmental stage, what were the key decisions? Including technological dead ends, overlooked alternatives and progressive, linear steps toward diffusion.
4. How did those key decisions skew the nature of the medium? Including technological capabilities and limitations (the medium's distinguishing characteristics), alteration of the medium's economics and influences on diffusion.

In addition to these essential questions, there are two additional questions that deserve attention if indeed they are answerable: To understand media evolution, does

one need to distinguish the technological frame that encompasses the early innovators and media owners from a second technological frame that encompasses media owners and consumers? And, considering the long-term implications of differing media technology choices, can those implications be discerned contemporaneously?

These questions are not merely academic or inconsequential. These early technological decisions have implications far beyond a choice between serif or sans serif type or a choice between Internet Explorer and Netscape browsers. Those decisions can affect, if not determine, essential qualities of new media, such as patterns of media ownership, the characteristics of the audience, the number of independent voices carried by the medium, and the types of content that the medium can efficiently deliver.

The Penny Press as a Case Study

To demonstrate the value of asking these questions, this dissertation uses a medium that evolved eight generations earlier, the penny press – especially the first successful newspaper to use this model. By doing so, I'm using a medium which has sufficient historical distance to take away the difficulty of analyzing the new media of today. While examining a 200-year-old technology presents its own set of challenges – such as obtaining first-hand accounts and documentation – there is an additional reason for selecting the penny press and its printing presses: In the history of media, the technological changes of that medium have been largely neglected – swept under

the journalistic, publishing concepts of objectivity, mass market advertising and newsboy deliveries.

In Flichy's analysis of 19th and 20th Century "new" media, he begins with the late 18th Century and early 19th Century development of the semaphore telegraph (the Chappe system) moves to the electric telegraph then photography, radio, television and computers. He makes only passing reference to the advent of mass market newspapers on the Continent and in the United States during the 1830s, concluding that those changes in the press occurred not because of technological innovation but because of the spread of the Enlightenment. His focus, as is common among scholars, is on causation when instead the question should be: What factors shaped this new medium, be they economic, social or technological? Even among the specialized histories of newspapers, the influence of journalists and publishers has been considered, broad societal influences have been examined, but significant technological decisions are either underplayed or misunderstood.[8]

This distorted view of the intersection between technology and, in this instance, the penny press makes it is an especially worthy case study for testing new theories and methodologies. The limiting factors of fewer primary records and the greater difficulty of reconstructing social interactions is offset by the potential for

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[8] Flichy, *Dynamics of Modern Communication: The Shaping and Impact of New Communication Technologies*, 58.

providing fresh, unexamined insights into this oldest mass medium when it finally moved beyond the legacy of Johannes Gutenberg.

The First Successful Penny Paper

The year was 1833. Andrew Jackson was President of 24 states – only two west of the Mississippi. Samuel Morse was at work on the telegraph; Cyrus McCormick on the reaper. There were 380 miles of railroad in the United States, and the Erie Canal had been open for eight years.

New York was already the largest city in the United States with 220,000 residents. However, a business depression had hit, the city was still suffering from a cholera epidemic that had killed 3,500 in the previous year, and the job-printing shop of 23-year-old Benjamin Day was near collapse. New York's city directory reported there were 529 lawyers, 530 doctors, 130 ministers and 132 churches, 41 insurance offices and 14 public markets. There were 34 weekly publications and 20 monthly periodicals, including *Children's Magazine, Truth Teller, Working Man's Advocate* and *Sylvester's Reporter and Counterfeit Detector.* Just one of many small printers, Benjamin Day had a crude hand-operated printing press in a 12-by-16-foot room at 222 William Street.[9]

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[9] *New York as It Is, Citizens' Advertising Directory*, (New York: J. Disturnell, 1835); "The Story of the Sun," *The Sun*, Sept. 3, 1883, 1.

In 1833, the city had 11 daily newspapers with a total circulation of less than 30,000. The largest morning newspaper was the *Morning Courier* with an estimated 4,500 circulation, and the largest afternoon paper with a circulation of 3,000 was *The Evening Post* – where Day first worked when he came to New York three years earlier. Neither of those publications would long survive what Day did that year.

To salvage his business, Day seized a vision that he and his printer buddies had talked about three years before when they worked in the backshop of the *Journal of Commerce.* They called it *The Sun,* a new kind of newspaper that would be sold very cheaply – for one cent – and that would sell to a mass audience. When Day finally started the newspaper, the primary purpose was to promote his printing business; and if he made a few dollars, that was a bonus. He could not know that he would be starting what would soon become the dominant urban newspaper genre, the penny press.

But at that moment, considering his business circumstances, he published as cheaply as possible and, notably, with as much flare as possible. Day's handy little paper was nine by twelve inches in contrast to the contemporary "blanket sheets" that were as large as 24 by 35 inches – a decision made out of economy, not journalistic invention. While small in size, Day's first issue boasted of its ambitious content: "The object of this paper is to lay before the public, at a price within the means of every one, ALL THE NEWS OF THE DAY, and at the same time afford an advantageous medium for advertising." Of course, that statement did not reveal what really had happened that day at the little print shop on Williams Street.

In reality on that first morning, Day did not begin to print *The Sun* until the other New York newspapers were out so that he could cut out their news stories and set them into type for his paper. All the news was someone else's news, and old news at that. With the exception of some police court items, all the local news was two to three days old: The suicide of a man from Boston, two stores broken open "by some villain or villains," and the observation that the city is "nearly full of strangers from all parts of this country and Europe." News from outside New York was at least a week old: a murder in Columbus, Ohio, 19 days earlier and the opening of a murder trial in Easton, Pennsylvania, 10 days before.[10]

The advertisements were bogus -- designed to make the newspaper look prosperous and also taken from other newspapers: A private family on Broadway wants cooks. A reward is offered for information on the robbery of a mail stage. The Secretary of State promotes a constitutional amendment so New York can elect its own mayor.

"It was a long time before I got any advertising to speak of, I put advertisements in, of course, to give *The Sun* the look of a daily newspaper, but they weren't paid for," Day recalled 50 years later.[11]

Day's newspaper did not surface on September 3, 1833, until hours after the other newspapers. In the rush to publish, he printed the wrong year on page two (1832

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[10] *The Sun*, Sept. 3, 1833.

[11] Edward P. Mitchell, "The Story of the Sun," *The Sun*, Sept. 3, 1883.

instead of 1833). But, the paper was cheap. For the first time in New York, he used the "London system" for distributing his paper: Newsboys, who initially were paid about $2 a week, hawked the product on the streets. On the second day of publication, Day ran this advertisement:

> TO THE UNEMPLOYED – A number of steady men can find employment by vending this paper. A liberal discount is allowed to those who buy to sell again.

With a circulation of about 1,000 copies and after discounts and unsold copies, Day brought in two, three, six dollars a day almost immediately – not counting expenses.[12] Recognizing his own limitations and interests as a journalist, within a week he hired a writer, to produce *The Sun*'s own news.

"George W. Wisner, a young printer who was out of work, had a knack for writing. The paper had been going about a week when Wisner came and said that if I would give him $4 a week he would get up early every morning and do these police reports," Day recalled. While Wisner, who would later become editor and co-owner of the newspaper, got started on the paper each morning, "I used to get up before the sun and buy early copies of all the morning papers and select the news we wanted."[13]

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[12] Sources differ on the number of copies that Day printed initially. Hudson wrote that 300 copies were printed. But 50 years later, Day recalled never printing fewer than 1,000 copies a day.

[13] Mitchell, "The Story of the Sun."

Measured by the number of people willing to buy it, Day's publication was a success almost overnight. But, he had what might appear to be an enormous problem, perhaps a fatal one. His job-shop only had a slow, hand-press – typical of what most printers used then, similar to what Benjamin Franklin had used 80 years before and not too different from what Gutenberg invented almost 400 years before. That press could print at most 200 pages an hour on one side of the paper, and with an issue of 1,000 copies, the press was barely capable of meeting the demand. Using the dominant press technology of the time, no newspaper in New York printed more than 5,000 copies a day. But, almost immediately *The Sun*'s circulation begin to sharply increase – exceeding 5,000 copies in only a few months and certainly exceeding the capacity of his little press.

In this blazingly successful example of entrepreneurship, did Day and his buddies at the *Journal of Commerce* envision a product with no practical way of actually producing it in the long-run? Did they envision a mass-market newspaper with no mass-market production system? Did they expect to print a daily newspaper that required 28 hours to produce? And, even if faster presses were available how could Day afford to buy one?

In the histories of American journalism, those questions have either been sidestepped altogether or rephrased in a simplistic way. At times, the question has been stated as "Did new faster printing technologies cause the penny press?" Some answered "yes." Others, "no." Some scholars have simply concluded that Day was

technologically backward, or that technology was irrelevant, because he only had a hand-press. No one seems to ask, "What did he know, and when did he know it?"

It's reasonable to expect Day to be knowledgeable about printing advances in New York, and perhaps elsewhere. These printing advances had been sporadically developed, just waiting for an appropriate use of their new capabilities. Day actually found a solution to his problem of production capacity rather quickly – in 12 weeks. It was a solution that had taken shape in a decades-long process beginning with technologists who had nothing to do with traditional printing and publishing. Any adequate explanation of the technological and economic environment for Day's new mass medium must undoubtedly be complex, cannot be explained in a simple cause-and-effect manner, and would likely involve a rich tale of interplay between early technologists and eventually publishers that began decades before the year of 1833. Indeed, it's a tale with bit players ranging from King George III, a bankrupt coal merchant, an anti-Napoleon French leader imprisoned during the Revolution, officers of the American Revolutionary navy and Santa Anna of Mexico.

Pursuing further details in this tale may inform us about the sources of media innovation, about how a new medium is constructed and socially constructed, and about the significance of early technological decisions in shaping a new medium. It will help us better understand invention as a pursuit of novelty not necessity, conceptualize the challenges facing inventors of new media channels, and perceive new complexities in "selling" those channels and content to a broad consumer audience.

Parameters of the Case Study

From this distance, the penny press may appear to be a sudden explosion of a new kind of publication in the largest U.S. city on September 3, 1833. Of course, it was not; indeed, it was a product of centuries of evolutionary steps that lead in the 1830s to a new mass medium. It was an urban phenomenon, and while the focus here will largely be on New York City, a reconstruction of what happened there must extend to Germany, Italy, France, England and elsewhere.

Significantly, the penny press was arguably the first mass medium, but existing histories either underplay or miscast the influence of upstart technologists. So far historians of journalism have largely focused on newspaper design and content, societal influences and famous inventor/journalists. The technological aspects, outside of histories of printing, have been largely ignored – indeed, misunderstood when mentioned at all: The interrelationship of technological innovation (faster printing presses) to changes in newspaper content, design and marketing have been mostly unexplored. The import of decisions – such as the rejection of stereotyping by newspapers for half a century -- has been ignored, and the blurring of the distinctions between printer/technologists and editor/journalists has clouded the understanding of the social construction of the penny press and perpetuated a press mythology. There is a significant difference between the romantic notion of peripatetic printer and editor

in the Western United States in the 19th Century and the hard realized of a rigid division of labor that was developing in the urban newspapers.[14]

We credit such misnamed "journalists" as Benjamin Day with inventing the concept of a low-cost, high-volume newspaper. Early historians attributed to him, to his contemporaries and to broad social influences the creation of such "journalistic" features as tabloid journalism, single-copy sales, local news and papers for a "penny." James Carey, Dan Schiller, Michael Schudson and others have noted the inadequacies of a "great inventor" and developmental or progressive models of journalism history and insisted on broadening the analysis to include larger social forces. Those scholars have certainly advanced our understanding of media; but they too neglected the technological components. Absent the specific examination of technological decisions during the early stages of development, our understanding of media – old and new – may be incomplete and distorted. [15]

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[14] John C. Nerone, "The Mythology of the Penny Press," *Critical Studies in Mass Communication* 4, no. December (1987).

15 James W. Carey, *Communication as Culture: Essays on Media and Society* (New York: Routledge, 1992); James W. Carey, "A Cultural Approach to Communication," *Communication* 2 (1975); James W. Carey, "The Problem of Journalism History," *Journalism History* 1, no. 1 (1974); Lawrence Grossberg, "Can Cultural Studies Find True Happiness in Communication?," in *Defining Media Studies: Reflections on the Future of the Field*, ed. Mark R. Levy and Michael Gurevitch (New York: Oxford University Press, 1994); Dan Schiller, "An Historical Approach to Objectivity and Professionalism in American News Reporting," *Journal of Communication* 29, no. 3 (1979); Michael Schudson, *Discovering the News: A Social History of American Newspapers* (New York: Harper, 1978).

Significant questions have been omitted from both the inventor histories and the newer social model of media development. Examples of these questions illustrate the potential misinterpretations of media creation by existing approaches to their histories:

Was the choice of smaller tabloid-size newspapers by the penny press a journalistic, marketing decision by Day and others (a common interpretation) or was it predominately the result of technological and economic constraints? The existing "blanket sheet" newspapers in U.S. urban markets were printed on huge, unwieldy sheets that were far larger than today's broadsheet newspapers. Day made a significant shift by producing a page size that was the equivalent of a business letter.

Was the penny press conceived in ignorance of faster methods of printing as Schudson suggests or was it inspired by the experimentation with the first improvements in printing in almost 400 years? Certainly, Day began with a hand press that was little different from the Gutenberg press, but experimentation in different printing techniques had been underway for decades.

Were the decisions about low prices and mass distribution driven by journalistic purposes – helping the workingman, for example – or were they driven entirely or in part by an early understanding of a driving principle of mass media, namely economies of scale? Indeed, could Benjamin Day and his cohorts have even been in a position to anticipate economies of scale considering the stagnated state of printing press productivity during the previous four centuries? For whatever reason, Day did begin, rather rapidly, to move toward a mass production model to replace the

low-circulation, high individual cost model of older newspapers. He was constantly pushing the technological envelope in order to meet the demand of readers while also capitalizing on ever lower marginal costs of each additional copy of his newspaper.

Who actually controlled the printing of Day's New York *Sun*? How did this financially strapped, under-equipped print shop owner afford expensive state-of-the-art presses only three months after starting his publication? In less than three months after beginning publication, Day began to print on a much faster, more advanced and more expensive press even though, by his own admission, the newspaper was still struggling to break even at that point.

The Role of the Technology Frame

This dissertation will hypothesize that early technological decisions – made independent of any concepts of journalistic purpose – greatly influenced the direction of this first mass medium. It will not be an argument for technological determinism, but rather it will focus on the social constructions by a few technologists – differentiating the technologists from the journalists – and by the earliest adopters of the technologies, printers and publishers. The key players in the relevant social groups include such diverse participants as: William Nicholson, a chemist who mostly spent his time developing inventions such as the hydrometer and improvements to the electric battery, never was in the printing business and, yet, received the first British patent for a rotary press. And, Robert Hoe, a businessman

who built industrial saws, experimental howitzers for the U.S. government and weapons for Santa Anna's Mexican military.[16]

While this dissertation does emphasize that early technological decisions alter a new medium's characteristics and, thus, its ultimate use by society, let me quickly note that this is not an exploration or defense of "technological determinism" – where new technologies rocket into the cultural environment inexorably causing disruption and change. Indeed, it is quite the opposite. There is no argument here that technology has an ontological status before culture; indeed, the outcome of this exploration is an affirmation of cultural influence – even in early stages when the number of individuals functioning as proxies for the culture is very small.[17]

This exploration does include elements of "technology assessment," but not in a narrow or predictive manner. It examines available and potential technologies during the period studied. It does consider environmental side effects – the interaction with other technologies and social goals. But, it also attempts to travel further – adopting the challenges of Ithiel de Sola Pool -- by understanding the market forces, including patterns of distribution, challenges to entrepreneurship and difficult

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16 William Nicholson. *Printing Machine,* 1790. Great Seal Patent Office, Great Britain. No. 1748; Stephen D. Tucker, "History of R. Hoe & Company, 1834-1885," *Proceedings of the American Antiquarian Society* 82, no. 2 (1972).

17 For a discussion of the prevalence and hazards of subtle determinism when applied to printing, see Michael Warner, *The Letters of the Republic : Publication and the Public Sphere in Eighteenth-Century America* (Cambridge, Mass.: Harvard University Press, 1990).

matching of technological capabilities with technological utilization. There are also implications for technological forecasting here, but that is not an essential goal. [18]

Any research in this field must maneuver through the ambiguous definitions applied to terms such as "media," "mass media", and "channels of communication." After all, a single channel of communication typically delivers data that are both mass *and* targeted: Radio, when it delivers broadcast data (ranging from words to music), is appropriately considered a mass medium, and, when it conveys individualized messages (in the form of CB radio or wireless messaging), is a targeted, not mass, medium. So, radio, and most other channels, offer both *mass* media capabilities and *targeted* media capabilities – and the line between the two is often blurred. Rather than attempting a full exploration of these terms and their ambiguous usage, I'll just state that in this dissertation my focus is on "mass media," referring to the use of channels of communication to deliver a common set of messages (content) to a relatively large, heterogeneous audience. "Media technologies" will include both the mechanisms for delivering those messages as well as the mechanism for constructing those messages.

In this dissertation, I am adapting methodologies and theoretical perspectives from several disciplines. As such an extensive part of this dissertation is the explication of my eclectic approach, and its unique application to media evolution. It

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[18] Ithiel de Sola Pool, *Forecasting the Telephone* (Norwood, NJ: ABLEX Publishing Corp., 1983).

is expected that the methodologies and theories I present will produce objections and disagreement – what I would consider a positive result. Historians of technology, especially those who use social construction as a primary tool, may object that I have taken a straightforward model and made it needlessly more complex. Journalism historians may not accept the value of this type of analysis.

Recognizing the limited documentation available on Benjamin Day and early penny press technologists, this dissertation is not primarily a document of factual discovery (though it may identify some errors in previous penny press histories); rather, it is a re-interpretation of this break-through medium using a model of technological change which I then can later apply to other cases, and with the proper refinement, to the newest of the media whenever the time period. When Trevor J. Pinch and Wiebe E. Bijker used the history of the bicycle to exemplify their then-new theory and model called "the social construction of technology," they emphasized they were not creating a "data-mining machine" but were rather testing a conceptual framework to see whether it is useful in explaining the empirical data. Likewise, my primary contribution is not in disclosing new data but in offering an alternative way of understanding existing data.[19]

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[19]Trevor J. Pinch and Wiebe E. Bijker, "Social Construction of Facts and Artifacts," in *The Social Construction of Technological Systems*, ed. Wiebe E. Bijker, Thomas Parke Hughes, and T. J. Pinch (Cambridge: MIT Press, 1989). For a subsequent discussion, see Wiebe E. Bijker and T. J. Pinch, "Scot Answers, Other Questions: A Reply to Nick Clayton," *Technology and Culture* 43, no. 2 (2002).

For this dissertation, I have re-examined traditional sources of information for Benjamin Day and the early penny press, including contemporaneous publications such as tourist guides and directories of 1830s New York, the entire first two years of *The Sun*, biographies of Day, James Gordon Bennett and others, plus histories of newspapers in New York, London and elsewhere. In addition, I have researched records not examined by journalism historians: early patents for faster printing presses, the personal documents and histories of printing press companies, manuals for printing techniques dating to the 1830s and earlier, and printing industry histories. Regrettably, there is a notable lack of documentation of Day's own newspaper activities – to a large extent because he sold *The Sun* in only a few years and was not in the newspaper business in the final decades of his life. An interview with Day on the 50th anniversary of starting *The Sun* is the dominant source of information about him independent of contemporaneous biographies and the newspaper itself. Nonetheless, the other evidence is sufficient to reveal the environment which surrounded Day at the time and to understand the ways in which he developed a community of interest with his readers, built a unique brand and created a newspaper model appropriate to higher speed printing technologies.

In writing this dissertation, I have both tried to emphasize an unfolding narrative of the penny press while also noting the relevant aspects of my model of media evolution. As such, there are instances of extrapolating from the available data and making a case for my particular perspective with the understanding that another reasonable person may reasonably disagree. In at least one instance, credible sources

of information are in total disagreement, and my conclusions are based on circumstantial, not direct, evidence.

Chapter 2 explains in detail my methodological and theoretical perspective, positioning it within the context of other fields of study. This is an eclectic approach borrowing from other disciplines but uniquely applying the composite to the history of media. Instead of contradicting existing scholarship, this methodology adds a missing piece to our understanding of media evolution. Chapter 3 examines the broad social and technological environment of newspaper publishing in the early 19th Century. Urbanization and other factors were beginning to make a mass market newspaper economically viable. Chapter 4 describes the technological frame for press innovation in the 18th and 19th Centuries, recognizing the considerable cross-Atlantic networking that existed among press innovators. Most of the early experimentation was conducted by inventors from outside the mainstream of publishing and who often faced fierce opposition to their innovations.

Chapter 5 identifies the technological choices that inventors and publishers were making or ignoring – sometimes leading to dead ends, to solutions that went unrecognized for decades and to dominant technologies that permanently influenced the urban newspaper industry. Some participants were able to bridge the gulf between the press innovators and the newspaper owners and, thus, produced broad changes in publishing while other participants merely invented and died. The chapter also explores the impact of those early technological decisions, and how those choices helped shape and skew the new medium. Preference was given to some technologies

over others, and what was once an exceedingly accessible enterprise became more difficult: Barriers to entry in the urban newspaper market grew rapidly and large. Micro- and macro-economic forces were embedded in the newspaper industry that would have a centuries-long impact.

Chapter 6 summarizes how Day took the technological capabilities, built news and information content appropriate to the technology, and then took product to the consumer market. He used marketing techniques that did not even receive names until decades later – brand identity, product differentiation, and communities of interest. Chapter 7 explains what was, perhaps, the most notable contribution that Day made to journalism: He built a news product that emphasized "yesterday," instead of last week. He developed a concept of a "perishable" news product that had an expiration date of 24 hours and that must then be replaced. Without perishability, the penny press business model and the expensive technological capability made no sense. Chapter 8 discusses the advantages and limitations of my methodological approach and points to future refinements that I intend to pursue.

But, first, we should examine what existing histories and studies have told us about urban newspapers in the 19th Century. Critics of journalism histories written through the first half of the 20th Century have said these histories were filled with mythologies. After that critical dialogue, many historians introduced new elements of historical research and new analytical models; nonetheless, it's appropriate to ask in the light of recent rapid changes in media technologies whether even those new models have overlooked or distorted key aspects of media development

Literature Review

Despite the landmark status given to Benjamin Day's launch of *The Sun* by historians of journalism and to the advent of cylinder presses by historians of printing technology, no thorough study of interplay between penny press publishers and technologists has been done. Of course, histories of newspapers have noted the use, or lack of use, of new-style presses, but the interaction of printers, publishers and press inventors has been inadequately explored. As a result, existing histories of the penny press often slide past critical sequences of development, include contradictions (or outright errors) and omit important players in the media evolution.

The dominant approaches to examining the penny press are represented by (1.) traditional histories often published as textbooks for prospective journalists (including the developmental interpretations established by Frederic Hudson), (2.) bio-histories of newspapers and newspapermen (they *were* mainly men), (3.) cultural histories (traced to Robert Park in 1925 and further developed by sociologists and historians in the last half of the 20th Century), and (4) histories of printing technology.[20] In addition, other fields of study have relevance to media evolution,

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[20] Frederic Hudson, *Journalism in the United States, from 1690 to 1872* (New York,: Harper & brothers, 1873); Robert Park, "The Natural History of the Newspaper," in *The City*, ed. Park, Ernest W. Burgess, and Robert D. McKenzie (Chicago: University of Chicago Press, 1925).

such as: the communications studies in diffusion of innovation and the technological histories of earlier electronic media.

The traditional histories and biographies were generally cast in a great inventor, progressive or developmental history perspective – characterizing the key players, whether printers or reporters, as journalists. The histories of print technology, with rare exceptions, divorced the technological changes from the changes in newspaper publishing and readership.[21] The culturalists have added substantial components to understanding the societal influences over the changes in newspapers, but they have largely excluded examination of the early social constructs by a smaller group of participants. The theory and methodology of scholars examining the diffusions of innovation offer some guidance for understanding newspaper evolution, but those insights have typically been applied only to the later stages of development. Thus, there is a need for new explanations of the penny press.

First, some background: It's accepted that Day started with a hand press – not significantly different from Gutenberg's press 400 years earlier. But, none of the existing historical perspectives ask: Did Day naively start a mass-market product without considering the production requirements necessary if the newspaper were a success? How did he advance to printing on a state-of-the-art higher-speed press in

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[21] In examining the influence of the R. Hoe & Co., Comparato dealt with the interactions between press technologies and newspaper developments. Frank E. Comparato, *Chronicles of Genius and Folly: R. Hoe & Company and the Printing Press as a Service to Democracy* (Culver City: Labyrinthos, 1979).

only three months? We know surprisingly little about where that press came from on such short notice, how this cash-poor printer acquired it, and how such high-capital cost equipment could be considered economically viable.

Much of what is known about Day is based on contemporaneous newspaper articles in The *Sun* and first-hand histories, on interviews with him decades after the founding, and on special editions of *The Sun* on the 20th, 50th and 100th anniversaries of its founding. The 50th anniversary edition included an interview with Day by then *Sun* reporter Edward P. Mitchell.[22] Contemporary histories by Frederic Hudson, Frank M. O'Brien and others added little to the details about Day's presses.[23] They do, however, restate an important component of penny press development: The concept of a low-cost, mass-distributed newspaper was often discussed by Day and several other printers while they were working as compositors (typesetters) for the *Journal of Commerce*. Day and the others eventually went on to start penny press publications in New York, Baltimore, and Philadelphia.[24] It was another typesetter,

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[22] Mitchell, "The Story of the Sun."

[23] Hudson, *Journalism in the United States, from 1690 to 1872;* Frank Michael O'Brien, *The Story of the Sun, New York: 1833-1928*, New ed. (New York, London,: D. Appleton and Company, 1928).

[24] In addition to Day, the printers included A.S. Abell, who later founded the Baltimore *Sun*, and William M. Swain, who later owned the Philadelphia *Public Ledger*.

Dave Ramsey, whom Day credited with the idea of a mass-market newspaper and with the name: "The Sun."[25]

O'Brien reflects the commonly used chain of events: "Dave Ramsey, a compositor on one of these six pennies, the *Journal of Commerce*, held an obsession. It was that a penny paper, to be called the *Sun,* would be a success in a city full of persons whose interest was in humanity in general, rather than in politics, and whose pantry-shelves were of negligible width. . . . Benjamin H. Day, another printer, worked beside Dave Ramsey in 1830. Ramsey reiterated his idea to his neighbor so often that Day came to believe in it. . ."[26]

Traditional Histories

Early U.S. journalism histories – often written as textbooks – have a few, very influential voices that uniformly have given scant attention to newspaper printing technologies. Moreover, they rarely make distinctions about the characteristics of those making newspaper innovation. Were they writers? Business leaders? Or, printers and technologists? Readers are only given hints of the motivating forces behind the innovations.[27]

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[25] Mitchell, "The Story of the Sun," 1.

[26] O'Brien, *The Story of the Sun, New York: 1833-1928.*

[27] The problems of defining "journalist" as well as choosing the most influential in the field are discussed in Joseph P. McKerns, "Introduction," in

Those histories, largely written for an audience of future journalists to indoctrinate them in the profession, can be generally characterized as being in the "developmental school" – where technology and output function in tandem to improve society. Those historians, if they dealt with the technology at all, treated technological changes as indistinguishable from journalistic changes in the inextricable march toward progress.[28]

As such, key decisions are treated as inexorably evolving improvements instead of an essential intersection of technical and economic decisions and journalistic choices. Frederic Hudson's pioneering overview of U.S. journalism history describes both the beginnings of the short-lived *New York Globe* (started by James Gordon Bennett) in 1832 and Day's New York *Sun* in the following year. In neither case does he identify the printing equipment used by the publishers, but he did establish a pattern for journalism historians that dominated for almost a century. As for the size of the *Globe*, Hudson used Bennett's notice in his first issue as explanation:

> A word on the size of my paper. For years past the public as been cloyed with immense sheets – bunglingly made up – without concert of action or individuality of character – the reservoirs of crude thoughts from different persons who were continually knocking

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Biographical Dictionary of American Journalism (New York: Greenwood Press, 1989).

[28] Carey, "The Problem of Journalism History," 3-4; James D. Startt and William David Sloan, *Historical Methods in Mass Communication* (Hillsdale, N.J.: Lawrence Erlbaum Associates, 1989), 25-29.

> their heads against each other, without knocking any thing remarkably good out of them. I have avoided this inconvenience. I shall give my readers the cream of foreign and domestic events. My sheet is moderate in size, an overflow of patronage shall demand more room, as it soon will, I may enlarge a little, but I shall avoid, as I would a pestilence, those enormous sheets – the pine barrens of intelligence and taste, which have been undoubtedly sent into the world as a punishment for its growing wickedness.[29]

Hudson states that the large size of the existing newspapers (24 by 35 inches and larger) was unnecessary, stating that space for news and advertising was wasted on extraneous material. [The technical and economic reasons for the difference in page size were omitted: It took just as much press-time to print a page 24 by 35 as a page that was 9 by 11. On the other hand, if advertising (or information) increased, adding another sheet to the newspaper would double the press-time. So, page size was largely a reflection of advertising volume not reader convenience.]

Hudson does observe that the early pioneers of the "Cheap Press" were mostly printers: "They were practical men. They had worked in the old party newspapers offices, and had had their joke and their moral over the articles they had put in type. This was their journalistic experience. They had no very comprehensive ideas of newspapers."[30] These technically oriented men were followed by journalists who were looking for an alternative to the party press, Hudson wrote.

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[29]Hudson, *Journalism in the United States, from 1690 to 1872*, 409.

[30] Ibid., p. 427.

What's missing from this first sweeping overview of journalism history? For one, there is no mention of the printing equipment used by Day and others. Hudson stated that Day's first issue had a circulation of 300 (a number reported as 1,000 elsewhere) and grew to 2,000 within three months. There was no explanation of how that was possible. A single flatbed press (which Day started with, according to numerous sources) could produce 100 issues an hour. Based on those descriptions; Day would require 20 hours to print the press run – forcing the impossible task of gathering the news, setting the type one letter at a time by hand and distributing copies to the newsboys who sold the paper on the streets within the remaining four hours.

James Melvin Lee's 1917 history of journalism uses Day's 1851 comments to describe the pressures to introduce steam-powered printing by 1835, but he says nothing about the technology decisions in the start-up phase of The *Sun*.[31] He does clarify the economic implications of page size, however:

> To make both ends meet he (Day) had to keep down the size of his paper, which was four pages with three columns of ten inches to the page, but it is wonderful how much news he was able to boil down and print in his limited sheet.[32]

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[31] James Melvin Lee, *History of American Journalism*, New rev. ed. (Boston, New York,: Houghton Mifflin Company, 1923).

[32] Ibid., p. 188

Later, William G. Bleyer would both support and contradict those earlier histories. He states that "With the aid of one compositor and a boy, he (Day) ran off probably not more than one thousand copies of the first issue of his little four-page paper, on a hand press, at the rate of 250 sheets an hours, printing them first on one side and then the other."[33]

Bleyer wrote that within four months, the circulation of *The Sun* reached 5,000. There was no explanation of how that was technologically possible since the original hand-press would have required a 50-hour day to produce a daily newspaper with that circulation size.

Surveys of journalism history covering this period conveyed similar explanations about the enabling role of press technology. For instance, Edwin Emery in 1962 characterized the groundwork for higher speed printing by describing David Napier's 1830 single-cylinder steam press and the R. Hoe and Company's role in bringing it to the United States. He wrote, "By 1833 all the ingredients were available for the establishment of such a venture. It was possible to print a paper that would sell

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[33] The output rates for early newspaper presses is often confused. The hand presses purportly could print 200 to 250 impressions per hour. A four-page newspaper required two runs through the press – first for one side and then for the other. Then the sheet was folded to produce the four pages. Thus, the actual output was 100 to 125 newspapers per hour. Merely increasing output by adding another press was almost never used except in the largest papers, in London for instance, because the entire issue would have to be typeset again, letter by letter. Willard Grosvenor Bleyer, *Main Currents in the History of American Journalism* (New York: Da Capo Press, 1927; reprint, 1973), 158.

for one cent, in contrast to the six cents charged by the average commercial dailies."[34] But, he never identified how that technology was utilized by the early penny press. Instead, when talking about press advancements, he jumped to the 1836 presses of the Philadelphia Public Ledger, where he said its Clymer hand-presses could not keep up with the 8,000 daily circulation.[35] The Ledger installed the Hoe Company's version of the Napier press – that Emery said previously was available by 1833. Emery does not identify the presses of *The Sun*.

Cultural histories

The new "social histories of journalism" -- represented by such names as Schudson, Nerone, Saxton, Schiller, Carey, Donald L. Shaw and others – argue that the penny press was a result of external forces and that scholars should look to the broader social and cultural developments to explain the new genre. They reject previous simplistic explanations that focused on the inventor genius, technological determinism and a form of journalistic manifest destiny. Typically these earlier histories were designed to convey an ever evolving (and improving) state of

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[34] After the criticism of cultural historians in the 1960s, later editions of the Emery series would reflect their changes in viewpoint. Edwin Emery, *The Press and America*, Second ed. (Englewood Cliffs, NJ: Prentice-Hall, 1962), 210-15. Michael C. Emery, Edwin Emery, and Nancy L. Roberts, *The Press and America : An Interpretive History of the Mass Media*, 9th ed. (Boston: Allyn & Bacon, 2000).

[35] Emery, *The Press and America*, 257-58.

journalism for the benefit of their primary audience: prospective journalists. As a result, they tended to be written as progressive historiography, adopted a "great man" approach to explaining changes in newspapers and specifically portrayed the penny press as the direct ancestor of the contemporary U.S. newspaper.[36]

In his attempt to identify better approaches to communications studies, James Carey turned to scholars outside the communications field. Unsurprisingly, he cited in 1975, among a covey of references, Thomas Kuhn – whose model for scientific change has been recast into explanations for changes in technology, business and innumerable other fields. While one can argue over whether new media ever qualify for Kuhnian paradigm shifts, Kuhn does offer some useful points of examination – such as his observations about the role of newcomers to a field who lead the way to breakthrough paradigms.[37]

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[36] Carey, "A Cultural Approach to Communication."; Schiller, "An Historical Approach to Objectivity and Professionalism in American News Reporting."; Schudson, *Discovering the News: A Social History of American Newspapers;* Donald Lewis Shaw, "At the Crossroads: Change and Continuity in American Press News 1820-1860," *Journalism History* 8, no. 2 (1981). For an interesting debate over these issues see: Nerone, "The Mythology of the Penny Press."; John J. Pauly, "The Rest of the Story," *Critical Studies in Mass Communication* 4 (1987); Dan Schiller, "Critical Response: Evolutionary Confusion," *Critical Studies in Mass Communication* 4, no. December (1987); Michael Schudson, "A Revolution in Historiography?," *Critical Studies in Mass Communication* 4 (1987); Donald Lewis Shaw, "Why We Need "Myths"," *Critical Studies in Mass Communication* 4 (1987).

[37] Carey, "A Cultural Approach to Communication."; Thomas S. Kuhn, *The Structure of Scientific Revolutions*, 2nd ed. (Chicago: University of Chicago Press, 1970).

Carey then argued for a more all-inclusive explanation to changes in journalism and publishing. Nonetheless, Carey's call for a broader perspective and a rejection of traditional histories still gives minimal scrutiny to technology. In a rush to explain media interactions with external social forces, the cultural histories following Carey's suggestions largely bypass or miscast the first wave of decision-making – the stage when crucial decisions are made among a small group of participants. For instance, Schudson explodes the presumptions of technological determinism by some traditional press histories: He points out that the first successful penny paper – the New York *Sun* – used 400-year-old technology, a slow flatbed hand-run press.[38] Schudson fails to note that printers in New York, including Benjamin Day, would have already understood the potential of high-speed presses because they had been in use there for several years, and he only mentions in passing that Day switched to a cylinder press in three months (something that doesn't happen without preparation). Such easy dismissal of determinism should not justify ignoring the impact of technology and technologists in the ultimate social construct – but it has.[39]

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[38] Schudson, *Discovering the News: A Social History of American Newspapers*, 31-35.

[39] Such conclusions are conveyed to future journalism professionals in academic textbooks. Jean Folkerts and Dwight Teeter, for example, state that advances in press technology came too late to explain the development of the Penny Press – not acknowledging that newspaper publishers were testing or using newer presses decades before Day started The *Sun*. Jean Folkerts and Dwight L. Teeter Jr., *Voices of a Nation: A History of Media in the United States* (New York: MacMillan Publishing Company, 1989), 144.

Nerone puts it even more bluntly characterizing Day and his cohorts as "journalists" who were "technologically retrogressive. . . . The earliest penny paper seemed to harken back to the days of craft production and artisan control rather than look forward to the modern newsroom. Benjamin Day, for example, began the *Sun* with a hand press and a few helpers. His entire operation was contained in a room that measured 12 by 16 feet. The *Cincinnati Daily Times,* one of the earliest successful penny papers, began publication on an old Dickinson hand press. . ."[40]

David Mindich particularly focused on the penny press era when he examined changes in the content and form of American journalism, especially objectivity and nonpartisanship, but he excluded technology issues except for the role of the telegraph in altering the organization of stories.[41]

In his sweeping analysis of communication studies, Daniel Czitrom explores the entry of the telegraph, movies and other electronic media with cursory attention to the technologies themselves, but nonetheless concludes: "Considered as an institution, each medium that evolved from the work of individual inventors and entrepreneurs was later subsumed into larger corporate or military contexts. The key

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[40] Nerone, "The Mythology of the Penny Press," 398.

[41] David T. Z. Mindich, *Just the Facts: How "Objectivity" Came to Define American Journalism* (New York: New York University Press, 1998).

roles played by small concerns and amateurs in the early history of new communications technologies are too often forgotten."[42]

One of the contributions of the social history approach is a better understanding of newspaper business motives. For instance, Schiller notes:

> From the moment of their initiation in the mid-1830s, penny newspapers took business success as their most fundamental goal. In this they differed radically from the party press which they displaced, for party editors had been forced by their patrons to place the tactics and strategy of political campaigning above enduring business stability and growth.. . . . At once both utilizing and prompting the emergence of ever more productive printing technologies – paper-making machines, types, presses – newspapers place the expansion of circulation at the forefront of their day-to-day operations and interests.[19]

William Huntzicker observed the changing nature of news as the popular press emerged, noting the changes in styles of writing and the acceptance of exaggeration and even hoaxes. He notes that these changes reflect changes already underway in American society. Alexander Saxton describes the evolution of newspapers from pre-1830 to post-1830 as a shift from "grande bourgeoisie" ownership to the artisan owners who first dominated the penny press. He argues that the Gutenberg press marked the beginning of mass communications when it replaced the monks who transcribed manuscripts by hand, and notes the shift in press

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[42] Daniel J. Czitrom, *Media and the American Mind: From Morse to Mcluhan* (Chapel Hill, N.C.: University of North Carolina Press, 1982), 185.

[43] Schiller, "An Historical Approach to Objectivity and Professionalism in American News Reporting."

ownership: "The press expanded readership at the cost of a fixed investment in technology as a prerequisite to entry. At one end of this sequence lay minimal price of entry and prohibitive unit cost; at the other, a unit cost curve approaching zero and an investment curve rising almost vertically: mass illiteracy at one end, oligopolistic or monopolized control of communication at the other."[44]

Thus, Saxton suggests that rising out of an artisan, egalitarian background, the penny press publishers were seeking to lower the cost of newspapers for consumers. He, for instance, connects Day with the Workingmen's Party movement. However, soon afterward, the cost of technological innovations would escalate the cost of entry for new newspapers and re-establish class separations between press owners and consumers.

Similarly, Elizabeth Faulkner Baker describes the transition from an owner/operator model of the press toward a labor/management approach. As she traces the history of the International Printing Pressmen and Assistants' Union, she notes the side-by-side changes in management (toward the distinctive role of "foreman"), increases in circulation and technological advances. She also explains the

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[44] William Huntzicker, *The Popular Press, 1833-1865, The History of American Journalism, No. 3* (Westport, Conn.: Greenwood Press, 1999); Alexander Saxton, "Problems of Class and Race in the Origins of the Mass Circulation Press," *American Quarterly* 35, no. 2 (1984): 222.

increasing division between publishers, journalists and backshop technical employees[45]

David Paul Nord explains the relationship between improved printing technology and financial incentives for economies of scale among religious publishers in the 19th Century and beyond. Those publishers pursued low-cost mass-distributed Bibles and religious tracts just as the penny press publishers pursued mass-market newspapers. They were early exploiters of stereotype technology that was adopted by the newspaper industry decades later.[46]

Recent approaches to media history certainly are not devoid of technological considerations. Fang's six information revolutions are mostly based in technology.[47] Journalism historian Dicken-Garcia notes that the consequences of intended or unintended technological decisions bear scrutiny that rarely exists:

> The long view of reactions to communications technology suggest generally little thought about social implications of new technologies during their development, emergent and novelty stages – or such consideration come as mere afterthoughts.[48]

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[45] Elizabeth Faulkner Baker, *Printers and Technology; a History of the International Printing Pressmen and Assistants' Union* (New York,: Columbia University Press, 1957).

[46] David Paul Nord, *The Evangelical Origins of Mass Media in America, 1815-1835*, ed. Lee B. Becker, vol. 88, *Journalism Monographs* (Columbus, OH: Ohio State University, 1984).

[47] Irving E. Fang, *A History of Mass Communication : Six Information Revolutions* (Boston: Focal Press, 1997).

[48] Hazel Dicken-Garcia, "The Internet and Continuing Historical Discourse," *Journalism & Mass Communication Quarterly* 75, no. 1 (1998): 24.

Diffusion of innovation and economics

In the field of communications, diffusion of innovation studies demonstrate the role of the audience (consumer) in the adoption and shaping of new technologies and ideas, and as such, they demonstrate how the original intentions of inventors, businessmen and publishers may be thwarted or redirected by users.[49] The studies of diffusion by Rogers and others give support to those broader cultural, sociological perspectives on the adoption of technologies. Threshold models of such as those developed by Mark Granovetter and others may help explain some of the rapid growth of the penny press in the 19th Century. Adoption of a new communication product feeds on itself: The incentives for a non-user to acquire the product increases as other consumers begin to use it.[50]

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[49] Tom Postmes, Russell Spears, and Martin Lea, "The Formation of Group Norms in Computer-Mediated Communication," *Human Communication Research* 26, no. 3 (2000); Everett M. Rogers, *Diffusion of Innovations*, Fourth ed. (New York: Free Press, 1995).

[50] M. Brouwer, "Prolegomena to a Theory of Mass Communication," in *Communication*, ed. L. Thayer (London: Macmillan, 1967); M. Granovetter, "Threshold Models for Collective Behavior," *American Journal of Sociology* 83 (1978); M. Lynne Markus, "Toward a Critical Mass Theory of Interactive Media: Universal Access, Interdependence and Diffusion," in *Organizations and Communication Technology*, ed. J. Fulk and C. Steinfield (Newbury Park, CA: Sage Publications, 1990); M. Lynne Markus, "Toward a 'Critical Mass' Theory of Interactive Media: Universal Access, Interdependence and Diffusion," *Communication Research* 14 (1987).

These studies have on occasion examined the developmental stage – looking at the influence of economic and technological decisions on consumer products, such as the refrigerator.[51] However, the primary focus has been on the diffusion stage (what historians of technology call "innovation" stage) – where consumers adopt, reject or adapt new technologies or ideas. As Rogers observed:

> "Past diffusion studies typically began with the left-hand tail of the S-shaped diffusion curve, that is, with the first adopters of an innovation. . . Past diffusion investigations overlooked the fact that relevant activities and decisions usually occurred long before the diffusion process began."[52]

Literature with an economics emphasis – whether executed by historians or economists – have only rarely dealt with newspapers, but their approaches offer insights. David Landes explains the complex intertwining of phenomena that shape technological change – ranging from scientific breakthroughs to population growth to ideology.[53] The role of competition – which becomes important in the later stages of penny press development – is broadly explained by economics perspectives offered

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[51] Donald A. MacKenzie and Judy Wajcman, *The Social Shaping of Technology : How the Refrigerator Got Its Hum* (Milton Keynes ; Philadelphia: Open University Press, 1985).

[52] Rogers, *Diffusion of Innovations*, 131.

[53] David S. Landes, *The Unbound Prometheus: Technological Change and Industrial Development in Western Europe from 1750 to the Present* (London,: Cambridge U.P., 1969).

by Michael Porter. [54] Technological adoption and acquisition are explored by Massoud Karshenas and Paul Stoneman, among others.[55]

From a media economics perspective, Benjamin Compaine and Douglas Gomery explain how economies of scale, "first copy costs," and barriers to entry have been substantial influences on most media, and newspapers in particular.[56] Compaine's explanation of modern newspaper economics – with its increasing utilization of economies of scale – has its origins in the 1830s penny press since earlier, slower printing press technologies effectively blocked its exploitation. Indeed, it's the development and exploitation of this economic advantage that dramatically differentiates the pre- and post- penny press eras.

Edward Constant, from the perspective of technology revolutions, discounts economic factors as "the chief dynamic force behind technological progress," but does recognize their eventual influence: "It is only after a candidate paradigm has

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[54] Michael E. Porter, *Competitive Strategy : Techniques for Analyzing Industries and Competitors : With a New Introduction*, 1st Free Press ed. (New York: Free Press, 1998).;

[55] Karshenas Massoud and Paul Stoneman, "Technological Diffusion," in *Handbook of the Economics of Innovation and Technological Change*, ed. Paul Stoneman (Cambridge: Blackwell, 1995).

[56] Benjamin M. Compaine and Douglas Gomery, *Who Owns the Media? : Competition and Concentration in the Mass Media Industry*, 3rd ed., *Lea's Communication Series* (Mahwah, N.J.: L. Erlbaum Associates, 2000).

taken shape in its creator's mind, it is only when that creator sets out to convert the relevant community, that economic factors can become directly determinant."[57]

Histories of press technology

Histories of printing in America primarily focus on the sequence of technological improvements: When did who do what, and where was it? While they sometimes correlate press productivity, for instance, with the size of newspaper circulation, they do not examine the broader implications of press technology, publishing business models or content.[58] For instance, James Moran devotes much of his attention to the evolution of large presses used by newspapers, but he makes no mention of the penny press or Benjamin Day and refers to the New York *Sun* only in the context of mid-19th Century patent dispute with British inventor Jeptha A. Wilkinson. Moran traces the modern cylinder press to William Nicholson who

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[57] Edward W. Constant, II, *The Origins of the Turbojet Revolution.* (Baltimore: Johns Hopkins University Press, 1980), 554.

[58] George Alfred Isaacs, *The Story of the Newspaper Printing Press* (London etc.: Co-operative printing society limited, 1931); James Moran, *Printing Presses: History and Development from the Fifteenth Century to Modern Times* (Berkeley: University of California Press, 1973); Rollo G. Silver, *The American Printer*, 1st ed. (University Press of Virginia, 1967); Rollo G. Silver, "Efficiency Improved: The Genesis of the Web Press in America," *Proceedings of the American Antiquarian Society* 80, no. 2 (1970); Isaiah Thomas, *The History of Printing in America, with a Biography of Printers*, Originally published 1810; reprint from the 2nd, 1874, ed. (New York: Weathervane Books, 1967); Charles Henry Wilson and William Reader, *Men and Machines; a History of D. Napier & Son, Engineers, Ltd., 1808-1958* (London: Weidenfeld and Nicolson, 1958).

received a patent in 1790 for a concept he never implemented and Friedrich Koenig who began cylinder press experiments in London in 1806. [59]

The step by step difficulties of improving print production are internationally explored by Maurice Daumas in his sweeping review of technological change. He notes that the extensive experimentation with presses that could replace the Gutenberg hand press reached a peak at the beginning of the 19th Century and was most dramatically illustrated by the Friederich Koenig cylinder press, which would allow all of the operations to be performed mechanically. He also notes the centuries-long development of stereotyping was largely motivated by the preservative aspects of that technique, not its ability to speed up the printing process by duplicating pages to be used on multiples presses. He describes the parallel development of printing techniques besides letterpress which was the dominant method in newspapers, such as relief, intaglio and lithography, that were rapidly advancing in the late 18th and early 19th Centuries as well. He attributes the vigorous pursuit of new press technologies to a world increasingly disposed toward the rapid mass transmission of information.[60]

Journalism historian Calder Pickett examines the correlation between the willingness of 19th Century New York publishers to adopt new printing technologies

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[59] Moran, p. 179-180.

[60] Maurice Daumas, *A History of Technology & Invention; Progress through the Ages*, 3 vols. (New York,: Crown Publishers, 1970).

with their willingness to publish stories about new technologies.[61] He calls *The Sun* "a creature of technology, made possible by the advance of mechanization."[62] Pickett concludes that the correlation between the publishers' interest in new technology news and their actual use of new press technology was inconsistent at best.

Frank Comparato's history of the Hoe Printing Press Company does place that company's contributions within the context of mass-market newspapers and U.S. society. Using that company as the predominant source of innovation, Comparato argues that press developments – rotary presses especially – in the last half of the 19th Century were crucial to modern newspaper development. [63]

Histories of electronic communications

Historians, sociologists and communications scholars who have examined earlier electronic communications – telegraph, radio and television – have at times dealt with the intertwining of technological decisions with the ultimate shape of the final medium.

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[61] Calder M. Pickett, "Six New York Newspapers and Their Response to Technology in the Nineteenth Century" (Dissertation, University of Minnesota, 1959); Calder M. Pickett, "Technology and the New York Press in the 19th Century," *Journalism Quarterly* 37, no. Summer (1960).

[62] Pickett (1960) p. 401

[63] Comparato, *Chronicles of Genius and Folly: R. Hoe & Company and the Printing Press as a Service to Democracy.*

Aitken's exhaustive examination of the development of radio technology demonstrates the influence of technological decision-making on the outcome of a medium. Others, such as Douglas, have extended the examination of radio to the broader social interactions. Douglas traces the diffusion of radio programming, including broadcast journalism, with an emphasis on the audience. She also identifies the important role of individuals outside the mainstream of the radio industry who made major contributions to the shape and form of radio programming and technology. These hobbyists who ran their own broadcasting stations and these amateur radio operators (hams) who transformed the passive medium into a participatory event shaped radio by innovating programming, by forcing governmental regulatory actions when radio was dominated by the military, and, perhaps most importantly, by grabbing the imaginations of a broader radio audience by assisting authorities in natural catastrophes, eavesdropping on world events or simply making the daunting technology seem less imposing. Robert McChesney examined the influence of governmental regulations on broadcasting but excluded the technological developments.[64]

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[64] Hugh G. J. Aitken, *The Continuous Wave : Technology and American Radio, 1900-1932* (Princeton, N.J.: Princeton University Press, 1985); Aitken, *Syntony and Spark : The Origins of Radio;* Ray E. Barfield, *Listening to Radio, 1920-1950* (Westport, Conn.: Praeger, 1996); Robert J. Brown, *Manipulating the Ether : The Power of Broadcast Radio in Thirties America* (Jefferson, N.C.: McFarland & Co., 1998); George H. Douglas, *The Early Days of Radio Broadcasting* (Jefferson, N.C.: McFarland, 1987); Douglas, *Listening In: Radio and the American Imagination;* Robert W. McChesney, *Telecommunications, Mass Media, & Democracy* (New York: Oxford University Press, 1994).

With application to media systems, Thomas Hughes explains the evolution of large technological systems through the stages of invention, development and innovation (diffusion). With his emphasis on complex systems, he explores the negotiated decision-making of the participants. "During invention and development inventor-entrepreneurs solve critical problems; during innovation, competition and growth, manger-entrepreneurs make crucial decisions; and during consolidation and rationalization financier-entrepreneurs and consulting engineers, . . . often solve the critical problems." He, however, largely deals with systems, such as the electrical power, where the deliverable product *is* the product – unlike media where the technology is merely the tool for delivering the product.[65] While these studies have greatly contributed to the understanding of electronic media, they have tended to largely ignore the media content implications while focusing on the technology (Aitken) or to address content by focusing on societal interactions (Douglas). In contrast, Claude Fischer's examination of the telephone encompasses the corporate interests as well as the user influences on that technology, but he mostly bypasses the implications of early technological decisions on the evolving medium.[66]

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[65] Thomas P. Hughes, "The Evolution of Large Technological Systems," in *The Social Construction of Technological Systems*, ed. Wiebe E. Bijker, Thomas P. Hughes, and Trevor Pinch (Cambridge, Mass.: MIT Press, 1990), 57.

[66] Claude S. Fischer, *America Calling: A Social History of the Telephone to 1940* (Berkeley: University of California Press, 1992).

In Summary

The significance of communications technology was certainly heightened as mass media evolved in the 19th and 20th Centuries to ever more complex systems. At the end of the 20th Century, the complexities and developmental expenses of the newest communication technologies – those associated with computers and the Internet – meant that early technological decisions were distanced from the mainstream of existing media and perhaps from society at large. With the Internet initially being a conception of military minds within the U.S. government and with the implementation of those governmental directives in the hands of technologists with little conception of its broader communications potential, there was a decades-long decision-making process well outside the media conventions of newspapers, radio and television. There was not even, in the early years, the kind of marketplace testing and adaptation that took place with the telephone 100 years previous. Not surprisingly, some of the "best" creations of these media makers were accidental or, at least, the result of unintended consequences – such as the one truly killer application of the Internet, e-mail.

By the time governmental authorities had decided to turn the Internet over to the public, more than 30 years of decisions about the technology had already been made: It was firmly entrenched as an asynchronous, packet-switched, multi-nodal communications system. Put another way, the core of the technology was established. In subsequent years, there were successful efforts in overcoming some of the

limitations of the Internet design by implementing "instant messaging" as a way of achieving a bit of the telephone's simultaneous communication capabilities and "streaming audio and video" as a way of approaching the broadcast capabilities of radio and television. But, both improvements are flawed by comparison to the media technologies they strive to emulate – flawed because the Internet designers never envisioned its eventual use as a mass medium.[67]

Even when the Internet "went public," it was still foreign to most participants in traditional, mainstream media. It was so technologically complicated that most media organizations were divided in the early days between those "who had gone on the Internet" and those who had not with the latter claiming some sort of rites of passage when they could come to work one day and say, "I went on the Internet last night." (In many cases, they had not. They had sent an e-mail message and had not actually surfed Internet sites.) Even more substantially, a vast number – if not the majority – of old-media participants scoffed at this new technology ever being friendly enough to be adopted by many of their very large audiences. As a result, this new "public" Internet still remained as the turf of primarily techno-centric individuals and companies, such as: Microsoft's Bill Gates, American Online's Steve Case, MCI's Internet godfather and guru Vint Cerf. When traditional media companies

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[67] Obviously, many scholars argue that the Internet is not a mass medium because the audience is inherently fragmented. But, it is nonetheless a mass medium in the sense that the delivery mechanism is placed in the hands of a mass audience, even if they are not all tuned to the same "channel."

awoke to the Internet juggernaut, they discovered the technologists already had made many of the key decisions and, moreover, they were in control. Not surprisingly a decade after the Internet went public, brand names included AOL Time Warner and Microsoft's MSNBC. The dominant Internet sites in the first ten years were Yahoo, Lycos, AltaVista, AOL and similar enterprises started by technologists, and sites owned by traditional media only began to catch up in the 21st Century.

Was that shift in media decision making and control unique to this latest new medium? And, if it is not unique, how can we better understand the evolution of media in a technological environment. In this dissertation, I posit that process is not unique to the Internet and, more significantly, that the traditional methods of understanding media evolution leave an important void. It's a void that cannot be filled by better understanding of external social forces – though those are essential considerations – nor by a purely chronological or technological account.

Some existing approaches to theory and methodology within the communications field offer potential guidance to understanding media as technological change, but those approaches have not been stretched to that purpose. Furthermore, most approaches have either underplayed or misstated the changes during the early developmental stages of new media. The older histories of journalism in the developmental school, for example, did little more than identify coinciding events in media technologies and media content in a chronological manner. The critical and cultural approaches added a significant component by explicating the

social and economic factors which surrounded evolving media. But, none of these approaches adequately explains the technological frame for key decisions.

Other fields of study have perspectives that have useful application to the problem at hand. Those theories and methods have at times been applied to media technologies; and, indeed, there are some excellent examples in the case of radio, for instance. However, these approaches have not explained how early technological decisions had lasting impact on media content, and on journalism in particular. Research on the diffusion of innovation, for example, has focused on the adoption stages with little attention given to early decisions which placed limiting parameters on a technology or idea moving into the marketplace. Social construction scholars have developed a valuable resource for understanding technological change; however, it has rarely been applied to the intersection between media technology and media content or especially between technology and journalism.

A better explanatory tool is needed. In this dissertation, I am first adapting existing theoretical and methodological approaches for the peculiar circumstances surrounding media evolution. This approach emphasizes the dichotomy that often exists between the developers of media technologies and the producers of media content. The division between the two groups is so great and the difficulty older media producers have in understanding new media is so profound that very often media technologists may be forced to become the producers of media content. That happened in the late 20th Century with the Internet's Steve Case and Bill Gates, and we will discover that it also happened at the end of the 18th Century with John Walter

and *The Times* of London. I have adapted social construction approaches to understand technological change in the context of evolving media and especially to explain those early technological decisions. This approach is not advanced as a replacement for existing media and communications scholarship, rather it is a complement. My approach will be presented in some detail, but it lacks substance without a detailed example of its implementation – such as the advent of the penny press.

Perhaps, the easiest example to use would be the Internet and surrounding technologies since those are the media prompting my critical view of existing scholarship, but I have chosen to avoid doing that. First, the Internet is still in very early stages of development, and its eventual composition is in doubt. Second, because my theoretical/methodological approach is constructed in part from my first-hand experience with the Internet, it could yield a circular argument.

Enough analyses have been done with radio and television to suggest that this modified approach to social construction could be applied to those technologies. But, using those electronic media as the case to study might seem too easy and too derivative. I've instead taken a much more challenging instance of media evolution – the 1830s penny press and its printing presses – in part because from afar its technology seems so much simpler than today's electronic media and in part because if the methodological approach works there it will clearly be differentiated from

existing scholarship. There is a certain amount of sex appeal as well to using what is arguably the first mass medium.[68]

Using the penny press, however, is not without considerable risk. The availability of primary documentation for the early participants is at times quite limited, and much of the existing narratives and academic scholarship is entrenched in a received history that some have characterized as a collection of myths. However, this undertaking is valuable not primarily as a discovery of new data but rather as a new method for synthesis that can shatter some of those myths. If used at all, some of the primary documentation that is available to scholars has been insulated within purely technological studies of presses and segregated from the data used by historians of media and journalism. In this dissertation, I integrate that data to provide a fuller understanding of the penny presses.

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[68] The premature rush to judgment about the Internet is discussed in David Abramson, "The Visible Hand: Money, Markets and Media Evolution," *Journalism & Mass Communication Quarterly* 75, no. 1 (1998); Mitchell Stephens, "Which Communications Revolution Is It, Anyway?," *Journalism & Mass Communication Quarterly* 75, no. 1 (1998).

Chapter 2: Theory and Methodology

Theories and models used in communications studies have rarely encompassed technological change as an integral component. Both in the study of media in general and the penny press in particular, the technological aspects of communication changes – especially the early evolution of media technologies – have been neglected.

This neglect of media technology has not gone unrecognized, but research has seldom assimilated newer theories and methodologies that explicate technological change. Denis McQuail says there is inadequate attention paid to media technologies, and Dicken-Garcia laments the lack of consideration of media technologies during their novelty and developmental stages. Certainly, Eisenstein's exhaustive works on the advent of printing and her explanations of its implications for law, science, nation-states and social structures illustrates the importance of emerging media technologies to societal changes. And the sociological/cultural studies by Kobre, Carey, Schiller and others demonstrate the value of looking beyond a narrow focus on media and media players.[69]

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[69] Carey, "A Cultural Approach to Communication."; Dicken-Garcia, "The Internet and Continuing Historical Discourse."; Elizabeth L. Eisenstein, *The Printing*

However, none of these approaches focuses on the decision-making and media shaping that occurs when a relatively small group of innovators coalesce around a new paradigm. These are the participants characterized by Kuhn (in the context of scientific change):

> "Almost always the men who achieve these fundamental inventions of a new paradigm have been either very young or very new to the field whose paradigm they change." [70]

While the kinds of change discussed here do not rise to the breadth of a paradigm shift as Kuhn discusses, a recognition that media technologies often evolve from technological innovations created by persons outside the media mainstream is important. There is nothing novel here about suggesting the outsiders have an influence, but the application of that realization to media change is new. These men are not the great men/inventors of traditional media histories and certainly not journalism histories, but rather the early media technology innovators who are participants in a small-group social construction that has lingering effects when the

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Press as an Agent of Change, 1979 ed., 2 vols. (Cambridge: Cambridge University Press, 1979); Sidney Kobre, "The Sociological Approach in Journalism History," *Journalism Quarterly*, no. 22 (1945); Denis McQuail, *Mass Communication Theory*, Third ed. (London: Sage Publications, 1994); Schiller, "An Historical Approach to Objectivity and Professionalism in American News Reporting."

[70] Kuhn, *The Structure of Scientific Revolutions*, 90.

technology evolves to a broader audience.[71] It's that initial social construction that is missed by impact-oriented communications studies, traditional histories and even the cultural approaches to understanding media. An understanding of those early technological decisions does not replace these other approaches, but it certainly fills a void in our understanding.

To clarify that significant context of decision making, I have developed a methodology that clarifies the unique contribution of those initial technologists. It's an approach that does not violate existing scholarship; though, it may add new perspective and, therefore, some revisions. With the task at hand, there are useful perspectives within communications studies and other fields for understanding the technological changes of mass media and for positioning my own theoretical approach. Here are four key examples:

Communication studies

McQuail uses a matrix to identify the different forms of communications studies and theory. The quadrants are primarily distinguished by orientation on a

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[71] Bijker uses the term "relevant social groups" instead of "audience" or "users" and notes these groups are heterogeneous with differing priorities. Wiebe E. Bijker, "The Social Construction of Bakelite: Toward a Theory of Invention," in *The Social Construction of Technological Systems*, ed. T. J. Pinch and Wiebe E. Bijker (Cambridge, Mass.: MIT Press, 1989).

scale of ideas or materials and on a scale of media focus or societal focus. He uses two continuums:

Culturalist versus Materialist: This continuum separates scholars whose interests and convictions lie in the realm of culture and ideas from those who emphasize material forces and factors. "This divide corresponds approximately with certain other dimensions: humanistic versus scientific; qualitative versus quantitative; and subjective versus objective."72

Media-centric versus society-centric: A continuum that gives media attributes of autonomy and influence at one end and that portrays media as a reflection of political and economic forces at the other end. This continuum is reflected in the shift in journalism histories from a predominately internal focus on media and journalism to a greater emphasis on the social environment of news organizations.

The approach used in this study will include elements from the extremes of both continuum. In the early stages of technological invention and development, the social circle is very narrowly drawn to include inventors, experimenters and earliest adopters; in this stage, decisions may be more narrowly focused on technological and economic forces and on technical solution. As a result, the emphasis will be technology-centric and materialistic. When media technologies move toward the adoption state, the theoretical analysis will tend toward the culturalist or qualitative and toward the society-centric.

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[72] McQuail, *Mass Communication Theory*, 3-5.

Histories of Technological Change

Historians of technological change have struggled with another way of presenting a somewhat similar matrix of options to identify the roles of technologists, technologies and society. While not specifically related to media, John M. Staudenmaier, one of the founders of the Society for History of Technology and long-time editor of its journal, *Technology and Culture*, has categorized the research undertaken by that relatively new field of study.[73] His taxonomy places histories of technological change into three categories:

Internalist history focuses on the details of the technology and its changes. This approach simply answers "how things are commonly done or made" and "what things are done and made." The focus is almost entirely on the artifact itself. In this instance, the data and the analysis are largely restricted to what's in the "black box."

Externalist history probes the context of technological events but does not discuss the design or function of the technologies in question. The construction of the artifact is largely irrelevant. In this case, what's in the black box is ignored.

C*ontextual history* blends technical design with historical context. The internal design of specific technologies is viewed as dynamically interacting with a complex of economic, political and cultural factors. To fully understand a new

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[73] John M. Staudenmaier, *Technology's Storytellers : Reweaving the Human Fabric* (Cambridge, Mass.: Society for the History of Technology and the MIT Press, 1985).

technology, this approach argues that all aspects of the technological environment are relevant. In this case, what's inside the black box is just as important as what's outside the box.

The approach presented in this dissertation primarily exists in the contextual category – with the context narrowly defined by a relatively few number of participants at the early stages of media development. For some communications scholars, this approach may be jarring. There is far greater emphasis on the details of technologies than one would find in either traditional media histories or in cultural histories. Such details, and the understanding that goes with them, are necessary to open the black box of technology and associate it with the relevant personalities, economics and culture.

Social Construction

Sociological perspectives have also been used to explore technological change, including media changes. Claude S. Fischer in 1992 outlined approaches that have been used to study society and technologies. He is primarily focused on the interaction between a technology and society – raising questions which have dominated communications studies on media impact. His approach, and the approaches advocated by other scholars using the social construction of technology

helps explain some of the distortions that exist in other forms of analyses. He divides the field into these categories with clear indications of his preferences: [74]

Impact Analysis is the "billiard-ball" model, in which a technological development rolls in from outside and "impacts" elements of society, which in turn "impact" one another. He compares this pure form of technological determinism with a softer form, where "historians of technology explain that a technological development may have unfolded otherwise were it not for social, political, or cultural circumstances." For instance, "the telephone created skyscrapers" is an example of the first, and the differences between telephone systems in France and the United States are explained by the soft version.

Impact-Imprint Model suggests that new technologies alter history, not by their economic logic, but by the cultural and psychological transfer of their essential qualities to their users. Marshall McLuhan is a noted, if disputed, example of this approach. A technology "imprints" itself on personal and collective psyches. One researcher concludes that unexpected telephone calls at home promote anxiety and feelings of helplessness. Others have argued that electronic media have made society "place-less."

Both the Impact and Impact-Imprint models are forms of technological determinism. And, Fischer argues both lead to inadequate history and misleading sociology.

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[74] Fischer, *America Calling: A Social History of the Telephone to 1940*, 10-18.

Symptomatic Analysis describes technologies not as intrusions into a culture but as expressions of it. In other words, the technology follows the development of society: The automobile assembly line merely epitomizes deeper conditions within the culture.

For instance Albert Borgmann's inquiry on *Technology and the Character of Contemporary Life*, distinguishes between "modern devices" with mysterious internal workings that merely deliver some end to us — like central heating and stereos — versus "focal things" that we understand and that can illuminate our lives— like fireplaces and violins. [75] Devices are bad; things are good. This approach, for Fischer, offers some insights, but its holistic nature makes it impossible to seriously examine a particular technology and may "conceal and confuse matters more than the piecemeal nature of technological determinism."[76]

Cultural studies in communication and media have tended to fall into this category – though some practitioners might object to the description.

Social construction represents the importance of all participants in the creation and adoption of technologies. Actors in the technological frame, the circle of individuals who come in contact with a new technology, can influence and shape the new creation. The shape of the device and its ultimate use are influenced and altered

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[75] Albert Borgmann, *Technology and the Character of Contemporary Life : A Philosophical Inquiry* (Chicago: University of Chicago Press, 1984).

[76] Fischer, *America Calling: A Social History of the Telephone to 1940*, 16.

by relevant groups. "Mechanical properties do not predestine the development and employment of an innovation. Instead, struggles and negotiations among interested parties shape that history."[77]

Fischer mostly endorses this approach, but pushes it further to insure that a whole range of studies can take place with the telephone or any other technology. He calls his version of social constructionism the *user heuristic*. "We need to study how specific devices were introduced and adopted, what people used them for, how that use changed as the technology evolved, how those uses altered other actions, how patterns of use changed the context for other actors, and so on." He greatly expands the role of the consumer as a key component of the social construct. [78]

This dissertation uses the social constructionist approach and uses the content of early penny press newspapers and the adoption patterns of readers as proxies for the user heuristic.

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[77] Ibid.

[78] Fischer's approach has similarities to work done by communications scholars who have explored uses and gratifications, such as: J.G. Blumler and E. Katz, *The Uses of Mass Communications* (Beverly Hills, CA: Sage, 1974); Jay G. Blumler and Michael Gurevitch, "Media Change and Social Change: Linkages and Junctures," in *Mass Media and Society*, ed. James Curran and Michael Gurevitch (London: Arnold, 1996).; Fischer, p. 17-18.

Path dependence

Described by Paul David in 1984, economists, and even natural history scholars, developed a body of literature on "path dependence" as a way of explaining the lingering effects of earlier economic, or evolutionary, decisions that seem out of place or unnecessary in later years. David colorfully described the crucial nature of paths: ". . . some important and obtrusive features of the rich technological environment that surrounds us may be the uncalculated consequences of actions taken long ago by heroes and scoundrels. The accretion of technological innovations inherited from the past therefore cannot be legitimately presumed to constitute social optimal solutions provided for us, either by heroic entrepreneurs or by herds of rational managers operating in efficient markets."[79]

Economists have primarily used path dependence as a tool to explain "market failures" – apparent disconnects between that field's commitment to inescapable market efficiencies, for example, and artifacts that clearly seem inefficient. Common examples included the QWERTY keyboard, Y2K two-digit year problems, and, for evolutionary studies, the male nipple. The business community had long recognized principles of "first mover advantage." And, historians of technology had observed

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[79] The reprint of David's 1984 presentation to the American Economic Association when he outlined path dependence is Paul A. David, "Clio and the Economics of Qwerty," *The American Economic Review* 75, no. 2 (1985). The quotation is in Paul A. David, "The Hero and the Herd," in *Favorites of Fortune*, ed. Patrice L. R. Higonnet, David S. Landes, and Henry Rosovsky (Cambridge, Mass.: Harvard University Press, 1991), 76.

skeuomorphism – the persistence of artifacts of old technologies even when replaced by new technologies.[80]

The path dependence concept produced heated discussion in the economics community, over the validity of economic anomalies and over the appropriate application of the concept. Is the QWERTY keyboard really inefficient, for instance?[81] Path dependence is a useful concept in explaining the evolution of media technologies – not in the normative sense that economists are using it but in a manner that identifies outcomes without making judgments about efficiencies. As such the concept helps explain the persistent influence of early technological decisions and demonstrates the need to understand those decisions.

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[80] George Basalla, *The Evolution of Technology, Cambridge History of Science* (Cambridge [England] ; New York: Cambridge University Press, 1988); Paul A. David, *Path Dependence, Its Critics and the Quest for 'Historical Economics'* (Stanford University, Department of Economics, 2000 [cited Oct. 16 2002]); available from http://www-econ.stanford.edu/faculty/workp/swp00011.pdf; Robert Friedel, "'a-Ok' to Y2k: Technological Confidence and History at the End of the Twentieth Century," in *Museums of Modern Science*, ed. Svante Lindqvist (Canton, Mass.: Watson Publishing International, 2000); Raghu Garud and Peter Karnoe, "Path Creation as a Process of Mindful Deviation," in *Path Dependence and Creation*, ed. Raghu Garud and Peter Karnoe (Mahway, N.J.: Lawrence Erlbaum Associates, 2001); Stephen Jay Gould, *Bully for Brontosaurus : Reflections in Natural History* (New York: Norton, 1991); Stan Leibowitz and Stephen E. Margolis, "Policy and Path Dependence from Qwerty to Windows 95," *Regulation* 18, no. 3 (1995); S. J. Liebowitz and Stephen E. Margolis, "The Fable of the Keys," *Journal of Law and Economics* XXXIII (1990).

[81] Leibowitz and Margolis, "Policy and Path Dependence from Qwerty to Windows 95."

All of the methodologies discussed previously have overlapping aspects even if they use differing terminology. The same is true of path dependence and its application in the fields of economics, natural history, networks theory and a growing list of other adopting disciplines. At its simplest, path dependence – the QWERTY effect – suggests that earlier decisions in the development of a technology, a political system or an institution may have a lingering, almost irreversible, existence long after the selection seems necessary or appropriate. This simplest interpretation has obvious utility in understanding media evolution. There are early technological decisions, often made for immediate, narrow purposes that have long-lasting influence and are difficult to alter at later stages.

As a refinement to his earlier description of path dependence in 2000, Paul David used the additional term of "lock-in." During the course of development, an economic system (or a technology) reaches a point of stable equilibrium, it cannot escape except through the intervention of some external force or shock. Path dependent systems may have a multitude of possible points of equilibrium; some of these points may lock-in components that are just as good as any other options or may take paths to places where everyone would wish to have been avoided. Thus, the outcome of path dependence may be neutral or positive; or, it may represent a "market failure."[82]

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[82] David, *Path Dependence, Its Critics and the Quest for 'Historical Economics'* ([cited).

In addition, there is a more complex application of path dependence, which this study utilizes. Path dependence does not solely exist in a realm of excluding options or concretizing anomalies; the theoretical perspective of path dependence also helps distinguish the importance of sequential decisions. The sequence of decisions can skew the eventual outcome just as much as any critical, unique choice. When a political candidate makes a decision to declare "no new taxes," it has a constraining influence on later circumstances that might warrant new taxes. Had he not made the earlier decision and pronouncement, he would have a freer hand to advocate new taxes when conditions required it.[83]

Because individuals, groups and institutions tend to focus on and become invested in a decision once it is made, the sequence of decisions, thus, can preclude or delay other options. This might be diagrammed as follows (where Ω represents the decision path, Q represents the individual decisions, and X_A and X_B are variations in the outcome). The first decision path, which produces outcome "A," can be diagrammed as:

$$\Omega : [Q_1, Q_2, Q_3 ...] \rightarrow X_A$$

And, the second path, which produces outcome "B", as:

$$\Omega : [...Q_3, Q_2, Q_1] \rightarrow X_B$$

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[83] Christian List, *A Model of Path Dependence in Decisions over Multiples Propositions* [Web site] (Nuffield College, Oxford, U.K., 2002 [cited December 6 2002]); available from http://www.nuff.ox.ac.uk/economics/papers/2002/w15/path-dep-nuffwp.pdf.

Thus, it is just as important to consider the order of decisions as it is to consider the discrete choices. The path of decisions may be altered by conceptual blocks by participants who simply cannot identify the alternatives, by economic forces, by governments or by broad social forces. In the case of faster printing press speeds in the 19th Century, the sequence of decisions placed high-tech press mechanics before eventual decisions about using stereotyping with implications for the outcome – namely, the cost of operating an urban newspaper rapidly increased. Both, high-speed presses and stereotyping (a much cheaper technology) were ultimately adopted, but the decision to use costly presses occurred first. Thus, this sequencing of decisions could produce a differing outcomes and shape of this new mass medium as well as subsequent adaptations of it.

Not surprisingly, the concept of path dependence is embraced by social constructionists but with some qualifications. Pinch, one of the originators of SCOT (the social construction of technology), accepts the value of path dependence as long as it does not encompass economic or technological determinism. Rather than "path dependence," he and others have used the concept of technological stability or "closure" to describe the point in which technological decisions become solidified but never, he would emphasize, permanently in place. Not only are technologies subject to later revisions by later actors, but differing groups may place different meaning or value on the same technology, called "interpretative flexibility" "For social constructivists, the stability of a technology always seems fragile. What stability there is threatened by the heterogeneous social world within which such technologies are

embedded." He is more comfortable with adaptations of path dependence, articulated by Raghu Garud and Peter Karnoe, which includes the concept of *path creation*, the dominant direction of technological choices that can be altered at a later time through a process of *path destruction.*[84]

While these theoretical approaches do offer some guidance for understanding media as technological change, taken singly they fail to offer adequate focus on a key venue for influences on new media technologies, namely the early interaction between technologists and the potential producers of media content. Media formation questions to date have largely been focused on the purely technological or broadly social with inadequate attention given to the formative invention and development stages. I will argue that, particularly in the case of media, an understanding of those stages is crucial to explaining the eventual form of the technology.

A New Explanation of Media Evolution

Mass media technologies have a peculiar evolutionary path because of an inherent characteristic of those technologies: they are perceived as valueless unless and until someone creates content to deliver through that medium. To maneuver a new mass medium through a successful path to consumer acceptance, first requires

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[84] Garud and Karnoe, "Path Creation as a Process of Mindful Deviation."; T. J. Pinch, "Why You Go to a Music Store to Buy a Synthesizer: Path Dependence and the Social Contruction of Technology," in *Path Dependence and Creation*, ed. Raghu Garud and Peter Karnoe (Mahway, N.J.: Lawrence Erlbaum Associates, 2001).

convincing someone to wrestle with, and devise, the potential content that can be delivered by the new medium and then, secondly, convincing consumers that the new combination of medium and content is worth consuming.

In a sense, the adoption pattern of new media products travels two cycles of Rogerian S-curves (from early adopters to full market penetration) in contrast to the single S-curve of most products: First, there is a curve reflecting the adoption of the technology by media content producers, and second, a curve representing the adoption of both the technology and content by media consumers. A successful mass media technology, must first climb the first S-curve and be adopted by sufficient numbers of media producers willing to gamble on the new technology and then must climb the second S-curve and be adopted by sufficient numbers of consumers who are attracted by both the technology and by the media content.

The necessity of creating and marketing content in addition to the technology is an added burden for mass media success. Except on some esoteric, epistemological level, the inventors and marketers of the automobile, for instance, did not have to create "destinations" before they could sell their products – though the definition of destination certainly evolved over time. While the interests of automobile marketers certainly were aligned with the creation of new roadways, that transportation channel, too, was largely undertaken by other entities.[85]

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[85] This distinction is made with mass media where the content is centrally produced in contrast to communication media (such as the telephone) where the content is produced by the consumers.

This peculiar path of a mass medium is a "double circuit." The first circuit encompasses the technological innovators who are pursuing the novelty of a new medium *and* the parties they approach who might use the new medium to build unique and usually expensive content for distribution through the medium. The interactions in that first circuit are incredibly complex, in part, because the existing, logical sources of content creation are inherently threatened by a new medium and are inherently and mentally locked into a concept of content bounded by older media. With the advent of radio, television and the Internet, prior media producers were approached about the new medium (newspapers had an interest in broadcast and the Internet), but they also felt threatened (i.e., some newspapers initially refused to carry television listings). As a result, during this first circuit, media innovators may face disinterest, rejection or hostility from existing content producers as they try to find someone who will build the content. As we will see in the case of newspapers, sometimes the technologists give up and try to build the content themselves – creating a significant break from traditional media.

The second circuit encompasses those same enterprises who have decided to give the new medium a try by building content suited to it *and* consumers. The content producers and distributors, then, in this second circuit must achieve an acceptable social construction with consumers who may be threatened by the new technology (computers and the Internet), offended at its early crudeness (facsimile machines), annoyed at its inconsistencies (VHS versus Beta), or simply confused about why anyone would need the new medium (the small, palm-sized Apple Newton

computer). In successful new media, the content producing enterprises and the consumer (variously called readers, the audience, the customer or the end-user, depending on the medium) will reach an acceptable social construction of what the new medium "is good for."

At first glance, the distinction between the two circuits may seem obvious and superfluous, but its importance lies in the potential isolation of decision making between the two realms. This isolation differs from the *single-circuit* approach commonly used in social constructions or in diffusion of innovation studies. The widely accepted pattern of technological adoption includes a cycle that moves through invention, development and innovation (what communications scholars call "diffusion"). These stages are not perceived as sharply divided nor consistently linear in progression, and additional stages (such as obsolescence) are added by some observers.[86]

These stages have been used to help illuminate the movement of successful technologies from inception to widespread adoption. Particularly, at the development stage (as the bugs are worked out) and in the early stages of innovation, a new device or idea may flip back and forth among these stages as users (consumers) accept, reject or object to aspects of the new conception and as inventors in turn add-to, re-invent and adapt. This process is rarely simple or timely. Something as simple as the zipper

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[86]Ray Kurzweil, *The Age of Spiritual Machines : When Computers Exceed Human Intelligence* (New York: Viking, 1999); Rogers, *Diffusion of Innovations;* Staudenmaier, *Technology's Storytellers : Reweaving the Human Fabric.*

or as complex as the fax machine may take decades to evolve.[87] That approach called social construction of technology explains these ambiguous stages through an analysis of interpretative flexibility for solving problems in the development, technological frames, closure and stabilization.[88]

Though usually difficult and protracted, this process, or negotiation, between inventor/developer and user/consumer is, in my parlance, a *single circuit*. While there are innumerable forces (economic or otherwise) and several groups of individuals (such as marketers) involved in this process, much technological change can be adequately understood by ultimately focusing on the inventor/developers and a heterogeneous decision-making group, the end-users or consumers. Pinch and Bijker used the development of the bicycle to illustrate their explanation of SCOT by using user groups defined by their sex (women who had specific desires for the way the bicycle was built because morality demanded that they wear skirts), young men and boys who viewed bicycles as a sport, and the safety-conscious who wanted efficient transportation.[89]

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[87] For a fuller discussion of the zipper see Robert Friedel, *Zipper: An Exploration in Novelty*, 1st ed. (New York: W.W. Norton, 1994).

[88] Bijker, "The Social Construction of Bakelite: Toward a Theory of Invention."; Bijker and Pinch, "Scot Answers, Other Questions: A Reply to Nick Clayton."

[89] Pinch and Bijker, "Social Construction of Facts and Artifacts."

In such instances, there is much less need to focus attention on early technological decisions which might alter the construct of the invention because we are dealing with a single circuit. Certainly, there were substantial societal, economic and aesthetic differences when Ford chose to transform the auto industry with mass-market, assembly-line cars. Ford did not, however, have to go to another party to invent "destinations." Of course, the car is dependent on support mechanism, gasoline and roads. But, the reasons for using the transportation were already there: home, work and recreation spots.

In contrast to this *single-circuit* process, successful media technologies complete a *double circuit* because there are actually two sets of technologies. The first set of technologies surrounds content *production*; the second set surrounds content *distribution.* The first circuit inherently influences or controls the second. For instance, a distinguishing characteristic of the Internet includes its capability for multi-nodal storage and transmission of simultaneous as well as asynchronous communication – a characteristic unlike any preceding medium and with profound influences on media content. A somewhat similar division is made by historians of technology who have observed the diffusion of innovation between "business-related innovations" and "household-related" innovations: For example, the TV station is the

business of the entrepreneur while the diffusion of television sets depends on decisions made in the home.[90]

Thus, new media technologies must maneuver through the first technological frame – where the relevant social groups typically include both technologists and entrepreneurs and may exclude old media representatives – before reaching the broad consumer social group in the second circuit. [I choose to use the label "circuit" instead of what SCOT scholars call "social groups" with "technological frames" to emphasize the negotiated decision-making between what is really two social groups within each circuit and to emphasize the somewhat closed environment of each circuit: The complexity of media systems produces barriers between the highly technical considerations in the first circuit and the simplified consumer-oriented decisions in the second.]

What's especially important about this model is its emphasis on what consumers can and cannot select within the second circuit. Consumers can select whether to adopt the new medium and choose how they use the medium. However, fundamental characteristics of the medium usually cannot be changed. Indeed with complex media technologies, the consumers do not even know about the alternatives

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[90] Paul Bairoch, "The City and Technological Innovation," in *Favorite of Fortune: Technology, Growth, and Economic Development since the Industrial Revolution*, ed. Patrice L. R. Higonnet, David S. Landes, and Henry Rosovsky (Cambridge, Mass.: Harvard University Press, 1991); P. O. Pederson, "Innovation Diffusion with and and between National Urban Systems," *Geographic Analysis* 2 (1970).

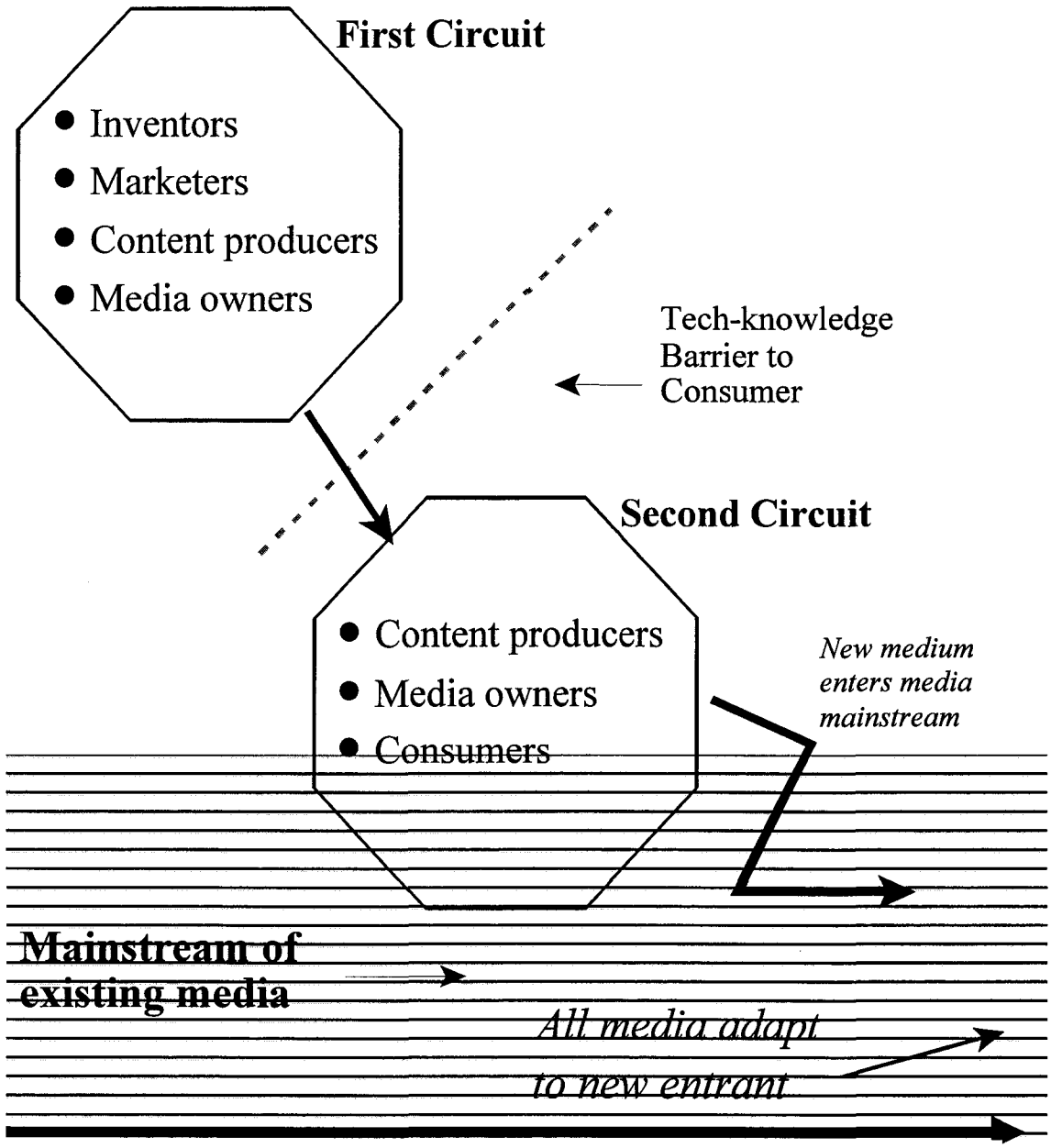
considered in the first circuit; there is a *tech-knowledge* barrier. The social construction of suitable content as viewed in the second circuit is also constrained by earlier, sometimes irreversible, decisions about the new medium's technological capabilities. The relevance of path dependence and sequential decisions in this process is obvious. Even if consumers push for changes, the momentum of early design decisions and content decisions may restrict the range of options.

A diagram of the double-circuit process (*See next page*) includes the first circuit, where the decision making participants include the inventors, engineers and, if successful, media producers (who may or may not be part of the existing media mainstream). Once that circuit has solidified the technology to the point it can be revealed to a broader audience, then it shifts to the second circuit, where the participants are the media producers, distributors and consumers. It is only after completing both circuits that the new media technology can enter the existing mainstream of media.

As an example of the double-circuit process:

- 1st Circuit – 19th Century printing press innovators had to convince publishers that the geometrical increase in printing speed with much higher equipment costs was worth exploring, and those publishers in turn had to develop content and business models that matched the capacities of that new technology.

Figure 1: Double-Circuit Model



Stages of a new mass medium: 1. An inventor creates a new medium. 2. In the first circuit, the inventor negotiates with entities willing to develop content for the invention. 3. In the second circuit the content producers and media owners must convince consumers that the medium and the content have merit. Consumers have limited ability to consider earlier options because of a "tech-knowledge" gap.

- 2nd Circuit – Those publishers then had to create and distribute content using the new medium, convince consumers that the new product was worth acquiring, and constantly fine-tuning it to the needs and wants of consumers while always restricted by earlier technological decisions.

Because of our longstanding, deeply ingrained acceptance of print, these distinctions may be hard to comprehend – though Eisenstein makes convincing arguments concerning the dramatic differences with the advent of printing. The distinction between the two circuits is more obvious with newer media, where recollections of technological hurdles and content missteps are more immediate.

Those 19th Century newspaper consumers never made a decision about using faster rotary presses instead of using stereotype technology, but that decision made in the first circuit had enormous impact on eventual consumer choices and became a part of the medium's defining characteristics. Twentieth Century Internet users had no choice but to use a "packet-switched" network instead of a traditional point-to-point network, but the decision to use this asynchronous technology – chosen during the first circuit -- became a defining characteristic of that medium.

One could argue that all successful innovations have production and distribution technologies, but I am referring here to separate decision-making circuits, one involving a negotiation between technological developers and content producers

where the producers are the ultimate decision-makers and a second circuit involving a negotiation between those content producers and media consumers where the consumers are the ultimate decision-makers. Despite those consumer choices, decisions in that first cycle – often decisions made unmindful of later implications – affect a medium's intrusiveness, its alteration of the communication process, and the adaptations forced upon existing media. Because of the threatening and unfamiliar nature of new media, the closure on that first social construction often takes place outside the influence of traditional journalists, content producers and old media owners.

Just as the stages of invention, development and innovation are tools for understanding technological change without being positioned with sharply defined delimiters, the *double-circuit* concept is a prism for better understanding media development – not an exacting taxonomy of media evolution. Some negotiations may sometimes move between the first circuit and the second, when a technology is rejected – for instance, early facsimile machines.

This theoretical approach brings focus to an important vortex of media making that is ignored by traditional media histories with their focus on inventors and by culturalists with their focus on societal influences. From this new perspective, the emphasis is placed on a series of fresh questions concerning media development, such as:

1. Who are the key participants in the decision-making at the production level? What individuals or groups are driving the technological change, and what are

their biases and vested interests? Who pays for the key technological components? What precursors existed for their decision?

2. What are the key economic determinants in production? What are the costs of media creation (as distinct from media distribution) and the subsequent implications for dispersal of media creation (or, barriers to entry)? What are the costs of media distribution and the subsequent implications for intermediation (marketing, sales, etc.)?

3. How do these production decisions limit or skew consumer choices? What are the direct unit costs of media consumption relative to other media? What are the barriers to media consumption (including time required to learn the technology, perceptions about the invasion of privacy, etc.) relative to other media? What, if any, alternatives are rejected in the social construction? What are the implications of these rejected constructs?

4. What are other systemic influences on the technological decision? What are the real and perceived disruptions to legacy media systems? What is the "essence" of new medium technology – those primary characteristics that distinguish it from previous media?

This dissertation uses the 1830s penny press to test and illustrate the double-circuit concept and especially focuses on the first circuit which has been largely ignored by other historical accounts of journalism and printing presses. This new perspective forces new hypotheses about the penny press:

- The initial penny press innovators should be understood as "journalistic outsiders" to properly understand their ability to break from the old press paradigm in a Kuhnian fashion: Benjamin Day was a technologist and printer, not a journalist.
- The initial exploration of faster printing technologies was driven more by a push toward novelty than by any immediate necessity. After faster printing methods were developed, some technologists and media producers began to explore ways of capitalizing on that speed by using innovative economic models – high-volume single-copy sales, low-price mass distribution and advertising driven by a new, broader audience. The first British patent for high-speed presses was issued in 1790 to an inventor totally removed from the printing business.
- The relevant social groups – technologists and entrepreneurs – chose to emphasize high-tech, high-capitalization methods to speed the printing process instead of using low-tech, less expensive methods.
- Those choices shaped the "essence" of the new medium – a one-point-to-many broadcast model in contrast to the multiplicity of print shops and periodicals in the old paradigm. That approach rapidly led to much higher barriers to entry in the newspaper field, and thus encouraged a concentration of ownership.

- Those choices also led to a centralized production process instead of a distributed process, and thus encouraged a few mass media channels instead of a network of many smaller media.

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This double-circuit approach fills a niche left vacant by existing communications scholarship that has focused on media impact, media and societal interactions or internalist portrayals of media institutions and players. The concept capitalizes on existing scholarship from several fields while adapting it to the peculiar path of new media from inception to market penetration. As such, it can give us a fuller understanding of the lingering influences of early technologists on the shape and development of new media. While this approach eschews technological determinism, it does recognize that early innovators and early media content producers can create a path dependence that is difficult to alter when the less technologically savvy consumers become involved in the social construction.

The double-circuit concept recognizes that decisions surrounding a technology are not made in a sociological vacuum by one or two inventors, but those decisions are dominated at the early stages by a relatively small group of people who have an interest in and have the necessary technical understanding of a new medium. In the first circuit, the implications of those decisions are often ignored or misunderstood. At this stage, a new medium may not even be considered "a new medium." At some

point during the first circuit – if the technology has any potential for entering the broader media marketplace – the early inventors must begin a negotiation with individuals or institutions that have a potential for utilizing the technology for the creation of distinctive, useful and interesting "content." Some inventors and inventions languish for decades because of the inability to reach a mediation with potential media producers. In other cases, as we shall see, the technological inventors also become the media producers when they fail to attract attention from the mainstream media.

When individuals or businesses decide to take the risk of building new media content utilizing new technologies, they must then move toward introducing and selling the new medium to new consumers – thus, entering the second circuit. During this circuit, the technology takes familiar paths such as development and diffusion, but because of the complexity of the technology, consumers (whether business-to-business consumers or broadly based consumers) have a limited range of options because the underlying technology is one step removed and very complex. The consumer, for instance, has no knowledge of whether a newspaper was printed on a rotary press, a cylinder press or a flat-bed press if the paper is delivered in a reasonable time and with reasonable clarity. Unless some outside force, such as governments (in the case of HDTV, radio frequency allocations or the British stamp tax per page on newspapers), enter the picture, consumers mostly have the option of just accepting or rejecting the new medium. They rarely have the ability to choose among various options that were accepted or rejected in the first circuit. Unlike the

bicycle where choices move rather directly from inventor/marketer to the consumer, with media there has been a preliminary stage that determined the technological composition of the medium in a manner that is largely invisible to the consumer.

Having conceptualized this double-circuit, now the task is to implement this theory and methodology within the framework of a specific medium: the 1830s penny press. As noted earlier, Pinch and Bijker said they examined the bicycle not to generate new, definitive historical data but rather used the bicycle as a vehicle for demonstrating their social construction model. In the process, they also put fresh light on the evolution of the artifact.

Likewise, the outcome of this study is two-fold: a fuller understanding of the penny press revolution/evolution when examined in the manner described and the testing and exploration of a new approach to media analysis that can be applied to other media, past and present.

Chapter 3: Case Study, Challenges for 19th Century Newspapers

A NEWSPAPER

A newspaper! It is the cradle of genius; the record of truth. Wood-cut engravings adorn it, and the muses smile graciously upon it. A newspaper! A city newspaper is a picture of the world. Cast thine eyes over the grim pages; like that all is confusion and bustle – each one pushing forward to extract attention by arts no matter how trivial. Little ships and big ships; steamboats with their roaring wheels and black smoke, whiz past us; rail cars, post coaches and post boys, -- boxes of tea and barrels of cognac; Franklin gridirons and La Fayette bedsteads; staryed animals and found animals, all are mingled promiscuously together. "Money!" cries the lottery office. 'Fire!' cries the insurance company. Strange that between both, men cannot get money and keep it. Some applicants for public notice are very modest in their approaches, only soliciting favor as long as they deserve it; others are not aware of their claims on public gratitude, and surely some are prompted by the very spirit of philanthropy. The same diversified scene! In one column a fire, in the next a successful speculation. Here a man eats himself to death, there a child is starving; the widow solicits a pittance, and the rich man offers his loan: – the register of *death* numbers the old, the middle aged and the young. *Matrimony!* – ah, the list is generally long and appalling. – *Notice!* Alas, some Jonathan is close at hand, advertising his refractory rib; what is the matter with thy wife, friend? Is thy steak cooked too much, or are the potatoes burnt up? Or thy doors locked at twelve P.M. and thou on the out-side? Or did she love gadding about? She must be a mild creature, for she makes no angry retort.

A newspaper! It makes one love this little round ball of earth. All the ships are well built, copper bottomed and fast sailing; the houses are in good repair, with extensive out-grounds, delightfully situated; no time bleached linens or damaged cambries; no mouldy almonds, rusty oranges or sour raisins: Madeira wine and Spanish segars are all of trans-atlantic origin. In short, everything comes from its proper place. Human beings, too, seem to be very social – so many

> partnerships. Sometimes, indeed we find some little soul, armed with a patent right, elbowing his way through the crowd, threatening "chains and slavery" to all who dare invade his proper sphere: but, generally, men seem to have coupled themselves together in loving fellowships. Much as our world has been abused by misanthropes, and despised by poets, we doubt whether they would find in the clouds any thing half so convenient. Why, here is every thing, theatres, circuses, rope dancers, and singers, gardens and gunpowder, doctors for the sick, teeth for the toothless, wings for the bald, braces for the ill-shaped, rouge for the pale, and white lead for the rosy.
>
> It is, indeed, a bright and beautiful world, and we pray, gentle reader, that thou mayest be preserved from the spirit of love and poetry; only read thy newspaper punctually, and it will always appear to thee bright and beautiful.
>
> *The* (New York) *Sun*, January 27, 1834[91]

Timely, real-life traumas and delights described above were almost never part of newspapers until the 1820s in England and the 1830s in the United States. The focus with few exceptions was on serious political commentary and commercial news designed for a very small, select audience. What general news existed was usually old and often "borrowed" from other publications. Except for a few large London newspapers, relatively slow printing presses – much like those of Gutenberg -- were adequate to meet the needs of most publishers until the 1820s and 1830s. Old newspaper business models and distribution systems were adequate until then as well.

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[91] "A Newspaper," *The Sun*, Jan. 27, 1834.

But, in something less than two decades, newspapers, presses and printing business models changed.[92]

The possible reasons are wide-ranging: urbanization, growing literacy, a young nation with an abounding sense of democracy, higher income levels, an inventive spirit and more. But, speculations about what produced the mounting pressure for change in the world's newspapers is a very small part of our story. It's the outcome of those forces that interests us. It's the collective reaction to a new spirit of publishing that's intriguing, sometimes puzzling and ultimately profoundly influential. Consider:

In 1826, some observers claimed this gigantic press – constructed of wooden 12x12-inch wooden timbers plus great quantities of iron – was the first powered printing-press in the United States. It was built on Daniel Treadwell's short-lived bed-and-platen design.[93]

There were elaborate combinations of cams and belts and pulleys to help shift the heavy moving parts and to help transport sheets of paper through the press:

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[92] Nerone, "The Mythology of the Penny Press."; Schudson, *Discovering the News: A Social History of American Newspapers.*

[93] Bed-and-platen printing was a branch of the printing press evolutionary tree that had temporary vitality but ultimately withered away to be replaced by cylinder presses. It depended upon a back-and-forth motion instead of the continuous rotation of cylinder presses.

> A very strong rotating-reciprocating vertical iron shaft gave motion to its numerous and complicated parts. Among many devices connected with said vertical shaft, there were firmly affixed to it two very strong cams, one above the other. To each of the cams was attached one end of a very thick sole-leather belt about three inches wide. The opposite ends of these belts were secured to the bed, the office of one of them being to bring the bed to its proper places under the platen, and the other to draw it away for the delivery of the printed sheet and for the reception of a fresh one.[94]

The press initially operated on one-horse power. The horse walked on a circular track about 30 feet in diameter, but whenever an impression was made the horse received such a jolt that it was almost jerked off its feet. The horse "soon became so familiar with these 'hard spots' in his path that when he approached one of them he would often come to a dead halt, from which no amount of coaxing or scolding – nothing but whipping – would induce him to stir.

"Therefore it soon became necessary to employ a driver with a whip to follow him around the track. After a short time, it became apparent that one horse could not endure the strain of such uninterrupted hard labor from day to day. . . and a second horse was added as a relay."[95]

This massive, powered press – which required at least three men, two horses and rent payments to the designer – produced about 500 impressions per hour. That's

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[94] John W. Moore, *Printers, Printing, Publishing, and Editing*, Second ed., vol. 167, *Burt Franklin: Bibliography & Reference Series* (New York: Burt Franklin, 1886), 35-39.

[95] Ibid.

basically what two men using two inexpensive older presses could produce in the same hour. Obviously, invention *must* have other "mothers" than necessity.

So, what were the technological circumstances that warranted such inefficient, yet inventive, alternatives to the printing methods used by Gutenberg and his successors for 350 years? An understanding of key roadblocks to greater printing speeds is required.

Economic Issues Confronting Newspaper Publishers

Through the early 19th Century, newspaper publishing functioned with a distributed model, where the number of publishing sites in an urban area, for example, was relatively large. The individual products reached a niche audience – segmented by politics, professional interests and educational interests. Distribution methods were limited, and consumer costs were relatively high.

With this restricted view of publishing options, there was no obvious need for faster printing capability until the second decade of the 19th Century. The economic benefits of centralization and "economies of scale," which became a driving force behind newspapers in the 1830s and, subsequently, later mass media, were simply not recognized in earlier decades.

Fitting the limited and somewhat elitist audience of New York newspapers in 1830, the publications were expensive – six cents per issue when the non-farm worker was earning less than 85 cents a day – and were often titled with names suited to their

political and business readership: *The Boston Daily Advertiser,* Baltimore's *Federal Republican and Commercial Gazette,* and New York's *Journal of Commerce.* Often, the newspapers were merely an entrée into the more lucrative business of being the official state printer or party press. The ownership of these publications, as would be expected, tended to be part of the party or business elite – though there were some efforts at producing workingman publications as well.[96]

Perhaps because of the substantial revenue coming from external sources, the financial aspects of the dominant newspapers were loosely managed by later standards. Both subscription revenue and advertising revenue were sold on credit. Employees delivered the newspapers, and subscribers either paid at the newspaper office or when approached by collectors. Advertising, which often ran as yearly contracts, was also collected after publication. As a result, the newspapers had large, uncollected debts on an ongoing basis. In the decade of the 1830s, the penny press would be established as a "cash basis" business, insuring that its small profit margins on each copy sold and on advertising were converted into real revenue in a timely fashion.[97]

The circulation of the pre-penny press newspapers was very low for city of 220,000 people – typically 2,000 or less and never more than 5,000. But, owning a

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[96] Hudson, *Journalism in the United States, from 1690 to 1872*, 408-12; Schudson, *Discovering the News: A Social History of American Newspapers*, 14-20.

[97] Bleyer, *Main Currents in the History of American Journalism*, 158-62.

printing facility or publishing a newspaper was relatively easy to accomplish; the capital investment was low since the production facility was built around a 400-year-old technology, the hand press. In the early 1830s, there were at least 15 daily newspapers in New York, nine semi-weeklies, 34 weeklies and 20 monthly periodicals. Unlike textiles and other industries which had long before evolved into capital-intensive, mechanized operations, publishing largely remained as an individualized craft. Nonetheless, these publishers had little motivation to change their business models, to threaten their consistent revenue from party sources or to adopt newer, more expensive technologies that would produce more copies than they needed.[98]

The essential qualities of their printing technology included not only its low cost but also its simplicity. The technological advances that had been made in the previous century were primarily aimed at reducing the physically brutal steps in printing a page and in providing a more reliable press (by replacing wood with metal). The technology inherently encouraged small circulations since only 150 papers an hour could be produced and enabled a proliferation of small print shops – a distributed production system.[99]

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[98] *New York as It Is, Citizens' Advertising Directory;* Schudson, *Discovering the News: A Social History of American Newspapers*, 408-12.

[99] Hudson, *Journalism in the United States, from 1690 to 1872.*

As a result, the technology was complementary to the goals of these publishers. Except for a few large London newspapers, relatively slow printing presses were adequate to meet the needs of the business models and distribution systems. But, in something less than two decades, newspapers, presses and printing business models changed. The early signs of those changes are demonstrated by technologists attempting to sell publishers on advanced printing presses, and by a growing criticism of traditional newspapers.

In a failed first-step towards the change in 1832, James Gordon Bennett articulated a changing attitude when he attempted to start the *New York Globe*. He failed to adequately change the business model, and the publication soon failed, but, he did begin to question some of the existing premises of newspaper publishing. For instance, he said that the publication would be dominated by Democratic Party politics through the next election, but then its content would evolve into "all the variety which makes a daily paper the welcome visiter of the tea-table or counting room." He noted, "For years past the public has been cloyed with immense sheets – bunglingly made up – without concert of action of individuality of character – the reservoirs of crude thoughts from different persons who were continually knocking their heads against each other, without knocking any thing remarkably good out of them."[100]

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[100] Ibid., 409-10.

A maverick sixpenny newspaper, the New York *Morning Courier,* experimented with changes in its content on occasion by imitating London newspapers' use of police court reports. Of course that so scandalized other traditional publishers, they felt the need to respond:

> The question is asked us by a correspondent, why we do not, like a few of our contemporaries of late, keep a regular chronicle of trials before the police, for the amusement and instruction of our readers? We have to reply, that it is a fashion which does not meet with our approbation, on the score of either propriety or taste. To say nothing of the absolute indecency of some of the cases which are allowed occasionally to creep into print, we deem it of little benefit to the cause of morals thus to familiarize the community, and especially the younger parts of it, to the details of misdemeanor and crime. . . .
>
> Besides, it suggests to the novice in vice all the means of becoming expert in its devices. The dexterity of one knave, arrested and sent to State Prison, is adopted from newspaper instruction by other yet at large . . . . There are now and then extraordinary cases, that require notice at our hands, and accordingly receive it; we also, at times, furnish from our foreign journals (for lack of other things) reports of a whimsical nature, in which there is considerable entertainment, totally unmixed with offence; but we are wholly averse to the task of dishing up the ingredients of which the majority of published trials are composed.[101]

Within five years, the penny press would routinely publish extensive police and court coverage. Bennett's failed attempt in 1832 and Day's success in the following year were part of a decades-long, profound change in the distinguishing

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[101] First published in the New York *Statesman* (June 5, 1828) and then reprinted with an endorsement by the *Evening Post* (June 6, 1828), as quoted in Bleyer, *Main Currents in the History of American Journalism*, 157.

characteristics of newspapers in urban New York that would soon spread to cities up and down the eastern seaboard.

Social Environment in the 19th Century

> Let us diffuse knowledge throughout the length and breadth of this great country; multiply the means of information, - send the schoolmaster into every hovel, — dot every hill with the schoolhouse and college, - let the Press, without intermission, night and day, pour forth its steady streams of light, — foster Science and the Arts, — let the civilizing and godlike influences of machinery uninterruptedly extend. Then will the future of our country open, boundless and great, beyond all example, beyond all compare, and countless ages bless its mission and acknowledge its glorious dominion.
>
> — **J.D.B. De Bow, 1854**[102]

The mythic figures of Benjamin Day and John Gordon Bennett dominate the history of American newspapers in the mid-19th Century. They are the inventor geniuses of the "Penny Press" – just as Robert Hoe and his son, Richard, who took over the Hoe Printing Press Company in 1833 after his father's death, are the inventor-geniuses of the presses that printed them.

As told by traditional histories of American journalism,[103] Day, Bennett and other 19th Century publishers invented the modern American newspaper, which for

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[102] J.D.B. DeBow, "The Progress of the Republic," *De Bow's Review*, Aug., 1854, 123.

[103] Emery, *The Press and America;* Frank L. Mott, *American Journalism: A History 1690-1960* (New York: MacMillan, 1962).

the first time contained objective reporting, appealed to large audiences of middle and lower classes instead of the elite, and capitalized on revenue from advertising. Hoe made it possible to keep up with a growing number of urban newspaper readers and a growing number of printed pages (in part because of advertising).

A re-examination of the period by critical historians since the 1960s indicates that these publishers were participants in social changes not the creators.[104] Social changes – including urbanization and industrialization – were already underway by the time Day started the first Penny Press, the *New York Sun* in 1833. The large increases in newspaper circulation were already happening even before the Penny Press began. And, newspaper advertising was prompted by a force already on the move -- the stirrings of a consumption society.

The United States and other parts of the West were experiencing what has been termed a popularization or diffusion of knowledge. In part extensions of Christian self-improvement expanded by Rousseau and other 18th Century Europeans as well as the popular revolutions of the 18th Century in America and Europe, moral and political philosophers embraced extending knowledge to the common man. As examples, consider:

- Massachusetts began free public high schools in 1827.
- The number of U.S. colleges increased from 173 in 1840 to 239 in 1850.

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[104] Nerone, "The Mythology of the Penny Press."; Schiller, "Critical Response: Evolutionary Confusion."; Schudson, *Discovering the News: A Social History of American Newspapers.*

- Between 1825 and 1850, 550 new libraries were founded in the United States, including the mechanics' and merchants' libraries for lower middle classes. [105]

In addition, the first half of the 19th Century was experiencing significant technological and economic changes. Industrialization and more rapid transportation systems made information current and less backward looking. Dispatches of news from other cities via the railroad and later the telegraph gave a different meaning to news – making it useful to a far broader audience.

Urbanization also encouraged larger newspaper circulations – selling many times more copies at one penny than could be sold at the previous going rate of six pence. In 1830, 6.7 percent of the U.S. population lived in towns over 8,000; in 1850, the percentage had increased to 12.5 percent. Thus, "in 1828, the annual circulation of newspapers was about six for each individual in the country; in 1850 it was approximately twenty-two."[106] Those larger commercial centers enabled larger newspapers (pages per issue) as advertising became increasing viable.

Similar transformations were taking place in the cities of Europe, notably in England and France. Circulation of *The Times* in London increased from 5,000 in 1812 to 50,000 by the middle of the century. In 1832, several low-priced, high-volume newspapers were established such as Charles Knight's *Penny Magazine.*

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[105] Merle Curti, *The Growth of American Thought*, 3rd Edition ed. (New York: Harper & Row, 1964), 335-57.

[106] Curti, p. 287.

While older newspapers used hand presses producing 1,000 copies a day, Knight's multiple presses produced more than 16,000 copies a day – ultimately reaching a circulation of 200,000 before it ceased operation in 1845. *La Presse*, the first popular daily in France, was established in 1836 by Emile de Girardin, contained a large proportion of advertising and was priced at one-half the older Paris dailies. [107]

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Thus, Day and the other publishers who started penny papers in the 1830s were responding at some level – consciously or not – to a range of technical, economic and social challenges and opportunities. How would they respond to an urban market where a widely dispersed information product was viable? How would they transform a business model built around party-politics and insular communication into a cheap but profitable product? And, how could they motivate low-paid workers to buy newspapers in mass? These were not questions readily embraced by owners and producers of mainstream media; indeed, they would resist many of the changes to follow. But, in London and eventually New York, these questions in some form began to be asked and answered.

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[107] Comparato, *Chronicles of Genius and Folly: R. Hoe & Company and the Printing Press as a Service to Democracy*, 240-51.

Each of these business and journalistic questions was important, but unless the publishers decided to confront their technological problems, nothing else mattered. They would have to break through the barrier that seemed to permit a maximum of 4,500 circulation in markets with more than a quarter million population. They would have to produce newspapers in such volume and with such speed that they could lend an air of immediacy and perishability to each day's paper. In the 1990s, *The Washington Post,* produced a series of cheeky, in-your-face promotional advertisements primarily aired on television that were considered objectionable by advertising executives outside of the Washington market who did not understand the peculiar relationship between that newspaper and its readers. Each of these commercials ended with the phrase, "If you don't get it, you don't get it," suggesting that if the citizen showed up at the water cooler at work without reading that day's *Post*, the poor worker would be at a disadvantage with his colleagues throughout the day.

Day, his printer colleagues, then Bennett and others would develop this "must-read today" approach to newspapering, but they also had to adopt methods for getting sufficient newspapers on the street to respond to the demand.

Chapter 4: The Technological Environment

POLICE OFFICE – (Yesterday)

Robert White was charged with an assault and battery on Margaret Boorham. Margaret could not make the magistrate believe her story, and the prisoner was discharged.

Catherine Denny stole a pair of ear rings from the daughter of Mr. Johnson, of Orange street. Catherine said she had worked for Mr. Johnson, and he would not pay her for her services. Last night she discovered the ear rings on the mantle piece, and thinking they would just about liquidate the debt, she put them in her pocket. Committed.

Mariah Sweeney was found in the street, without any home. Mariah said she used to be a "decent girl." Her parents were wealthy and respectable, and she their only child. Both father and mother were swept off by the cholera in 1832, and she was left without any support or protection. She obtained a situation as a nurse in the house of one of her acquaintances in Canal street, where she became acquainted with a thing in the form of a man, who so won her confidence that he succeeded in effecting her ruin. He hired her board in an abode of infamy in Church street for a few weeks, and then deserted her. To drown her troubles, she had resorted to the bottle, and was now an intemperate, houseless wanderer. Committed.

Daniel Freeland "pinched Julia Wilson's knees" (so said the complainant) in a porter house in Water street. This, at first, appeared to be a pretty serious charge against Mr. Freeland; but on investigation, it appeared that the prisoner, as he was taking a little drink, observed Julia sitting on a bench near him – pinching her on the knee, he said, "Madam, would you like a glass of gin, just for old acquaintance sake?" Julia, instead of accepting the prisoner's gin, as every polite young lady who spends her time in a grog hop ought to do, took offence – and asked Freeland what he meant by offering her such an insult. He apologized – said he didn't mean any harm – was very sorry to hurt the lady's feelings – and if she would only take a glass of gin with him, it would no doubt be all settled. The lady was inexorable – she called him a liar, and he called her a -------. A watchman entered the house and brought him up. Discharged.

☞ In the Board of Assistant Aldermen on Monday evening a resolution was offered by J.A. Smith, that neither the keeper nor assistant keeper of the City Hall furnish to any person, at the public expense, any spirit, wine, port, cider, or any strong drink, after this 24th of February, nor furnish cigars at the public expense to any person not strictly a member of the Common Council. Adopted.

The (New York) *Sun*, February 26, 1834[108]

The method of printing books and newspapers was largely unchanged from the time of Johannes Gutenberg in Mainz, Germany, to the first third of the 19th Century in America and elsewhere. Some wooden components had been replaced with metal, and the screw mechanism that Gutenberg used had in some cases been replaced with lever action, but overall, the methods of setting type, inking the type and pressing the type against paper had changed little. Thus, for almost 400 years, the production of printed material was limited by the slow, manual process of setting type, one letter at a time, and by presses limited to 200 or so pages an hour (100 an hour if both sides were printed). While I will not explore the details of slitters, angle bars, turtles, hell boxes and folders, some basic printing concepts are necessary to understand the developments of the early 19th Century.

Gutenberg's invention was actually a system of printing where the flatbed printing press was only one component of the process that included:

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[108] "Police Office -- Yesterday," *The Sun*, Feb. 26, 1834.

1. Type that was caste in molds, allowing for a standardization of the types' depth and for the relatively inexpensive replication of type. Of course, Gutenberg benefited from having a 26-letter alphabet instead of the thousands of ideographs required in China, where printing had a lengthier history. The type was manually assembled in forms creating a flat bed of words in a mirror image of the ultimate printed page. When the printing was finished, the type could be separated and used on the next job. This approach to typesetting would endure even through the early phases of the rotary press.
2. Suitable ink (pigment ground in a linseed-oil varnish as used by painters of the period) and paper (less absorbent and hard by Chinese standards). The ink was applied to the type with leather covered mallets and, later, rollers.
3. A press to cause the consistent kiss of paper to the inked type without smearing or tearing. Tradition suggests Gutenberg used a winepress as his model, but it might have been a linen press or a paper press or even a cheese press. Clearly he chose a downward-acting screw press where a flat board (or *platen* as it became known) pressed against the inked type. It's equally clear that Gutenberg, and printers for centuries,

rejected an alternative approach: using a lever and fulcrum to press the paper against the type.[109]

There were small improvements to the Gutenberg press in the following centuries, including a gradual shift from the wooden to iron components. The first significant improvements were attributed to William Jensen Blaew, an Amsterdam printer. About 1620, he developed a devise for rolling the type form in and out, used a new form of iron lever for turning the screw and made other improvements in the impression step. His designs soon reached England and elsewhere.[110]

The British Earl of Stanhope in 1798 manufactured a hand press entirely of cast iron. While cast iron could undergo the stresses of printing with far less maintenance, its design was still remarkably like Gutenberg's press (although weighted levers were used to control the screw). Some printers tried to adapt the more powerful lever action to wooden presses, and in the process, the presses were stressed and destroyed. It is worth noting that the Stanhope press was developed in England where the techniques of casting metal and the rise of a class of mechanics made

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[109] Moran, *Printing Presses: History and Development from the Fifteenth Century to Modern Times*, 19-23.

[110] Robert Hoe, *A Short History of the Printing Press* (New York: R. Hoe & Co., 1902), 6-7.

possible the precise machining necessary, but such capabilities were soon adopted in America.[111]

George Clymer of Philadelphia in about 1816 devised an iron machine that dispensed with the screw. A cast-iron lever was placed over the platen with one end attached to the uprights of the frame; raising and lowering the platen was far easier for the operator. He took his design to England, where it was known as the Columbian press. The R. Hoe & Co. improved on the lever design and began producing an all-iron press in 1822. Five years later, the Hoe company bought an improved design from Samuel Rust of New York. This press, which became known as the Washington press, utilized hollow supports with wrought-iron braces, requiring less metal and providing more stability. The Washington hand press – sold in six different sizes – was an overwhelming success; Hoe sold more than 6,000 that were shipped around the world.[112]

With these small advances to printing, the overall process remained inefficient and time-consuming with multiple steps to completion:

> Every sheet printed upon this press required nine operations. First the dabbers or pelt balls had to be covered evenly with the printing ink. This was done by placing a small quantity of ink upon the "slab" or ink table which was attached to the side of the press and working it carefully

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[111] Ibid; Moran, *Printing Presses: History and Development from the Fifteenth Century to Modern Times*.

[112] Hoe, *A Short History of the Printing Press*, 9-10.

> over the surface with the dabbers. The second – inking of the forme – was a very similar operation to that of inking the balls, only the ink, of course, was given off from the balls instead of being taken up. To obtain a good and even impression no little skill was required in the application of the ink, and it was important that there should be no skidding or sliding of the balls on the surface of the type. To ensure this the "pelt balls" were applied with a kind of rolling, dabbing motion, which not only imparted a better ink film to the forme, but enabled a much greater surface to be utilized than would have been possible with a simple vertical dabbing action. During the inking the balls were frequently rolled against each other to keep the ink evenly distributed over their surface. The third operation was to place the sheet of paper to be printed upon the tympan. The fourth was to fold the frisket down to secure it in position, and, by a continuation of the same action, to fold down at one and the same time the tympan, frisket, and sheet of paper on to the type. The fifth was to run the carriage under the platen. Sixth to pull the impression. Seventh to slide the carriage back again. Eighth to raise the tympan and frisket, and the ninth to deliver the printed sheet.[113]

Into this rugged work environment walked the experienced journeymen and a string of apprentices – such as Benjamin Day when he first began work as a printer. The apprentice system was part indentured servitude and part boarding school – with elements of very hard work and *in loco parentis*. Often, the apprentices were placed in service by their parents; Benjamin Franklin and Isaiah Thomas were among the indentures who violated agreements and escaped from their servitude.[114]

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[113] Operation of the Blaew press in *The Times Printing Number, Reprinted from the 40,000th Issue of the Times, Tuesday, Sept. 10, 1912*, (London: John Parkinson Bland, *The Times*, 1912).

[114] Lawrence C. Wroth, *The Colonial Printer* (Charlottesville, Va.: Dominion Books, 1964), 155-59.

An 1810 fill-in-the-blank contract for an apprentice reflected the dual nature of the work arrangement that forbid cards, dice, theft and marriage in exchange for meat, drink and lodging:

> This indenture made the____ day of _____ in the year of our Lord ____. Witnesseth, that ____ aged ____ by and with the consent of ____ his ____ of ____ hath,of his own free and voluntary will, placed and bound himself apprentice unto ____ of ____ to learn the trade, mystery or occupation of a ____ which he the said ____ now useth; and with him as an apprentice to dwell, continue and serve from the day of the date hereof, unto the full end and term of ____ from thence next ensuing, and fully to be complete and ended; during all which term of ____ the said apprentice his said master well and faithfully shall serve, his secrets keep, his lawful commands gladly do and obey; hurt to his said master he shall not do, nor willfully suffer it to be done by others, but of the same, to the utmost of his power, shall forthwith give notice to his said master; the goods of his said master he shall not embezzle or waste, nor them lend, without his consent, to any; at cards, dice, or any other unlawful games, he shall not play, taverns of ale-houses he shall not frequent; fornication he shall not commit, matrimony he shall not contract; from the service of his said master he shall not at any time depart or absent himself, without his master's leave; but in all things, as a good and faithful apprentice, shall and will demean and behave himself towards his said maters, and all his, during the said term. And the said master, in consideration of ____ in the said trade, mystery, or occupation of a ____ which he now useth, with all things thereunto belonging, shall and will teach, instruct, or cause to be well and sufficiently taught and instructed, after the best way and manner he can – and shall and will also find and allow unto his said apprentice, meat, drink, washing, lodging.[115]

Payment for such an agreement in 1810 included $20 per year, mending of the apprentice's clothes and two quarters schooling. However, the price was negotiable

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[115] Silver, *The American Printer*, 3.

depending on the apprentice's (or parent's) bargaining ability, age, previous experience, business conditions and availability of schoolmasters.[116]

These apprentices would face the same bottlenecks to faster printing that had existed for almost 400 years. Text was set by hand with the compositor picking up one letter and one space at a time. Squaring off, or justifying, lines of type was also a manual process of inserting spacers. There was no effective way of duplicating blocks of type (only the individual letters), which effectively barred the use of multiple presses to print more pages faster. Hand-operated flat-bed presses were slowed down by the stops and starts of back and forth motion and by the immense physical demands on the human operators.[117]

Solving any one of those bottlenecks would have increased the speed of producing printed material, but as might be expected, not all solutions were achieved at the same time. Indeed, the first choice used by newspaper publishers to solve the speed problem became the dominate solution. The sequence chosen for faster printing followed this path:

1. Cylinder presses, which permitted a continuous forward motion – first for inking and impressions and then later for the type itself. Cylinder presses –

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[116] Ibid.

[117] Some large newspapers, primarily in London, did have multiple printers typesetting setting the same text so that more than one press could be operated simultaneously.

expensive to own and operate -- became the primary choice of publishers for solving the problem.

2. Stereotyping, which is the duplication of blocks of type. With stereotyping, type could be easily replaced if it wore out or duplicated so that more than one press could be operated. A form of that technology was used by the textile industry in the early 18th century and was used by some book publishers by the early 19th Century, but it was basically ignored by newspaper publishers for another half century until it became a tool for enabling even faster presses.
3. Mechanized typesetting machines, which were not developed until the end of the 19th Century. That approach required fine tolerances for quickly assembling type molds (matrices) and casting lead type that was not possible in earlier decades.

This choice of solutions raises a significant, and reoccurring, question: Within the context of "path dependence" and "sequence of decisions," did the first choices made by inventors and newspaper publishers to solve these bottlenecks have a lingering influence on publishing?

Ignored Options: The Textile Industry

For at least 100 years before 1830, newspaper publishers were surrounded with technologies that enabled faster printing, but they did little to adopt the

advancements. Perhaps they were blind to the economic incentives of a large circulation newspaper. Perhaps, they were not yet presented with an audience with sufficient population density through urbanization or with an audience with sufficient literacy. Why these publishers decided to make rapid technological advances in London in the 1820s and in New York in the 1830s has been a matter of much speculation.[118]

Here, we are less concerned with the proximate "why" and are more focused on the technological environment for the changes that did occur, and that environment included solutions in the textile industry that could be readily adapted to printing on paper instead of cloth or wallcovering. By the 18th Century, the textile industry was aggressively moving towards greater mechanization, greater centralization, toward higher capitalization and away from labor intensity.[119]

Colorful calico fabrics originated in India in the 11th Century. Printed with images of lotus blossoms, other small flowers, pinecones or geometric figures, the fabric was popular for clothing in the East and eventually imported by the West for

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[118] A discussion of the reasons are included in, among others: Baker, *Printers and Technology; a History of the International Printing Pressmen and Assistants' Union;* Nerone, "The Mythology of the Penny Press."; Pickett, "Six New York Newspapers and Their Response to Technology in the Nineteenth Century"; Saxton, "Problems of Class and Race in the Origins of the Mass Circulation Press."; Schudson, *Discovering the News: A Social History of American Newspapers.*

[119] Landes, *The Unbound Prometheus: Technological Change and Industrial Development in Western Europe from 1750 to the Present.*

hangings, bedcovers and dresses. Initially, the calicos were printed using slow, labor-intensive "hand-blocks."

The fabric was stamped by a block containing the raised-relief of the design. The block had to be first inked with pigment then hand-pressed against the material. As the demands for greater quantities of the fabric increased, artisans experimented with different techniques for applying the designs – such as using inked rollers to distribute the colors on the blocks. By 1760, the experiments had progressed to the use of techniques that were very similar to the two-cylinder presses that would not be implemented by paper printers for almost 100 years. Material could be printed in a mechanized process with transport of the cloth and the printing of the design uninterrupted except for added more fabric. This rotary calico-printing process revolutionized the textile industry – producing the cloth at a speed *and* cheapness previously impossible.[120]

These advances in textile printing occurred while printing on paper was stagnantly attached to the slow, discontinuous Gutenberg press: Ink was manually applied to leather-wrapped balls, the balls were pounded against the type, the paper was placed on the press, the type was pressed against the paper and released, the paper was lifted from the type, and the sheet was set aside for the process to resume on the other side.

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[120] "Calico," in *Britannica© Cd 2000 Deluxe Edition* (Encyclopædia Britannica, Inc., 2000); John Southward and Frederick John Farlow Wilson, *The Principles and Progress Machinery* (London,: E. Menken, 1890).

An early historian of presses observed, "The tediousness of impressing a sheet of paper by this apparatus (the hand-press) must have caused amazement to any non-practical man, who had watched or heard of the plan of printing with a cylinder, which in comparison seemed simplicity itself."[121]

These improvements in textile printing were not taking place in a vacuum, however. The potential for applying these innovations to printing were widely noted – at least among those with innovation in mind. A 1772 patent for a cylinder machine by Joseph Adkin and Thomas Walker noted its ability to print "paper, silk, woolen cotton, and linen cloths and other articles made of silk, wool, cotton. . ." There were no drawings accompanying the patent and no implementation of the device, but it was an early indication of how calico printing could be applied to letterpress printing.[122]

However, most of the initial interest in using these faster technologies for paper printing surfaced not among printers and publishers but among innovators and inventors totally removed from the mainstream of publishing.

The Early Innovators

William Nicholson (1758-1815) was a British patent agent, an inventor of the hydrometer, an early experimenter with electricity and eventually the founder of the

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[121] Southward and Wilson, *The Principles and Progress Machinery*, 9.

[122] Moran, *Printing Presses: History and Development from the Fifteenth Century to Modern Times*, 174.

Journal of Natural Philosophy. Other than the journal he started in 1797, he had no interests in the publishing and certainly no prior involvement in printing technologies. Nonetheless, in the late 1780s he turned his interests towards printing, and in 1790, he obtained a patent for a cylinder printing press that would prompt some to call him the father of modern printing and others to say he had no such claim and only had devised a "scheme," not an invention.[123] The primary objection was Nicholson's failure to ever create an actual working press or even models of presses. Nonetheless, the ideas embodied in his patent surfaced over and over again among later press innovators.

Also, notable in Nicholson's patent is his recognition of the commonalities among printing of all types. He titled his invention as "A Machine or Instrument on a New Construction for the Purpose of Printing on Paper, Linen, Cotton, Woolen and other Articles in a more Neat, Cheap, and Accurate Manner than is effect by the Machines now in use."[124]

The Nicholson innovations, later reflected in presses actually built in England and the United States, included:

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[123] Southward declares Nicholson's patent as a breakthrough while not surprisingly the great innovator in U.S. press construction in the next century said Nicholson's design was merely an unrealized "scheme." Hoe, *A Short History of the Printing Press*, 12-15; Southward and Wilson, *The Principles and Progress Machinery*, 11-16.

[124] Nicholson. *Printing Machine,* No.

1. Attaching the letters to a cylinder that would rotate during the printing process. He proposed keeping the individual characters from flying off the cylinder by scraping the type "and rendering the tail of the letter gradually smaller the more remote it is or farther from the face." Thus, the type, in the shape of a keystone, could be wedged together and fastened to the cylinder "by screws or wedges, or in grooves, or by other methods well known to workmen." For printing materials other than paper and images other than type, the "blocks, forms, plates, types, or originals" would also be formed around a cylinder.[125]

2. Using what he called a "colouring cylinder" to apply pigment. The cylinder covered with leather or cloth would be smeared or wetted with the coloring matter and would "roll over and successively apply itself to the surfaces of said blocks, forms, plates, types or originals." He notes that the pigment coating will be thin in calico printing and heavy in letterpress printing, where "I apply two, three, or more small cylinders, called distributing rollers, longitudinally against the colouring cylinder, so that they may be turned by the

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[125] Ibid.No. Authorities who discount Nicholson's role in press evolution note that he merely alludes to a solution for maintaining the type on a rapidly revolving cylinder and does not actually solve the problem. See, Moran, *Printing Presses: History and Development from the Fifteenth Century to Modern Times*, 101-02.

motional of the latter; and the effect of this application is, that every lump or mass of colour which may be redundant, or irregularly placed upon the face of the colouring cylinder will be pressed, spread, and partly taken up and carried by the small rollers to the other parts of the colouring cylinder . . ."[126]

3. Using a third cylinder to hold and transport each sheet of paper through the printing process. "I cause the paper or cloth or other material intended to be printed upon (and previously damped if necessary) to pass between two cylinders or segments of cylinders in equal motion, one of which has the block, form, plate, assemblage of types, or original attached to or forming part of its surface, and the other is faced with cloth or leather, and serve to press the paper, cloth, or other material . . . so as to take off an impression of the colour previously applied."[127]

Nicholson's patent includes several very rudimentary sketches of possible press designs for printing on paper, cloth, paper hangings and floor cloths – all of which he notes can be powered by "wind, water, steam, animal strength, or any other natural change capable of producing motion."

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[126] Nicholson. *Printing Machine,* No.

[127] Ibid.No.

His concluding comments in the patent are, perhaps, a prelude to the critics who say he never really invented a press: "The materials, the adjustments, the fittings, and that degree of accuracy necessary to the perfection of every machine, have likewise made no part of my Specification, because every workman must know that no mechanism can be completed without a due attention to these well-known particulars."[128]

Despite those critics, two points persist. First, Nicholson is illustrative of the early press innovators who tinkered with the notion of faster printer from the perspective of a technologist not from the perspective of the mainstream publishers. Second, the *ideas* that Nicholson invented (or perhaps appropriated from the textile industry) surfaced repeatedly in printing press improvements during the 19th Century. For instance, 50 years later when Richard M. Hoe of the Robert Hoe & Co. filed a patent for his famous "lightning press," he would cite as unique the impression cylinder, the inking rollers and the cylindrical type bed – different names for the same three cylinders envisioned by Nicholson.[129]

Revealing the active "network" of inventors even across the Atlantic, Dr. Apollos Kinsley, of Hartford, Conn., in 1796 produced a scale-model cylinder press that was based on Nicholson's patent. Kinsley, who also invented machines for

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[128] Ibid.No.

[129] Richard M. Hoe. *Improvement in Rotary Printing-Presses,* 1847. U.S. Patent Office, U.S.A. No. 5,199.

making pins and for preparing clay bricks among others, printed one issue of a miniature newspaper but found no interest from printers in pursuing the idea.[130]

During the next 20 years after Nicholson's patent, other inventors pursued the novelty of faster printing. M. Sutorius of Cologne took out a patent for a cylinder press in 1808 but ended in financial ruin; John Sawin and Thomas Wait of Roxbury, Mass., patented a cylinder press in 1811, and William Elliott of New York attempted a hand cylinder press in 1813.[131]

None of these projects drew interest from publishers. And, indeed, why should they? These press inventions offered the potential of printing speeds 10 to 30 times greater than older presses, but no publishers envisioned a need for such high volumes of printed products. Their business model was satisfied with presses that could produce 200 copies an hour; 2,000 an hour as simply unnecessary. In addition, the new presses were extremely expensive and typically carried an annual royalty on top of the initial purchase price.

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[130] Moran, *Printing Presses: History and Development from the Fifteenth Century to Modern Times*, 103; Southward and Wilson, *The Principles and Progress Machinery*, 14-15; Thomas, *The History of Printing in America, with a Biography of Printers*, 35-36.

[131] Moran, *Printing Presses: History and Development from the Fifteenth Century to Modern Times*, 104.

Chapter 5: Rejection and Adoption in the First Circuit

'THE TIMES' PRINTING MACHINES – MECHANICAL EXPLANATION

The establishment of 'The Times' newspaper, says Mr. Babbage ('Economy of Machinery and Manufacturers' . . .) is an example, on a large scale, of a manufactory in which the division of labour, both mental and bodily, is admirably illustrated, and in which also the effect of domestic economy is well exemplified. It is scarely imagined by the thousands who read that paper in various quarters of the globe what a scene of organized activity the factory presents during the whole night, or what a quantity of talent and mechanical skill is put into action for their amusement and information. Nearly a hundred persons are employed in this establishment, and during the Session of Parliament twelve reporters are constantly attending the Houses of Commons and Lords, each in his turn after about an hour's work returning to translate into ordinary writing the speech he has just heard and noted in shorthand.

In the meantime 50 compositors are constantly at work, some whom have already set up the beginning, whilst others are committing to type the yet undried manuscript of the continuation of a speech whose middle portion is traveling to the office in the pocket of a hasty reporter, and whose eloquent conclusion is, perhaps, at that very moment making the walls of St. Stephen's vibrate with the applause of its hearers.

These congregated types as fast as they are composed are passed in portions to other hands, till at last the scattered fragments of the debate, forming when united with the ordinary matter 48 columns, reappear in regular order on the platform of the printing press. The hand of man is now too slow for the demands of his curiosity, but the power of steam comes to his assistance; ink is rapidly supplied to the moving types of the most perfect mechanism, four attendants incessantly introduce the edges of large sheets of white paper to the junction of two great rollers, which seem to devour them with unsatiated appetite, other rollers convey them to the type already

> inked, and having brought them into rapid successive contact re-deliver them to four other assistants, completed printed, by the almost momentary touch. Thus in one hour 4,000 sheets of paper are printed on one side, and an impression of 12,000 copies from above 300,000 movable pieces of metal is produced for the public in six hours.
>
> *Beauties and Wonders of Nature and Science*, 1830s[132]

Buried in this system of printing newspapers that evolved during the 1830s was a myriad of technological decisions, experimental business plans, failed ventures and successful "accidents." Over time many of these alterations to 400 years of printing history became transparent – assumed to be an inherent part of publishing. In reality, these buried artifacts and ideas determined the differentiating qualities of this new mass medium.

Before and as the penny press evolved, technology at times evolved down dead end paths, akin to the evolutionary tree where branches terminated and died. In other instances, alternative technologies with alternative qualities and implications were largely overlooked. Surviving newspaper technologies were the consequences of countless incremental decisions – often made in ignorance of their long-term implications – that shaped the essential, differentiating qualities – the essence, if you will – of the new medium.

Since Gutenberg in 1450, a very few changes developed in printing on paper, but in other industries with similar problems, especially the textile industry, huge

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[132] Quoted in George Isaacs, *The Story of the Newspaper Printing Press* (London: Co-operative Printing Society Ltd., 1931).

advances were being made in processes from transferring color and images to cloth, wall coverings and other materials.

When changes did begin to take place in the early 19th Century, not surprisingly there were missteps – like branches of an evolutionary tree that develop briefly only to whither away – and missed opportunities – alternative solutions with differing consequences. Examining the technological dead ends, the overlooked technologies and the successful inventions is not an exercise in technological determinism. Indeed, it's quite the opposite: Media technology is shaped not by an inexorable movement in a prescribed direction but is shaped by a myriad of incremental decisions.

Dead-end technologies

John Walter, the senior, was first a wealthy British coal merchant in a business started by his father. As his wealth grew, he branched out into other enterprises, notably underwriting shipping cargo and vessels. He was quite successful at that as well, until 1776 and the American Revolution.

In a letter to King George III, Walter wrote, "The capture of the homeward bound West India fleets by American privateers in the year 1776, and of the outward bound East and West India fleets in the year 1780, under convoy of Captain Moutray,

by the combined squadrons of France and Spain (in the safety of which I was deeply interested) shattered my fortune, and rendered my affairs irretrievable."[133]

Walter was, however, an honorable man – relinquishing his assets to creditors, who trusted him enough to appoint him as administrator for his own bankruptcy. He lost virtually all of his wealth – though the creditors allowed him to keep his house and household effects. And, he was adrift.

". . . All the fortune I had acquired by a studious attention to business sunk by hasty strides, and the world to begin afresh, with the daily introduction to my view of a wife and six children unprovided for and dependent upon me for support," Walter wrote.[134]

While liquidating his assets and struggling for a new life, he crossed paths with a printer who had an inventive idea – an idea that was a precursor to the third great 19th Century advance in newspaper printing, the Linotype.[135] The printer, Henry Johnson, conceived of setting type not one letter at a time, but one word at a time. By using these blocks of letters that had been previously cemented together, typesetting could be much faster, Johnson argued. Walter was sold on the idea and began to

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[133] *The Times Printing Number, Reprinted from the 40,000th Issue of the Times, Tuesday, Sept. 10, 1912*, 76.

[134] Ibid., 77.

[135] The other two were the rotary printing press and the application of stereotyping to newspaper printing.

spend his remaining funds on the experiments, which also involved the famous type founder William Caslon and two other men.

From that point forward, "logographic printing," as it was called, became the driving interest of Walter as he tried to put his financial life back together. But, Walter, obviously unfamiliar with the printing business and the men he was dealing with, immediately ran into problems – notably double-dealing by Johnson. "I discovered that the person from whom I had the original plan, was a swindler, who had imposed on two Members of Parliament, about three years before, by persuading them to procure him a patent, and then selling them two-thirds of the very business, a moiety of which he afterwards disposed of to me, as if he had been in possession of the whole."

Walter made another, even more critical, mistake: When the Chinese invented printing by the 2nd Century A.D., they were thwarted by the nature of their written language – based upon innumerable symbols of pictorial origin. One of Gutenberg's greatest contributions was his capitalizing on an alphabet containing only 26 letters and capable of composing all words using recyclable type. Walter's logographic printing was in the near-term a regression toward the Chinese problem. He tried to solve the troublesome issue by focusing on only the 5,000 most commonly used words. Later, he tried to deal with common syllables instead of words.

To finance his venture, he made repeated appeals to King George III for funds. He even sought intellectual support from an unlikely source – the rebellious

colonies and Benjamin Franklin. Franklin, Ambassador at Paris at the time, wrote a letter endorsing logographic printing.

Nonetheless, Walter's problems continued to mount. The established booksellers in England aggressively opposed logographic printing. And, the King's key advisor on the matter was one of those booksellers. At one point, Walter was forced to give up copies of *Robinson Crusoe* he had printed because one of the booksellers claimed ownership of the printing rights through a longstanding bookseller custom, even though the legal copyright had long expired. Caslon eventually was intimidated by the established printers and refused to cast type for Walter. Walter claimed the booksellers were offended by an outsider coming into the trade and were fearful of the better quality of his printing using the new technique.

Ultimately, the King rejected Walter's appeals, perhaps because Walter did not provide enough patronage from nobility and men of letters. But, in 1799, Walter wrote that he made another fatal error by offending the King when he included Franklin's name on the list of supporters he gave to the King. After the rejections, Walter on January 1, 1785, started his own newspaper as a demonstration project for logographics. Logographics were discontinued at the newspaper within a few years, but the newspaper, *The Times* of London, persisted as a dominant force in its commitment to faster printing.[136]

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[136] An extended and humorous account of Walter's logographic experiments is contained in *The Times* 1912 "autobiography:" *The Times Printing Number, Reprinted from the 40,000th Issue of the Times, Tuesday, Sept. 10, 1912.*

A far longer-lasting and more pervasive dead end for printing improvements was the category of presses called "bed-and-platen," which began to evolve in the 1820s. While printers were attracted to the more sophisticated cylinder presses (that will be discussed in the next section), most of them had no reason for the vast increase in speed. They wanted the capability of using steam-power but did not want to be saddled with the complex machinery and requirements for more mechanical skills inherent in the cylinder presses. The bed-and-platen press, or simply platen press, retains most of the principles of a hand-press while permitting steam-power, faster speeds, and, significantly, the use of rollers to ink the type.

Daniel Treadwell was key to bringing platen presses to the United States; after viewing cylinder presses in England, Treadwell returned to Boston in 1820. Within two years, he built a crude, largely wooden version of a platen press, using horse power, instead of steam. Only three or four of these presses were ever constructed. The press achieved speeds of 500 to 600 sheets per hour. Isaac Adams, also of Boston, made substantial improvements to the Treadwell concept and patented his platen press in 1830 and 1836. Another Bostonian, Otis Tufts, patented a platen press in 1834.[137]

In platen presses, the type is placed on an iron bed, as with hand presses, and this bed was raised and lowered by straightening and bending a toggle joint using a

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[137] Hoe, *A Short History of the Printing Press*, 10-11; Moran, *Printing Presses: History and Development from the Fifteenth Century to Modern Times*, 113-17.

cam, thus giving the impression upon the iron platen fixed above it. In a continuous process: The ink rollers move twice over the type form while the bed is down. The sheet of paper is taken in by grippers and carried over the form. The bed rises and the impression is given. And, finally, the sheets pass forward via tapes to a sheet flyer that stacks them on the fly board.

The Adams machines, with speeds reaching 1,000 impressions as hour, became hugely popular, especially in the United States. The Hoe & Co. began making very similar machines in the 1830s – leading to one of that company's bitter patent disputes and ending in Hoe's buying Adams' business.[138]

Despite the widespread use of platen printing and the high-quality that was produced by flat pressure on flat type, the speed of these presses could not break the 1,000-sheets-per-hour barrier and were ultimately overwhelmed by the cylinder presses which were already in use at some urban newspapers in the 1820s and were used almost entirely by the penny press by the late 1830s.

An overlooked alternative

As previously discussed, one of the bottlenecks for faster printing in the early 19th Century was the inability to make duplicate copies of entire pages of a newspaper

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[138] In Hoe's *Short History of the Printing Press*, the Adams dispute is dismissed with a single sentence: "In 1858 Adams's business became the property of Hoe & Co." p. 11.

so that multiple presses could be used. Otherwise, to use multiple presses, each page had to be separately set in type by hand. Actually, the technology to solve this problem did exist – and its implementation decades later would permit the greatest increase in press speeds – but its use in the first half of the 19th Century was blocked by mainstream publishers for a variety of reasons. The technology was stereotyping – a method of making casts or facsimiles of the pages composed of movable type. By duplicated the pages, printing speeds could be increased with the use of multiple presses printing the same content. Precursors to this technology existed as early as the 15th Century; however, the inventors who worked with these new concepts were confronted with disinterest and even enormous resistance.

The benefits of stereotyping are not limited to the ability to easily run multiple presses. In addition, stereotyping meant that book publishers could preserve pages of books for long periods of time without taking expensive movable type out of service. Pages of movable type were subject to errors because letters might be misplaced or drop out. Moving type forms was always dangerous – subject to dropping the form and jumbling the type (an accident that happened often enough that there was a name coined for it: "pi"). The storage space required for a book, such as the Bible was considerable. Nonetheless, the adoption of the technology was long-delayed, especially in newspapers.

"The transition from founding single letters to founding whole pages was so invitingly obvious, that the circumstance of its not having been attempted, may be imputed rather to a want of enterprise, than to any ignorance of the perfect

practicability of the art," George Kubler, a 20th Century executive of a stereotype supply house and historian of the technology, observed.[139]

There was another potential use of stereotyping. It could enable a highly efficient distributed model of publishing. Instead of printing all newspapers at a single location, stereotype copies of the pages could be delivered to remote sites for printing the actual paper copies; the process could be refined so that the "remote" printing sites could use much of the pre-composed type but substitute local news as appropriate. This distributed model of publishing was used in certain specialized situations – such as small rural newspapers in the United States – from the late 19th Century and until the late 20th Century when letter presses were largely replaced by offset printing.[140]

The earliest efforts were not truly stereotyping since they involved copies of relief plates or wood cuts, not movable type, but the methods were similar to later attempts with type. Basically, fine sand was mixed with calcinated baking-oven glue; the relief image was surrounded with a casting tray and dusted with coal dust; and then the glue mixture was poured over the type. Once the cast was removed from the

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[139] George Adolf Kubler, *A Short History of Stereotyping* (New York: Certified Dry Mat Corporation, 1927), 14.

[140] George Adolf Kubler, *A New History of Stereotyping* (New York,: [Printed by J. J. Little & Ives Co.], 1941); S. N. D. North, *History and Present Condition of the Newspaper and Periodical Press of the United States, with a Catalogue of the Publications of the Census Year* (Washington, D.C.: Census Office, Government Printing Office, 1884).

relief image, it was filled with molten type metal; and that metal form was attached to a base so that it can be used in a press.

In 1701, Johannes Mueller, a clergyman of the Reformed Church in Leyden, Holland, tried to solve some of the problems of preserving pages of movable type. Mueller was interested because he and his son were preparing to print religious books and Bibles. His approach, however, was extremely costly: After pages were composed, corrected and set up in a form, he turned the form over and cemented it to a solid plate with a mastic. Later, he soldered the type together. Obviously, his approach solved the problem of piing type, but the expensive movable type could not be reused for other print jobs. Nonetheless, it was an interim step towards true stereotyping.[141]

What is considered to be the first true application of stereotyping occurred in 1725 when William Ged, a goldsmith and banker in Scotland, became interested in helping one of his clients, a printer. Like Mueller, he set up his page with movable type, but he placed the type on gypsum or plaster of Paris when the substance was almost dry. When dry, he removed the form and used the gypsum cast to form solid plates of lead with the type impression. While his efforts drew interest among some book publishers and he received a royal commission to produce prayer books in

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[141] Willem Hendrik Jacob Westreenen van Tiellandt, *Report on the Researches Relating to the First Invention and the Oldest Practice of Stereotype Printing* (The Hague: Government Printing Office, 1833; reprint, in Kubler, George. *Historical treatises, abstracts & papers on stereotyping.* New York: J. J. Little and Ives Co., 1936), 85-104.

England, his efforts to put his work into full-scale production were thwarted by traditional printers who objected to the potential competition and changes in the volume of their work. Compositors working on his publications would purposely add a dozen more mistakes when they were asked to correct a single error. And, pressmen, when left alone, battered the letters in aid of the compositors. The plates that he did produce were eventually melted by the King's printing house in response to the pressures from traditional printers. Eleven years later after Ged and his son gave up and returned to Scotland, the two finally produced a book of works by an ancient Roman historian.[142]

Ged's work, though convincingly effective, languished for more than half a century before it was re-examined and improved. Meanwhile, other stereotyping techniques were being explored in France and Germany. Indeed, a significant boost to stereotype usage was the French Revolution. As France tried to cope with monetary inflation, it issued massive quantities of paper money, called "assignats." However, the assignats were immediately counterfeited – an action made easier because the printing on the money was so inconsistent because during long press runs the print images wore out, produced deteriorating print quality and then were replaced with new ones. The government could not even distinguish which assignats were real and which were forgeries. To solve the problem, they used stereotyping to readily produce

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[142] Kubler, *A New History of Stereotyping*, 39-47.

identical plates that could be replaced more often and that would be difficult for anyone else to duplicate.

Despite these successful experiments, stereotyping remained either a highly specialized tool or a technique used only by some printers on the fringe. It languished only to resurface in later decades. At the turn of the century, another inventor took up the challenge. The inventor was Charles Mahon, Third Earl of Stanhope, whose accomplishments included innovative experiments in electricity, a method of roofing houses, a machine for solving arithmetic problems and a steamboat. He also made an iron press that replaced the screw of the Gutenberg press with levers; the Stanhope press, easier to operate and more reliable than wooden presses, became a global success in the early 1800s. In 1800, he also began to research the history of stereotyping. He too relied on plaster of Paris casts, but he improved the mixture and the process; thus, he was able to greatly enhance the quality of printing. Stanhope and his associates operated a stereotyping business for several years, but never turned it into a commercial success.[143]

The next major step in stereotyping was using papier-mache to cast the type form instead of plaster of Paris. The lighter weight papier-mache had numerous advantages: much lower storage requirements, faster duplicating, easier transportability, and the ability to bend them. This invention was established by

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[143] Ibid; Moran, *Printing Presses: History and Development from the Fifteenth Century to Modern Times.*

patent as early as 1829 by Claude Genoux, a French printer. After variations and refinements, this approach to stereotyping dominated the process going forward.

In the United States, the Stanhope and related methods of stereotyping were being practiced by 1810. Bibles and school books were the first to be stereotyped, such as an 1830s book entitled "Henry's Commentary on the Scriptures."[144]

So, for more than 100 years before the advent of the penny press, the technology of stereotyping had gone through stages of experimentation that brought it closer to a reliable printing technology. Nonetheless, New York newspapers would not embrace this solution to many of their problems for another three decades. When they did broadly adopt stereotyping, it was to solve a problem with their decades-long commitment to ever more intricate, faster printing presses. Namely, the new rotary presses required a curved type surface, and stereotyping was the easiest way of delivering it. The papier mache mattes were first bent in a semi-circle before being used as a mould. In 1837, David Napier, a significant figure in the evolution of cylinder and rotary presses, patented in Britain a press using curved plates made through a stereotype process.[145] By 1864, the largest newspapers in New York – the *Sun, Times, Herald,* and *Tribune* – were all using stereotyping.[146]

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[144] Kubler, *A New History of Stereotyping*, 159.

[145] David Napier. *Letter-Press Printing Machines,* 1837. Great Seal Patent Office, Great Britain. No. 7343.

[146] Kubler, *A New History of Stereotyping*, 177.

Why had stereotyping been so consistently discounted despite its potential advantages? The reasons appear to be at least three-fold:

1. While all of the printing variations tended to be initially pursued by inventors outside the mainstream of printing or at least on the fringes, the development of high-speed presses eventually benefited by attracting the attention of mainstream publishers. The Koenig-Walters agreement on the first cylinder press was an important breakthrough in bringing outside influences on press development into the mainstream – thanks, to a very large degree to Walter's longstanding interest in technological innovation. No similar and dramatic joint effort occurred with stereotyping during the first circuit of creating this new medium.
2. While there is no concrete evidence to support the claim, one must also wonder to what extent the low-tech, even crude stereotype technology was a barrier to acceptance by publishers who were accustom to dealing with hard metal, levers and rigid matrices. Plaster of Pairs, clay, papier mache must have seemed like such flimsy components to the hard business of printing.

The extreme to which press inventors would go to achieve a high-tech solution to faster printing is illustrated by Augustus Applegath's vertical rotary type-revolving press he designed for *The Times* of London. After two years of construction, the press began operation in 1848. His machine attempted to overcome the handicap of flat forms of type that inherently

slowed down the printing process and made it a discontinuous motion. He could have achieved similar results with papier mache stereotyping that was available at the time. Instead, he built an enormous press where the type was held vertically on a polygon. Each side of the polygon was a column of type requiring its own set of inking and impression cylinders. In all there were eight sets of such cylinders and each one required the attendance of two boys.[147]

3. Focusing on presswork instead of typesetting reflected the laborious demands of the former. "Presswork on both sides of the Atlantic was usually performed by two men with strong arms, backs, and legs – one beat the ink while the other screwed and pulled. Each man took a turn every hour beating or pulling. In small offices where a boy inked the type the man was not likely to get relief except between jobs. The work was hazardous as well as backbreaking, for the wooden screw wobbled and sometimes broke, injuring the men. It was thus inevitable that this cumbrous, repetitive process would stimulate the imagination of inventors – first in Europe, then in the United States – long before the gentler art of typesetting."[148]

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[147] Moran, *Printing Presses: History and Development from the Fifteenth Century to Modern Times*, 185-86.

[148] Baker, *Printers and Technology; a History of the International Printing Pressmen and Assistants' Union*, 4.

4. Finally, there was a mental block that existed with stereotyping, reflecting a specialization that existed in printing – separating the book publisher from the periodical publisher. Stereotyping was primarily perceived as a preservative technique, so that the printer did not have to keep his capital locked up in standing type during a long press run or in multiple press runs separated by months or years. Once an entire set of plates was completed, the publisher could produce as many copies as he wished when he wished. Stereotyping was considered primarily useful for Bibles and other long-lasting works of literature. Not surprisingly, the most aggressive development of stereotyping in the United States during the early part of the 19th Century came from the American Bible Society and other publishers of large volumes of religious literature. In 1825, various regional religious publishers merged into the American Tract Society. Their primary motivation was the sharing of stereotype plates, and by doing so, they were able to drive down the printing costs of each individual piece of literature. Once the stereotype plates were made, the printing costs – exclusive of paper -- for a Bible-length book fell from 20 cents in 1821 to 10 cents in 1831.[149] As such, the advantages of stereotyping were primarily perceived in the context of preserving pages of books for printing again at a later time. The benefits to urban newspapers

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[149] Nord, *The Evangelical Origins of Mass Media in America, 1815-1835.*

where thousands of copies were being produced in a single day instead of being spread over several years were not immediately recognized.

Curiously, the distributed model of publishing newspapers using stereotyping did surface in such places as London and in the United States – sometimes to enable smaller, marginally profitable newspapers to obtain lower cost content. The use of stereotyping for efficiently distributing news, illustrations and advertising materials to remote printing sites did not exist until the last half of the 19th Century and continued well into the 20th Century until offset printing began to replace letterpresses. This "distributed" model of publishing permitting the production of type and other materials in a single location; and, then, that product could be distributed at numerous printing plants within the city or across the country. The services that grew up around this kind of produce-once, reprint many times approach were primarily used by rural newspapers since the urban newspapers had already adopted a centralized production model.[150]

In 1860, the National Press Association of London began typesetting copy in a single location and sending them throughout the country. On a smaller scale, as early as 1863, owners of the *Wisconsin State Journal* in Madison, were distributed what they called "insides" to 30 weekly newspapers. At this time, it was the actual metal

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[150] Some feature material, such as comic strips, was distributed to both large and small newspapers.

castings that were being distributed. Despite their bulk and sometimes the adaptations that were necessarily for the stereotype plate to be used on individual presses, there were substantial cost savings possible for local publishers who could bypass the expensive typesetting step.[151]

Some editors objected to the ready-print plates, scornfully calling them "boiler plate" since the material was not set and edited entirely within the local newspaper. Editors who used these plates and cut them to fit their needs were said to "edit their papers with a saw." Nonetheless, more and more groups of U.S. newspapers formed syndicates or unions to participate in the distributed printing model. The Western Newspaper Union was formed in 1880. The Hearst organization formed the Newspaper Feature Service, soon merged into the King Features Syndicate. The Newspaper Enterprise Association, formed in 1909, began to service large newspaper as well. Ultimately, these syndicates delivered through stereotype plates, and later papier mache mattes, content that included advice columns, dress patterns, canned editorials, feature stories, comic strips, half-tone photographs and advertising illustrations.

By the mid-20th Century, newspaper offices would receive large packets of the stereotype mattes by mail almost every day. While local printer unions sometimes demanded contracts that gave them the right to re-set all of the stereotype material at a later time, for the most part, newspapers could gain low-cost editorial material and

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[151] Kubler, *A New History of Stereotyping*, 318-22.

also save the cost of setting into type. This was a formal and more efficient process that was remarkably similar to the informal steps taken by Benjamin Day and most other publishers when they clipped out stories from other newspapers and set type from them for their own publications.[152]

If the sequence of decisions had been reversed and stereotyping was the first solution sought to meet the need for greater volumes of newspaper copies, would this new mass media in urban markets have gravitated so quickly to a centralized production and distribution model? While it's not worthwhile to pursue that kind of "what-if" question very far, it's logical to argue that had printing technologists first focused on a stereotype solution, faster printing could have been achieved with much lower investments in capital equipment – two low-cost hand-presses with one of them utilizing stereotyping would be far less expensive than cylinder printing. The model of sharing content between newspapers would have been facilitated, and the ability to financially sustain smaller newspapers even in urban markets would have been improved. Of course, that does not mean that the benefits of economies of scale would not have ultimately driven papers to the kind of centralized production and ownership that came to exist.

Thus, by the 1830s, a number of alternative technologies failed or were never given a chance. Instead, over time, a dominant set of solutions to printing urban

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[152] As a new journalist in the late 1960s, I was amazed to find the same canned editorials (unsigned) showing up on opinion pages in multiple newspapers as if they had been written by a local editor.

newspapers began to evolve. These solutions were discovered and promoted by persons who universally had a long-standing interest in cutting edge technologies, such as electricity. And, the technologies entered the mainstream of urban newspaper publishing when a social construction could be agreed upon by the experimenters and at least one or two media content producers.

Linear steps toward a consensus solution

Amid the missteps and overlooked alternatives in the early 19th Century, the primary solution to faster printing was evolving through a social construction involving press inventors and printers. This solution would eventually find its way to publishers – initially newspapers – who would adopt the new technologies and figure out a way to turn these costly machines into new found profitability.

The most prominent individual to first move his technologist perspective to the mainstream of publishing was Friedrich Koenig (born 1774 in Germany). Like the earlier press innovators, he received no interest from German printers and publishers for his method of faster printing with high-tech presses. He, however, decided to take his ideas elsewhere, and fortuitously ended up in London in 1806 where he met three printers who were willing to support his efforts – Thomas Bensley, George Woodfall and Richard Taylor. Within five years and after several trial efforts, Koenig and an engineer, Andreas Bauer, developed the first functioning cylinder machine. This machine should not be confused with Nicholson's much more ambitious design in

1790 (which Koenig read about in 1807) nor with the rotary presses that would eventually take hold in the 1830s. This machine was a hybrid – it retained many of the characteristics of a hand-press but allowed for much greater speed and the use of steam power. [153]

The Koenig-Bauer press retained the flat-bed of type but used cylinders for applying ink to the type and for pressing the paper against the type. As such, the platen was a cylinder holding the paper and pressing it against the typeform that moved back and forth. The cylinder was linked to the forward direction of the bed and was disengaged when the bed moved back under the inking rollers. Thus, like hand-presses, the type remained in a flat form, and unlike later rotary presses, the Koenig machine required a discontinuous, back-and-forth movement. Nonetheless, it was quickly able to reach the rate of 800 impressions an hour – at least four times greater than hand-presses.[154]

Koenig noted in his 1811 patent that a primary distinction was the use of the platen cylinder: ". . . the main principle of this part of my Invention is, that the impression is given by a cylinder round which or round part of which the sheet is wrapped in such a manner that it is presented in a circular shape for impress."[155]

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[153] Friederich Koenig, "To the Public," *The Times of London*, Dec. 8, 1814.

[154] Frederick Koenig. *Printing Machines,* 1811. Great Seal Patent Office, Great Britain. No. 3496; Moran, *Printing Presses: History and Development from the Fifteenth Century to Modern Times*, 105.

[155] Koenig. *Printing Machines,* No.

The Koenig press reduced the number of separate operations per page from nine to three. The hand-press required: "(1) Inking the dabbers; (2) Inking the formes; (3) Laying sheet on tympan; (4) Flying the frisket, folding the frisket and tympan down on the forme: (5) Running forme under platen; (6) Making impression; (7) Running out the forme; (8) Lifting the tympan and frisket; (9) Taking off the sheet." The cylinder press only required: placing the sheet, running the type table in and out and taking off the sheet. [156]

The London printers that backed Koenig were oriented towards book publishing, not newspapers where the higher speed would be of potentially greater use, but, eventually newspaper owners were invited to see the machine. Only one newspaper expressed an interest – *The Times* of London – and that would begin a decades long relationship that coincided with the transformation of printing as well as newspapering. John Walter II, agreed to purchase two steam-driven presses if Koenig could develop a double machine – capable of being fed sheets of paper from both ends.

In 1813, Koenig filed a patent that was the basis of that double machine. The patent includes several improvements over the 1811 design: Because type in the flatbed was imperfect, Koenig wrote "It is necessary, then, that the outside cover of the cylinder should be soft and elastic, to sink into the face of the old types, and to reach those parts which are worn down below the general surface of the form." He

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[156] Isaacs, *The Story of the Newspaper Printing Press*, 18-19.

also noted the development of "endless straps" to secure the sheets of paper to the cylinder while the page was printed. And, he mentions the "double machine, which is, in fact, nothing but a multiplication of the same parts and principles" of the single feeder machine.[157]

This improved Koenig machine gave *The Times* a production capability of more than 1,000 impressions per hour, or 500 copies printed on both sides, as against the 200 to 300 impressions or 100 to 150 copies on the Stanhope press previously used by the newspaper.[158]

Even after Koenig achieved the first connection between the purely technological frame with the publishing/producer frame during the first circuit, the threats to his invention did not end. When Walter installed and first used the Koenig machine, he did so in secret for fear of violence by *The Times* pressmen. The pressmen were told that the newspaper was being held up as news was expected from the Continent. Then, at 6 a.m., Walter entered the pressroom to surprise them with the news that the paper was already printed. The pressmen were given job guarantees until they could find employment elsewhere.[159]

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[157] Frederick Koenig. *Printing Machines,* 1813. Great Seal Patent Office, Great Britain. No. 3725.

[158] Isaacs, *The Story of the Newspaper Printing Press*, 22.

[159] Moran, *Printing Presses: History and Development from the Fifteenth Century to Modern Times*, 107-08.

That November 29, 1814, issue of *The Times* included an announcement that revealed both the hesitancies of the publisher and the aggrandizement of the technologists:

> Our journal of this day presents to the public the practical result of the greatest improvement connected with printing since the discovery of the art itself. The reader of this paragraph now holds in his hand one of the many thousand impression of *The Times* newspaper, which were taken off last night by a mechanical apparatus. A system of machinery, almost organic, has been devised and arranged, which, while it relieves the human frame of its most laborious efforts in printing, far exceeds all human powers in rapidity and dispatch . .
>
> That the completion of an invention of this kind, not the effect of chance, but the result of mechanical combinations methodically arranged in the mind of the artist, should be attended with many obstructions and much delay, may be readily admitted. Our share in this event has, indeed, only been the application of the discovery, under and agreement with the patentees, to our own particular business; yet few can conceive – even with this limited interest – the various disappointments and deep anxiety to which we have for a long course of time been subjected to.
>
> Of the person who made this discovery, we have but little to add. Sir Christopher Wren's noblest monument is to be found in the buildings which he erected, so is the best tribute of praise, which we are capable of offering to the inventor of the printing machine, comprised in the preceding description, which we have feebly sketched, of the powers and utility of his invention. It must suffice to say, further, that he is a Saxon by birth, that his name is Koenig, and that the invention has been executed under the direction of his friend and countryman, Bauer.

As would occur repeatedly with printing press innovations, critics almost immediately began to cast doubts on Koenig's claims to be first to invent cylinder printing. The clamor was loud enough that *The Times* gave Koenig lengthy space to argue his case a week after the new presses went into operation. In the statement,

Koenig outlined the history of his press developments, explained why he left the Continent to develop his new presses and defended the uniqueness of his innovations. He also revealed the difficulties he had faced in implementing his ideas:

> . . . The public are undoubtedly aware, that never, perhaps, was a new invention put to so severe a trial as the present one, by being used on its first public introduction for the printing of newspapers, and will, I trust, be indulgent with respect to many defects in the performance, none of them being inherent in the principle of the machine; and we hope, that in less than two months, the whole will be corrected by greater adroitness in the management of it, so far at least as the hurry of newspaper printing will at all admit.
>
> It will appear from the foregoing narrative, that it was incorrectly stated in several newspapers, that I had sold my interest to two other foreigners, my partners in the enterprise being at present two Englishmen, Mr. Bensley and Mr. Taylor; and it is gratifying to my feeling to avail myself of this opportunity to thank those gentlemen publicly for the confidence which they have reposed in me, for the aid of their practical skill, and for the persevering support which they have afforded me in long and very expensive experiments; thus risking their fortunes in the prosecution of my invention.
>
> The first introduction of the invention was considered by some as a difficult and even hazardous step, The Proprieter of *The Times,* having made that his task, the public are aware that it is in good hands.
>
> FR. KOENIG[160]

Even apart from his presses at *The Times,* Koenig continued to invent improvements to his cylinder press. One of the vexing problems confronting printers

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[160] Koenig, "To the Public."

ever since Gutenberg was having to put each sheet of paper through the press twice – once on each side. In 1814, Koenig received a patent for a "perfecting press" which would print both sides in one run through the press. By this point, it's clear that the press machinery is requiring very exacting tolerances; a perfecting press not only requires that both sides be printed but also printed in register (where the margins of both sides are in alignment).

While Koenig returned in retirement to Germany in 1818, *The Times* was printed on Koenig machines until 1827 when they were replaced by Applegath rotary machines. Koenig achieved with *The Times* what would be accomplished decades later with other publishers – an ongoing commitment to providing faster and more efficient printing. Why that newspaper? For one thing, from its outset *The Times* was a creature of invention. As previously noted, *The Times* largely came into existence as a proving ground for John Walter's logographic printing. In addition, its circulation was at 5,000 – the point where most publishers begin to have problems with older flat-bed presses.

While Koenig and his presses were a crucial bridge between hand-presses and later rotary presses, they were never put in widespread use. Bensley, the principal shareholder in Koenig's company, installed the presses for his book publishing business, but few English printers found a need for faster printing. The company established operations in Koenig's homeland of Germany, but with little response.

The difference in cost between a hand-press and a cylinder machine was enormous. A state-of-the-art Stanhope hand-press would cost £95 compared with the

simplest Koenig machine – single-cylinder, non-registering --which cost £900 and a double machine with a registering device which cost £2,000. On top of the equipment prices, there were annual royalty fees ranging from £250 to £500 a year. To justify the much greater costs, printers and publishers could not merely print traditional products faster; they would have to devise new uses for the presses – or, in essence, to establish a new medium. [161]

Nonetheless, inventors in England especially continued to adapt the Koenig machine, trying a variety of different cylinders, inking mechanisms and paper delivery systems. It was David Napier (1785-1873) of Scotland who would come to London and build the press with the greatest immediate impact on cylinder printing there and in the United States. The Napier (pronounced Nay-Peer) would be the press that Benjamin Day would already know about when he started *The Sun* because it was being used by some publishers already.

Like the Koenig press, Napier used a flat bed for the type and cylinders for inking and impression. Besides other difference, he notably added perfecting capabilities – printing on both sides of the paper in a single process. He used a system of "grippers" for taking hold of each sheet. The gripper fed the sheet to the first cylinder, holding it while the first side was printed and releasing it at a point when another cylinder received the page and printed the other side. His machines were

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[161] Moran, *Printing Presses: History and Development from the Fifteenth Century to Modern Times*, 110.

designed for operation by hand crank initially and then by steam-power. His initial machine was not patented, but a version with four paper feeding stations for one print cylinder was patented in 1828.[162]

His 1830 patent made an important advance by replacing "stop-cylinder" movement with a "two-revolution" concept. In the stop-cylinder press, the type bed engages a cogwheel incorporated in the cylinder while the bed is moving forward. When the bed is moved back to the starting position, the cylinder stops and the cogs disengage. A shallow cavity in the cylinder makes it possible for the typeform to slide underneath. In the two-revolution press, the cylinder never stops, but it is raised out of the way on its bearings when the bed moves back. As such, printing takes place during the first revolution and during the second revolution the cylinder runs without contact. Printing speeds – about 1,000 pages an hour – are similar for both presses. But, by avoiding the mechanical jerkiness due to the stopping of the cylinder, the two-revolution press has a much smoother action, especially suited for steam-power.[163]

In addition, the patent describes his use of a fly wheel to ease the operation by hand or to enable its powering by steam, or even combustion engines:

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[162] Ibid., 131-34; David Napier. *Letter-Press Printing Machines,* 1828. Great Seal Patent Office, Great Britain. No. 5713.

[163] David Napier. *Printing and Press Machines,* 1830. Great Seal Patent Office, Great Britain. No. 6010.

> As regards my method of economizing the power applied to my machines, and which is also applicable to other purposes, it is well known that in turning a fly wheel the man expends much power on points of the action where he can obtain little or no mechanical advantage. My improvement is that of applying one or more springs, similar to that of a clock, (but in proportion to the work) between the mover and the moved, or between the man and the fly wheel, which spring or springs the man is constantly winding up by means of a lever, somewhat similar to the action of a pump, so that no power may be expended in vain, which winding up would not be as in the clock by turning round the centre spindle on which the spring is wound, but rather by turning round the outer case in which the spring is contained. . . and seeing that it matters not with what velocity that lever is acted upon, it having no instantaneous effect upon the fly wheel, it is obvious that it might be applied either to explosive or steam engines, and especially where it would be an object to dispense with the crank, as in locomotives.[164]

Napier also built presses without perfecting capability at the time, called the Desideratum and the Double Imperial, which operated at a much higher speed with two sets of cylinders. The Nay-Peer perfecting press cost between £450 and £600; the Desideratum as low as £150; and the Double Imperial from £450 to £700. One of Napier's customers noted that the expensive machines had a greater appeal for larger newspapers because the cost of the machine "can only be repaid by executing an extraordinary quantity of work in a much less portion of time than that usually occupied for the same work done by ordinary means." Nonetheless, at least 140

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[164] Ibid.No.

Desideratum machines and at least 23 Double Imperials were built in the 1830s and 1840s.[165]

The entry of the Napier press into the United States, particularly for urban newspapers, was a significant event. In part, because it demonstrated first-hand the viability of cylinder printing for the first time since the Koenig press never arrived. And, also, because once again it gave the dominate U.S. press manufacturer the opportunity to copy and reproduce an important advance in printing. When Hoe & Co. began manufacturing similar machines by 1834, they were even called Napier machines.

A Napier cylinder machine reached the United States as early as 1825 when owners of the *New York Daily Advertiser* (morning) and the *New York American* (evening), imported a Napier cylinder machine from England. This was the machine that gave Hoe the idea of making cylinder presses.[166] In the Hoe company's two contemporary histories, that press is not mentioned, but they do state that the company sent an employee, Sereno Newton, to England in 1832 to investigate the

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[165] Wilson and Reader, *Men and Machines; a History of D. Napier & Son, Engineers, Ltd., 1808-1958*, 21-22.

[166] Moran, *Printing Presses: History and Development from the Fifteenth Century to Modern Times*, 139. Yet, another set of dates for Napier machines first being used in the United States were given by Bullen. He states, without attribution, that in 1829 a cylinder press was imported from England for use by a Washington, D.C., newspapers; and Hoe built and installed its first copy of the Napier press in 1830 at the *Temperance Recorder* in Albany, N.Y. Henry Lewis Bullen, "The Evolution of American Printing Presses: From the Year of Independence, 1776, to the Present Year," *The American Printer* (1926).

Napier machines and soon thereafter began to produce those machine under the Hoe name.[167]

Hoe's Transitional Role

Much like Koenig a decade before, Robert Hoe, his company and his sons were important participants in the first circuit of higher speed printing technology. They played a decades-long role in being a bridge between printing advances in Europe and the United States as well as a bridge between early, difficult to operate and maintain printing technologies and more reliable, and thus attractive, presses. Indeed, the Hoe company provided this function at two key points in printing press evolution: in the 1830s and more than two decades later. But, in both instances the company's role was one of considerable interaction between the technologists of press manufacturing and the owners of urban newspapers whose business models called for ever faster and greater output.

Robert Hoe, born in 1784 in Leicestershire, England, apprenticed as a carpenter before immigrating to the United States in 1803. Perhaps displaying the self-marketing skills that would be useful in later years, Hoe quickly obtained jobs

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[167] Isaacs wrote that the Hoe company began production of Napier machines in 1832. Hoe, *A Short History of the Printing Press;* Isaacs, *The Story of the Newspaper Printing Press;* Tucker, "History of R. Hoe & Company, 1834-1885."

that seemed beyond his experience: supervising the construction of an iron bridge and houses in Westchester County, New York.[168]

While doing that work he became a partner with two brothers, Matthew and Peter Smith, who were printers' joiners and equipment makers. The Smith, Hoe and Company was a multi-purpose manufacturer of items ranging from hobby horses to woodwork but clearly the desire of the partners was to become leaders in printing press production. In a pattern that would be repeated over and over, they "borrowed" ideas from other manufacturers and improved upon them. For instance, they converted the wooden frames of popular presses of the time to more durable iron frames.

In the 1820s, the firm's *Smith* press was in competition with a lighter, more advanced hand press designed by Samuel Rust, called the *Washington.* By 1835, Hoe – who had renamed the firm to R. Hoe & Company after the death and retirement of the Smith brothers – tried to buy the Rust manufacturing operations. When Rust refused, John Colby, foreman of the Hoe hand press and jobbing rooms, pretended to set up a business for himself and bought Rust's patent right, stock, tools and shop – soon transferring the whole business to Hoe.[169]

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[168] Comparato, p. 29.

[169] Moran, *Printing Presses: History and Development from the Fifteenth Century to Modern Times.*, p. 79-81.

It would be Hoe's improvements on the British *Napier* cylinder press that would solidify the company's reputation as a leader in the industry, both in the United States and Europe if not the world.

The reputation was not without barbs attached: An anonymous letter – signed Franklin - to the *Printer's Circular* in 1870 complained that the Smith press was really the John Wells press. He wrote that the Hoe double cylinder press of 1832 was "an exact copy of a British press, to which the Scotch (sic) name of (David) Napier was attached, and whom I always considered the inventor." The bed and platen was the invention of Isaac Adams; and Hoe's type revolving press was patented by "(David) Morison in England six years before Hoe brought out his machine."

But, the scathing letter went on to state:

"He (Hoe) turns out the most carefully finished work, as a whole, in the Republic, if not in the world. I never saw a botched article from the establishment. More than forty years ago my old shopmates chose the Smith hand-press because of the finish of all its parts. The polished brass hooks and buttons, the light neat spring points, the sure grip of the wrenches . . . showed the sweating pressman that some one or more, far off in the blacksmith's shop, thought of his troubles and wished to lessen them . . ."[170]

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[170] Letter to editor, Printers' Circular, March, 1870, p. 15, quoted in Comparato, *Chronicles of Genius and Folly: R. Hoe & Company and the Printing Press as a Service to Democracy.*, p. 301-302.

Indeed, three generations of Hoe family members conceded that ideas were borrowed and bought, but boasted that the firm's precision machinery made the difference. A family member in 1902 would write about press developments in 19th Century:

> "Most of the English machines, however, show defects in mechanical construction. In fact, the supremacy of the American printing press is maintained in a large measure by the simplicity, accuracy and perfection of its mechanism. Foreign presses, made by the cheap labor of Europe, have been repeatedly brought to this country and introduced into printing offices. They have never, however, lasted long, most of them having perished in the using or being found unprofitable."[171]

While the descendant's comments have an obvious promotional element to them, there were indications that the Hoe machine shop was distinctive. As a precursor to the corporate management of secret projects in the 20th Century, Hoe built a private experiment and model room with restricted access. The room was used not only for Hoe projects with patent potential but also for confidential projects, such as armaments, for outside customers. If metalworking machinery was not up to Hoe's demands for precision, then they would design and manufacture the machinery themselves.[172]

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[171] Hoe, *A Short History of the Printing Press*. p. 20.

[172] An employee of Hoe described the handling of one manufacturing problem: "The trade was constantly calling for larger cylinder presses and these required racks of such a length that our rack cutting machine, which had been in use some twenty-five or thirty years, had become too small, so in 1871 drawings were made for an improved machine. This new machine was arranged to hold the racks

In addition, the Hoe manufacturing operation was sought after for its ability to handle specialized, precision work ranging from cotton gins to weaponry. Here are a

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stationary, and move the cutter-head along, by means of a screw, to lay off and cut the teeth of the racks to the various pitches required, and the plan was so well liked that the machine was commenced at once. We knew there was no screw in the works sufficiently accurate to give the pitch divisions with the precision we desired, but supposed one could be obtained while the machine was being built, but after much time spent in making inquiries we could find no one, either here or in England, who would agree to make a screw guaranteed to suit our requirements for accuracy. Now, measures of length of great precision, copied from the British Government Standard, were obtainable, and Messrs. Darling, Brown & Sharpe and others were then making such measures divided with great accuracy, so I decided in 1874 to abandon the screw for the partly finished machine, and substitute a stationary rack in connection with a traveling worm or tangent-screw attached to the cutter-head, to obtain the pitch divisions. We then prepared two steel bars 1 by 5/8 inches and 15 feet long, one of which was sent to Darling, Brown & Sharpe and the other to the United States Coast Survey at Washington, with directions to divide one side of the bar into inches and the opposite side into centimeters, the divisions to be made with all the care and accuracy possible, and the lines to be as fine as consistent with visibility. Upon examination of the bars after division, the one divided by Darling, Brown & Sharpe was found to be far the better, in fact its few errors were scarcely discoverable. The bed of the machine was fitted up with its traveling cutter-head in proper working order and two rack blanks 11 feet long (one for a future machine) were clamped together on the machine in position to be cut. The steel bar divided by Darling, Brown & Sharpe was secured to the bed of the machine and an index arm, carrying a three inch D. B. & S. graduated steel rule at its point, was so attached to the cutter-head that the rule was held just in front of, and very close to, the steel bar. The cutter-head was then so set that the division lines on the rule and on the bar, seen through a microscope, exactly coincided, and a cut was made across the rack at the proper angle to suit the thread of the tangent-screw, and in this manner the racks were toothed 1/2 inch pitch from end to end. This was an exceedingly delicate and tedious operation, occupying about three months, for not only were the racks allowed to cool after each cut, but the temperature of the room was also taken into account. Notwithstanding all this care, the divisions of the racks were not absolutely perfect, but the inaccuracies, slight as they were, were corrected by dressing off the faulty teeth until they were as nearly perfect as the most skillful workman could make them." Tucker, "History of R. Hoe & Company, 1834-1885.", p. 435-436.

few examples of Hoe manufacturing projects, taken from a detailed chronology of the Hoe Company:[173]

- A brass experimental howitzer, 3 inches bore, for the U.S. government in 1838.
- A small machine for making pills in 1838.
- Model of a steamship for the Collins Line in 1847 to compare the efficiency of paddle wheels and screw for propelling vessels (The paddle wheels invariably beat the screw.)
- A washing machine and gold separating machine for California mining interests in 1849.
- 25 small steel breech loading rifled cannon, 1 1/8" bore and mounted on carriages for the Mexican government in 1855, intended for use "by Dictator Santa Anna in his efforts to subdue the revolutionists in the mountains of Mexico."[174]
- Hydraulic presses with steam pumps for the U.S Treasury to print bank notes and bonds in 1863.
- Oil well drills and other tools in 1865.

Through most of the history of the company, it was involved with making saws, including large circular saws for industrial applications. After the Hoe Company went into bankruptcy in 1969, only the saw manufacturing operations would emerge.

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[173] In 1895 manuscript reprinted as Ibid.

[174] Tucker, p. 396

There were reoccurring and substantial doubts about the originality of Hoe's work. But once its machine shops were turned loose on a new press improvement, the output would be precise and outdistance the competition. Hoe sons would continue the production model, and they contributed their second major press advances in the 1840s and 1850s.

Inventive Thoughts

> "One night in 1846 he (Richard Hoe) tossed from side to side in his bed and, unable to sleep, thought he would get up and walk about the room. As he rose, as with a flash the vista opened before him and he saw as clearly as if with the physical eye a solution of the long vexing problem. It was a plan for securing type on a horizontal cylinder – the panacea for the trouble of his patrons. Rushing to his desk he drew the diagram, which, after the details were perfected, resulted in the lightning press. . . ."
>
> -- upon Richard Hoe's death, *New York Herald*[175]

In mythic descriptions, the heroic inventor labors to the point of exhaustion to discern a breakthrough technology, or the insight comes in a flash of sudden realization. By the middle of the 19th Century, the invention of the rotary web press required neither sweat nor blinding flashes.

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[175] "Death of Colonel Hoe: The Great Inventor Stricken Down by Heart Disease," *New York Herald*, June 9, 1886., p. 7.

There are two key dates for Hoe's development of rotary printing: 1847 when the *Philadelphia Ledger* began use of the Richard Hoe's "Type Revolving Machine" or "Lightening Press" and 25 years later when Hoe would finally decide to use paper on rolls and develop its first web-fed rotary press (installed in 1873).

The two key problems to be solved in rotary web printing were: (1) Moving the paper through a series of cylinders that would impress the ink on the paper and (2) Holding the relief type on a cylinder without the individual pieces flying off. Using sheets of paper initially solved these problems; the rolls or webs of paper would be added later. Another problem would arise only after the presses increased in speed - efficiently removing the sheets from the press.

Antecedents for solving the two problems had been around since the 17th Century in the textile industry. Those presses used the intaglio printing process – with etched copper plates instead of type. The production of those plates was a laborious process closer to block printing in the pre-Gutenberg era. It was not practical for the creation of books and newspapers because it did not have the advantages of Gutenberg's movable type.

Nonetheless, these presses demonstrated multiple cylinders could be used to hold the print image and transfer the ink to rolls of fabric in a continuous, linear process. This form of rotary printing was widely used for printing and coloring cloth, leather and even paper. A 1764 patent described a machine that printed "by means of engraved copper cylinders on which the colours are laid by smaller cylinders which are put in motion by other plain cylinders, and the whole work of filling in, clearing

off, and stamping the impression is performed by the joynt assistance of sundry springs and the intermediums of coggs and rings turned by a wheel worked by either a horse, water or wind."[176]

By the late 18th Century, the technology would be applied to paper wallcoverings, calicos and other cloth. The potential connection to relief printing was obvious.

In 1790, Nicholson, an English patent agent who presumably was familiar with patents for rotary presses used in textiles, took out a patent for a rotary press with three key parts: "The first was for casting types in a multi-letter mould, so that 'two, three or more letters' could be cast at one pouring of the metal, but the resulting types were to be scraped into a shape so that they could be inserted around a cylinder. The second part called for cylinders covered with leather or cloth to distribute the ink. The third demanded that all printing was to be performed by passing paper or material to be printed between two cylinders, one of which ' has the block, form, plate, assemblance of types, or original, attached to or forming part of its surface.'"[177]

Solutions to the problem of curving the type around a cylinder were suggested in an 1823 patent by another Englishman, William Church, and experimentation was taking place in the United States by papermakers Joshua and Thomas Gilpin at about

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[176] Moran, *Printing Presses: History and Development from the Fifteenth Century to Modern Times.*, p. 173-174.

[177] Moran, p. 102.

the same time. Thomas Trench, also a papermaker, actually built a "machine for printing both sides of a continuous sheet of paper," patented in 1837.

In England, Rowland Hill in 1835 invented and built a rotary machine improving on the earlier Nicholson idea of printing from movable type. While Nicholson only suggested a crude technique of scraping type so that it would be wedged into place on a cylinder, Hill used molds that would have the appropriate shape. A key component of Hill's press was its use of a continuous web of paper. But, this approach ran headlong into the British paper tax, which required that each sheet be stamped separately. Instead of developing his press further, Hill devoted his time to getting the tax removed.

Another Englishman, David Morison, patented a similar press, but instead of using traditional movable type he suggested a stereotype plate – in essence a mold of the complete page of type cast as a single piece of metal into a cylinder. (Stereotyping, discussed below, ultimately solved the problem of holding movable type to a fast-revolving cylinder.)[178]

The most complete implementation of the rotary press was made by Jeptha A. Wilkinson. He claimed to have been working on the idea since 1818 and built a working model between 1837 and 1839 at Providence, Rhode Island. He left Providence in 1941 to build the press for the *New York Sun's* owner, Moses S. Beach. In the next year, Beach withheld payments from Wilkinson, claimed patents on the

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[178] Moran, p. 177.

press should be in Beach's name and sent his son to England to patent the press there. The patent dispute lasted more than a decade, but the direction of the improvements were clear. The press is described in an abridgment of the 1842 British patent:

> "In the press in which the paper (damped and in roll) is conducted successively between two pairs of cylinders, the type cylinder being uppermost in the first, and the pressing cylinder in the second pair, from which the paper receives the reiteration. An ordinary inking apparatus is attached to each type cylinder. After the impression the paper is led over rollers and between converging plates which fold it. It then passes between vertical cylinders, and is cut into sheets by a revolving knife.
>
> The types are tapering (the degree of taper varying with the size of the cylinder), and they, as well as the column rules, ring, cross rules, &c., have alternate indents and projections on their sides, the spaces between the lines having them on their ends. An apparatus, called a 'grab,' is used for placing a column of type up. on the cylinder. The types are secured by plates at the ends of the cylinder. Margins are made across the columns by tapering blocks, with indents and projections, and in the other direction by rings on the cylinder."[179]

Wilkinson ultimately won the patent dispute, but with few benefits. He tried unsuccessfully to sell his presses in France and when his shop was destroyed by fire he ceased work altogether. Wilkinson could not compete with the apparatus and skills the established press manufacturers even though his type-revolving press appeared at least seven years before the similar press of Richard M. Hoe. Whether or not Hoe knew about the Wilkinson press cannot be definitely determined even though it has been claimed that Hoe proposed to erect a plant for its manufacture. But Hoe captured

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[179] From *Printing Patents* (London, 1969), quoted in Silver, "Efficiency Improved: The Genesis of the Web Press in America.", p. 335-336.

the publicity as well as the market for his own press by producing a more satisfactory press.[180]

Hoe's 1847 type-revolving press was hugely successful – though not always in the most direct manner. The installation of the press at *La Patrie* in Paris in 1848 promised to be Hoe's breakthrough in the European market. But the downfall of the Republic and the re-imposition of stamp duty effectively shut down newspaper enterprise in France, and English publishers did not take note of Hoe's improvements until 1856 when Edward Lloyd of *Lloyd's Weekly Newspaper* in London visited *La Patrie.* Lloyd ordered the press, and other publishers quickly followed.

The reasoning was clear: The older cylinder press could print one side of a sheet at the maximum rate of 2,000 per hour, or 4,000 per hour from a double cylinder. (Average output was probably half those numbers.) While a newspaper could add additional presses, the cost was high because each press required its own manually assembled set of type forms. In contrast, the Hoe rotary press using four sheet feeders could produce 8,000 papers per hour (printed upon one side). When up to 10 feeders were attached to a single type-revolving cylinder, the output could reach 20,000 papers per hour.[181]

Even so, the type-revolving press had a major problem: The feeding of sheets into the large press could not be automated. Each feeding platform required a

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[180] Ibid., p. 344.

[181] Hoe, *A Short History of the Printing Press.*, p. 27-32.

pressman to manually insert the sheets, and even though grippers and other devices were used to speed the process it was nonetheless labor-intensive and subject to operator error. The solution was obvious and turned out to not be technically difficult: conversion to printing from a continuous web of paper.

So, why did that critical next step take 25 years to evolve in the Hoe company? The answer is not simple because it involves a mix of external market forces as well as the selective focus of Richard Hoe. As has been observed in other technologies, short-term priorities and advantages usually take precedence over long-term ideals.[182]

Three Decades of Distraction and Delay

Richard Hoe clearly recognized the advantages of web printing as soon as he perfected the type-revolving press. The intensity of that recognition was revealed in Stephen D. Tucker's year-by-year description of the company's activities.

Repeatedly between 1849 and 1871, Tucker cited examples of Hoe taking steps toward web printing, but, each time Hoe stepped back from the innovation – after all, his existing presses were selling quite well.[183]

- 1849: Hoe files a caveat with the patent office for a web-fed type-revolving machine. The rolls of paper would be drawn into the cylinders

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[182] Robert Friedel, "Why You Need to Understand Y2k," *Invention & Technology*, Winter 2000, 1999., p. 27.

[183] Tucker, "History of R. Hoe & Company, 1834-1885."

for printing on one side and then rewound. The rewound rolls would then be printed on the reverse before being cut into sheets. Tucker wrote: "Nothing further was done in the matter, but the caveat was kept alive several years although never patented."[184]

- 1850: Hoe conducted an experiment using rolls of paper that would be automatically cut into sheets before feeding into the press, thus dispensing with "feed-boys" as well as enabling the continuous printing on both sides (called perfecting). "The reversing device [for perfecting] did not work smoothly at the desired speed of 2,000 per hour, and the apparatus was laid aside, and although patented by Mr. R. M. Hoe, July 26, 1859, it was never brought into use."[185]
- 1853: Hoe attempted to use a web feed to print both sides of the paper from the same, very large cylinder. The plan required the web to be turned over after its first side was printed and then fed back to the same cylinder. But, the stresses on trying to return the web back to the same cylinder tore the paper, and "the plan was finally dropped."[186]
- 1854: The firm bought a patent filed in the same year by Victor Beaumont for printing a continuously moving web of paper on a type-revolving

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[184] Tucker, p. 388.

[185] Tucker, p. 389.

[186] Tucker, p. 392.

press. This design permitted printing both the inside and outside type forms on a single web in a nonstop manner. "This method of printing a web is very ingenious and is precisely the same as the web is printed on the firm's present Type web presses. But the scheme as a whole did not seem very practicable and the patent was probably bought to keep it out of the market."[187]

- 1857: The company produced a true web press to print tickets for the New York Central Railroad. Similar machines were built for the N.Y. & Erie and other roads.[188]
- 1858: Hoe filed a caveat for a press to print four webs from two type cylinders carrying wedge-shaped type. The press was perfecting and included a pair of cutting cylinders with a serrated knife to cut the sheets as they left the press. The design also included air blasts to separate and direct the sheets to fly-tables. "None of the above devices, however, have been patented in the United States."[189]
- 1859: Hoe obtained a patent for cutting sheets of various lengths from a roll of paper and feeding them into a perfecting press.[190]

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[187] Tucker, p. 395.

[188] Tucker, p. 400.

[189] Tucker, p. 404.

[190] Tucker, p. 409.

- 1869: Hoe obtained a patent for a web press in which the cylinders were arranged vertically instead of horizontally. The design permitted the production of large newspapers because it used multiple webs. "This seemed a very simple arrangement, but when the inking and other details were filled in it was seen to be very cramped and inconvenient for working, and as the factory was then filled with orders for type-revolving and other machines nothing further was done in the matter."[191]
- 1871: The firm finally committed to building a web press.

Not surprisingly, others preceded Hoe in the use of web technology. William Bullock, of Philadelphia, built a web press in 1865. The grandson Robert Hoe wrote, "This machine was put up in several offices and rejected because of its unreliability, especially in the delivery of the papers, but it was finally so far perfected that it came into use to a considerable extent."[192]

The London *Times* also began experiments with web printing in 1868, based on the Bullock press. And, Marinoni of Paris devised a similar machine.

Hoe installed in 1872 its first web press for its long-time customer, *Lloyd's Weekly Newspaper* in London.

Hoe's solution for wedging the movable type on the revolving cylinder bore considerable similarities to previous proposals: "The column rules were made "V"

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[191] Tucker, p. 429.

[192] Hoe, *A Short History of the Printing Press.*, p. 41.

shaped; i.e., tapering toward the feet of the type. It was found that, with proper arrangement for locking up or securing the type upon these beds, it could be held firmly in position, the surface form a true circle, and the cylinder revolved at any speed required without danger of the type falling out."[193]

Thus, a clearly superior and clearly understood technology was delayed for at least 25 years. The delay was actually more than half a century if one considers the cylinder press as an unnecessary interim technology. However, Nicholson's web idea in 1790 and Wilkinson's work beginning in 1818 went no where without the force of Hoe's precision machinery.

The Re-discovery of Stereotyping

Not all of the distractions came from within the Hoe Company. Two technologies that are related to web printing show how unexpected external forces can affect the path to innovation: stereotyping – which Hoe belatedly included in his presses – and the automated folding of papers as they came off the press.

Stereotyping, as it evolved, uses papier-mâché pressed against the type form to create a mold of the entire page. Then the mold can be used to caste a duplicate of the type form – solving the problem of having to manually set type multiple times for multiple presses. In addition, stereotyping had special application for rotary presses

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[193] Hoe, p. 31.

because the papier-mâché mold could be curved to match the press cylinders – thus eliminating the potential problem of loose type flying off the rapidly revolving cylinder.

Experimentation with different ways of making the mold – initially clay and plaster between layers of paper – was underway in France at least as early as 1822.[194] Despite the obvious advantages, the Hoe Company did not step in to develop the product – even though it could benefit greatly by selling multiple presses using stereotype plates. Instead, the development work was done by newspapers themselves, particularly in Europe, or by other printers, notably Chas. Craske of New York. Hoe became involved in stereotyping only after Craske sold his methods to the *New-York Daily Tribune* in 1854 and Hoe was hired to build the equipment.

Why would Hoe pass up such an obvious way of assisting its customers? Part of the answer must lie in the rather rigid division in the publishing world between "pre-press" – typesetting and other steps that create the full-page type form – and "press." While the Hoe Company attempted to build almost everything a printer might need, its promotion of new improvements – such as it was – tended to be in the press arena. Furthermore, there were enormous labor issues involved with

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[194] Moran, *Printing Presses: History and Development from the Fifteenth Century to Modern Times.*, p. 181.

stereotyping, which could dramatically reduce the labor requirements for pre-press operations. Hoe could understandably wait for publishers to take the initiative.[195]

Hoe's first installation of a rotary press, at *Lloyd's* in 1872, was designed to fold the newspaper as it left the press using blasts of air to separate the sheets. But, *Lloyd's* objected because a large proportion of their editions were sent outside London and it was more convenient and cheaper to send them in bulk unfolded. Even though other publishers would be best served by automated folding, it was years before Hoe returned to meeting this need.[196]

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When Day, Abell and the other New York printers were laying plans for a new penny newspaper called *The Sun* in 1830, they would have had first-hand knowledge of the printing capabilities of the Napier machine and were certainly aware of other potential changes in press technology. The choices those printers and artisans could make in New York, Baltimore, Philadelphia and Boston were possible as a result of a centuries' long movement towards faster printing using presses which

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[195] In 1863, Hoe installed a new press, including stereotyping equipment, in Washington, D.C., for the Government Printing Office. The press was repeatedly sabotaged by printers, and use of the machine was finally abandoned. Ibid., p. 416.

[196] Tucker, "History of R. Hoe & Company, 1834-1885," 433,37.

required increasingly higher manufacturing capabilities, required far more skill to operate and required geometrical increases in capital costs.

However, pursuing other options such as the use of multiple presses and stereotyping was not one of their options. That option and faster forms of typesetting were precluded by the social construction involving negotiated decision among earlier inventors and press operators. Either the development of those technologies had gone undernourished or was not perceived as appropriate for newspapers. Had these other options surfaced as part of the first-circuit dialogue, the alternatives might have been refined to the point of being useful.

Stereotyping, in particular, could have encouraged a more distributed model of publishing. Without falling into a "what if" type of history, it's clear – based on the later uses of stereotyping by rural newspapers in the United States and urban newspapers in England – that a distribution of content through stereotype plates could disperse media products while still retaining multiple voices and the broader distribution of media ownership. Stereotyping would have permitted the faster production of newspapers at a lower capital cost and at with substantial savings in the other key cost item of printing: the typesetting of copy. Instead, the social construction in the first circuit pursued faster, more expensive and complicated presses that were outside the investment capabilities of smaller publishers in an urban market. One cannot, obviously, argue that these press decisions *caused* the eventual concentration of ownership of newspapers, but those decisions surely pushed

newspapers towards a model of centralized production and created higher barriers to entry for new publishers.[197]

Day and the other early penny press publishers, however, had first-mover advantages. They were able to enter the market with a lower investment in production equipment and expand their press capacity as the business increased. They had no investment in the mainstream of New York newspapers – other than their jobs; they could afford to dream of a publishing enterprise that ran contrary to virtually every business principle of the existing publishers.

Once publishers begin to buy into this new technology in this first circuit, they then had to implement new business plans and attract new audiences for a much different kind of newspaper. The decisions they made would only further expand the need for faster printing. By the end of the 19th Century, a newspaper plant with 10 steam-driven rotary presses could produce 444,000 folded papers of 48 pages each in less than nine hours. The same edition would have required 10 hand presses running 266 full 24-hour days.[198]

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[197] And, equally important, the emphasis on higher speed presses heightened the barriers to exit – increasing the risks of even well-financed organizations that might want to enter the business and dampening the willingness of existing newspapers to expand. Richard Caves, *American Industry: Structure, Conduct, Performance*, Seventh ed., *Foundations of Modern Economics Series* (Englewood Cliffs, New Jersey: Prentic Hall, 1992).

[198] Baker, *Printers and Technology; a History of the International Printing Pressmen and Assistants' Union*, 24.

Traditional scholars have looked at these newspapers from a journalism perspective, examining types of stories, objectivity, and a movement toward broader democratization in American society. As we move into this *second circuit,* the focus will instead be on the kinds of challenges that confront any new entrepreneur in taking a new product or service to the consumer market.

Chapter 6: The Technological Decisions Enter the Second Circuit

DIFFICULTIES OF EDITORS

The truth is, an editor cannot step without treading on somebody's toes. If he expresses his opinions fearlessly and frankly, he is arrogant and presumptuous. If he states facts without comments, he dares not avow his sentiments. If he conscientiously refuses to advocate the claims of an individual to office, he is accused of personal hostility.

A jackanapes, who measures off words into verse as a clerk does tape – by the yard – hands him a parcel of stuff that gingles like a handful of rusty nails and a gimblet, and if the editor is not fool enough to print the nonsense – 'stop my paper: I won't patronise a man that's no better judge of poetry.' As if it was patronage to buy a paper at about one half more than so much waste paper would cost. One murmurs because his paper is too literary – another complains that the paper is too large, he can't find time to read it all. One wants a type so small that a microscope would be indispensable in every family – another threatens to discontinue the paper unless the letters are half an inch long – one old lady actually offered an additional price for a paper that should be printed with such types as are used for handbills.

Every subscriber has a plan of his own for conducting a journal, and the labour of Sysiphus was recreation when compared with that of an editor who undertakes to please all.

The (New York) *Sun*, May 15, 1834[199]

When old media companies and prospective new media owners looked at the potential of the Internet in the 1990s, they were struck with the immensity of building

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[199] "Difficulties of Editors," *The Sun*, May 15, 1834.

a business in the amorphous technology called the online world or the Internet. Armed with terminology just discharged by experts at the Harvard Business School Press, they set about to find the way to create critical mass or tipping points, product differentiation, barriers to entry and catchphrases such as "building communities" and "offering interactivity." Most of us who were in the midst of these challenges *knew* we were pursuing something that had never happened before: the creation of a medium unlike any other with unique marketing and content challenges. We wanted to shatter the business-as-usual attitudes of staid, old media companies.

These MBA graduates, venture-capital investors, media executives and upstart entrepreneurs were adopting a technology that had already been largely shaped by three decades of decisions by engineers, software developers and technologists in the U.S. Department of Defense, universities and private businesses. Now, it was time for a new set of innovators to take the technology to the broader marketplace -- to begin the second circuit. Had they taken the time, they might have discovered that much the same task was undertaken more than 150 years earlier when another new medium was created in a manner that startled old media companies and utilized the same business principles before they had names.

The penny press and its advocates built a new medium using new technologies and breaking with traditions. Through the 1830s and 40s, urban newspapers in New York and elsewhere were transformed from a low-volume, low-capitalization business with low barriers to entry into an ever more technologically complex and costly businesses. In those years, urban newspapering moved from being small

operations scattered across numerous tiny print shops and a few significant publishing plants to an industry dominated by ever fewer large-scale publishers. In contrast to the political-party and commercial press that preceded these newspapers, the paramount question became, in the words of a contemporary journalist, "how to expend; how to expand; how to promote the interests of the journal" above and beyond any advocated cause.[200]

Obviously, there are considerable societal and economic forces that enabled that shift, but the steps toward that new medium began with novel approaches to increasing the speed of print production, a social construction of what were the technologies most worthy of pursuit in that regard, and the adoption of those new technologies by content producers who were willing to gamble on a new medium. That was the *first circuit*. The major challenges in that first circuit was solidifying the consensus approach to faster printer and then selling those concepts to media producers.

Once those media producers began to adopt a technology and conceptualization a new medium – a low-cost mass-market newspaper – they had to enter the *second circuit* and sell the concept to the mainstream consuming audience, the readers. Persuading consumers to sample new media may be as simple as placing a cheap newspaper in their hands, but to convince them to buy a newspaper day after

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[200] Schiller, "An Historical Approach to Objectivity and Professionalism in American News Reporting."

day is a greater challenge. After all, the existing concept of a newspaper was stodgy, mind-bendingly boring, and mostly so static that it could be read anytime in the next three weeks and not suffer from lack of timeliness. While it might seem far more difficult to motivate individuals in the 1990s to buy a computer so they could experience new Internet news services, the 1830s penny press built a customer base that was 10 times the competition in only a matter of months – a feat to be envied by any MBA grad.[201]

While the changes produced by the penny press have been analyzed from a journalistic standpoint – objectivity, definition of news, etc. – and sometimes measured by traditional newspaper business models – sources of revenue – Benjamin Day's real breakthrough may have been in marketing and product development. He conceived of a way to get people who rarely read newspapers and, perhaps, never bought them directly to want to buy them, and buy them on a daily basis. He thought outside the bounds of existing publishers and journalists because he was neither.

While Benjamin Day did not have MBA guidelines for entrepreneurial businesses to guide him, he did have an instinct for creating a new medium as he moved into this second circuit. These were not instincts that would come easily to the

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[201] My experience in the startup phase of online news services illustrates how difficult it is to help potential consumers to understand new media products. The prospective audience for online information services included: (a) people who already had computers and had a rigid notion about what they would do and not do and how they should look and not look. And, (b) persons who did not own or use computers and could not conceive of potential services.

existing owners and editors of the broadsheet New York newspapers; Day's innovations reflect the view of an outsider or, at least a technologist. The romantic notion of the Western frontier printer/editor was not in place in New York where clear divisions of labor had already taken place: The Typographical Society of New York was formed in 1795, and there were fierce disputes over wages between the owner/editors and the printer/technologists.[202] As a printer at one of these established New York dailies, he would have little invested in the old ways of publishing and editing. Before starting *The Sun* and while he was still a part of that specialized printer environment, Day demonstrated a willingness to break from tradition with what were then unnamed, but nonetheless innovative publishing concepts, such as "brand identity" and "economies of scale."

After September 3, 1833

Day is recognized for making important changes in handling the business management of newspapers. He switched both subscription and advertising revenue from the traditional credit-basis to a pay-as-you-go cash basis. The efficiencies of that system meant that his lower prices in paper sales, for instance, translated in to a less dramatic discount than the cover price might suggest. Eliminating, the employee delivery and collection system meant that he had created a much lower-cost channel

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[202] Wroth, *The Colonial Printer*, 167.

of distribution. But, less commonly identified are the savvy 20th Century marketing skills that he instinctually used in selling a new product. Plus, he took the newspaper from being a product with an almost infinite shelf-life – because it had so little timely information in it – to a perishable product which required replacement every day. It's this product perishability that, I would argue, was Day's greatest contribution to changes in journalism and was made possible by high-speed presses that could replace yesterday's paper with a fresh one each day.

From a marketing standpoint, Day did many things wrong on that first day. His content was merely a replication of what was available in other publications. His news was old; his ads were "stolen" from other publications. And, his product looked flimsy in comparison to the much larger newspapers of the day.

But, he also did some things very right. He aggressively competed by cutting prices. He established a distribution system with far greater reach than any of his competitors. He took immediate steps to establish brand identity. And, perhaps most importantly, he began a dialogue with his potential customers to explain why they would want and need his new product. The nature of that dialogue is revealed in the pages of *The Sun* during its early years and in the response of its readers, measured by circulation. Just as Henry Ford in the following century would have an instinctual understanding of a mass production automobile, Day displayed an awareness of marketing efforts there were given names only long after Day died.

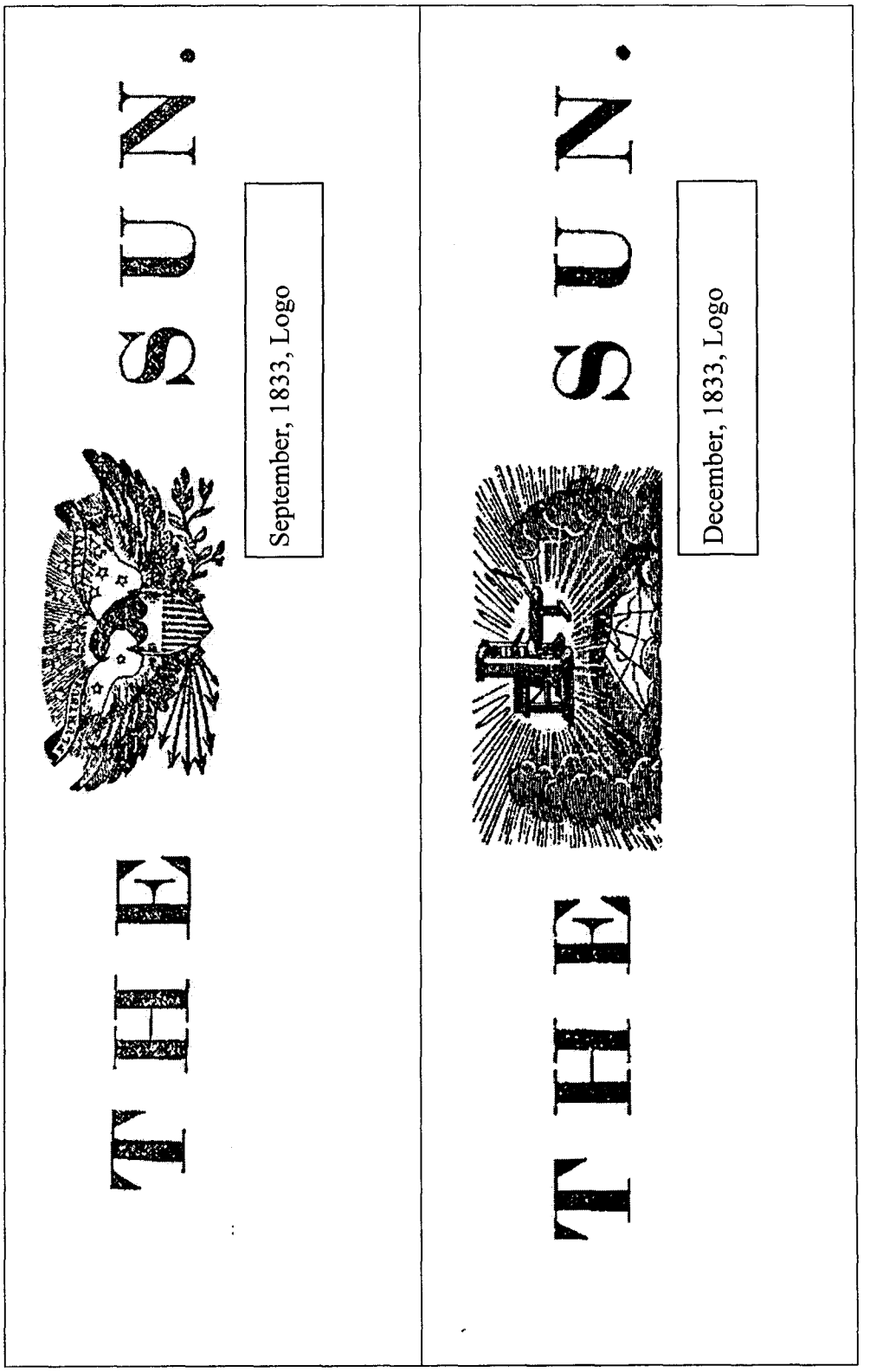
On the very first day, *The Sun* proclaimed: "The object of this paper is to lay before the public, at a price within the means of every one, ALL THE NEWS OF THE DAY, and at the same time afford and advantageous medium for advertising."

Brand Identity

When Day and his printer friends were talking about what they would do if they owned a newspaper, they not only discussed selling it for one cent but almost immediately began to conceive a branding strategy, not that they called it that. They would not use the traditional newspaper names with "Advertiser" or "Commerce" in the brand; instead they would seek a name that stood out and symbolized their new product – beaming light to the masses. Besides settling on the name *Sun,* Day also designed a logo for the publication – what was then called a *head-line* and is now called the *flag.* The first logo representing *The Sun* on September 3 was an eagle, shield and the phrase *e pluribus union.*

Day was so brand-conscious he tinkered with the logo two more times within the first three months of publication. After only eighteen days, the eagle was replaced by a solar orb rising over hills and sea. And, again on December 2, the design was changed showing a printing-press spreading light to the world below. He was clearly moving in a direction of stating a mission for the newspaper, even before the content matched the challenge. After 15 months of publishing, Day also added a motto for the newspaper, "It Shines for All."

Figure 2: Early logos of The Sun



Day's protectiveness of his brand is illustrated by a lengthy exchange of vitriolic commentary when a competing newspaper started in 1835 with the name of *True Sun.* The controversy first became apparent to readers of *The Sun* on January 22, 1835, when Day started the second page of the newspaper with a headline reading "The True Sun." And, immediately below the title was this cryptic paragraph:

> *The True Sun* – We have changed our inside head to "True Sun," for reasons which will hereafter be made known.

It was not until the following day that an explanation was offered. On January 23, 1835, the inside name was changed again to "The New York Sun," and Day and Wisner offered this explanation:

> *The True Sun* – Having understood on Wednesday that a daily paper was about being issued in this city as nearly like our own as it could be got under the title of The True Sun, for the avowed purpose of benefiting its proprietors at our expense, we yesterday changed our inside title, being determined to place an injunction upon any such practical proceedings. Yesterday morning, the anticipated *Sun* made its appearance, and at first sight, we immediately abandoned our intention of defending ourselves legally, being convinced that it is a mere second hand catch-penny concern – which (had it our whole list and patronage) would in one month be among the "things that were." . . . We like to see enterprising competition, when those who engage in it are honorable men, and free from that swindling disposition, which ever characterizes those who, without the talents or industry to invent an employment of their own, are ever ready to *pirate* on the earnings of the neighbors.
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> . . . The editor, Mr. Stephen B. Butler, formerly the editor of an anti-masonic paper in the country is an exceedingly temperate man (?) and was recently brought before the police magistrate for insulting a lady in the street, while under the exhilarating influence of *cold water.* By proper apologies, however, with tears in his eyes and on his knees, to the

injured party, he was discharged, and saved from public exposure at the request of the magistrate.

. . . It seems we are rather severe in our remarks, though we think the circumstances of the case will justify us. We have expended several thousand dollars in placing our establishment on a firm foundation, and we are not at all pleased with the idea of Messrs. Short and Butler building themselves up by availing themselves of the benefit of our hard-earned reputation.

EDITORS OF THE SUN[203]

The annoyance of Day and Wisner followed into the next day with a story also leading the second page:

The True Sun -- Since penning the paragraph in yesterday's paper in relation to the literary forgery of Messrs. Short & Butler, in establishing The True Sun, we have learned that Mr. Short actually *stole* the composition of the matter which it contained, from Mr. Burnett, the proprietor of the Weekly Messenger. Mr. B., it appears, was compelled to be absent from his office in consequence of sickness in his family, and during his absence, Short, who is one of the printers of the Messenger, actually purloined the composition of his reading matters, and arranged it in the form of "The True Sun" – thereby adding literary theft to literary forgery !! . . . We appeal to the members of our profession – in those who know the amount of toil and expense required to establish a daily paper – whether the soulless originators of this concern, with a stole name, are not morally guilty of robbery.

. . . We have no objection to any man competing with us on honorable terms, but to steal our patronage by stealing the name of our paper, is as bad, and evinces an equally as dishonest a principle as to steal our coat or hat. . .[204]

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[203] "The True Sun," *The Sun*, Jan. 23, 1835.

[204] Ibid., Jan. 24.

With obvious pleasure, the following week *The Sun* reported the outcome of the dispute:

> *The True Sun* – The system of literary fraud attempted by Wm. F. Short, and Stephen R. Butler . . . in establishing *The True Sun* has failed. After having been held up to the scorn and contempt of the profession, they have concluded to abandon their piratical course, and have announced that the *True Sun* would be published no longer. As for the editor, Mr. Butler, we have nothing to say. The mention, which appeared in one of the papers yesterday in relation to his having subjected himself to imprisonment in the penitentiary, by obtaining property under false pretences, is a sufficient pill for him to swallow, and in our opinion, will require more than one potation from the intoxicating bowl to wash it down. . .[205]

In another incident, Day was quick to defend the reputation of the newspaper after he had written a story about a job printing client, called the Wandering Piper, who paid his bill with a counterfeit note. The client denied that those were the bills he used to pay his account, and the controversy ended up being mentioned in a Philadelphia newspaper, which accepted the Piper's side of the story. Among other arguments, the *Sun* responded with "We would inform the Philadelphia writer that during the four months which The Sun has existed, its having a bad reputation has never before been hinted, to our knowledge; on the contrary, we have had every reason to believe the public appreciate our feeble efforts to lay *facts* before them – having patronized us to an extent which we never anticipated in the outset. Our

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[205] Ibid.

subscription list now numbers near five thousand daily, in the city, which is more than any other daily paper circulates. . ."[206]

There is a certain irony in the outrage of Day and his editor, Wisner, since both of them participated in the "theft" of other newspaper content in the very first issues of *The Sun* and would later participate in such outrageous journalism, by modern standards, as the series of moon hoax stories written by Richard Adams Locke in 1835.

Product Differentiation and Building Community

While some scholars have analyzed the penny press as the start of a movement toward objectivity and other journalistic principles, it is perhaps equally useful to view them as first steps in the entrepreneurial process of attracting customers by "product differentiation." Sellers who are striving for product differentiation – a way of making a product appear more distinctive – often use advertising. For Day, his product was the advertising, and one of the tools he used was to appear to be far more controversial than his stodgy competitors. The upstart *Sun* knew that one sure way of building controversy was to use the news columns to constantly tweak the mainline press with criticism and allegations – just as "City

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[206] "Editorial," *The Herald*, Aug. 31, 1835; "Facts Are Sometimes Stubborn!," *The Sun*, Jan. 16, 1834.

Paper," "City Pages," and other alternative newspapers would be doing 180 years later in U.S. cities.

The Sun was less than a year old when it attacked *The Journal of Commerce* for reprinting stories: "Will the Journal of Commerce give us the proper credit, when it publishes editorial articles from our paper. Recollect, gentlemen, that you once crib'd foreign news from Col. Webb's Bulletin, and published to your readers that it had been taken from papers then in your possession. 'O, how this world is given to lying,'as Falstaff says."[207]

The Sun claimed that police reporter for the *Star* never went to police proceedings and was, instead, plagiarizing incidents reported in a British book, "Morning in Bow Street," where Bow Street was the London police station. "If the gentleman, intends to continue the practice of purloining the writings of others, and palming them off upon the public as his own, we would advise him to place a sign over the door of his office, advertising himself as the most accomplished reporter of plagiarism in this or any other city. . ."[208]

Do we really think that Day and Wisner had so quickly forgotten their own "borrowing" of content from other publications – or that they did not continue to do so? More aptly, this should be viewed as an effort to differentiate their product from others, especially by controversy.

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[207] *The Sun*, April 11, 1834.

[208] "Plagiarism Unmasked," *The Sun*, Feb. 15, 1834.

Of course, getting a strong, negative reaction from the blanket-sheet papers made it even clearer that they were offering a unique product. In fact, getting sued seemed to be the best honor of all. In early 1835, Day and Wisner were indicted for criminal libel for a story that mentioned a reporter of the *New York Transcript.* Of course, the case was covered by *The Sun:*

> Thus it is – we "gentlemen of the press" are now getting ourselves into hot water. To be indicted by a criminal court, however, is not such a dreadful affair, after all. . . Indeed, we find, on reflection, that the greatest men in the country have some time in the course of their lives been "indicted." And, why should we, who have no pretensions to greatness, expect more indulgence than our "respectable sixpenny neighbors." . . . Joking aside now – The Recorder is the best natured, and fatherly old man that ever lived; the District Attorney is a kind-hearted fellow, and a gentlemen – every inche of him; and taking all things into consideration, we think we could not have fallen into better hands.[209]

When Day and Wisner were sued for libel and slander, as frequently did occur, they wore the suit proudly. In April, 1834, *The Sun* was sued for an article it had written about a prisoner and his custodian and described the results a week later:

> . . . On Monday last we were arrested by the Sheriff, and held in jail, at the suit of Mr. Turner, for slander – damages laid at $1,000. The offensive article in question is a true and correct report of the proceeding of a public court – and if we are not allowed to give our readers an impartial history of the proceedings of a public our public courts of justice, then the boasted liberty of the American press is not worth a fig. This is the third or fourth suit which has been commenced against us by

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[209] *The Sun*, Jan. 24, 1835.

different individuals, for exercising a right guaranteed by the constitution of the state. We have only to say to the whole of them – Go on, gentlemen, we shall meet you in an American court of justice – before a jury of our country, *prepared to prove* every assertion we have made in our columns. To those who have threatened violence to our person, we would say – Be careful how you attack. We respect the laws of the community in which we reside – we shudder at the thought of shedding human blood – but, may our arm wither at our side if we fail to defend our own honor. . .[210]

During the startup phase of this second circuit, Day and Wisner repeatedly presented themselves as participating with the community in a difficult, but rewarding role. They often explained to their readers how difficult it was to publish their special kind of newspaper. There was the woeful tale of a newspaper (written in a "I am a newspaper" style) entitled "life of a Newspaper. By itself"[211] and numerous extended comments on the trials of editorship, such as:

The readers of a daily paper little imagine the thousand ills its editor is heir to. They little think that while they are amusing themselves with his lucubration, he is witnessing such a scene as the following: [Enter an old lady.] – "Is this where they make 'Suns?'" "yes, madam, -- walk in." "Oh, how could you be so cruel as to publish my poor son Jimmy's name, in your police?" 'Has your son been before the police court, madam?' "O yes, -- but – then't was liquor, liquor – nothing else. Poor fellow! – I've done all I can for him.' After making us promise not to expose him again, the old lady evaporates to make room for a sour looking Irishman. 'By Jasus, Sir, you'll just stop my paper, if you please.' Very good, sir, -- and he leaves us, muttering something about poking fun

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[210] "Suit for Slander," *The Sun*, April 17, 1834.

[211] "Life of a Newspaper," *The Sun*, Feb. 20, 1834.

> at a man because he is an Irishman. In comes a well dressed fellow, on whom the lynx eyes of 'old Hays' have been fastened for the last five years; and whose movements have been watched by the 'dark looking thief catcher,' for twice that number. – 'Gentlemen, I'm sorry you intimate that I assisted in the robbery of *****'s Store. Your articles on that subject have ruined me.' 'We are very sorry, Sir, -- We don't intend to wound the feelings of any man. Explain to us, sir, how you came by the stolen property, and we will retract.' 'Why – why – well, I supposed I might explain, -- but then it would take me a good while.' 'Very good, sir, -- we can't retract until we have your explanation.' And away goes the good looking fellow and sues us for a libel. . .[212]

In all of the turmoil of city life and newspaper publishing, *The Sun* presented an image of always "being in it together" with its readers. Whether making fun of the sheriff or of a convict, the stories were told with humor and empathy:

> *Look Out* – As the fire wardens are perambulating the city about these times, we advise such of our citizens as are able to support a store to be particularly careful and see that the pipe not stopped up with pine boards, and that good strong wire is used to fasten up said pipes instead of two-strings, and "such like." The warden in our ward is a fat, good-natured fellow. He visited us yesterday, and as he looked at our fires, and pronounced them in first rate order, begged we would not publish his visit in the *Sun.* Had he not made this request we might tell a very laughable story about him.[213]

Economies of Scale and Looking Successful

Potential economies of scale were demonstrated by *The Sun* from the very first day. Its challenge was maintaining a production capability that allowed it to

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[212] "A Day's Work," *The Sun*, March 12, 1834.

[213] "Look Out," *The Sun*, December 31, 1834.

capitalize on the low incremental costs of each additional copy sold. The answer was a sequence of every faster presses, and along with the new presses, the ability to tell readers about their successes.

A month after it started on November 9, *The Sun* talked about its reception: "Scarcely two months has it existed in the typographical firmament, and it has a daily circulation of upward of two thousand copies, besides a steadily increasing advertising patronage. Although of a character (we hope) deserving the encouragement of all classes of society, it is more especially valuable to those who cannot well afford to incur the expense of subscribing to a "blanket sheet" and paying ten dollars per annum."

Within three months, *The Sun* was approaching 4,000 in subscribers and gained access to a new, faster press. [And this begins one of the most frustrating and unsatisfying elements in the research for this dissertation.] For a publication that was not hesitant to boast about its accomplishments, the announcement of the new presses was peculiarly underplayed. On December 17, 1833, a three-sentence news item on page two simply reported:

> Heretofore we have had numerous applications for our paper which we could not meet. This difficulty well hereafter be avoided, as we have procured a machine press, on which one thousand impressions can be taken in an hour. The daily circulation is now nearly FOUR THOUSAND.[214]

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Notably, the kind of press was not disclosed in the news item nor is it consistently identified in histories of *The Sun.* The speed of the press, as the article states, would suggest that it might be some form of a Napier press. A more penetrating question, however, might ask how this poor printer with a newspaper that was at only breaking even able to finance the purchase of a new press? Was *The Sun* actually hiring an outside printer – already equipped with faster presses? Either way, the rapid utilization of a new press runs contrary those scholars who have called Day technologically retrograde.

A year later, December, 1834, *The Sun* began to prepare its readers for another new press. On December 19, it stated, "In consequence of an accident to the printing machine, our paper, for nearly a week past, has not appeared as well printed as we could wish, and one or two days it has been issued later than usual. These evils we hope are now remedied." By this time, *The Sun* was circulating 10,000 newspapers, according to O'Brien.[215]

Indeed, there was a remedy. On December 30 and 31, *The Sun* previewed what would happen on the first day of the new year in a brief statement on page two. "To our Patrons. On Thursday morning the 1st of January, The Sun will appear in a form nearly twice as large as its present size. The price will continue to be one cent.

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[215] O'Brien, *The Story of the Sun, New York: 1833-1928*, 57.

We kindly thank our patrons for their support during the past year, and pledge ourselves to spare no exertions to make the paper – *worth one cent!!*"[216]

And, then on January 1, 1835, *The Sun* once again drew attention to its great new press in a very understated manner. Buried deep on page two was:

> To our Patrons – We have the pleasure to present our paper, on the birth day of the year, on a sheet of almost twice its former size, without any additional charge to the subscribers. Our establishment is now completely renovated in all its *material;* new and handsome types, from the foundry of the Messrs. Bruce & Co., a new Napier machine press from the manufactory of Robert Hoe & Co., and all the furniture and fixture also new. Ours is now the cheapest paper in the United States, and from its vast circulation, the best to advertise in of any in the city. We therefore respectfully solicit an increase of patronage corresponding with the enlarged size and improved appearance of our paper.

The installation of the Hoe press was confirmed in Tucker's company memoirs, and generally accepted in other histories.[217] But, again, the question arises as to the actual ownership of that press. Was this a press owned by Day and Wisner or owned by an outside printing house? The reason for doubt in this case is supported by multiple sources.

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[216] "To Our Patrons," *The Sun*, December 30 and 31, 1834.

[217] Tucker wrote "I was soon transferred to the Single Cylinder Press room and I recollect that in 1834 we built a Single Large Cylinder Press for Messrs. Day & Wisner, for printing the New York *Sun* and erected it in a basement on William Street. Tucker, "History of R. Hoe & Company, 1834-1885," 360.

Frank Comparato notes that when James Gordon Bennett wanted to start the *New York Herald* he approached in early 1835 the printing firm of Anderson & Smith, who were already printing *The Sun* and the New York *Transcript.* Bennett reluctantly signed a contract to have his paper printed at the same facility.[218]

This account is affirmed in a 1859 article in *The Printer:*

> . . . we may be allowed to observe that Mr. John Thomas (of the firm of Wynkoop, Hallenbeck & Thomas) formerly had charge of the single cylinder presses which printed the *Sun,* the *Transcript,* and subsequently the *Herald,* side by side, all in one pressroom, for Messrs. Anderson & Smith, during 1834-35, in Ann street, this city. There was risk enough in starting these papers, but the idea could never have been entertained at all, were it not for the facilities afforded by the single cylinder presses supplied by the Messrs. Hoe. We have no doubt that Brother Thomas remembers the circumstances clearly, and the large share the cylindrical principle and the Hoe presses had in originating and facilitating the success of the "penny press" generally, among those other newspaper enterprises which have now become permanent institutions in popular favor – an absolute necessity of the public mind – our daily pabulum from the press.[219]

Why the emphasis on who owned the printing presses? If Anderson & Smith owned the presses, then it shows the lingering influence of technologists -- non-journalists and non-media owners -- in the early years of this new mass medium.

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[218] Comparato, *Chronicles of Genius and Folly: R. Hoe & Company and the Printing Press as a Service to Democracy*, 99-100.

[219] "Hoe's Single "Large" Cylinder Printing Press," *The Printer*, Jan., 1859.

By August, 1835, and less than two years after it was founded, *The Sun*'s success as a mass medium and its ongoing technological struggles had become obvious. In it's note to readers it stated:

> *Our Circulation* – Never, since we commenced the publication of the Sun, has its circulation increased so rapidly as within the last two months – and our advertising patronage is multiplying . . . too. On the 1st of June last we enlarged our sheet so that it would contain about two columns of extra matter, calculating at the time that the enlargement would answer the demands of the public for the next six months. But we were agreeably mistaken. So rapid has been the increase of our advertisements that we have been compelled for a few weeks past to refuse weekly and sometimes monthly advertisers. We shall endeavor soon to remedy this evil. In the course of a few weeks we shall again enlarge the paper to a size that will at once accommodate our advertising friends . . . . We are now necessarily compelled to omit advertisements which we are handed after six o'clock, as it is impossible for us to strike off our edition in less than ten hours on a double cylinder Napier machine which will print from 2000 to 2200 sheets per hour.
>
> The present circulation of the Sun is as follows:
> Regular subscribers in New York 15,440
> Brooklyn 700
> Sold at the Markets, etc..... 2,000
> In Providence, Albany and other places 1,220
> Total circulation..... 19,360
>
> We do not hesitate to say that *our circulation is the greatest of any daily paper in the world,* the daily edition of the London Times being only 17,000.) Our only present difficulty is to strike off a sufficient number for the demand; and as we are at present negotiating for a new press (to be run with steam engine) which will printing 3000 sheets per hour, it is to be hoped that that difficulty will soon be remedied.[220]

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[220] "Our Circulation," *The Sun*, Aug. 28, 1835.

However, that story was in error! On Monday morning, *The Sun* published a correction:

> *Our Enlargement* – In our brief notice, on Friday last, of the great circulation which the Sun had attained, and some other matters pertaining thereto, an error occurred which escaped our notice until it was too late to rectify it in that edition. By an oversight in the printing office, we were made to say that we should make another enlargement of our sheet in a few *weeks*: -- it should have been, in a few *days.* Our arrangements had then already been made for the addition of an entire column in the width, and of several inches in the length, of each of our pages – which increase will render the Sun by far the largest daily penny paper in the city, and, indeed, in the world. – This essential improvement in the size of our paper and a corresponding one in its appearance, will take place *tomorrow morning,* when we shall issue, as usual with on such occasions, *ten thousand* copies of the Sun, in addition to our permanent edition of 19,500. The extra issue I intended for gratuitous distribution throughout this and the adjoining states, and will furnish to business men an opportunity for circulating their advertisements, far more advantageous than any they have ever yet been offered. – Their favors will be in season any time before 6 o'clock, though it is highly desirable that they be sent to day in to us as an early hour as possible.[221]

In addition to the revelations about production challenges and consumer success, these two announcements turned what is basically a technological limitation into something to boast about. Obviously, the original compact page size of the tabloid *Sun* was a matter of economics and technology – not journalistic innovation. Once the advertising expanded the page sizes were expanded. Expanding the page size was the only option available at the time: The faster presses could efficiently

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[221] "Our Enlargement," *The Sun*, Aug. 31, 1835, 2.

handle only the front and back of a single sheet, which was then folded to produce four pages. Collating multiple sheets in a timely fashion was more than a decade away – and at a point when stereotyping would resurface as a useful tool for newspapers.

These announcements were significant for another reason: they occurred just as *The Sun* was getting a circulation boost from publishing a series of articles to be known as the "Moon Hoax."

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Thus, Day quickly demonstrated an understanding of mass marketing in an environment where he had few models to copy. His sense of distinguishing his brand from other newspapers was perhaps one of the reasons his venture succeeded when previous penny papers failed. He created a sense of community with his readers and prospective customers that would be the mantra of Internet entrepreneurs 150 years later. And, he used his own news columns to let readers know they were buying a successful, prosperous product (at least as measure in circulation). And, he used technology both as a tool for producing the newspaper and as a way of promoting the product as superior to other publications.

Of course, these marketing strategies – as unconscious as they surely were – would not have been sufficient to sell so many copies of *The Sun.* Day also had to make changes in content appropriate for a mass medium in contrast to the early

newspapers. It was his willingness to experiment and to execute new models of content that really distinguished his efforts.

Chapter 7: A Perishable Product

Singular Insanity – Walter Holbrook, formerly a highly respectable merchant tailor of this city, but who has been for a considerable time laboring under and aberration of mind, which has given rise to many strange imaginings, was yesterday brought before the police authorities, on the representations of Mr. Popham and Mr. Shaw , of the Branch Bank, as a lunatic, under the following circumstances. It appears that he has long believed himself to be the President of the United States, and that he owned 35 millions of stock constituting the capital of the Bank of the United States and branches, the whole of which he imagines he is likely to be defrauded out of by the unjust proceedings of the officers of that institution.

He declared on a former occasion, that the Bank owed him $35,000,000, which he wished the directors to be called to an account for, before the criminal courts of our city. Being foiled in his efforts to obtain redress for the whole of his imaginary demand, and a small portion of method mixing itself with his madness, he determined to draw upon the Bank for small sums, that he might in detail obtain the satisfaction of his ideal claims.

For this purposes he proceeded on the 24th inst. to the Branch Bank in this city, with a check drawn for $200,000, and endorsed Walter Holbrook, President of the United States, and boldly demanded the money for it, which being refused, he was much vexed and went away. On the 26th inst. He went there again with a check for $10,000 endorsed in the same way, with the like success, and again with another and another, each for the same amount on the same day, and another again yesterday for $666,666, all of which the officers of the Bank refused to cash, and even had the hardihood to doubt his official rank, and his right to the monies of the institution, and to cap the climax of his wrongs, not only dishonored all his drafts, but retained them in their possession.

Goaded almost to a frenzy by disappointment and conscious injury, he then seized as many of their notes as he could grasp, and attempted to thrust them in his stockings for the sake of greater safety, but even in that patriotic purpose he was frustrated, for the notes were taken from him, and he himself brought to the police and complained of as an insane person.

He sat there majestically, calm, and dignified, until his wrongs were complete by being committed to custody to be taken care of.
The New York *Sun*, December 31, 1834[222]

For Day's new venture to work as a mass market product, he had to not only sell more newspapers than any New York publisher had sold, but he had to do so every day. He demonstrated a grasp of how the new press technology created in the first circuit would permit him to produce large volumes of newspapers with low marginal costs by the repeated modernization of his printing facilities. That technological capability – which he would constantly be pushing to the limit – would be profitable only if he could create content that was uniquely appropriate for the technology and for the new audience. He would have to develop – and do so quickly – a very different model for media content.

Traditional blanket-sheet newspapers had focused on timeless political commentary or had a sense of news requiring very little immediacy – a weeks-old news item from another city or a days-old local story was acceptable. In his first issue, Day mimicked the practices of the blanket sheets as well by copying many of their stories, but he knew that would not suffice and quickly added Wisner to his staff to cover the cop shop. Thus, one of Day's notable early achievements – perhaps his most substantial contribution to journalism – was to begin emphasizing news both as

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[222] "Singular Insanity," *The Sun*, December 31, 1834.

something that the reader had to have *today* and with the understanding that such news was perishable, needing to be replaced *tomorrow*. The creation of the police news column on the second page of *The Sun* created a must-read for people to learn about the scandals, sad stories, and wild tales about friends and neighbors. The column was not merely entitled "Police Office" or "Courts" but "Police Office – Yesterday" and "Court of Sessions – Yesterday"). A century after Day started *The Sun,* publishers and newspaper researchers would be talking about the "newspaper habit," and other industries would be talking about repeat business, customer loyalty and brand loyalty – market concepts anticipated by Day's actions.

In *The Sun*, court stories, fires, murders, thefts and accidents were told as brief items and as lengthy tales. The reader could read about his sheriff, postmaster, relative, employer and minister. Such stories did not merely "sell newspapers," they sold newspapers today and re-enforced the concept that more would follow on the next day. These were stories often told with great relish:

> Jas. Duncan was charged with stealing $15 from a young lady who lives in Orange street. From the complainant's story, it appeared that Duncan, who is a chuckle-headed, mischievous fellow, "picked up" the young lady some where in Chatham street, and went home with her. "In the course of human events," and considering it a "fair business transaction," James gave the lady $1 to pay her for the trouble of accompanying him to her house. As she deposited the dollar in her pocket, the prisoner's eye caught a roll of banknotes, which after adding the newly-early fee, she deposited in a receptacle, in the side of her dress, call a pocket. "Light come, light go," whispered Duncan to himself as he took the lady's arm, and commenced promenading the room. After a few moments walk on the Turkey carpet, the prisoner bade the lady good night, and left the house. Miss Jane Smith felt in

her pocket and discovered that her roll of bills were gone. She ran to the door, set up a cry of stop thief, and gave chase. Duncan was overhauled by a watchman whose nap had been disturbed by the screams of Miss Smith, in pursuit, and brought up. Prisoner was detained. [223]

The Sun was part of a broader trend in newspapers that reduced the time between a news event and its being published in a newspaper. The reprinting of news from other publications began to wane and the increase in local news with immediacy began to grow. While Day did not invent timeliness in news, he did quickly move to emphasize it by focusing more attention on community and city news and by hiring writers to emphasize that kind of news.[224]

By today's journalistic standards, one of the most peculiar episodes in Day's publishing career has been called the "Moon Hoax" of 1835 when for a week in August *The Sun* ran a series of articles about British astronomer Sir John Herschell's seeing life on the moon through his high-powered telescope on the Cape of Good Hope. It's bewildering to consider this fakery to be part of the foundation for objective journalism or independent reporting. Unlike Orson Welle's "War of the Worlds" a century later, the series of articles, written by Richard Adams Locke, was clearly calculated to deceive, and more importantly, the serialized nature of the hoax

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[223] "Police Office," *The Sun*, March 18, 1834.

[224] Shaw, "At the Crossroads: Change and Continuity in American Press News 1820-1860."

emphasized the need for keeping up with the "news" on a daily basis – creating a sense of perishability. The stories began modestly enough – describing the powerful telescope, moon craters and less outrageous sights. By the end of the series, animals, humanoids and residences were being described. Lithographs that were circulated at the time showed these creatures jumping and running – all from a ground-level viewpoint.

Fifty years after founding *The Sun,* Day recalled the moon hoax story: It began with Day's interest in another series of stories, a murder trial in White Plains, New York, and involving a man called "Matthias the Prophet." Day had gone there to cover the trial, met Locke and asked Locke to write the dispatches, which were also reprinted in a pamphlet. After Locke covered the murder trial, he proposed writing the moon story based on a fictitious scientific journal. Since he had done well with the court story, "I let him do it," Day said. "The moon story puzzled every body for a time. Even the astronomers didn't know what to make of it. . . . I remember we had a deputation from Yale College come to the office and request to see the original copy of the magazine article. I pretended to be vastly indignant that they should doubt our word. 'I suppose the magazine is somewhere upstairs,' said I. 'but I consider it almost an insult that you should ask to see it.' They went back to New Haven apparently perfectly satisfied."[225]

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[225] Mitchell, "The Story of the Sun."

Day paid Locke between $500 and $600, plus Locke sold lithographs of the scenery and animals on the moon. "The story was so clever that it attracted attention all over the world," Day recalled. "It gave *The Sun* a great impetus." Thus, it's easier to understand the hoax as a marketing tool than a peculiar form of journalism, and the ongoing nature of the spoof reflects Day's remarkable instincts for building daily demand for newspapers.

Even James Gordon Bennett, who had become Day's fiercest competitior at the time, conceded its brilliance as a marketing strategy. Bennett's newspaper, *The Herald,* was not published during the Moon Hoax series because fire had destroyed his printing plant. On the very first day of resuming publication, Bennett wrote:

> The Astronomical Hoax Explained. – The town has been agape two or three days at the very ingenious astronomical hoax, prepared and written for the Sun newspaper, by Mr. Locke, formerly the police reporter of the Courier and Enquirer. Mr. Locke is an Englishman by birth, is a graduate of Oxford or Cambridge – was intended for the Church, but in consequence of some youthful love affair, getting a chambermaid in some awkward plight, abandoned religion for astronomy.
>
> A few years ago when he came out to this country he was introduced to Mr. Webb of the Courier and enquirer, as one who could make a good reporter. We were than connected with that paper ourself, and remember the favorable impression Mr. Locke's talents made on our mind. He was a little too gorgeous and florid in his descriptions of police scenes, but otherwise showed learning and science, although out of place. . . . Soon after that time [the Matthias trial], I saw him again, and in conversation he told me he was engaged on some scientific studies. He mentioned optics, and I think astronomy, as the particular branches. He was then busy concocting his recent ingenious discoveries in the moon, and has struck out a piece of invention of superlative drollery, which as actually deceived several of our men of science (have mercy on us.) He has, however, dressed it up, in rather too much finery – and made several mistakes in his philosophical

> keeping. His descriptions of the shadows in the moon are incorrect on mathematical principles, and we also doubt whether his optical principles correspond with fact. He has also made a blunder in the name of Herschell, dubbing him and LL.D. which is not the fact – also in calling the supplement the "Edinburgh Journal of Science" no work of that kind being now published. A few years ago there was such a work, but it merged into another journal published in London, and now bears the London title.
>
> Mr. Locke, however, deserves great credit for his ingenuity – his learning – and his irresistible drollery. He is an original genius, and very gentlemanly in his manners. If he could come out and tell the public frankly the whole secret history of his hoax, he would lose nothing in character or in talents. We tender to him cheerfully the columns of the Herald for that purpose.[226]

Day explained how the truth behind the hoax eventually surfaced: "The secret got out through Locke's own fault. The *Journal of Commerce* had a reporter named Finn, who was intimate with Lock. The *Journal of Commerce* had swallowed the whole story. Hallock [editor] had put it in type, and was going to publish it the next morning. What must Locke do but get tipsy with him that very night! 'Better not print it right away,' he told Finn. 'I wrote it myself.' The *Journal of Commercie* then came out and denounced the Discoveries in the Moon as a fabrication."[227]

While 20th Century television stations would hawk news with teasers declaring "details at 10," *The Sun* reminded readers in the Moon Hoax series and elsewhere that more news would follow the next day. An article about riots in the city, concluded with "P.S. – [7 o'clock last night] Duane street, between Broadway

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[226] "The Astronomical Hoax Explained," *The Herald*, Aug. 31, 1835.

[227] Mitchell, "The Story of the Sun."

and Chatham street is one scene of riot. The troops were expected every moment." On another day the lead item on page 2 was "The trial of the editors of the Sun, for an alleged libel on William H. Attree, will take place this day in the Court of Sessions." A periodic series of stories covered "pirates" looting ships: "On further inquiry respecting the great pirate story, we have ascertained that nine of the thieves have been arrested, and measures are being taken to secure the rest of them. The number of villains engaged at Barnegat in stealing and plundering from wrecks is incredible."[228]

The Changing Newspaper Landscape

As a consequence of a new mass medium entering the mainstream of traditional media in the second circuit, changes in the older media were inevitable. The blanket sheets – dominated by partisan political ties and older economic models – would either have to adapt or die. Indeed, what Day began ended in a rapid alteration of the composition of newspapers in New York City. When Day began his penny paper, the New York daily papers and their circulations were:

Morning Courier and *New York Enquirer*	4,500
Democratic Chronicle	4,000
New York Standard	2,400

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[228] "The Barnegat Thieves," *The Sun*, December 31, 1834; "Riots in the Sixth Ward," *The Sun*, April 11, 1834; "Trial of Editors," *The Sun*, March 10, 1834.

New York Journal of Commerce 2,300
New York Gazette and General Advertiser 1,500
New York Daily Advertiser 1,400
Mercantile Advertiser and *New York Advocate* 1,200
The Evening Post 3,000
The Evening Star 2,500
New York Commercial Advertiser 2,100
New York American ..... 1,800[229]

Fifty years later, all of those newspapers had died with the exception of the *Journal of Commerce.* Obviously, other newspapers were started; some survived some didn't. The changes in publishing were not only apparent in newspaper content but also apparent in the shifts in newspaper circulation, the costs of ownership and a largely unnoticed turmoil in the industry.

As would be expected, the growth in the number of newspapers in the 19th Century across the United States increased as the country's population and territory expanded. There were 360 newspapers in 1810 growing to 1,300 in 1830, 1,631 in 1840, 2,526 in 1850, 5,983 in 1870, and 21,000 in 1899. (*See also Table I at end of this chapter.*) During the same period, the total number of copies printed in a year increased from 22.5 million in 1810 to 7.8 billion in 1899. While those numbers may be useful in understanding the entrepreneurial spirit of budding publishers and may reflect the public's interest in news, they do not necessarily reflect changes in

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[229] Mitchell, "The Story of the Sun."

newspapers themselves. Some numbers do suggest another trend, the movement towards larger and larger newspapers as measured by circulation: The average number of subscribers for each U.S. newspaper rose from 800 in 1788 to 2,000 in 1850, a number that would continue to dramatically increase, reaching 3,500 by 1870 and almost 6,000 by 1900.[230]

Disguised by those apparently encouraging numbers and the country's increasing population was another set of critical statistics that revealed what was happening to the newspaper industry and its business model: Underlying those numbers was a movement towards greater and greater centralized production and control of the news – long before the multi-newspaper chains of Pulitzer, Newhouse, Knight and Gannett. Disguised by the rapid-growth numbers was an industry in turmoil – subject to the "restaurant" phenomena where many new ones opened their doors only to shut down after a year or two. An 1881 Bureau of Census report showed that of the 5,871 news publications in existence in 1870, 1,904 had gone out of business by the next census in 1880. From 1833 to 1880, there were 146 daily

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[230] The accuracy of circulation figures have been disputed, perhaps as a reflection of exaggeration by publishers. But, Dill uses a combination of reports from early journalism historian Isaiah Thomas, the U.S. Bureau of Census, Library of Congress records and in later periods the Ayer's Newspaper Directory identifies some patterns even if the individual numbers themselves are not precise: William Adelbert Dill, *Growth of Newspapers in the United States* (Lawrence,: University of Kansas Dept. of journalism, 1928).

newspapers started in New York City, but only 29 were still publishing by the end of that period.[231]

Embedded in the earlier years but obscured by a rapidly growing country was an industrial composition that would soon be unalterable – an actual decline in the number of separate newspapers products published per capita. In 1800, there were .03 newspapers per thousand population. That number increased to .10 by 1830, declined slightly to .09 in 1840, rose steadily for the next half century, and then peaked in 1890 at .28 newspapers per thousand population. *(See Table II at end of chapter.)* Despite the continuing growth of urban areas, population increases, literacy, wars, World War I and enhanced news as reflected in telecommunications, the number of newspapers per person in the United States began an irreversible decline. By 1925, the number of newspapers per thousand population had declined to .12 – not too different from the number in 1830. There was no total or per capita decline in newspaper circulation after 1890; indeed, only one in five persons bought a newspaper in 1830 while in 1925 two papers were sold for every person. More individual copies were being sold, but the "voices" producing those copies had begun to decline. Within 50 years of the advent of the penny press, the medium began a trend of ever greater centralization of production and distribution. In the year 2000,

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[231] North, *History and Present Condition of the Newspaper and Periodical Press of the United States, with a Catalogue of the Publications of the Census Year*, 59, 99.

the number of newspapers per thousand population was back to .03 – the level of 1810.[232]

Because of the vast expanse of territory, the total number of newspapers continued to increase, but fewer papers were started in new cities and competitive pressures forced out some existing newspapers. While once it was possible to publish a small daily newspaper with a very small capital investment in either an urban market or a rural market, the dynamics began to change, especially in the urban markets. To compete in the urban market, a publisher had to compete in very large circulation numbers – to get the subscriber fees as well as to command competitive advertising rates – and that meant relatively huge capital investments. While newspapers have always required a much lower capital investment than some industries because much more of their value coming from market dominance, higher speed presses blocked the ability of neighborhood print shops from entering the competition.[233]

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[232] Dill, *Growth of Newspapers in the United States*, 22. The 2000 figure is based on newspaper totals from *Number of Daily and Non-Daily Newspapers* [Internet] (Newspaper Association of America, 2003 [cited Jan. 14 2003]); available from http://www.naa.org/info/facts02/12_facts2002.html. and 2000 Census numbers from *United States Census 2000* (U.S. Bureau of Census, 2000 [cited Jan. 14 2003]); available from http://www.census.gov/main/www/cen2000.html.

[233] North, *History and Present Condition of the Newspaper and Periodical Press of the United States, with a Catalogue of the Publications of the Census Year*, 79.

There were geometrical increases in capital costs to build a newspaper around cylinder or rotary presses. Even in 1859, it was possible to equip an entire print shop with all the necessary equipment including a hand-press for $690 in capital costs. That would be the best equipment possible for producing a newspaper of 2,000 to 3,000 circulation. *(See Table III at end of chapter.)* But, that level of investment would be far shy of what would be necessary to compete in an urban newspaper market where a new rotary press alone would cost $12,350. *(See Table IV at end of chapter.)* In addition, there were the ongoing costs of manpower, steam power and type – not to mention a greater cost of gathering news. A Benjamin Day-style, poorly capitalized entrepreneur was no longer a viable option.[234]

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As the second circuit of mass market newspapers reached stability, the distinguishing or essential characteristics of the medium and its technology had become clear – not unalterable but with considerable momentum. The technology was built around higher and higher capitalization costs which could be justified only with larger circulation and centralized production. The marketing emphasis was on a single

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[234] Peter Hoe, Letter to H. Clark, April 17, 1859, R. Hoe & Company Collection, Library of Congress Manuscripts, Washington, D.C; Invoice for Four Cylinder Type Revolving Machine to George Outram, Glasgow, England, May 14, 1859, R Hoe & Company records, Library of Congress Manuscripts, Washington, D.C.

mass audience that could be attracted to a singular or small number of products. And, a business environment in which competition would be reduced or eliminated.

These outcomes were not purely technologically driven; instead, the technology was only one component of a series of choices made in the first and second circuits of the medium's social construction. However, some of those technological decisions excluded other alternatives or led to using alternatives in a different sequence, giving impetuous to certain business models over others. Once in place, those business models also drove the nature of news products and marketplace competition – not in some technological determinist sense but in terms of a social construction that made the best choices out of a pre-existing set of options.

The path these choices would take were probably very difficult to foresee. Even the threatened competition of the penny press could see value in the changes they brought. The most progressive of the New York sixpenny newspapers, the *Journal of Commerce* published in 1835 this description of the upstart penny press, referring to the changes in content as well as its conduct of business:

> It is but three or four years since the first Penny Paper was established. Now there are half a dozen or more of them in this city, with an aggregate circulation of twenty or thirty thousand, and perhaps more. These issues exceed those of the large papers, and, for aught we see, they are conducted with as much talent, and *in point of moral character we think candidly they are superior to their sixpenny contemporaries.* By observing the course of these papers, we have been led to regard them as quite an accession to the moral and intellectual machinery among us. The number of newspaper readers is probably doubled by their influence, and they circulate as pioneers among those classes who have suffered greatly from want of general intelligence. Let all classes of the community but

read, and they will think, and almost, of course, will become less entirely the dupes of designing individuals.

There is hardly any thing which his Holiness of Rome has more reason to be afraid of than the Penny Papers. Those who have read them will, as a natural consequence, come more or less to the commission of the execrable offense of forming opinions for themselves. But for the subserviency which, from the nature of their circulation, they are compelled to exercise towards Trades Unions and such like humbug affairs, we see not why the effect of the little papers should not be almost wholly good. They are less partisan in politics than the large papers, and more decidedly American, with one or two exceptions. The manner in which their pecuniary affairs are conducted shows how much may come of small details. They are circulated on the London plan, the editors and publishers doing no more than to complete the manufacture of the papers, when they are sold to the newsmen or carriers at 67 cents per 100. The carriers distribute the papers, and on Saturday collect from each subscriber six cents, so that for each call their net income to the carriers is but one third of a cent. We wish our penny associates all success, hoping that they will grow wise, good, and great, until they make every sixpenny paper ashamed that tells a lie, or betrays its country for the sake of party, or does any other base thing.[235]

The *Journal of Commerce* could not know that the shame the penny press would bring to its sixpenny cohorts would be the shame of going out of business.

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[235] "Penny Papers," *Journal of Commerce.* June 29, 1835. As quoted in Hudson, *Journalism in the United States, from 1690 to 1872*, 425.

Table 1: Growth of U.S. Newspapers 1776-1840[236]

States.	1776	1810	1828	1840
Maine			29	36
Massachusetts	7	32	78	91
New Hampshire	1	12	17	27
Vermont		14	21	30
Rhode Island	2	7	24	16
Connecticut	4	11	33	33
New York	4	66	161	245
New Jersey		8	22	33
Pennsylvania	9	72	185	187
Delaware		2	4	6
Maryland	2	21	37	45
District of Columbia		6	9	14
Virginia	2	23	34	51
North Carolina	2	10	20	27
South Carolina	3	10	16	17
Georgia	1	13	18	34
Florida		1	2	10
Alabama			10	28
Mississippi		4	6	30
Louisiana		10	9	34
Tennessee		6	8	46
Kentucky		17	23	38
Ohio		14	66	123
Indiana			17	73
Michigan			2	32
Illinois			4	43
Missouri			5	35
Arkansas			1	9
Wisconsin				6
Iowa				4
Total	**37**	**359**	**861**	**1,403**

[236] Kubler, *A New History of Stereotyping*, 47; North, *History and Present Condition of the Newspaper and Periodical Press of the United States, with a Catalogue of the Publications of the Census Year.*

Table 2: Newspapers in Relation to Population[237]

Year	No. of Papers	Papers per 1,000 Pop.
1704	1	.0033
1710	1	.0028
1720	3	.0063
1725	5	.0050
1730	8	.0107
1740	12	.0135
1750	14	.0108
1760	22	.0118
1770	29	.0154
1775	48	.0171
1780	38	.0137
1788	93	.0252
1790	106	.0270
1800	150	.0282
1810	393	.0497
1820	861	.0899
1828	852	.0697
1830	1,300	.1010
1835	1,258	.0899
1840	1,403	.0822
1850	2,526	.1089
1860	4,051	.1288
1870	5,871	.1523
1880	11,314	.2234
1890	17,616	.2797
1899	18,793	.2506
1904	21,848	.2652
1909	22,141	.2449
1914	22,754	.2334
1919	20,489	.1964
1921	13,167	.1214
1923	13,077	.1179
1925	14,065	.1219

[237] Dill, *Growth of Newspapers in the United States*, 47.

Table 3: Cost of Traditional Hand-Press Newspaper Office, 1859

Invoice to H. Clark, New York[238]

Item	Cost
Washington Press	220.00
Set Distribution	25.00
Half Chassis	9.00
Brass rules	12.00
Head Rules	2.50
Advertising rules	5.50
Cuts	2.00
Title letter	8.00
Fancy cuts	8.00
Dash rules	3.25
Font sticks	6.00
Bodkins	1.75
25 lbs news ink	7.75
350 lbs primer	119.00
250 lbs primer	105.00
Composing sticks	6.00
Brushes	1.88
Common Galleys	6.50
Double galleys	8.25
Job type	50.00
Frames	24.00
Boxing and carting	7.50
Total	690.83

[238] Hoe, Letter to H. Clark, April 17, 1859, R. Hoe & Company Collection,

Table 4: Cost of Rotary Press Only, 1859

Invoice Created by Hoe Printing Co. for George Outram, Glasgow, England[239]

Item	Cost
4-cylinder type-revolving machine	11,750
8 type bed tables	80
12 Braf Galleys	90
9 Steel Column Rules	45
1 Finger Rod	10
10 Wrot Iron Fingers	6
38 Screws	20
7 Proof Pref	70
2 Brass Head Blocks	10
12 Double Head Rules	10
1000 Advertisement Rules	72
Boxing & Carting	160
Other items	27
Total	**12,350**

Prices were originally stated in British pounds. They were converted to dollars at the 1859 rate of .2 pounds per dollar

[239] Invoice for Four Cylinder Type Revolving Machine to George Outram, Glasgow, England,

Chapter 8: Conclusions

To R Hoe & Company

January 6, 1850

We are the publishers of a little newspaper, which when opened is about the size of this sheet. Hearing that you had all kinds of presses, we thought we would write and ask the price of a small one, suitable for such work . . . We do not wish to go over 8 or 10 Dollars.

Respectfully Yours,
Louis O. Henop and Sidney S. Henop
14 & 7 years of age.

P.S. Answer as soon as possible[240]

The above letter may be the most powerful statement about the status of newspapers and printing presses as it evolved during the 19th Century. I apologize for the hyperbole, but in a few years of research on this topic, I keep coming back to this letter.

There is both a sense of empowerment with media and a sense of right – the right to be able to publish, broadcast or Weblog, to use a 21st Century term for personal publishing on the Internet. The presumption is that right should extend to

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[240]R. Hoe & Company Collection, 1835-1890, Library of Congress Manuscripts, Washington, D.C.

anyone in a democracy of ideas. But in an ongoing sequence of mass media creation – print, radio, television and, next perhaps, the Internet – each new medium has evolved to a point where a seven-year-old and most 27-year-olds are excluded from independently delivering their messages despite earlier promises. Each new medium tantalizes with the potential for access to everyone: Merely, turn to early amateur radio to hear the claims that the airwaves were open to everyone. Desktop publishing, using computers and printers, meant anyone could publish a 'Zine in the 1980s. Certainly, the early days of the Internet promised a town-hall on every computer screen and a global voice to every keyboard. However, to date, no medium has evolved in that manner: They either evolve as largely personal communications media (such as the telephone) or as mass media (such as newspapers and television). Despite the claims to the contrary, media have tended to fall victim to, or benefit from, depending on one's perspective, marketplace forces that consolidate ownership, concentrate distribution and, most significantly, continually raise the cost of participation in the process. The number of mass media consumers seems unlimited while the number of mass media "voices" seems to forever be diminishing.

The process of consolidation is not merely the result of corporate greed. In reality, it is the discerning tastes or appetite of the media consumer – for more and better media content – that drives the costs up and the potential for participation down. In addition, the technologies that were selected to execute increasing production quality or increasing volume of production have been expensive. Digital media meant that every boy and girl could become a moviemaker. But, few people

have any desire to see their next-door neighbor's video production when they can be startled and amazed at the $100 million blockbuster made by a Steven Spielberg.

So, Louis and Sidney in 1850, in the letter above, had already fallen behind the evolution of the printing press. Their little newspaper was long-since bypassed by presses that cost tens of thousands of dollars, not a hundred dollars, much less $10. We do not know how the Hoe company responded to their letter, but their catalog certainly listed no presses that met the needs of these brothers. Nor, by 1850, did they offer presses that made it easy for a near-bankrupt, struggling job-shop printer, such as a Benjamin Day, to enter and compete in the intense market for urban, mass-media newspapers in the United States.

The 1830s penny press, perhaps like mass media to follow, was built on an amazing contradiction: The process of empowering the masses with cheap, readily accessible information came at the cost of making it increasingly difficult – actually near-impossible – for an individual within those masses to singularly take an active role in media creation. Benjamin Day, in 1833, made it possible for *everyman* to own a copy of a newspaper, but his success make it virtually impossible for an *everyman* to ever own a newspaper thereafter. Newspapers changed from having a minimal price of entry but a prohibitive unit cost to a nearly prohibitive cost of entry and incremental, marginal costs approaching zero. The change meant the industry moved from a distributed model of production to oligopolies or monopolies.

These are not necessarily normative judgments nor terribly revealing observations. Media evolution happens, and we should be intelligent about

understanding the influencing factors of technology, economics, market forces and a social construction of media shape and meaning. There are questions here, though: Does the process of technological and economic decision making prohibit or limit the consideration of other options and other priorities? Can a higher awareness of decisions about media in the making in its early stages allow for taking a different path? That media visionary Pool, said "yes" 40 years ago, but his confidence in technological assessment is probably not widely shared in a more skeptical social and technological environment.[241]

The Need to Examine the Technological Change of Media in a New Way

At the beginning of this dissertation, I described the difficulties of maneuvering within the rapidly changing world of a new mass medium, such as the Internet. Strangers to media production are usually making technological decisions unmindful of potentially long-lasting effects and, perhaps, unaware that they are even creating a mass medium. But, this problem is not restricted to media when they are evolving; our understanding of how old media were created and shaped is often misunderstood if we do not understand the decisions made by early technologists. Existing methodologies for studying media evolution provide useful information about key decision makers and about social influences. But, they fail to examine key

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[241] Pool, *Forecasting the Telephone;* Ithiel de Sola Pool, *Technologies of Freedom* (Cambridge: The Belknap Press of Harvard University Press, 1983).

decisions in the early stages of the technology that create long-lasting artifacts or path dependence. These lingering effects can have considerable impact on the near-term and long-term defining characteristics of the medium.[242]

Histories of mass media, particularly journalism histories, have tended to focus on bio-histories of the key players or bio-histories of the institutions after they have reached a fully functioning existence. Little attention is given to the early technological decisions, to technological failures or to the implications of the successful technological choices. Dicken-Garcia, McQuail, Pool and Flichy have lamented this lack of scholarship where technology and media creation intersect. However, one of the challenges is to establish a framework of analysis that sufficiently encompasses technology in general, the specific attributes of the technologies that create new media channels of distribution and media content production.[243]

Carey, Schudson, Schiller and others emphasized the need to break away from histories of journalism that solely focused on media players and institutions. They

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[242] Several efforts have been made to examine the "accidental" nature of the decisions surround the Internet, such as: Bruce C. Klopfenstein, "The Internet Phenomenon," in *Understanding the Web: Social, Political, and Economic Dimensions of the Internet*, ed. Alan B. Albarran and David H. Goff (Ames, Iowa: Iowa State University Press, 2000).

[243] Dicken-Garcia, "The Internet and Continuing Historical Discourse."; Flichy, *Dynamics of Modern Communication: The Shaping and Impact of New Communication Technologies;* McQuail, *Mass Communication Theory;* Ithiel de Sola Pool, *Technologies without Boundaries: On Telecommunications in a Global Age*, ed. Eli M. Noam (Cambridge, Mass.: Harvard University Press, 1990).

broadened the perspective to especially include social and macro-economic influences ranging from literacy to urbanization. These fresh perspectives of the last half of the 20th Century were certainly valuable in expanded our understanding of evolving mass media by stepping away from a "great man" model of history. They also shattered myths of deterministic developments – whether it was an inexorable progress in a democratic form of journalism or a technological inevitability. Nonetheless, these newer approaches, while valuably bringing attention to the societal precursors, fail to consider another crucial venue for understanding the path taken by new media.[244]

In this dissertation, I am not advocating the substitution of one discredited approach to mass media history – developmental historiography – for another equally suspect concept that is wedded to the notion that technology develops in a linear process largely independent of any social, political, economic or cultural considerations. Instead, we need to understand that one of the components of media development is technological, and that a technological artifact – either physical or conceptual – interacts with other parts of the communication system. This is a process not unlike those identified by scholars using the Social Construction of Technology as

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[244] Carey, "A Cultural Approach to Communication."; Carey, "The Problem of Journalism History."; Mindich, *Just the Facts: How "Objectivity" Came to Define American Journalism;* Nerone, "The Mythology of the Penny Press."; Schiller, "An Historical Approach to Objectivity and Professionalism in American News Reporting."; Schudson, *Discovering the News: A Social History of American Newspapers;* Schudson, "A Revolution in Historiography?."

a tool for analyzing invention, development and diffusion – where there is interaction and joint decision making by actors coming from a variety of perspectives. Indeed, a key element of technological diffusion is the acceptance or rejection by consumers of various components of the new technology.

This "multi-directional" portrait of technology evolution, where all the actors have a voice in the development process, however, is difficult to overlay on media technologies. A primary thesis of this dissertation posits a detachment and alienation from the existing processes of media content production that creators of new channels of communication technologies may confront. This does not suggest that the technologists creating the new channel are free from external social influences; rather, those technologists usually have little knowledge of mainstream content production, such as journalism and information products. Moreover, the actors involved in early decisions surrounding the technology may be unaware that they are creating a new mass media channel. Their decisions, nonetheless, can create path dependence or entrenched artifacts that persist when the technology begins to enter the media mainstream.

I have proposed a new methodology and typology to address this theoretical conception of media evolution. The components of that methodology need to include a recognition that media technologies do not evolve in a vacuum, that those technologies often develop in a context removed from the mainstream of media production, that there is a transitional phase when new channels of communication are viewed as a mechanism for delivering different kinds of content and that when the

content reaches the mainstream media consumer, many technological decisions are obscured and sometimes difficult to change.

Viewing Media Evolution as a Double Circuit

"Two-step flow," as described by Paul Lazarsfeld, Bernard Berelson, and Hazel Gaudet, suggested that media messages do not directly influence the audience; that, instead, opinion leaders receive the media messages in the first step and greatly influence the rest of the audience in the second step. The first step involves a more active audience and the second a more passive group of participants. Altered, refined and rejected at times during the past 50 years, the concept was surely useful in recognizing the intermediary nature of some parts of the audience.[245]

Likewise, I have suggested a two-stage evolution of media technologies, but instead of opinion leaders being the intermediary, in this case the buffer between the first stage and the second stage is a group of people who are willing to take the risk of building content for the new medium. Very often these risk-takers are outside the mainstream of existing media, and certainly the technologists they are negotiating with typically have a non-traditional orientation. I have called this process a "double-circuit," where the first circuit of decisions is completed by technologists developing the new channel and the potential creators of content appropriate to the channel. The

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[245] P.F. Lazarsfeld, B. Berelson, and H. Gaudet, *The People's Choice* (New York: Columbia University Press, 1948).

first circuit involves complex technological decisions as well as an often difficult conceptualization of what the new medium is "good for." The content producer is gambling that he can understand, and perhaps influence, the design of the channel sufficiently to in turn take the technology and the content to mainstream media consumers – the second circuit. The costs and risk to the content producer can be extremely high and can take an unpredictable time to achieve financial profitability.

Recognizing that media evolution involves two circuits of decision making helps to explain the different nature of paths taken in the first circuit, where technology is viewed in greater isolation from existing media and from eventual outcomes, and in the second circuit, where the focus is taking the pre-existing technological choices and transforming them into a hopefully sellable new medium to consumers. At times, the first circuit rejects technological options that might shape the new medium in a different manner, might alter the production and ownership patterns, or might change how the medium is ultimately used. In other words, the defining characteristics – or essential qualities – of the new medium may be largely determined in the first circuit. Those characteristics have the potential for being altered in the broader marketplace, but this happens only with considerable delays and, perhaps, added costs.

In the introduction, I suggested four areas of inquiry that were rarely explored by media scholars but nonetheless seemed significant. Do those questions still seem germane and, moreover essential?

1. *What was the broader context of the technological change? Including relevant technological, social and economic factors.*

A holistic examination is essential to avoid distortions and outright errors in understanding the evolution of a new medium. Cultural histories have made strides in broadening the scope of research, but they have failed to adequately include the technological aspects.

2. *What was the technological frame for key decisions in the early evolution of the new media technology? Including the source of innovation, the specific new technologies pursued and the initial efforts to move from novelty to implementation or innovation.*

Conventional methodology for examining media creation starts far too late in the process. The ideas and artifacts of creation typically begin decades or centuries before the new medium becomes tangible and reaches the consumer marketplace. Absent consideration of that early technological frame, gaps in our analyses of and incorrect assumptions about a new medium will persist. Furthermore, any ability to fully understand currently evolving media is impossible.

3. *As the medium moved into the developmental stage, what were the key decisions? Including technological dead ends, overlooked alternatives and progressive, linear steps toward diffusion.*

Much is revealed about a new medium by looking at the path of its development. Rejected technological options and postponed options often expose as much about the ultimate shape of the medium as the linear map of adopted technologies.

4. *How did those key decisions skew the nature of the medium? Including technological capabilities and limitations (the medium's distinguishing characteristics), alteration of the medium's economics and influences on diffusion.*

Perhaps, the most difficult challenge is understanding the implications of early decisions – especially at the time those decisions are being made. If answering this question requires the establishment of cause and effect, then it may be a flawed and impossible inquiry. If, instead, the question recognizes that these early decisions discourage certain paths and encourage other paths, then the inquiry is useful. The distributed, asynchronous architecture of the Internet did not cause e-mail to be wildly successful, but it certainly enabled and supported this text-based communication method when the world had been moving increasingly towards oral, real-time communication.

These research questions proved useful in directing a new theoretical and methodological framework. They drove the inquiry into penny press – the case study used to test the double-circuit concept and to consider a new dimension to our understanding of media evolution.

The Case Study: Benjamin Day and the Penny Press

To test and demonstrate the utility of the double-circuit concept, I applied it to the 1830s penny press. As a case study, this part of the dissertation was not primarily a discovery of new data about that mass medium when it was new. Instead, the goal was to analyze existing data pertinent to that era of urban newspapers. However, to adequately explore the 1830s penny press, I had to explore data from sources not used by media histories and not analyzed by historians in other fields in the same way.

In 1833, New York was becoming a sizable city, nearing 250,000 population. It was a vibrant trade center where many of the citizens were interested in ships entering the harbor – to hear about relatives, old countries, new materials and even jobs. As part of a young nation, the citizens had a sense of empowerment and a democratization of government; they wanted to participate and to learn. The urban environment encouraged innovation and experimentation.[246]

In New York and Philadelphia, there had been attempts to publish newspapers for the broader populace than served by the existing newspapers, which tended to be extensions of partisan political groups or commercial interests. These traditional newspapers could hardly be called mass media – in a city of 220,000, the largest of these dailies had 4,500 subscribers. (Contrast that with today, when it's not unusual

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[246] Bairoch, "The City and Technological Innovation."; Schudson, *Discovering the News: A Social History of American Newspapers*.

for a U.S. town of 15,000 population to contain a newspaper with 6,000 subscribers in the town and in surrounding rural areas.) The earlier attempts at starting a mass market newspaper failed, perhaps, because the price was too high, the location was wrong or some other less obvious factor barred success. Walking into this social environment in 1833 was Benjamin Day as he hoped to fulfill a years-long ambition to start a low-cost newspaper for the everyman.

When Benjamin Day and his printer colleagues were envisioning a new type of newspaper – a medium for the masses – they were functioning within a context of a relatively new technology that would allow them to produce large quantities of newspapers. They would have reasonably known that the Gutenberg-style presses that were most common in the 1830s and before could not adequately print pages with sufficient speed, but they had seen newer presses which could supply the speed for a new kind of newspaper.

These faster presses were the outcome of at least a century of experimentation and development by other industries, such as textiles, that used similar technology, by inventors totally removed from the publishing business and by persons willing to take the risk to use the new technology and to build products appropriate for them. These actors in this first circuit of technological decision making included the chemist William Nicholson who first patented a high-speed rotary press that was never seriously implemented, the European press manufacturer Frederick Koenig who finally convinced one newspaper publisher to try his invention, the U.S. press manufacturer Robert Hoe who repeatedly adapted European presses to make them

more reliable and attractive to publishers and a couple of U.S. publishers who were willing to try Napier and Hoe's new presses. So, when Day began his publishing experiment, he had a solution for high-volume production at hand – even though the new technology had not been fully utilized to that point.

Other technological solutions besides a single press operating at faster speeds were possible at the time, but Day had little reason to know about those options or use them if he did. Those were options long before considered and rejected or never considered at all. Day could not solve his printing problem, for example, by using more than one inexpensive Gutenberg-style press in conjunction with stereotype plates to double and triple his output. Given the option, he might have preferred locating several presses scattered across the metropolitan area to make newspaper deliveries simpler and less costly. He might have wanted to reduce his typesetting costs by sharing national and international news with other newspapers by utilizing stereotyping. But, these alternatives were largely foreclosed by a series of choices made by printing innovators in the previous decades. The work by the minister Johannes Mueller and the goldsmith/banker William Ged would remain largely unrecognized by newspaper publishers. John Walter, the bankrupt shipping underwriter, started his own newspaper in a frustrated attempt to demonstrate his technology to speed up the typesetting of pages.

Thus, by the time that Day became a participant in that first circuit, he was an actor not fully in control of all the options. He did envision a use for the faster presses and at the right time was willing to take the risk of creating content tailored to that

new technology – a technology that was best utilized when it capitalized on centralized, mass production, economies of scale and a new mass audience. He was not bound – either financially or conceptually – to the narrow purposes of the existing politically oriented publications. He was willing to produce a quite different product from the media mainstream and was motivated to market the product to the mass consumer audience – thus entering the second circuit.

Arguably, Day was not envisioning the creation of modern journalism. He was without a doubt, however, creating a poster-child for media entrepreneurship. Day quickly demonstrated key attributes of all future mass media: first mover advantage, mass production, economies of scale, predatory pricing, efficient channels of distribution, high barriers to entry, brand identity and product differentiation. Each of these economic innovations shaped the form of the new medium and was enabled in part by earlier technological decisions.

From the very first issue, Day began to sell the notion that his paper would be very different and would begin to create a "community of interest" that became the mantra of Internet business gurus 150 years later. He wrote: "The object of this paper is to lay before the public, at a price within the means of every one, ALL THE NEWS OF THE DAY, and at the same time afford an advantageous medium for advertising." He did not so much revolutionize the content and shape of journalism as

much as he adeptly selected from existing forms of journalism to emphasize news with human-interest appeal, with sex appeal and with mass market appeal.[247]

As Day entered the second circuit and had to prove the worth of his new medium and its content, he moved into a marketing campaign including most concepts that would await names until the 20th Century, such as brand identity and product differentiation. I argue that Day's greatest contribution to the field of newspapers and journalism was his ongoing ability to create a sense of perishability – a recognition that yesterday's news dies tomorrow and needs to be replaced. He achieved this by an emphasis on local, timely news coverage written in a style that engaged the community. He distinguished his product from the competition by techniques ranging from proudly announcing feuds and lawsuits with other publishers to proclamations about his winning the circulation wars – indeed, he established the concept of circulation wars in New York. What has been considered as an embarrassment by most journalism historians, the infamous 1835 Moon Hoax is a prominent example of Day's instinctual use of an ongoing story: It was a series of stories that drove people to buy the paper day after day. It was unique to that newspaper. It was a story with extraordinary appeal to a wide range of people. Plus, he could print thousands of extra copies at a diminishing marginal cost – approaching zero.

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[247]; Hagel and Armstrong, *Net Gain: Expanding Markets through Virtual Communities.*

The consumers – who were actors in the second circuit – could not have known about the alternative technologies, nor cared. They could not have known that the technological decisions involving faster presses, rapidly increasing capitalization costs and a tendency toward centralized production would lead to an initial explosion of new penny newspapers and an ultimately a decline in the number of papers offered to readers. Even though alternatives to faster presses might help produce a difference path for development of urban newspapers, consumers in the second circuit would know nothing about stereotyping, for instance. In this second circuit, they could make choices about whether to buy or not, but they could not reshape the technological or the technological implications.

As the population of and number of urban centers in the United States rapidly increased through the rest of the 19th Century, the superficial statistical portrait of the newspaper industry looked extraordinarily favorable. The number of newspapers and the total circulation of newspapers rapidly increased. This gave the appearance of a growing number of media voices and a substantial movement toward the democratization of publishing. But hidden beneath the numbers was a different trend, driven in part by the increasing capital costs, barriers to entry, exit costs and centralized publishing. Beginning in 1890, the newspaper industry began a long, and as yet unending, slide towards fewer and fewer newspaper voices per capita – by the

year 2000 reaching a level of newspapers per person matching pre-penny press days of 1810.[248]

In the introduction, four hypotheses about the penny press were proposed as possible outcome of this research. They were:

1. *The initial penny press innovators should be understood as "journalistic outsiders" to properly understand their ability to break from the old press paradigm in a Kuhnian fashion: Benjamin Day was a technologist and printer, not a journalist.*

   The label of "technologist" versus "journalist" seems of less importance than the ability of some participants to adopt fundamentally different ways of producing a newspaper. Day, as well as most of the technological innovators involved with faster printing, appeared quite willing to break from the confines of traditional newspaper publishing. He, Walter at *The Times* of London, and press-inventor Koenig, were among those participants in the social construction who were willing to leap beyond existing business and technical models.

2. *The initial exploration of faster printing technologies was driven more by a push toward novelty than by any immediate necessity. After faster printing methods were developed, some technologists and media producers began to*

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[248] North, *History and Present Condition of the Newspaper and Periodical Press of the United States, with a Catalogue of the Publications of the Census Year.*

explore ways of capitalizing on that speed by using innovative economic models – high-volume single-copy sales, low-price mass distribution and advertising driven by a new, broader audience. The first British patent for high-speed presses was issued in 1790 to an inventor totally removed from the printing business.

This hypothesis comes too close to adopting technological determinism. New press technologies did not "cause" the penny press, but the technologies did do more than merely enable a new kind of newspaper. Clearly, Koenig and the other press developers were proselytizers of the new technology at a time that there was no clear need for faster, more expensive presses. The awareness and dialogue that they prompted surely created an environment for asking how speed might pay.

3. *The relevant social groups – technologists and entrepreneurs – chose to emphasize high-tech, high-capitalization methods to speed the printing process instead of using low-tech, less expensive methods.*

There should be little doubt that high-tech, high-cost presses were chosen as the preferred method for speeding up newspaper production and that other lower-cost alternatives could have been developed.

4. *Those choices shaped the "essence" of the new medium – a one-point-to-many broadcast model in contrast to the multiplicity of print shops and periodicals in the old paradigm. That approach rapidly led to much higher*

barriers to entry in the newspaper field, and thus encouraged a concentration of ownership.

Part of this hypothesis was born out: The newspaper industry unquestionably moved toward centralized production, higher barriers to entry, and a concentration of ownership. Proving the causation of those shifts is, however, problematic. While the adoption of higher cost presses certainly contributed to the higher barriers to entry and probably hastened a concentration of ownership, it's impossible to eliminate other factors which might have inexorably lead to fewer and fewer publishing voices. This hypothesis, and the questions it prompts, is valuable to pursue, but proving it will always be near-impossible.

Thus, one cannot reasonably make the argument that the diminution of newspaper voices was solely the result of an early decision to emphasize higher cost, faster printing presses. But, some influence of path dependence and, perhaps more relevant, path sequences deserves consideration. Choosing high-capitalization technology as the very first step in a sequence of solutions – that would eventually resurrect stereography and a version of logography – may have hastened a process of centralization or even shut off alternatives to centralization. Alternative, distributed production models surely had become more difficult in that environment. If these early decisions did not hasten a shift towards centralized management of newspapers, they certainly did nothing to slow down the process.

What the Case Study Reveals about the Double-Circuit Approach

The use of the penny press as the case study to test and demonstrate the value of the double-circuit process of media evolution provided several insights: It clarifies the source of early technological decisions affecting the urban newspaper, it counters suggestions that penny press publishers were unaware of newer technologies, and it illustrates the difficulty that innovators of media products have in finding someone to devise appropriate new media products.

A social construction view of Day's interaction with his audience – through the pages of *The Sun* – provides a different prism for understanding his role in developing the new medium. His media designs were later copied and refined by such publishers as James Gordon Bennett – who capitalized on the business model and the journalistic model. Day's most significant contribution was in creating, or at least building on, the concept of a newspaper as a highly perishable product – that had to be replaced each day.

On the other hand, the double-circuit model presents some difficulties: It is very difficult to extract conclusions about the effect of those early decisions on the new medium without falling into a "what-if" historiography – perhaps more appropriate for novels than serious scholarship.

This case study demonstrates the importance of technology for enabling the penny press while at the same time revealing the reluctance of the publishing industry to accept and adapt to the potential technologies. Previous scholarship has treated the

technology in a simplistic, deterministic manner or altogether ignored it. It's clear that there are moments of negotiation among players in the first circuit when a spark of understanding occurs. When Frederick Koenig approached the publisher of *The Times* of London after years of failure with other publishers, a connection was finally made between the pure technologist and someone who was willing to build content using the new channel of communication. Those important moments of connection are matched in the second circuit by those times when a Benjamin Day is able to attract sufficient early adopters to begin an S-curve toward mass market success.[249]

The penny press case also illustrates the invisibility of early technological decisions when a new medium reached the consumer market. The consumer not only was unaware of what was going on in the black-box of the print shop but was unaware of alternative technologies. Even if something had peaked the interest of a consumer, his or her ability to understand the complexities of platens and matrixes or papier mache mats would have prohibited disclosures for all but a very few customers. As such, consumers were dependent upon the media producer – in essence, their proxy in the first circuit – to make correct choices. By the time these complex technologies reached the consumer, they could only accept or reject the

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[249] It's the second connection that is explored in Rogers' Innovation scholarship and such popular works as Gladwell's "The Tipping Point." Malcom Gladwell, *The Tipping Point: How Little Things Can Make a Big Difference* (Boston: Little, Brown and Co., 2000); Rogers, *Diffusion of Innovations*.

media producers' content, but they had only a limited ability to discern and alter early decisions.

In contrast, the penny press case study is less effective in illustrating or supporting the path dependence and effects of early technological decisions. For one thing, the choices are not as dichotomized as they might be in other media – for example, there is a very explicit difference between the uses of asynchronous technology versus synchronous technology in the case of the Internet. With the penny press, there is circumstantial evidence that the sequence of technological solutions for the faster production of newspapers may have hastened the movement toward centralized production. And, there are concrete examples of how a distributed system using stereotyping could produce different results. But, there are too many other economic and social factors in play to create a predictive model.

Nonetheless, that inability to predict effects does not eliminate the value of this analysis for understanding media evolution. The arguments that the penny press was a creation of urbanization and literacy are likewise circumstantial. Cultural historians use a variety of components in describing the environment for changes in social institutions; this component should be added to the mix. Unless these technological paths are considered, social and economic considerations will omit an important element, especially in the case of media development.

Refinements and Options for Future Study

This case study suggests sufficient value in the double-circuit model to pursue it further. Even with the severe limitations on fully explicating a social construction of the penny press technology because of the limited amount of direct documentation, it is possible to discern a much different portrait of Benjamin Day than has previously existed. The double-circuit concept provides a better prism for viewing his options and choices, and the second circuit, especially, is useful in understanding Day's transformation of newspaper publishing in the 1830s.

The penny press was chosen as the case study partially because of its sex appeal as the first mass medium and partially because of the scarcity of scholarship focusing on the interrelationship between the medium and printing technology. It was a risky choice because there is so little primary documentation – Day, for example, has no repository of business records, left the business after only a few years and maintained no memoirs of his experiences. When I pursue similar analyses in the future, I will certainly select subjects that have a far greater amount of documentation needed to explore the social construction. That said, documentation in the first circuit may always be problematic; by its very nature, decisions may be made in the mind of a single individual, in the confines of a small group or be made without recording the reasons. In addition, the data pertinent to the social construction in the first circuit can be highly perishable – residing in the life-span of only a handful of people. The origination of e-mail for example is largely recorded in the recollections of a single

individual (early Internet developer Ray Tomlinson), but thankfully he has been interviewed sufficiently to preserve the moment he accidentally discovered inter-computer personal communication. There are other aspects of the Internet that are beginning to fade as that generation of innovators begins to disappear. Before the World Wide Web and browsers, the first really friendly interface to the Internet was called "Gopher," named after the mascot of the University of Minnesota. It was developed in 1991, and it's time to dig for details on its creation while the human databanks are still around.

The double-circuit model offers a refinement to both social construction of technology and to studies of path dependence by recognizing the somewhat segregated nature of early technological decisions and later consumer, marketplace decisions with experimental media producers existing as mediators between the two circuits. While I have developed the model primarily in relation to media technologies, it perhaps has utility in other areas. The exploration of that possibility is probably beyond the potential scope of my work but perhaps will be considered by others.

While I have not given up on the notion that this model can be used to identify the effects of early technological decisions on the shape and use of the new medium, I recognize this is the area that requires the greatest refinement. In researching and writing this dissertation, I have attempted to reject technological determinism in its simplest form as well as to reject the attitude that the technology and technologists are irrelevant and only a reflection of social forces. Achieving an intellectually legitimate

middle ground between the two extremes has been challenging, and no doubt I have failed at times. As suggested by the delayed adoption of stereotyping by urban newspapers, there certainly are implied effects when one technological solution is chosen over another or when the sequence of solutions is ordered in one way over another. One must carefully sort through those implications without overdrawing potential causes and effects; nonetheless, I argue, the exercise of understanding those choices and the potential implications is worthy of scholastic pursuit because it gives us another window on media evolution.

The application of the double-circuit concept to other new media or components of media is a promising way to expand our understanding of media evolution as technological change. It, no doubt, will be a framework for my future research efforts – both in applying it to other examples and in continuing to refine the model itself. I'm sure that I will receive interesting and challenging responses from my colleagues, and I hope to never become so path dependent that I can't alter my direction.

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