

# How Business Enterprises Use Technology: Extending the Demand-Side Turn

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Today, we are all aware of the importance of technology to modern business, including process technologies as well as consumer and industrial products incorporating technology. The significant role of technology in business (and vice versa) is not, of course, new. Although the history of technology and business history have different professional organizations and often focus on different theoretical and empirical phenomena, the large number of historians who work at the intersection of the two today reflects the importance of each to the other over a much longer time period.<sup>1</sup> Yet historians of both types still too often give short shrift to the role of business enterprises as technology users as well as to the actual business use of technology.

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JOANNE YATES is Sloan Distinguished Professor of Management in the MIT Sloan School of Management. I thank Richard John for his very helpful suggestions about relevant literature during my early stages of writing the Business History Conference presidential address, of which this paper is an expanded version. By pointing me in some directions I had not considered, he helped me develop my original idea more fully. In the period between the Business History Conference address and the Hagley Symposium, I received helpful comments from attendees of the Harvard Business School's Business History Brown Bag Lunch series. I also received helpful pointers toward specific literatures from Wanda Orlikowski, Geoff Jones, Maggie Levenstein, Meg Graham, and several others. I appreciate the suggestions of all these people. Contact information: MIT E52-544, 50 Memorial Drive, Cambridge, MA 02142-1347, USA. E-mail: [jyates@mit.edu](mailto:jyates@mit.edu).

1. Two of the last five Business History Conference presidents (Philip Scranton and I) work at this intersection, as does the current president-elect of the Society for the History of Technology (Steven Usselman) and its most recent past-president (David Hounshell). Many other scholars are active members and officers of both associations.

During the time I spent researching and writing my recent book, *Structuring the Information Age: Life Insurance and Technology in the Twentieth Century*, I became increasingly aware of two issues around technology users and technology use in business. First, although my business school colleagues are quite familiar and comfortable with the notion of “user firms,” this terminology has received an odd reaction from some historians, who typically see technology users as individuals, not as firms. Second, in studying the transition from tabulator use to computer use in my chosen user industry, life insurance, I was, as I expected, learning a great deal about the development path of commercial computer technology and about the dynamics of the vendor industry. Yet even though I saw my book as addressing a gap in the history of computing, the Library of Congress originally catalogued it under the history of life insurance, omitting any mention of computing.<sup>2</sup> Clearly, these cataloguers, like many historians, did not fully understand the notion of studying firms and an entire industry as *users* of a technology that they did not, in the traditional sense, invent or develop. Indeed, both business historians and historians of technology have traditionally focused on inventors and manufacturers of technology, not on its users.

Recently, scholars of technological innovation, in both business history and the history of technology, have ceased to focus solely on inventors and producers and have increasingly taken up the demand side of the story, studying the *users* of technology artifacts, including their role in innovation. These users, however, are typically seen as individuals. Relatively rarely have firms and other enterprises—with the exception of government or military organizations—been considered as users. In this essay, I argue that business historians as well as historians of technology would benefit from broadening the demand-side notion of technology users (or consumers as they are often cast, especially in business history) to include enterprises as well as individuals.

In addition, I suggest that the historical study of technological innovation in both subfields would benefit from extending its focus beyond *users* to studying technology *use*—or “technology-in-practice,” as my MIT colleague Wanda Orlikowski has put it.<sup>3</sup> Although scholars have recently focused increased attention on (individual) technology *users*, most have assumed that once the technology

2. The publisher was able to get “computing, history of” added to the entry.

3. Wanda J. Orlikowski, “Using Technology and Constituting Structures: A Practice Lens for Studying Technology in Organizations,” *Organization Science* 11, no. 4 (2000): 404–28.

stabilizes, examination of ongoing technology use is irrelevant; moreover, scholars who look at users or consumers typically focus their study on the period up to adoption or purchase rather than on the subsequent actual *use* of the acquired item. I will argue that studying technology use will help us better understand the early and ongoing influence of technology on firms and individuals, and these users' influences on the technology and on innovation in general.

Broadening the demand-side turn will also give our research added interest to many contemporary scholars of technology, especially those in business schools. Recently, an article entitled "Teaching History in Business Schools, 1982–2003," published in a management journal, drew attention to a drop in historical teaching in the business school setting.<sup>4</sup> The discussions of this article that occurred on the internet forum H-Business and elsewhere have all highlighted business history's need to maintain at least some relevance to management scholars to demonstrate the importance of business history to that curriculum, both for those of us who teach in business schools and for our students seeking jobs. Research on *business enterprises* as technology users and on the role of ongoing technology use resonates with work currently being done by many management scholars. Such a research perspective may offer business historians the opportunity to contribute to the history of business and technology, on the one hand, and to the contemporary management literature, on the other hand.

After discussing some assumptions about users and consumers that have evolved in the two historical fields, I will recommend that business historians (i) redefine *users* to include business enterprises and (ii) look at *use* in addition to users.

Although my focus in this paper is primarily on *technology* users, I believe that these general points may be extended to consumers more broadly, and I will briefly suggest how that might be done. Finally, I will discuss why we might want scholars of contemporary business to see history as relevant and how this approach may help us to portray it that way.

### Assumptions about Users

Traditional approaches to technology, in the history of both technology and business, focused on the source or *supply side* of technological

4. David van Fleet and Daniel Wren, "Teaching History in Business Schools, 1982–2003," *Academy of Management Learning and Education* 4, no. 1 (2005): 44–56.

innovation. Traditional history of technology, for example, studied inventors as heroic sources of innovation. Thomas P. Hughes played a major role in shifting that field's focus away from heroic inventors and inventions toward technological systems and system builders; indeed, his own work progressed from the biography of inventor Elmer Sperry in the 1970s to a study of large electrical systems in the 1980s.<sup>5</sup> Still, the field's focus remained on the supply side of such systems.

Similarly, business history traditionally focused on how firms *manufactured* and *distributed* goods and services. Business historians interested in technological innovation tended to focus more on the individuals and firms producing such innovations than on their users. Alfred D. Chandler's *The Visible Hand* introduced a new narrative structure to business history, viewing firms as crucially dependent on new communication and transportation technologies to allow them to expand their markets and control their throughput; still, his work focused primarily on the growth and structural evolution of large manufacturing firms.<sup>6</sup> His recent work continues to focus on the producer side of the equation.<sup>7</sup> In the past two decades, the Chandlerian emphasis on large producer firms has been complemented by Philip Scranton's analysis of smaller organizations that used craft skills to provide flexible customization.<sup>8</sup> In business history, too, however, the focus remained more on the producers of technology and products than on the users.

Beginning in the 1980s, according to Jean-Christophe Agnew in a recent essay, "... historians, sociologists, and anthropologists turned away from the so-called *supply side* [emphasis in original] of the consumption function to look at the *demand side*: the consumers themselves . . . ."<sup>9</sup> This demand-side turn opened up important new arenas for research. Still, it is important to understand exactly what assumptions underlie this demand-side turn, in both the history of technology and business history.<sup>10</sup>

5. Thomas P. Hughes, *Elmer Sperry, Inventor and Engineer* (Baltimore, Md., 1971); T. P. Hughes, *Networks of Power: Electrification in Western Society, 1880–1930* (Baltimore, Md., 1983).

6. Alfred D. Chandler, Jr., *The Visible Hand: The Managerial Revolution in American Business* (Cambridge, Mass., 1977).

7. A. D. Chandler, *Inventing the Electronic Century: The Epic Story of the Consumer Electronics and Computer Industries* (New York, 2001).

8. Philip Scranton, *Endless Novelty: Specialty Production and American Industrialization, 1865–1925* (Princeton, N.J., 1997).

9. Jean-Christophe Agnew, "The Give and Take of Consumer Culture," in *Commodifying Everything: Relationships of the Market*, ed. Susan Strasser (New York, 2003), 14.

10. The literature I cite throughout this paper comes primarily from U.S. business history and history of technology, simply because I write about the United States and am most familiar with this literature.

### In history of technology

The social construction of technology (SCOT) approach that emerged from the sociology of science and technology in the 1980s took the history of technology by storm. After several preliminary works, the movement's manifesto—*The Social Construction of Technological Systems*, edited by Wiebe Bijker, Tom Hughes, and Trevor Pinch—was published in 1987.<sup>11</sup> In it, the editors adopted the notion of social construction from the sociology of scientific knowledge, arguing that technology was not simply applied science and that, like science, it was socially constructed. Consequently, historians and sociologists of technology could no longer simply look at designers and manufacturers of new technological artifacts, or even of entire systems; instead, they needed to look at the whole range of influences shaping technical innovations, including social factors related to the potential users of the technology. Technology was, they claimed, the outcome of variation, selection, and stabilization—in all of which users, as well as other socially relevant groups such as nonusers and government bodies, played an important role. Subsequent edited volumes and monographs have further developed this approach.<sup>12</sup>

The SCOT approach was deplored by some historians of technology as too relativistic—most memorably by David Hounshell, who noted that “the social constructivists have at once brought the history of technology into the postmodern world, have slain the dragon of technological determinism, and have rendered the field incapable of saying much more than ‘all technology is socially constructed.’”<sup>13</sup> Despite some resistance, however, SCOT broadened the focus of much work in this area to include the *demand* side—*users* or *consumers* of technological artifacts—and how such actors helped shape the technologies.

Subscribers to the social construction school generally conceptualize these users as individual consumers. Indeed, Bijker (e.g., in his

11. Wiebe E. Bijker, Thomas P. Hughes, and Trevor Pinch, eds., *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology* (Cambridge, Mass., 1987). Earlier works in this tradition appear, for example, in Donald MacKenzie and Judy Wajcman, eds., *The Social Shaping of Technology* (Milton Keynes, U.K., 1985).

12. See, for example, Wiebe E. Bijker and John Law, *Shaping Technology/Building Society: Studies in Sociotechnical Change* (Cambridge, Mass., 1992); Wiebe E. Bijker, *Of Bicycles, Bakelites, and Bulbs: Toward a Theory of Sociotechnical Change* (Cambridge, Mass., 1995); Nelly Oudshoorn and Trevor Pinch, eds., *How Users Matter: The Co-Construction of Users and Technologies* (Cambridge, Mass., 2003).

13. David A. Hounshell, “Hughesian History of Technology and Chandlerian Business History: Parallels, Departures, and Critics,” *History and Technology* 12 (Sept. 1995): 214.

discussion of bakelite), Ronald Kline (who wrote about rural consumer/user resistance to using telephones as the telephone companies prescribed), and others seemed to use the terms *user* and *consumer* more or less interchangeably.<sup>14</sup> Thus in talking about the role of users, such scholars often focused on consumer products such as Bijker's bicycles and Ruth Schwartz Cowan's household technologies, or on the consumer side of such technological systems as electrical power.<sup>15</sup> Although individual users could be aggregated into more or less formally constituted groups—such as bicycle clubs or loosely defined groups of urban versus rural household consumers—the notion of user is typically taken to refer to individual consumers. Firms enter the picture primarily as the producers and distributors of technological artifacts (e.g., bicycles) or of products of technology (e.g., electricity) to individuals.

Early in a technology's development, according to SCOT proponents Pinch and Bijker, it was defined as having "interpretive flexibility"—that is, various relevant groups, including user groups, had differing understandings of it and through social negotiations could shape its physical configuration.<sup>16</sup> But in the studies in this and subsequent volumes, SCOT scholars typically presented social influences as ending with the "stabilization" of the artifact's form and the rhetorical "closure" of any associated interpretive problems. After stabilization, users were assumed to accept the negotiated understanding and enact it in their actual use of technology, with no further influence on the technology. When technology users are conceptualized as *consumers*, their role was typically seen as ending at purchase; Cowan's "The Consumption Junction," for example, was the temporal and spatial junction at which an individual consumer purchased a new technology for the household.<sup>17</sup> With a few exceptions (e.g., Kline's

14. Bijker, *Of Bicycles, Bakelites, and Bulbs*; Ronald Kline, "Resisting Consumer Technology in Rural America: The Telephone and Electrification," in *How Users Matter*, ed. Oudshoorn and Pinch, 51–66. User and consumer denote and connote different things, however. A *user* is actively engaged with a technology, whereas a *consumer* simply acquires the artifact. This distinction is more significant in looking at technology use.

15. Bijker, *Of Bicycles, Bakelites, and Bulbs*; Ruth Schwarz Cowan, *More Work for Mother: The Ironies of Household Technology from the Open Hearth to the Microwave* (New York, 1983). See also Bijker and Pinch, "Social Construction of Facts and Artifacts," and Cowan "The Consumption Junction: A Proposal for Research Strategies in the Sociology of Technology," both in Bijker, Hughes, and Pinch, eds., *The Social Construction of Technological Systems*, pp. 17–50 and 261–80, respectively.

16. Bijker and Pinch, "Social Construction of Facts and Artifacts," 17–50, esp. 40–46. They draw on H. H. Collins's "Empirical Programme of Relativism" in the sociology of science for this notion.

17. Cowan, "The Consumption Junction," 263.

rural telephone consumers), individuals were assumed to use the technology in line with the producer's expectations.

SCOT's influence on the history of technology has been extensive, and the role of the demand-side users or consumers has become increasingly central to work in the history of technology. Indeed, one of the most recent volumes out of this tradition, Oudshoorn and Pinch's *How Users Matter*, argues that SCOT did not move far enough toward the user side and that users and technology should be seen as "co-constructed."<sup>18</sup> Nevertheless, this approach still typically conceptualizes users as individual consumers and their role as ending after a technology's stabilization, and certainly after the point at which a user purchases the technological artifact.

### In business history

In the past two decades, the demand-side turn has also reached business history. Business historians have been influenced by SCOT literature in the history of technology as well as by other trends coming from social, cultural, and economic history. Recently, many business historians have followed Kenneth Lipartito's exhortation to move beyond internalist business history to integrate broader cultural issues into the field.<sup>19</sup> Thus scholars have looked increasingly at the intersection of business history with cultural history—a nexus where the *consumer*, a term business historians tend to use more often than *user* in talking about items incorporating or made with the aid of technology, plays a major role. In several books and papers, Susan Strasser has provided excellent overviews of consumption as a new arena of study relevant to the history of business and technology.<sup>20</sup> The new consumption history uses a wide variety of perspectives, including those of gender and race from social

18. Oudshoorn and Pinch, eds., *How Users Matter*. This book focuses more on the sociology than the history of technology.

19. Kenneth Lipartito, "Culture and the Practice of Business History," *Business and Economic History* 24 (Winter 1995): 1–42.

20. Susan Strasser, ed., *Commodifying Everything*; Strasser, "Making Consumption Conspicuous: Transgressive Topics Go Mainstream," *Technology and Culture* 43, no. 4 (2002): 755–70; Strasser, Charles McGovern, and Matthias Judt, eds., *Getting and Spending: European and American Consumer Societies in the Twentieth Century* (New York, 1998); and Strasser's entry on "Consumption" in *Encyclopedia of the United States in the Twentieth Century*, vol. 3, ed. Stanley I. Kutler et al. (New York, 1996), 1017–35. For an early example of this literature, see also her *Satisfaction Guaranteed: The Making of the American Mass Market* (New York, 1989). For a more skeptical look at the notion of America's consumer culture, see Louis Galambos, "Myth and Reality in the Study of America's Consumer Culture," in *The Modern Worlds of Business and Industry: Cultures, Technology, Labor*, ed. Karen R. Merrill (Turnhout, Belgium, 1998), 183–203.



history.<sup>21</sup> Even economic history, a less obvious influence on the demand-side turn, has always shown some interest in consumption and demand as a factor in economic development.<sup>22</sup>

Sometimes this consumption history intersects with more traditional concerns of business history. Roland Marchand and Pamela Laird, for example, have brought consumers into the picture by looking at the evolution of advertising.<sup>23</sup> Laird observed that advertising's focus shifted around the turn of the twentieth century from producer-oriented styles, which portrayed the manufacturer's point of view, to consumer-oriented styles, which put the emphasis on consumption rather than on production. Regina Blaszczyk's *Imagining Consumers* showed how consumers, as imagined by fashion intermediaries, shaped technological innovation in the design and production of glass and ceramics.<sup>24</sup> Such works of business history incorporated consumers as interpreted or mediated by others—such as advertising companies and retail buyers.

Just as the SCOT literature has tended to see technology users as individuals, the business history literature has tended to see consumers of technology (or of other products and services) as individuals, who together made up a market for some item incorporating technology or made with technology. Consumers are typically seen as helping to shape the purchased product or service primarily through their aggregated individual purchases or through fashion intermediaries. Strasser pointed out that the consumption literature has gone beyond “visualiz[ing] middle-class urban and suburban

21. For example, see Philip Scranton, ed., *Beauty and Business: Commerce, Gender, and Culture in Modern America* (New York, 2000); Mary Louise Roberts, “Gender, Consumption, and Commodity Culture,” *American Historical Review* 104 (June 1998): 749–82; Robert E. Weems, Jr., *Desegregating the Dollar: African American Consumerism in the Twentieth Century* (New York, 1999); Roger Horowitz, ed., *Boys and their Toys? Masculinity, Class, and Technology in America* (New York, 2001).

22. See, for example, John Brewer and Roy Porter, eds., *Consumption and the World of Goods* (London, 1993); Martha L. Olney, *Buy Now, Pay Later: Advertising, Credit, and Consumer Durables in the 1920s* (Chapel Hill, N.C., 1991); Diane Lindstrom, *Economic Development in the Philadelphia Region, 1810–1850* (New York, 1978); and Maxine Berg, “Consumption in Eighteenth and Nineteenth-Century Britain,” in *The Cambridge Economic History of Modern Britain*, vol. 1, *Industrialization, 1700–1860*, ed. Roderick Floud and Paul Johnson (Cambridge, Mass., 2004), 357–387.

23. Roland Marchand, *Advertising the American Dream: Making Way for Modernity, 1920–1940* (Berkeley, Calif., 1985); Pamela Walker Laird, *Advertising Progress: American Business and the Rise of Consumer Marketing* (Baltimore, Md., 1998).

24. Regina Lee Blaszczyk, *Imagining Consumers: Design and Innovation from Wedgwood to Corning* (Baltimore, Md., 2000).



women” as consumers, now also seeing “working-class and even poor consumers, white and African-American” as well as “men and boys” and even rural consumers.<sup>25</sup> Still, scholars in this school continue to conceptualize consumers as individuals, not as organizations or business enterprises. Moreover, studies of consumption typically focus on how consumer taste—as interpreted by fashion intermediaries and ultimately demonstrated when an individual purchased an artifact—influenced what the manufacturer developed to be sold. This focus may in part reflect our field’s use of the term *consumer* rather than *user*, because the former has a more economic connotation than does the latter, which directs attention to actual use. For whatever reason, *use* of artifacts, if considered at all, is typically an afterthought in the business history literature.

### Redefining Technology Users or Consumers to Include Businesses

With this background, I will first argue that historians of business and technology should redefine technology users or consumers to include business enterprises as well as individuals. Firms (whether large or small) manufacture the goods and technologies that individual users or consumers buy. But many manufactured items—whether themselves technological devices or whether created through production processes heavily dependent on technology—are not intended for individual users or consumers. Rather, many such artifacts (e.g., forklifts and mainframe computers) are created and sold only to other institutional users, whether a business enterprise or a government or nonprofit organization. Others (e.g., laptops and vehicles) are purchased by both organizations and individuals, though generally in very different quantities, for internal use in further production of consumer goods or services. In either case, they are acquired by what in today’s business jargon might be called business-to-business (B2B) transactions.

Historians of both business and technology have long examined the role of government organizations as technology users or consumers. Merrit Roe Smith’s influential *Harpers Ferry Armory and the New Technology* focused on the influence of the military in shaping technological innovation.<sup>26</sup> Richard John’s essay on the post office

25. Strasser, “Making Consumption Conspicuous,” 758.

26. Merrit Roe Smith, *Harpers Ferry Armory and the New Technology* (Ithaca, N.Y., 1977).

and the railway mail service showed how the Postal Service, as a user of the railroads, shaped their development, particularly around scheduling.<sup>27</sup> Much history of digital computers focuses on government's role in shaping the technology and the industry. Kenneth Flamm's *Creating the Computer: Government, Industry, and High Technology*, for example, considered government (particularly the military) as the primary customer shaping computer technology and treated the development of a commercial computer industry only as an afterthought.<sup>28</sup> Paul Edwards combined the history of technology with political, military, social, and cultural history in *The Closed World: Computers and the Politics of Discourse in Cold War America*, which showed how computers came to reflect and in turn shape the thinking of their military users about Cold War America.<sup>29</sup>

Although government users have received frequent attention in this historical literature, commercial firms have very rarely been studied as technology users or consumers.<sup>30</sup> The greater accessibility of governmental than of business records only partially explains why historians have focused more on governmental than on business users, because historians have studied firms as producers extensively, using records from university libraries (e.g., Harvard's Baker Library), private libraries supported by foundations (e.g., the Hagley Museum and Library), and even firms themselves (e.g., MetLife Archives).

Of course, economic and business historians have not ignored this area entirely. Naomi Lamoreaux, Daniel Raff, and Peter Temin noted the growth of long-term relationships between supplier and buyer firms, rather than pure markets or pure hierarchies, as an increasing portion of the economy in recent decades.<sup>31</sup> Such a view would suggest a corresponding need for increased historical emphasis on

27. Richard R. John, "Recasting the Information Infrastructure for the Industrial Age," in *A Nation Transformed by Information: How Information Has Shaped the United States from Colonial Times to the Present*, ed. Alfred D. Chandler, Jr., and James W. Cortada (New York, 2000), 55–105.

28. Kenneth Flamm, *Creating the Computer: Government, Industry, and High Technology* (Washington, D.C., 1988). He mentioned only one commercial firm as a computer purchaser—defense contractor Northrop.

29. Paul N. Edwards, *The Closed World: Computers and the Politics of Discourse in Cold War America* (Cambridge, Mass., 1996).

30. For rare exceptions to this pattern, see James W. Cortada, *The Digital Hand: How Computers Changed the Work of American Manufacturing, Transportation, and Retail Industries* (New York, 2003); and David Caminer et al. *The World's First Business Computer: User-Driven Innovation* (London, 1996).

31. Naomi R. Lamoreaux, Daniel M. G. Raff, and Peter Temin, "Beyond Markets and Hierarchies: Toward a New Synthesis of American Business History," *American Historical Review* 108 (April 2003): 404–33.

relations between supplier and purchaser (or user/consumer) firms. Economic historians Nathan Rosenberg and Christine MacLeod, for example, have both noted the role of user firms in developing particular aspects of machine tools, and Ross Thomson has studied the “learning by selling” process by which users influenced ongoing technological innovation in mechanized shoe production.<sup>32</sup> Business historians have also studied firms such as General Electric, which marketed large-scale technological artifacts to other firms, and Alcoa, which used technology to develop new production processes and aluminum alloys to sell to manufacturing firms making products out of them.<sup>33</sup> Similarly, firms often used products manufactured by Scranton’s specialty manufacturers, and railroads purchased and used the locomotives produced by Baldwin Locomotive Works.<sup>34</sup> Still, the focus in such studies has typically been more on the producer’s side of the equation than on the buyer’s side.

A few noteworthy examples of scholarship look more intensely at the role of user firms in shaping innovation. Several of them center around innovation in the steel industry. Over a decade ago, Janet Knoedler wrote about railroads as “consumers of innovation” in steel products.<sup>35</sup> In *A Nation of Steel*, Thomas Misa traced the influence on steel suppliers of different organizational buyers, from railroads to architects, the military, and automobile manufacturers, showing how firms and other institutions shaped technological innovation in steel.<sup>36</sup> More recently, Steven Usselman’s exemplary book-length treatment of technological innovation in the railroad system provides a detailed chapter exploring the interactions between railroads and the steel companies that supplied them with rails.<sup>37</sup> Although

32. Nathan Rosenberg, *Perspectives on Technology* (Cambridge, U.K., 1976); Christine MacLeod, “Strategies for Innovation: The Diffusion of New Technology in Nineteenth-Century British Industry,” *Economic History Review* 45, no. 2 (1992): 285–307; Ross Thomson, “Learning by Selling and Invention: The Case of the Sewing Machine,” *Journal of Economic History* 47 (June 1987): 433–45; R. Thomson, *The Path to Mechanized Shoe Production in the United States* (Chapel Hill, N.C., 1989).

33. W. Bernard Carlson, *Innovation as a Social Process: Elihu Thomson and the Rise of General Electric, 1870–1900* (New York, 1991); Margaret B. W. Graham and Bettye H. Pruitt, *R & D for Industry: A Century of Technical Innovation at Alcoa* (New York, 1990). Alcoa itself also made some consumer products.

34. Scranton, *Endless Novelty*; John Brown, *The Baldwin Locomotive Works* (Baltimore, Md., 1995).

35. Janet T. Knoedler, “Market Structure, Industrial Research and Consumers of Innovation: Forging Backward Linkages to Research in the Turn-of-the-Century U.S. Steel Industry,” *Business History Review* 67 (Spring 1993): 98–139.

36. Thomas J. Misa, *A Nation of Steel: The Making of Modern America, 1865–1923* (Baltimore, Md., 1995).

37. Steven W. Usselman, *Regulating Railroad Innovation: Business, Technology, and Politics in America, 1840–1920* (Cambridge, U.K., 2002). See, especially, chap. 6.

railroads initially used market power and contract specifications in attempting to gain control over the manufacturing of steel rails, ultimately cooperation among producers and consumers in a viable system of innovation was achieved through industry-wide standards or specifications negotiated by experts through engineering and trade associations. This interaction between firms is only one part of Usselman's broader story, in which railroads produced services that the American public used, but it demonstrates the importance of railroads as *users* of steel, highlighting the mutual influence between buyers and suppliers, technology producers, and large-scale firm users.

Some business history literature about technological innovation in firms producing fabrication materials other than steel also looks more closely at the user role. In their study of technical innovation in Alcoa, Margaret Graham and Bettye Pruitt showed how that firm (and its predecessors) worked with major customers such as electrical power firms to develop new products such as steel-reinforced aluminum cable for high-tension electrical transmission lines; indeed, they demonstrated that Alcoa preferred working with such large enterprises to working with "those small, fractious customers in highly fragmented and volatile markets, the novelty makers, and the cookware manufacturers," that is, small firms with limited technical capability.<sup>38</sup> They also demonstrated that working with and helping a large set of diverse corporate customers in the innovation process, as Alcoa did with companies in developing aluminum rigid container sheet (RCS) for making into cans, carried its own risks, including giving away know-how or undercutting profitability by spending too much on technical support.<sup>39</sup> Graham, this time working with Alec Shuldiner, similarly considered innovation for large-enterprise customers in Corning.<sup>40</sup> They noted that Corning established several formal or informal partnerships with major customers, such as Sylvania for light bulbs and television and automobile companies for catalytic converters, to undertake innovation in glass processes and products that these customer firms used in their products. Again, this strategy held risks as well as rewards (as in the use of Corning's Celcor substrate in catalytic converters, the markets for which were subject to regulations outside of Corning's control).<sup>41</sup>

The works just discussed are welcome exceptions to business historians' dominant focus on the supply side of technology. I would

38. Graham and Pruitt, *R & D for Industry*, 33, 75–97, quotation at p. 75.

39. *Ibid.*, 331–76.

40. Margaret B. W. Graham and Alec T. Shuldiner, *Corning and the Craft of Innovation* (New York, 2001).

41. *Ibid.*, 142, 274, 350–58.

like to encourage more such work and encourage historians to take the work even farther. Right now, such work still ultimately focuses on the suppliers of technology, although these examples consider seriously how customer firms shaped the technology's development. By taking our knowledge of firms as institutions and combining it with the popular demand-side turn, business historians can examine in even more depth the role and influence of firms as buyers and users, not just as producers and sellers, of technological artifacts.

In my recent book, for example, I look at how information technology (IT) user firms in one industry, life insurance, adopted and used pre-computer tabulating technology and then replaced it with early computer technology. The notion of firms as "IT users" was an obvious and familiar one to someone teaching in a business school and familiar with IT research.<sup>42</sup> But I quickly found that this approach was not so obvious to historians of business and technology. After a presentation on life insurance firms as users of early computers, I was stunned when one historian of technology asked me where the "users" were in my story! What he thought of as *users* were the individuals I would label as computer *operators* in this case. Although operators may be interesting in their own right, they did not exercise a primary function attributed to users or consumers in recent literature—acquisition or purchase of the technological artifact. But with large-scale items such as mainframe computers or railroad cars or machine tools, the operator did not decide whether to purchase, or exactly what to purchase—critical decisions at Cowan's "consumption junction." Instead, an organization made up of many individuals with different roles and interactions, in this case a business, made that decision. Moreover, even after the computer had been acquired, the operator did not decide how the computer was to be used (i.e., what applications it would perform) and had nothing to do with programming these applications—other parts of the firm were in charge of these areas. In this case, ignoring all but the operators in examining technology use would miss most of the story.

42. For example, see James L. McKenney, Duncan C. Copeland, and Richard O. Mason, *Waves of Change: Business Evolution Through Information Technology* (Cambridge, Mass., 1995); Linda M. Applegate, F. Warren McFarlan, and James L. McKenney, *Corporate Information Systems Management: Text and Cases* (Chicago, 1996); Daniel Robey, Jeanne W. Ross, and Marie-Claude Boudreau, "Learning to Implement Enterprise Systems: An Exploratory Study of the Dialectics of Change," *Journal of Management Information Systems* 19 (Summer 2002): 17–46; Timothy F. Bresnahan, "Measuring the Spillovers from Technical Advance: Mainframe Computers in Financial Services," *American Economic Review* 76 (Sept. 1986): 742–55.

A brief look at life insurance firms as users of early computers demonstrates that adoption and application decisions involved multiple institutional factors. For example, enterprises typically have rules that govern justifying capital purchases above a certain cost. The Univac large-scale magnetic tape computer, marketed by an acquired division of Remington Rand starting in 1954, was the first computer available to commercial firms. Before an insurance firm could commit to buying one of these computers for \$1.25 million, typically an internal committee had to design an application that would, on paper at least, pay for itself in cost savings within a certain period (the fact that both Metropolitan Life and Franklin Life, the former of which was two orders of magnitude larger than the latter, claimed they could achieve a four-year payback suggests that that period was typical).<sup>43</sup> D. K. Swinnerton of Pacific Mutual, which was closer to Franklin Life than to Metropolitan Life in size, explained the type of Univac application his firm chose by looking at how firm size affected this payback period:

Obviously, a large volume work load is essential if you are to have an economically sound application for a large scale data processing device. Accordingly, it appeared to us that there were two broad general approaches to installing this type of equipment. The size of the company pretty much dictates which of the two approaches would be followed.

First, in a very large company, it is practical to convert the work of one department or one function—the work of a single department having sufficient volume.

Second, in a medium or smaller sized company, the work volume of one department is not adequate. It, therefore, becomes necessary to use a consolidated or combined functions approach. In this manner, sufficient work volume can be achieved by combining a number of related operations.<sup>44</sup>

Thus understanding the system for approving capital expenditures illuminates how such firms chose to use them.

Even more interesting to those studying technological innovation, however, is the comparison of this situation with that faced by the

43. JoAnne Yates, *Structuring the Information Age: Life Insurance and Technology in the Twentieth Century* (Baltimore, Md., 2005), chap. 6. Of course, claiming a four-year payback before computer acquisition was one thing, and showing one afterward was another. Companies spoke at trade associations about the results of their pre-adoption studies but never reported *post hoc* results.

44. D. K. Swinnerton, "Installing a Daily Cycle Data Processing System," *Proceedings of the Insurance Accounting and Statistical Association* (May 1956): 97.

IBM 650, a much smaller card- and drum-based computer developed within IBM and first available to commercial firms in late 1955. Because IBM rented this machine, rather than selling it, and because its rental price (just over \$3,200 per month) was comparable with the rental for already familiar sets of IBM tabulating equipment, the corporate decision-making process to acquire it was much simpler. At a 1955 conference of an insurance trade organization, Glenn O. Head of United States Life Insurance Company described his firm's decision to rent a 650 based on a limited investigation:

In November, 1953, it appeared to us that we could use the recently announced IBM Type 650. Our investigation before ordering the machine was not extensive. We felt that our job was big enough to use a machine of this size, and we had confidence that IBM would build one that would be workable and well serviced.<sup>45</sup>

The key factors were the relatively small size of the 650 combined with U.S. Life's established faith in IBM's reliability and service. According to an automation consultant, Equitable Life Insurance Company of Iowa made its decision to rent a 650 based only on its pricing, which was comparable with that of tabulators they already rented from IBM, and the insurance firm's established practice of standardizing office equipment:

The data processing equipment of different manufacturers was not compared because it is company policy to use only one make of equipment, such as one make of typewriter, one make of adding machine, one make of punched card equipment. The selection of the IBM 650 was justified on the basis that it would replace IBM punched card equipment, either installed or on order, with an approximately equivalent monthly rental.<sup>46</sup>

IBM's knowledge of tabulator rental prices and decision-making processes within firms already renting its tabulators undoubtedly helped it price the 650 so attractively. And it was the small 650 that by 1956 gave IBM the lead over Remington Rand and other competitors in the new computer market.

45. Glenn O. Head, "650 Planning at United States Life," *Proceedings of the Insurance Accounting and Statistical Association* (May 1955): 465-66.

46. R. Hunt Brown, *Office Automation: Insurance* (a loose-leaf handbook published in New York by Automation Consultants, 1959, first revision 1960, in Charles Babbage Institute at the University of Minnesota), Part III, Section D4-1.



Insight into issues such as corporate decision making help us understand not only why users bought particular machines but also why IBM so quickly took over the lead in the new computer market, even though it lagged behind the makers of the Univac in its technology at this stage. Thus business historians, who presumably know more about the institutional structure and processes in business enterprises than historians of technology (or many other historians, for that matter), have an opportunity to expand the realm of technology users into this familiar corporate world. Such an approach encourages us to look at how these user (or consumer) firms influenced innovation, as much social construction and consumer literature has done for individuals. We can also extend the notion that users and technology are “co-constructed,” as Oudshoorn and Pinch argued in *How Users Matter*, from individual to firm users.<sup>47</sup> Moreover, firms purchasing large quantities of what may also be seen as a consumer good or part of a consumer good (e.g., electricity and catalytic converters for automobiles), or very large and expensive technology that is used to produce the end product (e.g., machine tools, main frame computers, and steel rails), have more market power than individual consumers, or than many groups of such consumers, so they are better positioned to influence the technology produced. Studies such as those discussed above reveal the influence of insurance companies, of railroads, and of television and auto makers as users or customers of technology.

Assuming that firms, too, can be customers also opens up opportunities for those who study business functions such as sales and marketing, or technical support services. Business and economic historians have long noted that complex technologies for which customers want support and training require a different type of sales relationship than simple ones.<sup>48</sup> Technologies sold to firms frequently belong to this category. A vendor such as IBM, which rented and later sold tabulating systems and then computers to relatively large firms, had to train its sales force to explain how the technology would solve the purchasing firm’s problems and its service force to support the equipment after its rental or sale. Service forces, in particular, have received little attention in business history, so studies of the role played by them may produce important insights.

These arguments may also hold promise for those business historians who study consumption without emphasizing technology.

47. Oudshoorn and Pinch, *How Users Matter*.

48. For example, Chandler, *The Visible Hand*; and Lamoreaux, Raff, and Temin, “Beyond Markets and Hierarchies.”

Although business and social historians have studied buying habits of and retail selling to individual consumers, only a few historians of sales and/or marketing, such as Walter Friedman, Timothy Spears, and Pamela Laird, have considered wholesale selling of consumer items to retail firms, and even fewer have looked at the purchasing side of the transaction.<sup>49</sup> Looking at the organizational processes around wholesale transactions may illuminate both the production of consumer items by large enterprises and their marketing to and consumption by individuals and firms, as well as the role of wholesale enterprises themselves.

Business historians could also view firms as consumers of items never used by individuals, but sold to and used only by enterprises (e.g., industrial materials, such as chemicals and abrasives, and factory equipment such as forklifts). How do these organizational consumers decide what to purchase? How do they pay for their purchases? What role does a purchasing firm's culture play in the decision to buy and in the subsequent appropriation of the item? What implications do such acquisitions have for the corporate consumers and producers of such items? The history of consumption has looked at symbolic or status values in individual consumption but could also examine the organizational values or culture expressed by enterprises through their purchases and consumption. In the early days of typewriters, for example, some firms purchased them as much or more for their symbolic message of "modernity" as for their functional value, which was not yet well understood.<sup>50</sup> Historian of technology Eric Schatzberg has shown that the cultural symbolism of metal as connoting technological progress influenced engineers and designers of airplanes between the two world wars.<sup>51</sup> Business historians could no doubt add to the story by focusing on cultural and institutional aspects of firm purchasers and users of airplane materials, such as Lockheed.

Thus business historians could take the tools and questions developed to study individual consumption, as well as individual technology use, and apply them to firms as consumers and users. Doing so should offer many new arenas of study while leveraging business

49. Walter Friedman, *Birth of a Salesman: The Transformation of Selling in America* (Cambridge, Mass., 2004); Timothy B. Spears, *100 Years on the Road: The Traveling Salesman in American Culture* (New Haven, Conn., 1995); Laird, *Advertising Progress*. For the purchasing side, see Chandler, *The Visible Hand*, chap. 7.

50. JoAnne Yates, *Control Through Communication: The Rise of System in American Management* (Baltimore, Md., 1989).

51. Eric Schatzberg, *Wings of Wood, Wings of Metal: Culture and Technical Choice in American Airplane Materials, 1914–1945* (Princeton, N.J., 1999).

historians' understanding of how firms function internally and within society.

### Examining Use in Addition to Users

Returning to firms as technology users, I would also urge business historians to look beyond technology users to examine ongoing firm use of such technology. SCOT's useful notion of "interpretive flexibility" is generally assumed to last only until "stabilization" or "rhetorical closure" is achieved—that is, when the form of a particular technological artifact is settled and all previously identified problems have been solved.<sup>52</sup> This is the point at which some contemporary scholars of innovation would say that a "dominant design" has been reached.<sup>53</sup> This assumption is problematic, however, as many uses of technological products and processes continue evolving, either sporadically or continuously, beyond the point at which the technology itself has seemingly stabilized. Consumer products such as aspirin and baking soda (originally stabilized around pain killing and baking and cleansing applications, respectively) began to be used by individual consumers for new purposes (to combat heart disease and to deodorize refrigerators) a century or more after they were originally developed and marketed.<sup>54</sup> Attention to ongoing use is, I would argue, valuable when technology users are enterprises, as well as when they are individuals. Large firms may purchase the same technological artifact but use it quite differently, with different effects on themselves and on future development of that artifact.

Historians focusing on technological innovation in metals processing and products have paid some attention to this issue. We have seen that Misa illustrated the different demands various uses—from carrying trains to fabricating automobiles—put on steel technology and steel suppliers.<sup>55</sup> Usselman, focusing specifically on railroad innovation, demonstrated that even different types and sizes of engines used by firms on different parts of their systems placed differing demands on the steel.<sup>56</sup> Problems with existing rails under

52. Bijker and Pinch, "Social Construction of Facts and Artifacts," 40–41.

53. James M. Utterback and William Abernathy, "A Dynamic Model of Process and Product Innovation," *Omega* 3, no. 6 (1975): 639–56; and James M. Utterback, *Mastering the Dynamics of Innovation* (Cambridge, Mass., 1994).

54. Steve Kahl and JoAnne Yates, "Radical Incrementalism: Factoring Customer Use into Technological Change," Unpublished paper accepted for presentation at the Academy of Management Annual Conference, Atlanta, Ga., Aug. 2006.

55. Misa, *A Nation of Steel*.

56. Usselman, *Regulating Railroad Innovation*.

certain types of use led railroads to pressure steel companies for alternatives and to engage in an extended interaction through professional and trade associations out of which ultimately came the standards Usselman discussed. Similarly, Graham and Pruitt showed that new uses for aluminum by Alcoa's major customers (e.g., electrical power firms) shaped their demands and ultimately Alcoa's process and product technologies. The differences in use in these examples are important both for how they influenced metal formulation and metal working and for what they tell us about the railroads, automobiles, and electrical systems using them.

Ongoing changes in use over time, especially by lead users, are important in other types of businesses, as well.<sup>57</sup> Certainly, military and governmental uses of technologies (e.g., use of CRT bulbs for radar) shaped these users' capabilities and the ongoing evolution of the relevant producer technology (Corning's technology for making the radar bulbs).<sup>58</sup> The notion of "learning by doing," addressed by Lamoreaux, Raff, and Temin in their edited book of this title, also focuses attention on technology use. For example, Kazuhiro Mishina's chapter examines another military contracting case, this time airframe fabrication by Boeing during World War II. It shows that Boeing's productivity gains in B-17 production came well after the firm had made all its changes in production technology, apparently as a result of learning *not* by the individual workers but by the production "system" over time.<sup>59</sup> Ongoing system use was key to the gains, even when the technology was stabilized.

One important innovation in early computing came directly from another military contractor's use and subsequent modification of technology over time. In late 1947 Northrop Aircraft, a major IBM customer with a large tabulating installation for computing guided missile trajectories, connected an IBM 601 electric multiplier to an IBM 405 tabulator (or "accounting machine," as IBM called them at this time) to eliminate a card-handling step in their calculations.<sup>60</sup> This work-around (initially improvised without the help or permission of IBM) increased calculation speed somewhat, but still not as much as Northrop wanted to increase it. Soon Northrop had IBM

57. Eric von Hippel explores the role of lead users in contemporary technological innovation in *The Sources of Innovation* (New York, 1988).

58. Graham and Shuldiner, *Corning and the Craft of Innovation*, 182–95.

59. Kazuhiro Mishina, "Learning by New Experiences: Revisiting the Flying Fortress Learning Curve," in *Learning by Doing in Markets, Firms, and Countries*, ed. Naomi Lamoreaux, Daniel M. G. Raff, and Peter Temin (Chicago, 1999), 145–79.

60. This story is related in C. J. Bashe et al., *IBM'S Early Computers* (Cambridge, Mass., 1986). See also Paul Ceruzzi, *A History of Modern Computing* (Cambridge, Mass., 1998), 19.

replace the 601 with the recently introduced and faster IBM 603 vacuum-tube multiplying punch and connected it to the 405 tabulator and bank of relays, creating an assemblage—referred to within Northrop as a “poor man’s ENIAC”—that could carry out short sequences of calculations without human intervention.<sup>61</sup> Because Northrop was not secretive about this development, other customers soon began asking IBM for such an assemblage. By 1949, IBM had created a product similarly assembled from tabulating devices and was marketing it as the Card-Programmed Calculator (CPC). This device was installed in several hundred commercial firms and anticipated some of the capabilities that computers would soon offer.

My work on life insurance adoption of early computers also reveals how important different uses were in shaping how hardware for the commercial market was originally configured and which hardware vendors were most successful commercially, as well as what software was developed and/or adopted and how such software was used.<sup>62</sup> Life insurance firms saw computers as related to and extending the capabilities of tabulators. Based on long experience with that technology, they, unlike many military and scientific users but like many other commercial users, wanted computers to process a great many transactions with only a small amount of computation per transaction. Input/output and long-term record storage were critically important for their uses. Insurance firms already possessed millions and millions of the 80-column cards used in IBM tabulating equipment—cards that were punched with customer data and that were recognized as legal records by various regulatory bodies. This necessarily conservative user industry, which retained records for as long as a human lifetime, did not want to give up this humanly readable storage medium for invisible electric charges on magnetic tape.

Through direct interactions between potential vendors, on the one hand, and the representatives of insurance firms and associations, on the other hand, this large potential user industry helped shape the configuration of input and output on the early commercial computers. First, Prudential’s Edmund Berkeley convinced Prudential executives to sign a development contract with Eckert-Mauchly Computer Company (EMCC), which was struggling to develop the Univac. This contract, written to reflect Berkeley’s imagined use of the computer in Prudential, required EMCC to develop card-to-tape and tape-to-card converters and to improve output printers. Even more significantly for the evolution of the computer industry, the operational

61. Bashe et al., *IBM’s Early Computers*, 70.

62. Yates, *Structuring the Information Age*, see especially chaps. 5 and 6.

use envisioned by a committee of the Society of Actuaries (an insurance association) attracted many of the small- to medium-sized life insurance firms to IBM's first commercial computer, the small, card-and-drum-based 650, originally intended as a stop-gap measure to keep tabulator customers from jumping to the Univac or another computer until IBM could create its first large computer. When the 650 became a much bigger success than expected, IBM followed up by developing and introducing the even more successful (but still small-scale and card-compatible) 1401, in addition to the larger and more technically sophisticated magnetic tape-based 700 series and 7000 series computers.<sup>63</sup> Small, card-based computers such as the 650 and the 1401 put IBM at the front of the emerging computer industry well before it created the 360 line, which proved its technical sophistication. Once IBM recognized that insurance firms and other commercial customers wanted to use the new computers much as they had used tabulators, it adapted its hardware strategy to that use.

Moving from hardware to software, we find that the very notion of closure in interpretive flexibility is problematic in this realm, because software typically offers users multiple options for exactly how to use it, and users can often change those options over time.<sup>64</sup> In the early days of commercial computing, vendors such as IBM often bundled software with hardware to increase demand for the latter. Commercial users created a demand for general-purpose software routines such as those used to create reports, and several hardware vendors provided libraries of such routines. The life insurance industry accounted for so many tabulator and potential computer customers that IBM developed software for a specific insurance application to attract them to its 1401 computer.

Because the insurance firms that initially adopted computers had struggled with programming them, some other firms in the industry initially held back from adopting computers. IBM took the insurance application initially designed by the Society of Actuaries committee to guide insurance companies' early computer use (called the Consolidated Functions approach) as the basis for developing its '62 CFO (Consolidated Functions Ordinary) application package, a modular set of programs that could be used to integrate multiple functions related to processing individual life insurance policies (including premium billing and accounting, and policy loans). The software was successful in attracting medium-sized firms, which could not afford to adopt a computer for just one function, to the IBM 1401,

63. *Ibid.*, chap. 7.

64. Some programs are more flexible than others, of course.

allaying their fears of incurring the high costs and delays that the pioneering companies had struggled with when they attempted to develop their own software independently.

Even though IBM provided the same software technology to all life insurance firms purchasing its 1401 computer, firms customized and used it in different ways and with different results. Although the committee that developed the original Consolidated Functions approach had stated that it improved performance more through its consolidation of the functions than through the computer's increased speed in performing each function, '62 CFO's modular structure allowed users to adopt as many or as few of the application's modules as they desired and to integrate them only when they wanted to do so. The majority, influenced by insurance's conservative, public service culture, took the most incremental adoption path, transferring functions one by one from tabulating systems directly to the 1401 computer, minimizing disruption by leaving integration until much later (if at all).

Firms with too many policies to be handled by a 1401 running '62 CFO could adopt a bigger IBM computer from the 700 series, but without the software package. Both Equitable Life and Prudential, for example, attempted to program their own versions of the Consolidated Functions application but approached the task in very different ways.<sup>65</sup> Equitable took an explicitly incremental approach like that used by most adopters of '62 CFO. Prudential, in contrast, attempted—unsuccessfully—to integrate its policy-related functions immediately, discovering part way through the troubled implementation that its IBM 650s were paying for themselves, whereas the 700 series computers were not. Adjusting its purchasing decision at this point, it ended up with an unfortunate mix of computers, and its attempted integration was ultimately delayed by almost two decades.

Only by looking at how insurance firms actually *used* the hardware and software they adopted can we begin to understand how it affected them. For example, it helps explain why it apparently took two decades for insurance to realize any cost reductions with the technology. It also suggests one explanation for the “productivity paradox”—the absence of expected productivity gains among user industries investing in IT—that long puzzled scholars of contemporary IT during the 1980s.<sup>66</sup>

Moreover, examining use helps us understand the evolution of the technology itself as well as of the vendor industry. It clarifies why

65. Yates, *Structuring the Information Age*, chap. 6.

66. For an overview of research on the productivity paradox, see Erik Brynjolfsson, “The Productivity Paradox of Information Technology,” *Communications of the ACM* 36 (Dec. 1993): 67–77.



the 80-column card, for example, remained central to computer technology for so long, despite the technological advantages of magnetic tape. It also illuminates IBM's success in making the transition from the tabulator business to the computer business in the 1950s and 1960s, an outcome not expected by most contemporary specialists in technological innovation. Thus examining how firms actually use technology elucidates the suppliers' competitive landscape and the pressures on innovation, as well as user firms' operations.

Business historians who study consumption without an emphasis on technology may also gain from focusing on use, as well as purchase, of goods and services, by individuals or firms. Studying historical use of individual consumer goods poses challenges in obtaining primary sources but may expose trends that shaped subsequent innovations in these and related products. New uses for products like baking soda, as noted earlier, may well have emerged in consumer use long before they were embraced and marketed by producers. Scholars from other fields, including material culture, sociology, and anthropology, but typically not business history, sometimes study the actual use of individual consumer products.<sup>67</sup> Studies of how firms, rather than individuals, actually used equipment they rented or purchased from other firms may be even more fruitful for business historians, illuminating evolving office and manufacturing practices. Although literature from early twentieth-century manufacturers of filing cabinets, for example, recommended that firms keep all files in a centralized filing room (a view reinforced by efficiency experts of the era), in practice, filing cabinets frequently proliferated throughout physical facilities. Focusing on their use reveals that some managers wanted to keep copies of their internal correspondence for later reference, leading to decentralized files which, in turn, encouraged increased internal correspondence in many early twentieth-century firms.<sup>68</sup> Similarly, examining how firms actually arranged and used factory space and equipment illuminates manufacturing processes as well as labor practices in those firms, as Lindy Biggs has shown in her study of *The Rational Factory*.<sup>69</sup>

Thus by taking the notion of technology users and consumers beyond the points of design stabilization and/or technology

67. In her essay on sources in *Imagining Consumers*, Blaszczyk notes that historical "[w]orks that consider the use and meaning of artifacts are few and far between" (p. 358), although she cites many works from nonhistorical fields (e.g., by French social theorist Pierre Bourdieu, American sociologist Herbert J. Gans, and anthropologists Mary Douglas, Baron Isherwood, and Daniel Miller).

68. Yates, *Control Through Communication*.

69. Lindy Biggs, *The Rational Factory: Architecture, Technology, and World in America's Age of Mass Production* (Baltimore, Md., 1996).

purchase, and by recognizing that users continue to shape as well as be shaped by technology and material goods in use, business historians may find that their tools allow them to explore more facets of the business world as well as of human life and material culture.

### Relevance to Contemporary Management

This brings me to my final topic—relevance to contemporary management studies. I believe that focusing on firms as users or consumers and looking more deeply at how they use and shape technology, as well as how they are shaped by it, may make our work more relevant to many scholars of contemporary management. Business history as a field has, in recent years, focused on its relevance to economics and to social and cultural history, but less on its relevance to modern management studies.<sup>70</sup> Although these connections are important to business history, and the connection to cultural history, in particular, energized the turn toward consumption studies in the field, business historians should not ignore the connections to business disciplines. Business history has a long and deep connection to business education in places such as Harvard Business School. Chandler's own work, much of it done while he was at Harvard Business School, certainly had a profound influence on contemporary business fields.<sup>71</sup> His *Strategy and Structure* was required reading in corporate strategy courses for many years.<sup>72</sup> Nevertheless,

70. For relevance to economics, see, for example, Lamoreaux, Raff, and Temin, "Beyond Markets and Hierarchies"; for relevance to cultural history, Strasser, ed., *Commodifying Everything* and Lipartito, "Culture and the Practice of Business History"; for relevance to social history, Angel Kwolek-Folland, *Engendering Business: Men and Women in the Corporate Office, 1870–1930* (Baltimore, Md., 1994) and Juliet E. K. Walker, *The History of Black Business in America: Capitalism, Race, Entrepreneurship* (New York, 1998).

71. Nicolai Foss included excerpts from *Strategy and Structure* in his edited management reader, *Resources, Firms and Strategies* (New York, 1997), and identified Chandler as a seminal contributor anticipating the modern resource-based approach (p. 13). Chandler is also widely cited in strategy, entrepreneurship, evolutionary economics, and international business. See, for example, Jorge Nascimento Rodrigues, "Strategy and Structure Redux," *Business Strategy Review* 13, no. 3 (2002): 20–27; Richard R. Nelson, "Recent Evolutionary Theorizing About Economic Change," *Journal of Economic Literature* 33 (March 1995): 48–90; Bruce Kogut and Udo Zander, "Knowledge, Market Failure and the Multinational Enterprise: A Reply," *Journal of International Business Studies* 26, no. 2 (1995): 417–26.

72. Chandler, *Strategy and Structure: Chapters in the History of the American Industrial Enterprise* (Cambridge, Mass., 1962). This book, of course, was written long before he arrived at Harvard Business School.

as van Fleet and Wren recently pointed out, the teaching of history in business schools has declined in the past two decades.<sup>73</sup> Most business historians would agree that knowing something about the history of business and technology would deepen the business understanding of undergraduate business majors, MBA students, doctoral students, and faculty. In addition, business schools add significantly to the market for new business historians and could add even more. One important way business historians can increase the field's visibility in business schools is to show contemporary scholars in management fields points of connection between our field and theirs.

Expanding our focus to include firms as users or consumers of technological products allows us to connect with work in several business fields, starting with management of technological innovation. Scholars in this field have long been open to historical contributions, because they have both used extended historical examples and argued for the value of history and historical methods to their field.<sup>74</sup> Work by Eric von Hippel and his colleagues has long focused on the important role of users (both firms and individuals) in shaping technology to their own uses, and his 2005 book argues that the trend toward user shaping of technological innovation is increasing, not decreasing, in recent years.<sup>75</sup> Other scholars of technological innovation have also recognized the significant role of user firms.<sup>76</sup> By focusing on user firms, business historians can document an important piece of such user-led innovation historically and produce work that resonates with that of these scholars in business schools who study technological innovation.

Historical work focusing on firms as users or consumers of technology (and other goods and services) will also help us connect with some other areas of management scholarship. For example, some such work is related to contemporary work on supply chain management

73. van Fleet and Wren, "Teaching History in Business Schools, 1982–2003."

74. See, for example, the use of historical examples in Utterback, *Mastering the Dynamics of Innovation*; on the value of history to the field, see Stephen R. Barley, "What Can We Learn from the History of Technology?" *Journal of Engineering and Technology Management* 15 (Sept. 1998): 237–55.

75. von Hippel, *The Sources of Innovation*; Eric von Hippel, *Democratizing Innovation* (Cambridge, Mass., 2005); Pamela D. Morrison, John H. Roberts, and Eric von Hippel, "Determinants of User Innovation and Innovation Sharing in a Local Market," *Management Science* 46 (Dec. 2000): 1513–27.

76. See, for example, Robin Williams and David Edge, "The Social Shaping of Technology," *Research Policy* 25 (Sept. 1996): 856–99; James Fleck, "Learning by Trying: The Implementation of Configurational Technology," *Research Policy* 23 (Nov. 1994): 637–52.

and the flow of raw materials and components from suppliers to manufacturers and of final products to wholesalers and finally retailers, an area which became central to the field of operations management in the 1990s and also has connections to marketing and purchasing.<sup>77</sup> Some scholars of information systems study a related issue—how IT supports and enables connections between buyer and supplier firms in the supply chain—and may be interested in how close buyer–supplier transactions were handled before the technology of the past three decades.<sup>78</sup> In such contemporary research, firms are treated as technology users and/or consumers. Thus expanding our recent focus on the demand side to include firms as users could give our work added resonance among contemporary management scholars in these management areas.

Similarly, we have opportunities to connect to contemporary management scholarship when we work on technology use. Research on how users shape (and are shaped by) technological artifacts beyond the hypothetical point of closure, when the “dominant design” has been achieved, can also enable us to contribute. Although many management scholars in a range of areas have a deterministic view of technology, an increasing number do not. Work in the management of technological innovation highlights the fact that modification to a technology as it is being used shapes subsequent generations of the technology.<sup>79</sup> A growing group of scholars at the intersection of IT and organization studies are looking at differences in how technologies are appropriated by different user organizations such as firms, hospitals, and government institutions.<sup>80</sup> Many

77. See, for example, Charles Fine, *Clockspeed: Winning Industry Control in the Age of Temporary Advantage* (New York, 1999); Sharon Novak and Steven D. Eppinger, “Sourcing by Design: Product Complexity and the Supply Chain,” *Management Science* 47 (Jan. 2001): 189–204. Two journals directly addressing such B2B relationships and transactions began publishing during the second half of that decade: *Supply Chain Management: An International Journal* in 1996 and *Supply Chain Management Review* in 1997.

78. See, for example, Peter Weill and Michael Vitale, *Place to Space: Migrating to E-business Models* (Cambridge, Mass., 2001); Srinivasan Raghunathan and Arthur B. Yeh, “Beyond EDI: Impact of Continuous Replenishment Program (CRP) Between a Manufacturer and its Retailers,” *Information Systems Research* 12 (Dec. 2001): 406–19; M. R. Subramani, “How Do Suppliers Benefit from Information Technology Use in Supply Chain Relationships?” *MIS Quarterly* 28, no. 1 (2004): 45–73.

79. Sonali Shah, for example, studied this process in sports equipment, focusing on communities of individual users rather than on firm users: Nikolaus Franke and Sonali Shah, “How Communities Support Innovative Activities: An Exploration of Assistance and Sharing among End-Users,” *Research Policy* 32 (Jan. 2003): 157–78.

80. See, for example, Orlikowski, “Using Technology and Constituting Structures”; Daniel Robey and Sundeep Sahay, “Transforming Work Through Information

of them study how user firms implement large IT systems (software, such as Enterprise Resource Planning systems, as well as hardware) and are interested in issues such as how a user firm's corporate culture affects the appropriation of technology—a topic business historians can certainly address around earlier generations of technology.<sup>81</sup> These scholars have also shown interest in learning from historical studies.<sup>82</sup>

A relatively small but increasing number of scholars in this area are taking a practice perspective that looks in detail at how people within groups or organizations actually use technology in their everyday work.<sup>83</sup> Practice scholars typically accept many of the assumptions of social construction, mutual influence, and co-construction that underlie much recent historical work on consumption and technology use. By focusing on technology use, by business enterprises in addition to individuals, we can contribute to this strain of modern management scholarship.

To articulate the connections between historical work and contemporary management fields, business historians need to find some ways to communicate to management audiences as well as to other business historians.<sup>84</sup> One method is presenting historical studies at

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Technology: A Comparative Case Study of Geographic Information Systems in County Government," *Information Systems Research* 7, no. 1 (1996): 93–110; Stephen R. Barley, "Technology as an Occasion for Structuring: Evidence from Observation of CT Scanners and the Social Order of Radiology Departments," *Administrative Science Quarterly* 31 (March 1986): 78–108.

81. For example, Robey, Ross, and Boudreau, "Learning to Implement Enterprise Systems: An Exploratory Study of the Dialectics of Change."

82. The interest of such scholars in firm adoption and use of earlier, pre-computer information systems and technologies by firms is demonstrated both by requirements to study that history in the new Information Schools (e.g., University of Michigan's School of Information required doctoral course includes historical readings) and by acceptance of historical symposia by the Organizational Communication and Information Systems (OCIS) Division of the Academy of Management (e.g., "Historical Research: A Method for Today," symposium co-sponsored by the OCIS and Management History divisions at the Academy of Management, Aug. 2003, Seattle, Wash.).

83. Theodore R. Schatzki, Karin Knorr Cetina, and Eike von Savigny, eds., *The Practice Turn in Contemporary Theory* (London, 2001); Wanda Orlikowski, "Knowing in Practice: Enacting a Collective Capability in Distributed Organizing," *Organization Science* 13, no. 3 (2002): 249–73.

84. The conversation should, of course, go both ways. We can and should also learn from the theoretical perspectives used by scholars in business schools. Historians of business and technology have begun to incorporate questions and theoretical frameworks from social scientists in business schools as well as social science departments. Philip Scranton, for example, has drawn on several social theorists (Giddens, Foucault, and Bourdieu) whose meta-theories also underpin some contemporary business literature, as well as on empirical literature by Clifford Geertz, Mark Granovetter, and Paul DiMaggio (see, e.g., Philip Scranton,

meetings such as the Academy of Management.<sup>85</sup> I am currently pursuing another method—coauthoring historical papers with individuals in specific management areas. I have long collaborated with colleagues in IT to study contemporary adoption and use of electronic communication media by individuals and groups, occasionally drawing on historical data for illustration.<sup>86</sup> Recently, however, I have also collaborated with a doctoral student in technological innovation to write a paper in which his theory informs and is informed by historical data and arguments from my study of insurance use of early computers.<sup>87</sup> That paper has been accepted for presentation to the Academy of Management in August 2006, and we also intend to revise it for submission to a major management journal. Although publication in such venues is very difficult to achieve, it is also very visible. I believe that business historians need to try for such visibility to make our methodology more acceptable in business schools. Moreover, if business historians do not make such efforts to reach out to contemporary management fields, the little history that gets incorporated into the management literature and curriculum will come from sociologists rather than from business historians.<sup>88</sup> It is ultimately in our interest to strengthen the field's position in business schools through such visibility.

## Conclusion

In this paper, I argue that business historians have an opportunity to take the demand-side turn farther in two particular areas: (i) redefining

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“Determinism and Indeterminacy in the History of Technology,” *Technology and Culture* 36, no. 2 (1995), Supplement [“Snapshots of a Discipline: Selected Proceedings from the Conference on Critical Problems and Research Frontiers in the History of Technology, Madison, Wisconsin, Oct. 30–Nov. 3, 1991”]: S31–S53). My *Control Through Communication* was influenced by the issues of contemporary IT and *Structuring the Information Age* is informed by structuration theory (Anthony Giddens, *The Constitution of Society: Outline of the Theory of Structuration* [Berkeley, Calif., 1984]), which I came to know through the work of my management school colleague Wanda Orlikowski (see, e.g., her “Using Technology and Constituting Structures”).

85. See, for example, JoAnne Yates, “The Adoption and Use of Computers in Life Insurance: A Historical Perspective,” presented in the 2003 AOM symposium on “Historical Research: A Method for Today,” Seattle, Wash.

86. JoAnne Yates and Wanda J. Orlikowski, “Genres of Organizational Communication: A Structural Approach to Studying Communication and Media,” *Academy of Management Review* 17 (April 1992): 299–326.

87. Kahl and Yates, “Radical Incrementalism: Factoring Customer Use into Technological Change.”

88. See, for example, Mauro Guillen, *Models of Management: Work, Authority, and Organization in a Comparative Perspective* (Chicago, 1994).

technology users to include business enterprises and (ii) looking at technology use beyond the point of apparent closure. Although I have focused on technology use, I believe that scholars of consumption in general can also benefit from these recommendations by applying the techniques of consumption history to firms as well as individuals and by looking beyond the point of purchase to focus more extensively on use by firms and individuals.

Such approaches are not without potential pitfalls. We will need to use our knowledge of the complexities of business enterprises as we examine firms as technology users and consumers. Otherwise, we run the danger of reifying organizations as monolithic rational entities or as larger “individuals,” potentially ignoring the real role of individual agency within organizations. Similarly, we need to be clear about what we are attempting to illuminate as we examine actual firm (and individual) use or consumption. Some of us will be interested in how such use shapes the technology, whereas others will focus on what use tells us about the user. Studying a particular user firm or set of firms will not always reveal a significant influence on a technological artifact, for example. It may, however, still reveal a great deal about the user firm and industry, as well as about firm and national culture and social issues. As we study actual use, we need to be clear about what roles and levels in the firm we are and are not examining, whether for reasons of available documentation or of interest. We do not want to make claims beyond what we can substantiate.

If we expand our research into these new areas, however, I believe that we will increase our points of contact with scholars of contemporary management. By making our work more visible to researchers in business schools, we can help rebuild an important market for business historians—a market that can provide jobs for us now and for our students in the future.

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#### *Unpublished Works*

- Kahl, Steve, and JoAnne Yates. "Radical Incrementalism: Factoring Customer Use into Technological Change." Unpublished paper accepted for presentation at the Academy of Management Annual Conference, Atlanta, Georgia, Aug. 2006.
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