*James W. Cortada*

# Change and Continuity at IBM: Key Themes in Histories of IBM

IBM has been the subject of considerable study by historians, economists, business management professors, and journalists. This essay surveys the various writings on the company, placing their contributions in a roughly chronological account of the company's history, from its early days in tabulating through to its dominance of global markets in computing. The essay includes well-known studies of IBM in addition to more obscure accounts. It emphasizes the need to consider the company's culture along with its technological and managerial changes in order to grasp the reasons for its longevity.

**Keywords:** IBM, Thomas J. Watson Sr., Thomas J. Watson Jr., Arthur K. (Dick) Watson, Herman Hollerith, IBM World Trade Corporation

This essay provides a guide to the voluminous writings on IBM by historians and by others whose work is useful to historians, including IBM employees and management and technology experts. This is a global history and looks at sources in English and in other languages. To do so, it also traces briefly the continuities and discontinuities in IBM's strategy and culture over time, and highlights key events in its history.[1]

[1] For general works on IBM, see Robert Sobel, *I.B.M., Colossus in Transition* (New York, 1981); Saul Engelbourg, *International Business Machines: A Business History* (New York, 1976); James W. Cortada, *Before the Computer: IBM, NCR, Burroughs, and Remington Rand and the Industry They Created, 1865–1956* (Princeton, N.J., 1993); Emerson W. Pugh, *Building IBM: Shaping an Industry and Its Technology* (Cambridge, Mass., 1995). On IBM as part of the computer industry see Jeffrey R. Yost, *The Computer Industry* (Westport, Conn., 2005). On IBM's role in policies, see D. M. Hart, "Red, White, and 'Big Blue': IBM and the Business-Government Interface in the United States, 1956–2000," *Enterprise and Society* 8, no. 1 (2007): 1–34, which includes a useful account of IBM's lobbying efforts; see also Hart's earlier article, "IBM in American Politics, 1970–1999," *Business and Economic History* 28, no. 2 (1999): 49–59; Steven W. Usselman, "Unbundling IBM: Antitrust

To provide an overview of IBM's experience and its historiography, I discuss the company's history in roughly chronological order–and much of the value of the essay resides in the footnotes. These chronological divisions are essentially those adopted by historians and others writing about IBM, but remain rough at best as no one period ended and a new one emerged in a particular year. This essay divides the company's history into five parts: the early history into the 1930s; the tabulating era; the company's move to becoming a computer company; the era of global dominance, 1960s–1980s; and finally the company's embrace of a new culture in response to crisis. This approach, inevitably, causes continuities from one era to another to be overlooked or be too minimized, while transformations might be overstated. To create some continuities, two overarching themes weave through the entire discussion: one, transformations, consistencies, and countervailing tensions in IBM's behavior over time; and, two, the nature of its legendary "strong" culture, what IBM's CEO in the 1990s, Louis Gerstner, critically called "deeply inbred and ingrown."[2]

This essay hopes, also, to bring together the vast literature on IBM that has been created by different disciplines. Historians have been particularly interested in IBM's responses to its relations with governments (especially with that of the United States), with its markets, and with the role of the father-son Watson family that managed IBM from 1914 to

---

and the Incentives to Innovation in American Computing," in Sally H. Clarke, Naomi R. Lamoreaux, and Steven W. Usselman, eds., *The Challenge of Remaining Innovative: Insights from Twentieth Century American Business* (Stanford, 2009): 249–79 which provides an excellent analysis of IBM's antitrust problems; on contemporary comments regarding IBM, International Data Corporation, *IBM and the Courts: A Six Year Journal* (Framingham, Mass., 1975). About economic depressions and wars, see Cortada, *Before the Computer*, 144–48, 189–221. Kevin Maney provides a thorough discussion of the depression years based on Watson's papers demonstrating the firm's creative responses to economic crises and later to world wars, *The Maverick and His Machine: Thomas J. Watson, Sr. and the Making of IBM* (Hoboken, N.J., 2003): xxii, 120–25, 154–56, 189–90, 242, 293–306, 309–14, 389.

[2] Louis V. Gerstner, *Who Says Elephants Can't Dance: Inside IBM's Historic Turnaround* (New York, 2002), 189. On the persistence of culture, see, for the period 1920s–40s, Walter D. Jones, "Watson and Me: A Life at IBM," *IEEE Annals of the History of Computing* 24, no. 1 (2002): 4–18; on 1930s–50s, Ruth Leach Amonette, *Among Equals: A Memoir: The Rise of IBM's First Woman Corporate Vice President* (Berkeley, 1999) and Luis A. Lamassonne on Latin America, *My Life with IBM* (Atlanta, 2000); on 1950s–60s, W. W. Simmons, *Inside IBM: The Watson Years: A Personal Memoir* (Pittsburgh, 1988); on the 1970s and 1980s, James W. Cortada, "Carrying a Bag: Memoirs of an IBM Salesman, 1974–1981," *IEEE Annals of the History of Computing* 34, no. 4 (2013): 32–47; on 1970s–80s, Milton Drandell, *IBM: The Other Side: 101 Former Employees Look Back* (San Luis Obispo, Calif., 1984); David Mercer, *The Global IBM: Leadership in Multinational Management* (New York, 1988), and most familiar to IBM historians, Emerson W. Pugh, *Memories that Shaped an Industry: Decisions Leading to IBM System 360* (Cambridge, Mass., 1984) and Thomas J. Watson Jr., *Father, Son & Co.*, the latter covering the 1930s–1971.

1971.[3] Economists commented on its dominance in both the tabulating and mainframe markets and the implications for antitrust activities.[4] There is a large literature on IBM's research and development, and about its technologies, written by both IBM employees and others outside the firm.[5] Journalists contributed well over half the books published on IBM, often, too, focusing on the role of the two Watsons, or on Herman Hollerith, inventor of punch-card tabulating equipment.[6] Every time IBM ran into financial difficulties, reporters published books forecasting the demise of the firm.[7] Professors of managerial

[3] For example, Steven W. Usselman, "IBM and Its Imitators: Organizational Capabilities and the Emergence of the International Computer Industry," *Business and Economic History* 22, no. 2 (1993): 1–35; Richard S. Tedlow, *The Watson Dynasty: The Fiery Reign and Troubled Legacy of IBM's Founding Father and Son* (New York, 2003); James W. Cortada, *The Computer in the United States: From Laboratory to Market, 1930 to 1960* (Armonk, N.Y, 1993); Watson Jr., *Father Son & Co.*; Lars Heide, *Punched-Card Systems and the Early Information Explosion, 1880–1945* (Baltimore, 2009).

[4] In defense of IBM's market behavior, see Franklin M. Fisher, James W. McKie, and Richard B. Mancke, *IBM and the U.S. Data Processing Industry: An Economic History* (New York, 1983); Franklin M. Fisher and John J. McGowan, *Folded, Spindled, and Mutilated: Economic Analysis and U.S. vs. IBM* (Cambridge, Mass., 1983); critical of IBM, Richard Thomas DeLamarter, *Big Blue: IBM's Use and Abuse of Power* (New York, 1986); and for a broader discussion of IBM's role as part of the U.S. Government's promotion of the computer industry in the 1950s–70s, Kenneth Flamm, *Creating the Computer: Government, Industry, and High Technology* (Washington, D.C., 1988) and his earlier volume, *Targeting the Computer: Government Support and International Competition* (Washington, D. C., 1987); and an often overlooked economic analysis of IBM's performance in the 1950s and 1960s, Alvin J. Harman, *The International Computer Industry: Innovation and Comparative Advantage* (Cambridge, Mass., 1971).

[5] The essential works are Charles J. Bashe, Lyle R. Johnson, John H. Palmer, and Emerson W. Pugh, *IBM's Early Computers* (Cambridge, Mass., 1986), Emerson W. Pugh, Lyle R. Johnson, and John H. Palmer, *IBM's 360 and Early 370 Systems* (Cambridge, Mass., 1991) that look at technological, institutional, and manufacturing aspects of technology development and production; Heide, *Punched-Card Systems and the Early Information Explosion* that contains much about patent fights and innovations prior to the arrival of the computer; the now iconic guide to how to run large IT projects based on the S/360 experience by Frederick P. Brooks Jr., *The Mythical Man-Month: Essays on Software Engineering* (Reading, Mass., 1975); on IBM's AS/400s of the 1980s, Roy A. Bauer, Emilio Collar, Victor Tang, Jerry Wind, and Patrick Houston, *The Silverlake Project: Transformation at IBM* (New York, 1992); and crucial for understanding how IBM's work fit into the broader context of the technical history of computing, Paul E. Ceruzzi, *A History of Modern Computing*, 2nd ed. (Cambridge, Mass., 2003); for a bibliography of many key articles and other material on IBM, Jeffrey R. Yost, *The IBM Century: Creating the IT Revolution* (Hoboken, N.J., 2011), 231–65.

[6] Although the author worked for IBM, he was by training and profession a journalist, who wrote the standard biography of Herman Hollerith, Geoffrey D. Austrian, *Herman Hollerith: Forgotten Giant of Information Processing* (New York, 1982); Maney, *The Maverick and His Machine*; and for an in-depth study of the making of IBM's personal computer (PC) at the start of the 1980s, James Chposky and Ted Leonis, *Blue Magic: The People, Power, and Politics Behind the IBM Personal Computer* (New York, 1988).

[7] Paul Carroll, *Big Blues: The Unmaking of IBM* (New York, 1994) criticizes how IBM managed its PC business; Robert Heller, *The Fate of IBM* (Boston, 1994) blames IBM's troubles in the early 1990s on its mismanagement of the PC business; Rex Malik, *And Tomorrow . . . The World? Inside IBM* (London, 1976) examines World Trade and centralized IBM management; on a forecast that IBM would go out of business, see Charles H. Ferguson and Charles R. Morris,

practices studying IBM came closest to exploring its culture.[8] Many employees wrote memoirs, or studies of specific IBM activities and, with *no* exceptions, placed more emphasis on the role of the firm's culture than historians, economists, or journalists.[9]

I should admit that I am one of those IBM watchers keen on understanding how the firm lasted so long and who, especially, acknowledges the profound influence of its corporate culture. I worked at IBM from 1974 through 2012, holding various sales, consulting, managerial, and executive positions. I have long explored its history. The archival collections on IBM add massively to the substantial body of publications as there are important collections on IBM at the Hagley Museum and Library, the Charles Babbage Institute at the University of Minnesota,

---

*Computer Wars: How the West Can Win in a post-IBM World* (New York, 1993); on the post-2000 period, Robert X. Cringeley, *The Decline and Fall of IBM: End of an American Icon?* (London, 2014).

[8] In addition to writing case studies about IBM's management practices for the Harvard Business School, David B. Yoffie has also written on the history of the firm, *Strategic Management in Information Technology* (Englewood Cliffs, N.J., 1994), 271–89; on the firm's business and product strategy in which he demonstrates how IBM surged in the 1950s–70s, Alfred D. Chandler Jr., *Inventing the Electronic Century: The Epic Story of the Consumer Electronics and Computer Industries* (Cambridge, Mass., 2005), 82–215; D. Quinn Mills and G. Bruce Friesen, *Broken Promises: An Unconventional View of What Went Wrong at IBM* (Boston, 1996) argue that IBM in the 1980s and 1990s got into trouble for reducing quality service to customers and for breaking its long-term full employment practices, becoming arrogant and losing touch with its constituencies. On personnel practices see David L. Stebenne, "IBM's 'New Deal': Employment Policies of the International Business Machines Corporation, 1933–1956," *Journal of the Historical Society* 5, no. 1 (2005): 47–77; Geert Hofstede, *Culture's Consequences: International Differences in Work-Related Values* (Newbury Park, Calif., 1980) which is based on employee surveys done at IBM between 1967 and 1973; for a later study on related themes, see Leonard Greenhalgh, Robert B. McKensie, and Rodrick Gilkey, *Rebalancing the Work Force at IBM: A Case Study of Redeployment and Revitalization* (Cambridge, Mass., 1985). Peter C. Little, an anthropologist, critically examines IBM's role in Endicott, N.Y., in *Toxic Town: IBM, Pollution, and Industrial Risks* (New York, 2014).

[9] Between articles and books (most self-published) there are now scores of sources covering the activities of the firm around the world, largely in the United States. For explaining the culture of the firm, see Mercer, *The Global IBM: Leadership in Multinational Management*, focusing on how management worked in the 1960s–80s; Watson Jr. *Father, Son & Co.*, with special reference to the 1950s–60s; Simmons, *Inside IBM*, dealing with how strategy was developed; F. G. "Buck" Rogers, *The IBM Way: Insights Into the World's Most Successful Marketing Organization* (New York, 1986), covering the 1970s–80s. For IBM in Europe and IBM World Trade Corporation, see the memoirs of a French IBMer who became CEO of World Trade, Jacques Maisonrouge, *Inside IBM: A Personal Story* (New York, 1988); the French original edition has slightly different content, *Manager International* (Paris, 1985), both are quite laudatory of the firm. For insights on engineering and product development, see Garth Lambert, *Fifty Years in Information Systems* (n.p., 2005, 2006) and George J. Laurer, *Engineering Was Fun! An Autobiography* (n.p., 2007), both should be consulted in tandem with a similar memoir by Joseph C. Logue, "From Vacuum Tubes to Very Large Scale Integration: A Personal Memoir," *Annals of the History of Computing* 20, no. 3 (1998): 55–68.

and smaller collections scattered across various academic and government archives, while IBM also has a magnificent corporate archive.[10]

## Early History of IBM, 1880s–1930s

IBM had its start in 1911, called the Computing-Tabulating-Recording Corporation (C-T-R). Not until 1924 did the name change to International Business Machines Corporation. The core that would comprise IBM consisted of the Tabulating Machine Company (TMC), established by Herman Hollerith to commercialize his crucial invention, punch card tabulating equipment. He began renting these in 1890 to government census bureaus on both sides of the Atlantic, later to civilian and military agencies, and to large data-rich enterprises such as banks, insurance firms, railroads, manufacturing, and a few department stores. His biographer portrayed him as a practical inventor and a reasonably effective salesman. Historian Lars Heide emphasized the intense rivalry between Hollerith and James Powers, another inventor of tabulating equipment, altering in the process the prior notion that Hollerith and later Watson essentially had the market locked up. Financier Charles R. Flint acquired the firm in 1911 and then added the other two smaller components he had recently purchased to create C-T-R. Hollerith remained on the board of directors until retiring in 1914. The other firms sold myriad products such as butcher scales, coffee grinders, time recording clocks, and office furniture. Hollerith's part of the business did well in comparison to the others, in part because he faced only one major competitor, the Powers Accounting Machine Company.[11] However, C-T-R was organized as three loosely tied entities, each with their own marketing, sales, and production.

[10] At the Hagley Museum and Library, see records from the Richard Thomas deLamarter Collection of IBM Antitrust Suit Records, 1950–1984, http://findingaids.hagley.org/xtf/search?keyword=IBM (accessed 17 Mar. 2015). The Charles Babbage Institute Archives has multiple sets of archival materials on IBM, see Computer and Communications Association's IBM Antitrust Trial Records, 1969–1982, http://www.cbi.umn.edu/collections/archmss.html (last accessed 17 Mar. 2015). For the most thorough description of IBM, written by its archivist and out-of-date today, Robert E. Pokorak, "International Business Machines (IBM) Archives," in James W. Cortada, ed., *Archives of Data-Processing History: A Guide to Major U.S. Collections* (Westport, Conn., 1990), 121–28.

[11] Austrian, *Herman Hollerith*; Heide, *Punched-Card Systems and the Early Information Explosion*; Lars Heide, "Shaping a Technology: American Punched Card Systems 1880–1914," *IEEE Annals of the History of Computing* 19, no. 4 (1997): 28–41; Friedrich W. Kistermann, "Hollerith Punched Card System Development (1905–1913)," *IEEE Annals of the History of Computing* 27, no. 1 (2005): 56–66. Hollerith continued inventing and interacting with the firm until his death in 1929. Austrian argues that Hollerith and Watson did not always see eye-to-eye on crucial issues, *Herman Hollerith*, 337–39; Cortada, *Before the Computer*, 44–63, 149–54, 228–33. Rowena Olegario, "IBM and the Two Thomas J. Watsons," in Thomas K. McCraw, ed., *Creating Modern Capitalism: How Entrepreneurs, Companies, and*

To improve overall performance, Flint hired Thomas J. Watson Sr. in 1914 as C-T-R's general manager. Watson, then 40 years old, had been a successful sales executive at the National Cash Register Corporation (NCR) with over twenty years of sales experience at the firm. Crucial to the evolution of the future IBM, he brought with him what one historian observed was an "obsessive focus on the marketing function." He imprinted on the firm a sales culture learned at NCR, a firm recognized at the time as one of America's most successful, a leader in the professionalization of selling and marketing. From then to the end of his life in 1956, at age 82, he hired and trained salesmen, organized into sales branch offices, across the United States, Europe, and parts of Latin America and Asia. His direct hands-on approach led him to establish a highly centralized management system headquartered in New York. In time, Watson was seen as the "founder" of IBM; his photograph hung in IBM offices and manufacturing facilities from the 1920s through the mid-1950s. Inside IBM, for nearly a century 1914 was viewed as the founding year of the firm, when Watson came on the scene.[12]

When Watson joined it, C-T-R was a small company. In 1914 the combined three parts generated $4 million in revenues, with a workforce of 1,346, of which only 29 worked outside the United States. Watson used a direct sales force in the United States all through his time at C-T-R/IBM, and largely independent agents in other countries. He only established IBM sales forces in a country once local business had

---

*Countries Triumphed in Three Industrial Revolutions* (Cambridge, Mass., 1995), 349–95. Historians of IBM's early history, routinely overlook the memoirs of Charles R. Flint, *Memories of An Active Life: Men, and Ships, and Sealing Wax* (New York, 1923) and his private papers in the Manuscripts and Archives Division of the New York Public Library. See also, Frederick Lincoln Fuller, *My Half Century as an Inventor* (n.p., 1938). Fuller, better known for his recollections of engineering work at NCR also worked in the early years at C-T-R; his private papers, the Frederick Lincoln Fuller Papers, 1905–1941, are located at the Siscoe Center for American History, University of Texas, Austin. On the sales and management side, see Walter D. Jones, "Personal Observations and Comments Concerning the History and Development of IBM" in Yost, ed., *The IBM Century*.

[12] Maney provides the most complete history of Watson's years at NCR, *The Maverick and His Machine*, 3–35, and for an example based on the stock market crash of 1929, 129–31. The standard text on the professionalization of sales functions, including that of NCR and IBM, is Walter A. Friedman, *Birth of a Salesman: The Transformation of Selling in America* (Cambridge, Mass., 2005), 117–50. See, for example, published on the seventy-fifth anniversary of Watson Sr. joining IBM, "IBM: A Special Company," *THINK* 55, no. 5 (1989), entire issue. For financial data, see Pugh, *Building IBM*, 323–24. For a broad description of his hands-on influence on company practices, see historian Tedlow, *The Watson Dynasty*, 103–26. Similar comments were made by many of the IBM memoirists cited in previous notes. Additionally, the IBM Corporate Archives in Poughkeepsie, N.Y., has hundreds of hours of film (now in video format) of Watson Sr. interacting with IBMers all over the world, while the company magazine, *THINK*, routinely covered his ubiquitous presence. This magazine had started as *Time*, but was renamed *THINK* in 1935, Robert Cousins, ed., *The Will to THINK: A Treasury of Ideas and Ideals from the Pages of THINK* (New York, 1957).

proven sufficient to justify establishment of a company-managed sales branch. The lion's share of revenue came from leasing tabulating equipment and the sale of punch cards. Historians and other observers agree that Watson increasingly focused on the market for these, retreating slowly from those served by the other two parts of the business.[13]

While demand for information handling equipment and other advanced "office appliances" expanded during World War I and throughout the 1920s, C-T-R/IBM faced enormous challenges. As historian Heide explained, the company constantly developed new products to meet varying requirements of customers who had different needs in Europe than those in the United States. Battles over patents first with Powers, later with European competitors, kept the firm in a constant state of heightened uncertainty and tension, in developing and protecting its patents and products. At the same time, its machines became more complex, requiring a well-trained field service staff to maintain them and a sales force that was versed in the features and benefits of these products and who could translate their knowledge into specific solutions.[14]

In the years prior to February 1924, when IBM launched its new name, Watson had experimented with different organizational arrangements. In countries where C-T-R operated, local firms were licensed to use company patents (Great Britain). In other countries, independent agents rented its equipment (the bulk in Europe and Latin America). Over time he established local firms under various names using such words in their names as "Tabulating" or "Watson." In 1924, he eliminated confusion and articulated a very clear message to his employees and customers, with the name IBM.[15] His optimism as a salesman and executive was reflected in the changed name. He believed the demand for automated information handling was enormous and thought the company would have to scale up to meet that supply around the world. This optimistic strategy proved effective during the Great Depression of the 1930s when the firm, still small, contracted with the U.S. Social Security Administration (SSA) for tabulating equipment.

Historians and IBM veterans have considered this transaction as the most important piece of business the company landed in the first half of

---

[13] Tedlow, *The Watson Dynasty*, argues that Watson Sr. first tried to get all three parts of the business "whipped into shape," (75), and profitable (95–96) before concentrating on the tabulating piece of the business (96–97), which by the end of the 1920s dominated IBM's revenues and attention.

[14] An argument made by IBM employees, for example, Jones, "Watson and Me: Life at IBM," 4–18.

[15] The argument is made by Tedlow, *The Watson Dynasty*, 75–76, similarly by Maney, *The Maverick and His Machine*, 89–90, the first based on secondary sources, the latter on Watson's correspondence. Watson, Jr. thought the name was changed to impress customers and the outside world more so than its employees, Watson, Jr., *Father, Son & Co.*, 28.

the twentieth century, because it put the firm on a trajectory for steady growth. Some have characterized this transaction in nearly mythic proportions.[16] As late as 2011, during centennial celebrations within IBM, this message was repeated. Use of IBM's equipment by the SSA led many companies to turn to IBM for the data handling requirements that came out of the Social Security Act of 1935.[17]

During Watson's first decade at IBM (1914–1924), revenues grew from $4 million in 1911 to $11 million in 1924. By that latter year, IBM had a workforce of 3,384 people, of which nearly a third worked outside the United States. By the end of the decade, IBM and Remington Rand dominated the punch-card business. In describing the firm's activities during its first half-century, historians, journalists, and memoirists focused on the core business: tabulating equipment. IBM was now defined outside the company by this class of products, so too by its employees. Watson's personal hand was seen in all major actions of the firm, his office the center of all major and many minor decisions, even for as small as the hiring of an individual salesman on occasion. He visited sales offices, factories, and customers on a seemingly continuous basis for four decades. Before World War II most employees had seen Watson personally, even spoken with him and shaken his hand.[18]

Along with these studies of IBM's rise in the field of tabulating, there is a growing body of historical research on business cultures in these early years. One often overlooked study is Terrence E. Deal and Allan A. Kennedy's book on corporate cultures, which included IBM as a case study.[19] The book explores the creation of a core set of values and the corporate celebration of individuals who seemed to embody those values. They argue this culture was the primary reason IBM could

---

[16] Arthur L. Norberg, "High-Technology Calculation in the Early 20th Century: Punched Card Machinery in Business and Government," *Technology and Culture* 31, no. 4 (1990): 753–79; the sale was unprecedented and had to be implemented quickly, arguments made by authors of IBM's centennial history, Kevin Maney, Steve Hamm, and Jeffrey M. O'Brien, *Making the World Work Better: The Ideas That Shaped a Century and a Company* (Upper Saddle River, N.J., 2011), 313–14.

[17] A consequence of SSA using IBM's equipment overlooked by historians. Additionally, SSA continued to extensively use IBM's technologies in subsequent decades because it had to be compatible with how data was coming into the agency from companies, James W. Cortada, *The Digital Hand*, vol. 3, *How Computers Changed the Work of American Public Sector Industries* (New York, 2008), 142–48.

[18] Watson, Sr. made it a point to walk the shop floors of his factories and laboratories, visit sales branch offices, and host "Family Dinners," dressy affairs held at a local hotel at which the entire employee population, and their spouses, of a city would be feted, normally involving hundreds of people. The IBM Corporate Archives has hundreds of photographs and film of Watson at these dinners and visiting IBM facilities, IBM Corporate Archives, Poughkeepsie, N.Y (hereafter IBMCA).

[19] Terrence E. Deal and Alan A. Kennedy, *Corporate Cultures: The Rites and Rituals of Corporate Life* (Reading, Mass., 1982).

adapt to most changing circumstances over many decades, why the development of cultural/social networks within the firm made it possible for individuals to "get things done" and be effective.

Other scholars have pointed to the limits and even problems of such a strong culture, especially after IBM went through a disastrous several years, beginning in the late 1980s. Jacques Rojot, a senior French business management scholar noted that companies could be constrained by culture, as occurred at IBM where for too long it focused on large mainframes as the technology became more modular, with the emergence of personal computers and "thus [the company] lost ground that was almost impossible to make up."[20]

## The Arc of the Tabulating Era, 1890s–1950s

IBM's "tabulating era" has received considerable attention by scholars over the past twenty years—though not nearly as much as the "computing era" has.[21] Yet, it was the tabulating product line that made it possible for Watson Sr. and a tight circle of long-serving executives and employees to take a relatively small, unknown American firm and gain sufficient size to take on computers with their enormous costs for research, development, and their complexity. To be sure, there were also many tactical tasks to be done, such as development of relevant products (Heide's point), dealing with the U.S. government (Steven W. Usselman's contribution), solid engineering and manufacturing (Emerson Pugh), and excellent sales execution (James Cortada, David Yoffie). By the time IBM dominated that business with the same thoroughness as it did the tabulating market, the culture created earlier remained, but its operations had been significantly transformed, leading to new strategies and structures more familiar to observers and customers of IBM during the second half of the twentieth century.[22]

In order to understand the tabulating phase, it is necessary to review the "product line," as it was not simply one or two machines and punch cards. Tabulating equipment comprised a system of interconnecting and codependent devices. The central business issue for customers and IBM was how to collect, in a cost effective way, the large amounts of data that companies needed to be able to inform decision-making and daily

[20] Jacques Rojot, "Culture and Decision Making," in Gerard P. Hodgkinson and William H. Starbuck, eds., *The Oxford Handbook of Organizational Decision Making* (New York, 2008), 147.

[21] Most notably by three scholars of IBM: Heide, *Punched-Card Systems and the Early Information Explosion*; Tedlow, *The Watson Dynasty*; and Maney, *The Maverick and His Machine*.

[22] Thoughtfully described by an ex-IBM manager and executive, Mercer, *The Global IBM*; also by Watson Jr., *Father, Son & Co.*

operations. This required not just the ability to collect, but to analyze and sort data quickly. To accomplish these tasks required a series of specialized integrated machines. For that purpose, various machines were constantly developed and improved to impose data onto cards (key punches), sorters, and tabulators, which were rapid adding machines that "tabulated" totals and printed results. Other specialized devices, called reproducers or collators, added or deleted cards from a collection.[23] Additionally, IBM sold millions of punch cards, generating about 4 percent of the company's revenues between the two world wars.

To take advantage of the speed and accuracy of such equipment both customers and IBM employees had to understand information requirements, how they needed to be collected, analyzed, sorted, and used, and the economic/business benefits to be derived, since the equipment was complex and expensive. Those circumstances led IBM to develop a sales force that became deeply knowledgeable about their customers' operations and that could explain benefits specific to each organization. Customers became highly engaged with IBM employees to explain what product innovations they needed to better use these devices that had become so essential to their operations. Research and development at IBM depended on this interaction between engineers and customers. This symbiotic relationship also characterized what happened during the era of the mainframe, discussed further below.[24]

IBM was not alone in this field. There were hundreds of providers, not the least of which was the giant in that field of smaller devices, Burroughs Corporation.[25] Most users of IBM's equipment also relied on these smaller devices for less extensive functions and ad hoc small projects. So, customers and IBM employees came to understand in what

[23] Every historian of IBM has provided a summary of the technology. For one of the most detailed, see Heide, *Punched-Card Systems and the Early Information Explosion*, which makes the crucial point about the use of multiple devices in a coordinated fashion, which was also an essential concept of subsequent computer systems. There have been many technical descriptions published over the past century. For an introduction to the literature see, James W. Cortada, *A Bibliographic Guide to the History of Computing, Computers, and the Information Processing Industry* (Westport, Conn., 1990), 107–11 and its sequel, *Second Bibliographic Guide to the History of Computing, Computers, and the Information Processing Industry* (Westport, Conn., 1996), 38–41.

[24] Begin with Kenneth Lipartito, "Business Culture," in Geoffrey Jones and Jonathan Zeitlin, eds., *The Oxford Handbook of Business History* (New York, 2007), 603–28, which also includes an excellent detailed bibliography. While most commentators discussed this issue, the most thorough sources on IBM's post-tabulating sales activities still come from IBM employees. Key sources include Mercer, *The Global IBM*, especially 179–90; Rodgers, *The IBM Way*, and Cortada, "Carrying a Bag."

[25] There is not a formal biography of the firm written by a historian. For a short history of the firm, see James W. Cortada, *Historical Dictionary of Data Processing: Organizations* (Westport, Conn., 1987), 85–92; however, the corporate archives for Burroughs, held in the Burroughs Corporation Records (CBI 90), is housed at the Charles Babbage Institute Collections, University of Minnesota, Minneapolis. It is an extensive and important collection.

circumstances one type of device versus another made sense, complicating the process of persuading customers to adopt IBM's products, especially as a customer's dependence on large volumes of data increased.[26]

As the field of data collection grew, C-T-R/IBM broadened its base of customers, largely in the United States in the beginning, but later in Europe too. It became possible for the firm to expand the variety of information collected and cataloged by firms. One list of substantive innovations cataloged twenty four of these between 1917 and 1939, with nearly half introduced during the years of the Great Depression.[27] Innovations were driven at least as much by customer requests as by the need to respond to competitors, such as the few tabulating firms (Powers Accounting Machines Company, later part of Remington Rand, and Machines-Bull) and the large number of office appliance firms. These behaviors reinforced historian Heide's contention that there was much innovation even though IBM dominated the market for such products during a global depression.

Research and development was a crucial activity at IBM, despite its pervasive sales orientation. It was not uncommon for the corporation to devote 6 or more percent of its operating budget to this activity. IBM conducted its R&D like many other large American corporations. In the early decades, development and production were located in Endicott, New York, at Plant No. 1. During the 1920s and 1930s, additional facilities in Europe provided localized products and development. Engineers and production staff collaborated, while customers visited to do the same. But, because of the complexity of the uses to which the technology was applied, IBM, like other firms, established more formal development laboratories, including academic partnerships. Historian Glenn Porter demonstrated that unique requirements of a large company's customers often provided the impetus for their establishment, particularly for complex engineering, scientific, and technological products, as encountered by electrical and chemical firms, and office appliance manufacturers, such as IBM. A pattern of managing R&D that linked together manufacturing, sales, and customer feedback developed at IBM and survived intact into the twentieth century. Interaction among these

---

[26] JoAnne Yates has argued that these various technologies were massively embraced, including paper products such as folders and 3 x 5 cards, while James Beniger has articulated the case for using these to help control ever-larger enterprises long before the arrival of the computer. JoAnne Yates, *Control through Communication: The Rise of System in American Management* (Baltimore, 1989) and *Structuring the Information Age: Life Insurance and Technology in the Twentieth Century* (Baltimore, 2005); James R. Beniger, *The Control Revolution: Technological and Economic Origins of the Information Society* (Cambridge, Mass., 1989).

[27] Robert H. Gregory and Richard L. Van Horn, *Data-Processing Systems: Principles and Procedures* (Belmont, Calif., 1960), 628–29.

constituencies remained dynamic as business, technological and economic circumstances changed, and new competitive forces engaged.[28]

The ability, even the willingness of IBM to evolve, has only briefly caught the attention of historians looking at the company's response to its growing presence in the computer business in the late 1950s and its response to the personal computer (PC) in the 1980s.[29] Memoirists and reporters, however, fixated on the rate of IBM's response to emerging markets.[30] Well understood was Watson's "contention management" style in which various organizations and individuals could vote down an idea, forcing a slowdown as they haggled over the issues. Use of dual teams to work out solutions to the same problem were integral to this process, as yet another way to bring out the best thinking and work of Watson's employees. One business management professor who studied this process concluded that the "competitive, results-oriented environment produced functional excellence."[31] Organizational changes and the way these were implemented throughout the century had essentially been worked out during the 1920s and 1930s at IBM. An internal IBM study conducted to document some of these changes for the period 1911 to 2004 cataloged transformations of 177 organizations that were minimally the size of a division or a wholly owned subsidiary.[32]

Pushing these internal transformations was senior management. During the tabulating era, the central force for change were the actions taken by Watson as he created IBM's culture, its way of doing things that resulted in organizational changes.[33] Business management professor David B. Yoffie captured the essence of Watson's role when he argued

[28] Glenn Porter, *The Rise of Big Business, 1860–1920* (Wheeling, Ill., 1992), 55–56. For an excellent account of early technology projects at IBM, written by an engineer/historian, Pugh, *Building IBM*, 37–87; Jean Ford Brennan, *The IBM Watson Laboratory at Columbia University: A History* (White Plains, N.Y., 1971). Reinforced in the accounts of the construction of IBM's computers by IBM engineers, Bashe et al., *IBM's Early Computers* and Pugh et al., *IBM's 360 and Early 370 Systems.*

[29] Historians have discussed these situations, but not specifically the rate of response: Why was IBM not the first, or earliest, in some cases in responding to new circumstances? Was there intent behind slow response, or was it the inertia of a large organization, or some other cause? We do not yet have an empirical answer to what is an essential question regarding the firm's performance over the past seven decades.

[30] For a detailed analysis of how many vendors, not just IBM, responded to the arrival of the computer in the 1950s–60s, which begins to discuss related issues, see Cortada, *The Computer in the United States*, 64–101, and for how the public and users responded, see 102–24.

[31] Yoffie, *Strategic Management in Information Technology*, 272.

[32] Ken W. Sayers, "A Summary History of Selected IBM Divisions and Business Units, 1911–2004," IBMCA; also available at Charles Babbage Institute, University of Minnesota, Minneapolis.

[33] The two IBM scholars who have most thoroughly explored his role in recent years are Tedlow, *The Watson Dynasty*, and Maney, *The Maverick and His Machine*, but universally historians and journalists commenting on the first half century of IBM credit Watson Sr. with being the primary driver in shaping the culture, organization, and strategy of the firm.

that, "perhaps most important to Watson Sr. was his belief that people were IBM's most valuable assets." Watson replaced managers with new ones who treated employees with respect, who valued company ideas, and who were committed to providing customer service.[34] Watson reinforced employee bonds to IBM by paying executives well, providing insurance and other benefits, and mandating continuous training.[35] Turning to Yoffie once again, "Watson Sr. and his successor, Thomas Watson Jr., went on to create a work environment that rewarded winners and sought the highest possible standard of performance."[36] Watson Jr. codified this philosophy in a 1963 book routinely issued to IBM employees for the next thirty years.[37] Historians noted the contention system developed before World War II.[38] Sales offices, districts, and individual salesmen competed for bonuses, promotions, and recognition, as well. These actions became foundation blocks for IBM's culture.

Historian Usselman, while examining IBM's performance in the post-tabulating era, called out the special care with which IBM dealt with the U.S. government.[39] Many of his observations apply just as well to other national governments, most notably the largest of these: Great Britain, France, and Germany, and to a lesser extent to Japan, Sweden, Italy, Spain, Mexico, Brazil, and Argentina.[40] While historians and journalists

---

[34] Yoffie, *Strategic Management in Information Technology*, 272.

[35] Of these three initiatives, the least understood is IBM's training, which has not been studied by business historians. For an introduction to the issue, see Jones, "Watson and Me: A Life at IBM," 4–18; on events in the 1910s–30s, Mercer, *The Global IBM*; on the 1960s–early 1970s, Rodgers, *The IBM Way*; on the 1970s–early 1980s; James W. Cortada, "'There Is no Saturation Point in Education': Inside IBM's Sales School, 1970s–1980s," *IEEE Annals of the History of Computing* 37, no.1 (2015): 56–66.

[36] Yoffie, *Strategic Management in Information Technology*, 272.

[37] Thomas J. Watson Jr., *A Business and Its Beliefs* (New York, 1963), which remained in print into the early 2000s. Under his chairmanship and after, other collections of corporate statements on policy, practices, and philosophy were published in the thousands and distributed to IBM employees. The most important of these was IBM, *Thirty Years of Management Briefings, 1958 to 1988* (Armonk, N.Y., 1988), which was distributed to managers at all levels and published in other languages, as was Watson Jr.'s book. For the entire IBM population, dozens of pamphlets and booklets had been published throughout the century in various languages describing the firm, its philosophy and behavior, for example, IBM, *IBM: About Your Company* (Armonk, N.Y., 1977), which by then had expanded to over 120 pages. These were anthologies of speeches and editorials of the senior Watson published both internally (e.g., in *THINK* magazine) and externally, Thomas J. Watson Sr., *Men, Minutes and Money* (New York, 1927, 1930), *As a Man Thinks* (New York, 1936), and *Human Relations* (New York, 1949). Each are lengthy volumes, essential for understanding his thinking and are core sources on the formation of IBM's corporate culture.

[38] For an insider's view of the contention system, see Watson Jr., *Father, Son & Co.*, 288–89; also, Sobel, *IBM*, 215. Most memoirs of the S/360 product development experience frequently spoke about rivalries, largely based on differences of opinion, which was not the same as assigning the same problem to two different groups to resolve.

[39] Usselman, "IBM and Its Imitators," 1–35.

[40] On a major role for IBM World Trade, see Nancy Foy, *The Sun Never Sets on IBM: The Culture and Folklore of IBM World Trade* (New York, 1975); James W. Cortada, *The Digital*

have long recognized that IBM's relations with the U.S. government were important, they speak of the firm's relations almost as with one voice. Perhaps a convenient shorthand use of phrases, but it could be misleading. In reality, relations proved more complex.

IBM employees treated large governments as ecosystems or communities comprised of different departments and agencies. In the case of IBM and the United States government, its first customer was the Bureau of the Census and then one by one other agencies and departments were won over during the next half century. While the sales force engaged with those customers, executives, and most notably Watson Sr., cultivated relations with senior public officials, such as American presidents and European national leaders, including infamously Adolph Hitler.[41] Another facet of IBM relations involved regulators, most specifically during the tabulating era the U.S. Department of Justice, which expressed antitrust concerns involving the monopolistic sale of punch cards and other terms and conditions. This led to flare-ups in the mid-1930s and to a formal Consent Decree, signed in 1956. Missing during this early period, but in full force during the later years of the mainframe era, was a formal lobbying initiative in Washington, D.C.[42] Similar patterns of these three forms of interactions existed in Europe and in Asia, where there were multiple customers within a government, relations cultivated by Watson and senior local IBM leaders with public officials, and extensive negotiations with regulators.[43]

---

*Flood: The Diffusion of Information Technology Across the U.S., Europe, and Asia* (New York, 2012). The former documents such behavior worldwide in the 1940s–early 1970s, the latter through the early 2000s; Maney describes such efforts in the Watson Sr. period, *The Maverick and His Machine.*

[41] Relations with Hitler became a contentious issue when a researcher specializing in the role of corporations "collaborating" with Nazi Germany published a book on IBM's role, see Edwin Black, *IBM and the Holocaust: The Strategic Alliance Between Nazi Germany and America's Most Powerful Corporation* (New York, 2001). IBM's worldwide revenues during the period of greatest concern to Black (1933–1942) increased from $17 million to $86 million, with the bulk generated in the United States. Pugh, *Building IBM*, 323. For other perspectives on IBM and Nazi Germany, see Jacques R. Pauwels, *The Myth of the Good War: America in the Second World War* (Toronto, 2002): 37, 71–72, 194–95, 198, 200–3; Maney, *The Maverick and His Machine*, 205–7, 218, 222, 293, 411; while Tedlow gives the issue only a passing nod, quoting Watson Jr. who thought his father was simply naive about Hitler and that he (Sr.) did not harbor any anti-Semitic feelings, *The Watson Dynasty*, 128; for more details on specific IBM-German and European activities, see Foy, *The Sun Never Sets on IBM*, 29–35.

[42] For an authoritative discussion on the topic, see Hart, "Red, White, and 'Big Blue,'" 1–34. Historians have given too little importance to this consent decree that started forcing IBM management to define and control sales and marketing behavior. As late as the 1980s, even after the settlement of the major antitrust suit against the firm, IBMers still had to abide by the terms of the 1956 agreement.

[43] A series of publications by Steven W. Usselman have explored many of these issues, calling attention to their importance, "Unbundling IBM: Antitrust and the Incentives to Innovation in American Computing," 249–79; "Learning the Hard Way: IBM and the Sources of

In part because of these multiple levels of engagement with governments and companies, revenues grew from $38 million (1939) to a peak of $140 million (1944), then closed 1945 at $138 million. This growth was also reflected in the number of employees. In 1939 IBM had 8,602 workers in the United States, 12,656 worldwide. It ended 1945 with 14,476 in the United States and 18,257 worldwide. Peacetime expansion stimulated massive growth of IBM, while it was still living largely in its tabulating era: $266 million in revenue and $37 million in profits in 1950 with a worldwide workforce of 30,261, of which two thirds resided in the United States. In short, between 1936 and 1950, the number of employees tripled, while revenues grew tenfold.[44]

## IBM Becomes a Computer Company, 1940s–1960s

Well over half the literature on IBM concentrates on the post–World War II period.[45] Historians and other observers initially became interested in IBM largely because of what occurred during the period of the 1950s through the 1980s, when the firm experienced four transformations: its entry into the mainframe computer market and its domination (garnishing 70–80 percent of the market); global expansion and evolution into a large multinational corporation; endurance of a twelve-year antitrust suit filed by the U.S. Justice Department that nearly led to the breakup of the company, and related other antitrust suits filed by competitors; and, finally, a series of mishaps and successes with products, ranging from being accused of "missing" the minicomputer revolution to successfully entering the PC market before being outflanked by rivals. The company began the 1950s with momentum, expanded enormously, but ended the 1980s entering a period that came widely to be described as a "near-death" experience.[46]

---

Innovation in American Computing," in Naomi R. Lamoreaux and Kenneth Sokoloff, eds., *Financing Innovation in the United States, 1871 to the Present* (Cambridge, Mass., 2007), 317–63; "Fostering a Capacity for Compromise: Business, Government, and the Stages of Innovation in American Computing," *Annals of the History of Computing* 18, no. 2 (1996): 30–39; and "Selecting Flexible Champions: Markets, Firms, and Public Policies in the Evolution of Computing in the U.S., U.K., and Japan," *The Journal of Business Studies (Ryukoku University)* 35, no. 1 (1995): 27–43; Cortada, *The Digital Flood*, 207–15.

[44] Pugh, *Building IBM*, 323–24.

[45] Largely the thesis of historian Engelbourg, *International Business Machines*, written in the early 1950s. A senior executive working at IBM in the late-1940s and throughout the 1950s, James W. Birkenstock, wrote about the transition out of tabulating into computing equipment, linking it to the size, structure, and proposed mission of the firm, that is essential to the study of IBM's history in this period. See Birkenstock, "Pioneering on the Frontier of Electronic Data Processing, A Personal Memoir," *IEEE Annals of the History of Computing* 22, no. 1 (2000): 4–47; Yost, *The IBM Century*, 231–65.

[46] The idea stemmed from the fact that IBM quickly flipped from being profitable to unprofitable in 1990 (last profitable year) and was followed by several years of losses in

The most important transition to follow IBM's commitment to tabulating equipment was senior management's move into the computer business. Much has been written about this move, but Watson Jr. provided the most complete account in his memoirs, in which he argued that it was a slow process unfolding during the late 1940s and during the first half of the next decade with young engineers (and himself) in favor of IBM's entry into this market, while an old guard aligned with Watson Sr. urged caution or resistance. Historians, officials, and reporters essentially aligned with his account but added the support provided by various U.S. government agencies, notably the Army, Navy, and Department of Defense, that were absorbing a considerable amount of the risk of the transformation process by funding early R&D, then acquiring systems needed to prosecute the Cold War.[47]

IBM, and other computing firms, contributed to the realization that there existed a commercial market for such products, then moved relatively quickly into that business after the mid-1950s with the result that, by the early 1960s, IBM had become a major provider of such products. The firm learned how to mass-produce these in the hundreds then thousands. Innovations in product design and production led to declining costs for these systems for customers while encouraging the launch of multiple lines of computers that were, however, not compatible. That problem began raising the cost of conversion to larger, newer systems for customers as they became increasingly reliant on computing by the early 1960s, thereby setting up a technical crisis for all vendors and their customers. IBM eventually solved this problem with the

---

earnings. *IBM Annual Reports,* IBMCA. Journalist Robert Heller, *The Fate of IBM*, blamed IBM's inability to sell PCs for a profit as the cause of the problem; business management professors have been reluctant to comment extensively yet on this period, with the notable exception of Yoffie, who had access to IBM's CEO of the period, John Akers, and, thus, is a major source on his thinking and actions; unfortunately Yoffie, *Strategic Management in Information Technology*, 278–89, took the story only to 1991, ending it before the massive decline that led to the ouster of Akers.

[47] Other IBMers filled in details on the complex decision to get into computers and launch this new line of business. See Charles J. Bashe, "The SSEC in Historical Perspective," *Annals of the History of Computing* 4, no. 4 (1982): 296–312; Cuthbert C. Hurd, "Early Computers at IBM," *Annals of the History of Computing* 3, no. 2 (1981): 163–82; J. C. McPherson, F. E. Hamilton, and R. R. Seeber Jr., "A Large-Scale General Purpose Electronic Digital Calculator—The SSEC," *Annals of the History of Computing* 4, no. 4 (1982): 313–26; Byron E. Phelps, "Early Electronic Computer Development at IBM," *Annals of the History of Computing* 2, no. 3 (1980): 253–67; G. R. Trimble Jr., "A Brief History of Computing: Memoirs of Living on the Edge," *IEEE Annals of the History of Computing* 23, no. 3 (2001): 44–59 and his earlier, "The IBM 650 Magnetic Drum Calculator," *Annals of the History of Computing* 8, no. 1 (1986): 20–29. Flamm, *Creating the Computer*, and *Targeting the Computer*, which make clear how important the Federal Government's support was in funding early computer developments at IBM; Paul N. Edwards, *The Closed World: Computers and the Politics of Discourse in Cold War America* (Cambridge, Mass., 1996), which argues that computing and the military comprised a closed world intimate and dependent on each other.

introduction of the S/360 family of computers. An alternative, not incompatible interpretation held that competitive forces compelled IBM to finally address this problem, leading to the S/360.[48]

Its early initiatives generated several results. First, the shift from tabulating to computing occurred in an evolutionary manner, involving peripheral devices and technologies used in earlier times deployed with computers, such as the use of "IBM" punched cards and associated hardware (key punches, sorters, and printers).

Second, the kind of employees required to sell systems needed skills different from those needed by salesmen and technicians selling tabulating equipment. Management replaced both sales and production staff with more college-educated employees, especially with engineers more familiar with the electronics that had emerged during World War II. The Watson Sr. old guard retired as they aged or were pushed out. All of these changes began by the start of the 1950s when, for example, computer-savvy engineers were hired in quantity at the combined Poughkeepsie, New York plant and laboratory; salesmen later in the decade.

Third, financial and organizational shifts resulted in dramatic changes. In 1950, just over 30,000 people worked for IBM worldwide; in 1963 (by which time IBM was reporting what percent of its revenues now came from computers) its workforce had expanded to 137,612 employees. Worldwide revenues in 1950 came in at $266 million, at over $2.8 billion in 1963. Most of the early revenues from computing originated in the United States during the 1950s, with annual cash flows climbing steadily by over half by the mid-1950s to just over $2 billion in 1963.[49]

After Watson Jr. became head of the company in the mid-1950s he began to reorganize the firm to handle its growth. In 1959, the organizational form the company held essentially for the next three decades emerged, with a sales division to sell computers, called the Data Processing Division (DPD), and other product-oriented divisions, such as Office Products Division (OPD) to sell typewriters and related products, and manufacturing divisions aligned by products as well. While most chronologies of the firm's history leave this transformation out of their

---

[48] The argument that a commercial market existed and how it was pursued are themes described by Arthur L. Norberg, *Computers and Commerce: A Study of Technology and Management at Eckert-Mauchly Computer Company, Engineering Research Association, and Remington Rand, 1946–1957* (Cambridge, Mass., 2005). The near-definitive description of how that happened, based on extensive primary sources at IBM, is the very large book by Bashe, Johnson, Palmer, and Pugh, *IBM's Early Computers*; explained by Martin Campbell-Kelly, William Aspray, Nathan Ensmenger, and Jeffrey R. Yost, *Computer: A History of the Information Machine*, 3rd ed. (Boulder, Colo., 2014), 124–27.

[49] Still best described by Pugh, *Building IBM*, 324, 326.

lists, it is one that profoundly affected how the firm went to market making it worth further study.[50]

Various interpretations surfaced to explain IBM's transition during the 1950s and early 1960s, none of which were necessarily mutually exclusive. Jeffrey Yost argued that the firm's ability to acquire necessary scientific and technological expertise in the construction of computers proved crucial. Others contended that IBM mimicked its competitors, citing its late arrival into the market. But in time, the tables turned, as rivals mimicked IBM's approach, particularly in the 1960s and 1970s. Watson Jr. attributed the transition's success to his superior workforce's selling approach.

Historical works have documented the uncertainty of this transition. Pugh, who spent his IBM years on the research and development side of IBM, described the risks, while calling out the uncertainties and difficulties of developing and selling this new class of products in four books.[51] Historian Alfred D. Chandler Jr.'s own research reaffirmed this sense of urgency, uncertainty, complexity, and extensive competition surrounding the emergence of IBM's dominant position in the market. It was one that the company aspired to, planned for, but wasn't certain it could achieve.[52] Employee memoirs confirmed the uncertainty yet ultimately profound transformation that IBM underwent. IBM employees recalled years of seventy-hour work weeks, high levels of stress, yet personal earnings in excess of what they had enjoyed in the 1940s and 1950s, particularly in the 1960s.[53]

## Global Dominance of Mainframe Computing, 1960s–1980s

Especially risky was the development of the IBM S/360 family of computers. Chandler called these systems one of the most important

---

[50] For one for example, since IBM's own internal chronologies often omit this event, see Yost, *The IBM Century*, 225, his recent and excellent chronology. For a source not generally available, see "IBM Highlights, 1885–2006," the only chronology I found acknowledging the reorganization, Dec. 2001, IBMCA. Watson Jr. became president in 1952 but was not his own man, as Watson Sr. held the post of chairman. Not until his father died in 1956 did he finally have full control of the top leadership position. The best account of these reorganizations comes from the author of that change, Watson Jr., *Father, Son & Co.*, 284–99.

[51] Pugh, *Building IBM*; Pugh et al., *IBM's Early Computers*; Pugh et al., *IBM's 360 and Early 370 Systems*; and the often least cited but perhaps most insightful of Pugh's studies on what may turn out to be the most technologically innovative period in IBM's history, *Memories that Shaped an Industry*.

[52] Chandler, *Inventing the Electronic Century*, 82–176.

[53] For citations of articles by engineers, Yost, *The IBM Century*, 231–54. In the early 1970s I was regaled with hundreds of stories about engineering, sales, and support during the 1950s and 1960s, others by customers and users, the two latter communities normally overlooked in the accounting for IBM's technological history of the period.

products in American history.[54] Almost universally, observers of the history of IBM and the computer industry agreed with that assessment for both positive and negative reasons. Yet, when the company began its development in the early 1960s, most prudent employees would have forecasted its failure, due to its aggressive ambitions and complexity. They were almost right, because of its complexity, frustrating technological problems, enormous expense (estimated at $5 billion in 1960's dollars), and time-consuming evolution. While many early IBM computers were "game changers" in the industry, such as the 701/702, SAGE, 650, and 1401 among others, they paled in significance when compared to the System 360, which, when announced in April, 1964, comprised 5 compatible different sized computers and some 150 other related interchangeable peripheral equipment and software products, what leading historians of computing called a technological "revolution."[55]

IBM went from being a middling size company to a giant international corporation in less than a decade as a result of the success of this product line.[56] The computer industry grew at double-digit rates through the 1960s, too, as product providers mimicked IBM's computer lines and technological designs and customers strongly embraced this new generation of computers. Almost all systems built in the Soviet Union were either exact copies of these systems or built on them for over two decades, adding to the diffusion of this new class of computing.[57] Ultimately, perhaps most importantly, use of computers by large organizations took off in the 1960s, and in the process IBM dominated 70 to 80 percent of almost all national markets in the industrialized world for mainframe computing.[58] This all happened rapidly, in the space of one decade in most countries, in fifteen years in less developed

[54] Chandler, *Inventing the Electronic Century*.

[55] In addition to the Pugh volumes, which constitute the primary source on the technical history of the S/360, see Carliss Y. Baldwin and Kim B. Clark, *Design Rules: The Power of Modularity* (Cambridge, Mass., 2000), which explores features of the S/360's architecture; and by participants, B. O. Evans, "System /360: A Retrospective View," *IEEE Annals of the History of Computing* 8, no. 4 (1986): 155–79; J. E. O'Neill, "'Prestige Luster' and 'Snow-Balling Effects': IBM's Development of Computer-Time Sharing," *IEEE Annals of the History of Computing* 17, no. 2 (1995): 50–54; and Campbell-Kelly et al., *Computer*, 124–33, one of the most useful accounts of the S/360 today.

[56] Revenues grew from over $3.5 billion in 1965 (the first year S/360s were put on leases) to $7.5 billion in 1970, while the number of employees grew from more than 172,000 to more than 269,000, essentially growing the company's physical presence by half again in a half dozen years, Pugh, *Building IBM*, 324.

[57] Richard W. Judy and Robert W. Clough, "Soviet Computers in the 1980s: A Review of the Hardware," *Advances in Computers* 29 (1989): 261–323 and their, "Soviet Computing in the 1980s: A Survey of the Software and Its Applications," *Advances in Computers* 30 (1990): 223–306.

[58] Based on examining individual country files worldwide for IBM of the period, results reported in Cortada, *The Digital Flood*.

economies, and faster than other competitors could respond to with their own products.[59]

New IBM factories and laboratories were built or transformed to keep up with changing technologies and growing markets. Sales offices expanded in number from less than 150 in the early 1950s to well over 500 in the United States and to an additional several hundred in Europe, Asia, and Latin America by the end of the mainframe era. Customers interacted with their local IBM sales offices and traveled to the company's factories and laboratories to learn about the new machines. Like many other American multinational enterprises, IBM treated all of Western Europe as one integrated market, unlike many of its local rivals that operated largely within their small national markets. Their competitors did so largely because of how their local national governments sought to create "national champion" firms.[60] Meanwhile, IBM

---

[59] Summarized by Campbell-Kelly et al., *Computer*, 130–33. Also useful, see Usselman, "Selecting Flexible Champions," 27–43. On European debates, for example, Magnus Johansson, "Big Blue Gets Beaten: The Technological and Political Controversy of the First Large Swedish Computerization Project in a Rhetoric of Technology Perspective," *Annals of the History of Computing* 21, no. 2 (1999): 14–30; Corinna Schlombs, "Engineering International Expansion: IBM and Remington Rand in European Computer Markets," *IEEE Annals of the History of Computing* 30, 4 (2008): 42–58; Petri Paju, "National Projects and International Users: Finland and Early European Computerization," *IEEE Annals of the History of Computing* 30, no. 4 (2008): 77–91; Pierre E. Mounier-Kuhn, *L'Informatique de la seconde Guerre mondiale au Plan Calcul en France: L'émergence d'une science* (Paris, 2010) and his earlier, "Sur L'Histoire de L'Informatique en France," *Engineering Science and Education Journal* 3, no. 1 (1995): 37–40, and his "Product Policies in Two French Computer Firms: SEA and Bull (1948–64)," in Lisa Bu-Frierman, ed., *Information Acumen: The Understanding and Use of Knowledge in Modern Business* (London, 1994), 113–35; Alain Beltran, "Arrivée de l'informatique et organization des enterprises françaises (fin des années 1960-début des années 1980)," *Enterprises et histoire* 60 (Sept. 2010): 122–37; François Hochereau, "Le mouvement de l'informatisation d'une grande entreprise: Les visions organisantes successives d'un processus d'activité stratégique," *Enterprises et histoire* 60 (Sept. 2010): 138–57; Alfonso Molina, "The Nature of Failure in a Technological Initiative: The Case of the Europrocessor," *Technological Analysis and Strategic Management* 10, no. 1 (1998): 23–40.

[60] The "national champion" programs in Europe have been the subject of much debate, most of it to explain why Europe could not succeed against the aggressive Americans, and most frequently, IBM. For a few samples of the discussion see, Margaret Sharp, ed., *Europe and the New Technologies: Six Case Studies in Innovation and Adjustment* (Ithaca, 1986); Richard O. Hundley et al., *The Future of the Information Revolution in Europe: Proceedings of an International Conference* (Santa Monica, Calif., 2001); Richard Coopey, "Empire and Technology: Information and Technology Policy in Postwar Britain and France," in Richard Coopey, ed., *Information Technology Policy: An International Perspective* (Oxford, 2004), 144–68; Eda Kranakis, "Politics, Business, and European Information Technology Policy: From the Treaty of Rome to Unidata, 1958–1975," in Coopey, ed., *Information Technology Policy*, 209–46; Dimitris Assimakopoulos, Rebecca Marschan-Piekkari, and Stuart MacDonald, "ESPRIT: Europe's Response to US and Japanese Domination of Information Technology," in Coopey, ed., *Information Technology Policy*, 247–63; James W. Cortada, "Public Policies and the Development of National Computer Industries in Britain, France, and the Soviet Union, 1940–80," *Journal of Contemporary History* 44, no. 3 (2009): 493–512; Pascal Griset, "Du 'temps réel' aux premiers réseaux: une entreprise rêvée, une informatique à l'épreuve du quotidian (des années 1970)," *Enterprises et Histoire* 60 (Sept. 2010):

moved quicker to introduce new products, driving down their costs through transnational economies of scale. In the process, it shaped much of the knowledge about computing, consequently creating worldwide IBM-based technologies, technical practices and standards widely used by its customers.[61]

Crucial to these international developments was the expansion of IBM's pre–World War II "go-to-market" strategies that valued use of its sales culture. At the end of World War II, IBM had a presence in seventy eight countries. Yet, having centralized management in New York was increasingly proving slow and inadequate in managing these overseas efforts, as non-U.S. operations were only producing roughly one-eighth of the firm's profits. To increase focus on non-U.S. markets, improve profits, and possibly find a senior position for his second son, Arthur K. (Dick) Watson, in 1949 Watson Sr. established the wholly owned IBM World Trade Corporation (WTC) and put Dick in charge of it.[62] Operations outside North America were grouped under this umbrella organization. As historian Geoffrey Jones noted, American multinational corporations "stressed structure and systems as a means of exerting management control" over affiliates, using "formalized reporting and written guidelines," while allowing local nationals to run and populate these organizations.[63] IBM proved to be no exception to this observation.

World Trade grew rapidly as global demand for IBM products expanded, actually growing faster over the next quarter century than the U.S. side of the company. Despite recent historical research on IBM's role in various countries, we do not have a formal history of World Trade. The only study devoted to a composite view of World Trade was published in 1974 by Nancy Foy, a reporter, who complained

---

98–121; Gerard Alberts, "Appropriating America: Americanization in the History of European Computing," *IEEE Annals of the History of Computing* 32, no. 2 (2010): 4–5; Arthe Van Laer, "Developing an EC Computer Policy, 1965–1974," *IEEE Annals of the History of Computing* 32, no. 1 (2010): 44–59.

[61] IBM shaped much of the information about how its systems were designed and operated, followed by 70 to 80 percent by all users, which meant an IBM-centric view pervaded. For a broader view of the flow of information about computing, James W. Cortada, "When Knowledge Transfer Goes Global: How People and Organizations Learned about Information Technology, 1945–1970," *Enterprise and Society* 14, no. 1 (2014): 68–102.

[62] An important gap in our understanding of IBM's history is the role of Arthur Watson and the lack of a formal history of the WTC. No formal biography has been written about Arthur, and he is given minor attention by all the biographers of the Watson family. On the family, see Thomas and Marva Belden, *The Lengthening Shadow: The Life of Thomas J. Watson* (Boston, Mass., 1962); Maney, *The Maverick and His Machine*; Tedlow, *The Watson Dynasty*; and not to be overlooked, the excellent insightful memoirs of Thomas J. Watson Jr., *Father, Son & Co.*

[63] Jones, *Multinationals and Global Capitalism*, 176.

at the time about the near secrecy of its operations, a critique that almost still holds true.[64]

The reorganization that occurred subsequently across the entire company in 1959 extended the decentralization of work and responsibilities that had started with the creation of World Trade. In the 1960s, reorganizations, turf battles over development of the S/360, and other debates within the firm about strategy and tactics made for contentious management, all operating in an environment characterized by stress and urgency as new competitors and lawsuits occupied senior and middle management's energies, and as new, sometimes unstable technologies, came to the fore. Nothing focused IBM at all levels across all divisions more, however, than the threat of competiton, leading to decisions and actions, a point made by S/360 product developers and increasingly by historians.[65]

By viewing Europe as one integrated market, despite the existence of over two dozen different countries, cultures, and languages, IBM's management developed practices that made it possible to implement a pan-European approach—an approach they essentially continued using to the present and replicated in Asia, Latin America, and Africa. Over time, IBM invested across Europe in excess of any competitor, establishing sales offices in every major city where business prospects proved tangible. It ran a combination of research, development, manufacturing, and education centers in over a dozen countries. Across the century IBM operated a quasi-pan-European headquarters, first in Geneva, then after World War II in Paris. It worked closely with IBM headquarters in New York and globally with laboratories, factories, and other sales offices around the world. The European and American headquarters collectively decided where in Europe to develop and support a product, when and where to invest in local sales offices, and how to shift work from one nation to another to optimize local tax policies and labor

[64] Foy, *The Sun Never Sets on IBM*, xii–xiii. Other books written by ex-IBMers and journalists have spoken about WTC, such as Mercer, *The Global IBM*, and his sequel, David Mercer, *IBM: How the World's Most Successful Corporation Is Managed* (London, 1987), 41–43; while historians usually devote one or a few pages to the subject and exclaim how well it prospered.

[65] Yost, *The IBM Century*, 19–20, endnote 66, 35. Corporate organization charts are of use to historians as a tool for fitting in various parts of an enterprise. Prior to1956 at IBM few existed since Watson Sr. ran most operations out of his personal office. However, buried in a large history of IBM technology is a collection of organization charts covering the period 1956 through 1976, see Pugh et al., *IBM's 360 and Early 370 Systems*, 651–69. Two IBM employees involved in the firm's strategy development published on how that was done in the 1960s, Simmons, *Inside IBM*, and a lesser known article written by IBM's Director of Corporate Strategy Development at the time of publication, D. G. Thoroman, "Strategic Planning at IBM," *Long Range Planning* 4, no. 1 (1971): 2–6. See also, Evans, "System/360: A Retrospective View," 155–79; Watson Jr., *Father, Son & Co.*; Campbell-Kelly et al., *Computer*, 130–33.

laws.[66] This capability, essentially operational by the end of the 1920s, was by the end of the 1940s how IBM did business; to think otherwise ran contrary to IBM's culture.

Once established, international offices tended to stay open for decades, but with changing missions over time as IBM's needs and its customers' requirements evolved.[67] This pattern involved adding facilities over time, pruning populations of employees when global markets or corporate strategies required (as happened in the 1990s, again in the early 2000s in Europe, and in India in 2014).

Due to Cold War circumstances, IBM's presence in Eastern Europe was minimal; the Moscow branch office reported to IBM in Vienna that managed relations with Comecon countries behind the Iron Curtain. It created a dense infrastructure of IBM employees, customers, local and national officials, all interacting across borders by necessity—a virtual IBM community, populated with hundreds of thousands of people over the decades. The number of facilities continued to expand at individual sites and in the number of employees at each in subsequent decades. IBM's pan-European strategy led to deep penetration by the company into every country it chose to be in by the late 1950s (see Table 1).[68]

In 1969, IBM's business outside the United States (under the direction of the IBM World Trade Corporation) contributed 20 percent of the firm's revenues, with 67 percent of World Trade's revenue coming from Europe alone.[69] IBM navigated the patchwork of countries, regulatory regimes, tax structures, and variety of fragmented industries of their customers. All of this was evident to its customers, too. One student of the process commented that, "the combination of local management and the stability of an American corporate giant proved irresistible in the war's [World War II] aftermath." Further, on the matter of execution, "IBM filled World Trade with some of the most talented businessmen

[66] This process is being repeated in both Africa and Latin America, which senior management concluded in 2010–2012 was now ripe for massive growth. In Asia, IBM expanded out of Japan as its base of operations, beginning aggressively in the 1980s, and now extends to over a dozen countries, including India, China, the Asian Tigers, and such emerging markets as the Philippines, Indonesia, and Vietnam. The organization of IBM's operations are described in considerable detail based on archival sources in Cortada, *The Digital Flood*.

[67] That process of plant/lab relations and changing missions was recently documented by two professional historians examining IBM's facility in Rochester, Minnesota, U.S., on the occasion of its fiftieth anniversary. Many of their findings apply to all of IBM's plant sites, including those in Europe, Arthur L. Norberg and Jeffrey R. Yost, *IBM Rochester: A Half Century of Innovation* (Rochester, Minn., 2006), http://www.cbi.umn.edu/hostedpublications/pdf/IBMRochesterHistory.pdf (last accessed 20 Dec. 2014).

[68] Peter Halbherr, *IBM: Mythe et Realite: La Vie Quotidienne Chez IBM France* (Paris, 1987); Nancy Foy, *The Sun Never Sets on IBM*. An examination of the few existing internal IBM telephone directories document expansion in a number of locations in Europe, IBMCA.

[69] Cortada, *The Digital Flood*, 212.

*Table 1*
## Number of IBM Field Offices in Western Europe, 1969

| Country | Number of Field Offices |
| --- | --- |
| West Germany | 35 |
| France | 30 |
| United Kingdom | 13 |
| Spain | 11 |
| Italy | 10 |
| Netherlands | 9 |
| Switzerland | 8 |
| Belgium | 8 |
| Austria | 7 |
| Norway | 6 |
| Sweden | 5 |
| Denmark | 4 |
| Finland | 3 |
| Portugal | 2 |
| Ireland | 2 |
| Cyprus | 1 |
| Greece | 1 |
| Luxembourg | 1 |
| Malta | 1 |

Source: IBM World Trade Corporation, *Annual Report 1969* (Paris, 1970), 24–25, IBM Corporate Archives, Poughkeepsie, N.Y.

in Europe."[70] Even as European governments tried to help their local "national champion" companies, customers turned to IBM's pan-European structure.

Meanwhile in the United States, IBM contended with antitrust suits from the 1960s to the early 1980s. These cases hung over the company's operations worldwide and continued subtly to affect how IBM functioned into the next century. Reporters tended to comment and opine more on the suit than historians, while economists openly debated for and against the firm's position.[71]

These trials can be seen as part of a longer history of legal battles in the United States, stemming from the fact that the company controlled over 70 percent of the tabulating equipment market for decades (true) and very quickly did the same with mainframe computer systems. In 1936 the U.S. Justice Department concluded that IBM had practiced

[70] Quote from Maney, *The Maverick and His Machine*, 378–79.
[71] For example, Malik, *And Tomorrow*; William Rodgers, *THINK: A Biography of the Watsons and IBM* (New York, 1972); Halbherr, *IBM: Mythe et Realite*; and Foy, *The Sun Never Sets on IBM*.

illegal product ties (using dominance in one market to control another with punch cards).[72] Then in 1952, on the eve of shipping its first generation of mainframe computers, IBM was charged with controlling 90 percent of the tabulating market. IBM signed a consent decree in which it agreed to sell equipment at prices competitive to leasing them, to cut its ties to its service business (which sold data processing services), and to price hardware maintenance and spare parts separate from the machines themselves. It was an important event for IBM because it was on this occasion that Watson Sr., who wanted to fight the charges, relented to Watson Jr.'s urging that they settle the case, largely because tabulating sales represented the past and computers the future.[73]

By the mid-1960s, IBM's dominance of the mainframe business began once again to raise concerns within the Justice Department, while competitors, too, began a series of lawsuits accusing the firm of monopolistic behavior.[74] With RCA and other vendors producing computers compatible with IBM's, using IBM's operating system software, and the specter of another antitrust suit facing IBM, the firm announced unbundling of its software in December 1968 with implementation during the next year. "Unbundling" meant that software would be leased separately from hardware instead of being priced into the rental charges for the equipment. One result of this move was that a software industry, embryonic in form, now grew explosively over the next twenty years.

The U.S. Justice Department chose to file an antitrust suit against IBM on the last working day of the Johnson Administration, in January 1969. The case dragged on for twelve years, only to be dismissed by the Reagan Administration. Few historians have yet explored the effects of this case on IBM's way of doing business, although they recognize the difficulties faced by both sides: IBM had to navigate the antitrust

---

[72] Tedlow, *The Watson Dynasty*, 124–25; Sobel provides the most complete account, *IBM*, 90–92; Pugh, *Building IBM*. Historians routinely dismissed this antitrust case with barely a comment when, in fact, it bothered Watson Sr. and made him unwilling at first to resolve the more serious case facing IBM in the early 1950s. Watson Jr. in *Father, Son & Co.*, mentioned a number of times how irritating these suits were to his father, affecting his judgment regarding whether to settle them out of court.

[73] Considered a major event by historians and employees in the life of the firm. For the most complete account, see Pugh, *Building IBM*, 250–59; also Sobel, *IBM*, 142–49, for a broader perspective on the effects on IBM. See, for example, the all too brief but to the point discussion by Tedlow, *The Watson Dynasty*, 193.

[74] For useful overviews, see Yost, *The IBM Century*, 21–23; and Sobel, *IBM*, 254–76. Sobel argues that all the lawsuits involving IBM and monopolistic behavior need to be understood together, not just the Federal case. Pugh avoided discussing the case, *Building IBM*; Watson Jr. did not and provides useful observations on its very earliest phases, *Father, Son & Co.*, 376–89.

laws, the Justice Department how to deal with the characteristics of the emerging computer industry.[75] It was not uncommon for senior executives to spend over half their time dealing with the case during the decade of the 1970s.[76] IBM spent over $250 million in legal fees, and in the process, produced some one billion pages for evidentiary purposes that now constitute a massively rich body of historical evidence on both the company and its industry, covering the 1950s through part of the 1970s.[77] Meanwhile in Europe, journalists and public officials criticized IBM's dominance of their national computer industries, most notably in France where it became a subject of major public discussion.[78]

The U.S. case turned on what IBM and the Justice Department thought constituted the computer industry that IBM was accused of dominating. The firm's lawyers argued that the industry was larger/broader than the Justice Department thought, hence its market share much smaller and not controlled by IBM, as it was accused of doing. It lined up economists who continued to support that contention even after the case had closed. Government economists argued the opposite, accusing the company of ruthless marketing practices. The language was heated. For example, a Justice Department economist, Richard Thomas DeLamarter, used language like "IBM's use and abuse of

[75] Useful insights on IBM's decision to unbundle come from memoirs by IBM employees involved in that process, such as by Watts S. Humphrey, "Software Unbundling: A Personal Perspective," *Annals of the History of Computing* 24, no. 1 (2002): 59–63. For a broader historical account of the origins of the notion of unbundling, see Emerson W. Pugh, "Origins of Software Bundling," *Annals of the History of Computing* 24, no. 1 (2002): 57–63; while Grad Burton, who also participated in the decision process, provided, "A Personal Recollection: IBM's Unbundling of Software and Services," *Annals of the History of Computing* 24, no. 1 (2002): 64–71. For the most useful presentation of the subject within the broader context of IBM-Federal Government relations, see Usselman, "Unbundling IBM: Antitrust and the Incentives to Innovation in American Computing," while the leading authority on the history of the software industry documented the direct consequence of unbundling to the growth of business software products and services, Martin Campbell-Kelly, *From Airline Reservations to Sonic the Hedgehog: A History of the Software Industry* (Cambridge, Mass., 2003). However, this topic and the large antitrust suit have inadequately been studied; yet during the proceedings, IBM delivered to the Federal court in Manhattan more than a billion pages that are available for study about the case and, more importantly, about the entire computer industry of the 1950s and 1960s. A set may be found at the Richard Thomas deLamarter collection of IBM antitrust suit records, 1950–1984; Yost, *The IBM Century*, 23; Usselman, "Unbundling IBM: Antitrust and the Incentives to Innovation in American Computing."

[76] CEO in the 1970s Frank Carey shared that fact in conversation with James W. Cortada in 1985.

[77] The Richard Thomas deLamarter collection of IBM antitrust suit records, 1950–1984 (last accessed 14 Nov. 2014).

[78] For a detailed discussion, based largely on IBM archival sources and contemporary French publications, see Cortada, *The Digital Flood*, 112–22.

power," and "ominous implications of its stranglehold on the Information Society," years after closure of the case.[79]

IBM management became more cautious about how they behaved in the market place. The company implemented formal marketing practices guidelines for all employees that were rigorously enforced for decades. Fearing the company might be broken up, as later happened to AT&T, senior management reorganized the firm in such a way as to reduce disruptions to business should that happen. Large accounts and large product manufacturing were clustered together in their own divisions, while smaller sets of customers and products they normally acquired were also grouped together. Typewriter sales were kept in OPD as before. The research division did basic development that could be used by each part of the firm, and that sat alongside development work that occurred within the product divisions.[80] Employees who lived through these very uncertain years did not know if the firm would be dismantled. It was widely believed, from the chairman to the lowest levels in the company, to be a real possibility. To the present, many were reluctant to discuss the case in their memoirs beyond superficially mentioning it, let alone with people outside the firm. Employees remained so on edge for well over a decade that management implemented changes in how the firm operated, fearful of too much market dominance in the United States, even in other global markets in the 1980s and early 1990s. A closer examination of the case and its consequences have been seen by some as part of the root causes of IBM's poor financial and marketing performance in the years immediately before the arrival of Louis Gerstner to run the company in the early 1990s.[81]

Meanwhile technology and the industry continued to evolve. The event that most captured the attention of historians, economists, and industry observers was the arrival of the PC, beginning with non-IBM products in the second half of the 1970s and with IBM's own introduction of microcomputers in August 1981. That development generated a body of historical, industry, and journalistic discussion amounting to scores of books (so far) and thousands of articles, all invariably including assessments of IBM's role. Often lost in much of that discussion was the recognition that a fundamental shift in computing was occurring in which centralized processing of the 1960s was giving way to distributed processing wherever work took place, using private telecommunications

---

[79] The economic argument outlined by economists supporting IBM's case, Fisher, McGowan, and Greenwood, *Folded, Spindled and Mutilated*, and disputed by the Justice Department's economist, DeLamarter, *Big Blue.*

[80] Evident in IBM organization charts by June 1971, see sample chart in Pugh et al., *IBM's 360 and Early 370 Systems*, 666–67.

[81] Hinted at by, for example, Mills and Friesen, *Broken Promises.*

networks, online systems, mini- and microcomputers in addition to mainframes, and creating many new software products, additional customers, and thousands of new suppliers competing with IBM.[82]

IBM quickly sought to have a presence in the microcomputer market. The crucial decision involved how to develop it. Not confident that the normal product development process would work fast enough, CEO Frank Cary and his senior management team decided to establish an independent business unit headed by an experienced executive (William Lowe) to put together a product in one year, using off-the-shelf components. His team accomplished that task, including the now famous agreement to license from Microsoft the DOS operating system. IBM sold its PC system through its existing direct sales force and through retail outlets not owned by IBM—a new approach for IBM. The product received quick endorsement from the firm's business customers and within several years owned over 20 percent of the market for what was now called the Personal Computer. Very quickly, however, competitors, too, appeared, using DOS, and similar off-the-shelf components as IBM, most notably Compaq. IBM struggled from the late-1980s to the early 2000s trying to extract profits from this product line.[83]

The decision not to use patented designs and components has been the subject of a contentious debate among historians, economists, and industry observers.[84] Not negotiating a proprietary control over DOS, in particular, was frequently cited as a cause for the growth of a thicket of competitors, what historian Yost called a "misstep," while making it possible for Microsoft to become one of the largest start-up firms in modern times.[85] Over time, however, it became increasingly evident that as the PC market expanded and crowded with vendors, that the Justice Department's concerns with antitrust issues shifted from IBM to Microsoft, whose operating system was used by some 95 percent of

[82] However, historians were quick to understand that fundamental shift. James W. Cortada, *The Digital Hand: How Computers Changed the Work of American Manufacturing, Transportation, and Retail Industries* (New York, 2004), 103–5.

[83] Computerland's experience reflects the new distribution strategy of the day, Jon Littman, *Once Upon a Time in Computerland* (Palo Alto, Calif., 1987); the key early study of PC computing, in particular is Paul Freiberger, *Fire in the Valley: The Making of the Personal Computer*, 2nd ed. (New York, 1999). For a detailed study of this firm's activities, Rod Canion, *Open: How Compaq Ended IBM's PC Domination and Helped Invent Modern Computing* (Dallas, Tex., 2013); my account repeats the widely held one by historians, for example, Yost, *The IBM Century*, 26–29, and Campbell-Kelly et al., *Computer*, 253–74.

[84] Arguments summarized in Chposky and Leonis, *Blue Magic*. IBMers have been virtually silent in print about the PC. The literature on Microsoft parallels the volume of material about IBM. For a brief introduction to this literature, see the now slightly dated bibliography, Cortada, *Second Bibliographic Guide*, 234–35; on Microsoft's strategy, see Michael A. Cusumano and David B. Yoffie, *Competing on Internet Time: Lessons from Netscape and Its Battle with Microsoft* (New York, 1998).

[85] Yost, *The IBM Century*, 28.

all PC users by the late 1990s.[86] Microsoft faced similar problems with the European Union. The shift in focus gave IBM room to pursue other opportunities without concern for action by the Justice Department. IBM developed its outsourcing business and exploited its general IT services opportunities. Both began in the late 1980s and were in full force by the mid-1990s.[87] More serious for IBM, however, was the shift from centralized processing to distributed client-service computing during the 1980s and 1990s that so fundamentally challenged the firm's ability to sustain prior levels of revenues, profits, market share, and control over IT as it had in the 1970s and 1980s.

At the height of its mainframe era, the 1960s to the 1980s, the structure of the firm remained remarkably consistent with the organizational strategy laid out in the late 1950s. Sales, product R&D, and manufacturing were organized along a matrix of large to small customers; production was divided by product lines, with cross fertilization of research across divisions but normally housed on manufacturing campuses.[88] Country organizations staffed with local nationals had similar reporting requirements to World Trade Headquarters staff, largely resident in Paris, but with ultimate reporting to Corporate in New York City and, later, in Armonk, New York, just a few miles to the west. Management experimented using business partners and establishing independent business units (known as IBUs), in the 1980s and more extensively in the 1990s, but these did not fundamentally alter the overall approach. Armonk controlled capital and division-level operating budgets, and normally the number of employees various divisions could have. That control approach allowed IBM to expand geographically and to

[86] Stan J. Liebowitz and Stephen E. Margolis, *Winners, Losers and Microsoft: Competition and Antitrust in High Technology* (Oakland, Calif., 1999); Joel Brinkley and Steve Lohr, *U.S. v. Microsoft: The Inside Story of the Landmark Case* (New York, 2000); David B. Kopel, *Antitrust After Microsoft: The Obsolescence of Antitrust in the Digital Era* (Chicago, 2001); William H. Page and John E. Lopatka, *The Microsoft Case: Antitrust, High Technology, and Consumer Welfare* (Chicago, 2007). These comment variously on IBM.

[87] The only historian to comment on this period (so far) is Jeffrey Yost, *The IBM Century*, 29–30, providing background on IBM's services history dating to the 1950s. Gerstner described in detail his strategy for IBM's services, *Who Says Elephants Can't Dance?*; also see two books published on IBM's late 1980s–early 1990s problems and Gerstner's role, Robert Slater, *Saving Big Blue: Leadership Lessons and Turnaround Tactics of IBM's Lou Gerstner* (New York, 1999), and Doug Gaar, *IBM Redux: Lou Gerstner and the Business Turn-around of the Decade* (New York, 1999). Both are useful, detailed studies of IBM in the 1990s.

[88] Mercer, *IBM*, for a useful overview covering the 1970s and 1980s. On IBM's approach to technology, the most thorough explanation is provided by Pugh, *Building IBM*, 301–16; for specific issues, such as semiconductor research at IBM, Ross Knox Bassett, *To the Digital Age: Research, Labs, Start-up Companies, and the Rise of MOS Technology* (Baltimore, 2002); on IBM's servers by IBMers involved in their development, Bauer et al., *The Silverlake Project*; on how IBM manufacturing and research worked together using the IBM Rochester, Minn., facility as a case study by two computer historians, see Arthur L. Norberg and Jeffrey R. Yost, *IBM Rochester: A Half Century of Innovation* (Rochester, Minn., 2005).

respond to emerging product lines. Although for legal reasons it maintained local national companies, it continued to manage the delicate relations with national governments both as customers and regulators, now an international concern involving scores of regimes, not simply the United States.

The company also experimented with various go-to-market approaches in the 1980s, such as selling PCs through retail outlets, some of which were owned by IBM. It formed partnerships with firms that could provide access to leased lines, and later to the Internet.[89] IBM offered new terms and conditions for selling products, beginning in the early 1980s, to stimulate a rapid influx of cash as it shifted from a leasing to a purchase-only model, and to contracts that permitted customers to buy products in bulk at a discount. Before the end of the 1980s, the firm also began negotiating outsourcing contracts, closing nearly a dozen by 1986 in the United States, as a way of experimenting with an emerging market.[90]

In terms of performance in this era, in 1965 (first full year of shipping S/360 systems) IBM generated revenue of nearly $3.6 billion, with net earnings of $477 million. It did that with just over 172,000 employees worldwide. Despite the antitrust suit, recessions, and other exogenous forces, IBM continued to grow. That growth continued unabated through 1990, when it posted revenues of nearly $69 billion and net earnings of $6 billion. Then began a quick and sharp decline, leading to the ouster of CEO John Akers and the hiring of Louis Gerstner in 1993. IBM's employee population peaked in 1985 at 405,536 workers, and ended 1990 with just over 373,000, reflecting the already evident financial and operational crisis faced by the company.[91]

## Crisis and a New Culture, since the Late 1980s

Late in the mainframe phase of its history, IBM began encountering some of the most serious challenges it had faced since the 1930s. In 1986, earnings declined by 27 percent and continued to drop; in 1989, they were off their peak of 1984. Then from 1991 through 1993, IBM revenues shrank, in the process losing billions of dollars in earnings, $8.1 billion alone in 1993.[92] It became almost customary to speak about "near

[89] A process of strategy innovation and experimentation that continued into the new century, Koen Dittrich, Geert Duysters, and Ard-Pieter de Man, "Strategic Repositioning by Means of Alliance Networks: The Case of IBM," *Research Policy* 36 (2007): 1496–1511.

[90] I conducted one of the first studies within IBM documenting its experience with outsourcing (done in 1987) that concluded the firm needed to hire managers experienced with this form of computing, copy in author's possession.

[91] Pugh, *Building IBM*, 324.

[92] Ibid.

death experiences," certainly the velocity of losses was increasing. Historians have yet to analyze the causes of this crisis, in part because the necessary archival sources and oral histories have yet to become available. During this period, the company broke with many old traditions: it laid off or retired some 170,000 employees in a half dozen years; shut down lines of businesses; slashed budgets, including for research; and diminished benefits, such as its pension program.[93] CEO Akers lost his job and the new CEO dismissed many executives.[94] Akers, the ousted chairman, never provided his version of what happened. However, Akers's intentions were documented by Harvard Business School professor, David B. Yoffie, who interviewed him in the 1980s for a series of case studies, which later appeared in a book on strategic management and IT. At the time, there seemed no hint of the crisis IBM was headed toward.[95]

Historian Yost wrote in general terms about the effects of Moore's Law in driving down the cost of computing hardware as contributing to the firm's decline. Business historian Richard S. Tedlow opined that perhaps IBM had lost its way after the departure of the Watsons. More specifically, he argued that IBM failed to deliver goods and services wanted by customers. D. Quinn Mills and G. Bruce Friesen conducted an empirical study about the decline in the mid-1990s. They concluded that, "IBM squandered its enormous research and development effort in the 1970s on an effort to build a larger mainframe, instead of developing microcomputer technology," and also failed to honor long-standing implied commitments to customers (to provide excellent products and services) and to its employees (lifetime employment), and that it "abrogated both contracts."[96] Reporters echoed similar charges at the time with far harsher language.[97]

Ultimately, historical research may well also point to changes in corporate culture, as suggested by Rowena Olegario as an important source of understanding in the analysis of the Watson era, and as Gerstner mentioned repeatedly in his memoirs on running IBM in the 1990s.[98] However, Olegario may have struck just the right note when she concluded that, "the long-term significance of the company's

---

[93] Mills and Friesen, *Broken Promises*.

[94] The dominant account of what Gerstner did came from his memoirs, *Who Says an Elephant Can't Dance?*, along with the work of two reporters who wrote about his tenure as chairman, providing brief accounts of the cause of his arrival, Slater, *Saving Big Blue*; Gaar, *IBM Redux*.

[95] Yoffie, *Strategic Management in Information Technology*, 278–89. I could not find any historian or other commentator on IBM who cited this source, the only one that explores Akers's role.

[96] Yost, *The IBM Century*, 29; Tedlow, *The Watson Dynasty*, 270; Mills and Friesen, *Broken Promises,* 8 for quote, 9.

[97] Carroll, *Big Blues*; Heller, *The Fate of IBM*.

[98] Olegario, "IBM and the Two Thomas J. Watsons," 270–76; Gerstner observed that at IBM, "culture isn't just one aspect of the game—it *is* the game." *Who Says Elephants Can't Dance?* 182.

problems, and its attempts to resolve them, will become clear only in the future," when historians can assess IBM's actions within the context of the industry in which it operated.[99]

The challenges remain considerable in understanding the structure, conduct, and results from IBM. Professor of business organizations, Jay R. Galbraith, on the occasion of publishing a comparative study of MNE matrix organizations in 2007, observed, "the most complex organization that I have encountered is IBM's."[100] The breadth of its lines of business, sets of customers, and countries in which it operated were always in continuous variegated change, tension, and uncertainty.

.   .   .

JAMES W. CORTADA is a senior research fellow at the Charles Babbage Institute, University of Minnesota. He is the author of over one dozen books on the history of information and the information technology industry. His most recent book is *All the Facts: A History of Information in the United States since 1870* (2016). He has just finished writing *IBM* (forthcoming 2019) and is currently exploring the role of information ecosystems and infrastructures.

---

[99] Olegario, "IBM and the Two Thomas J. Watsons," 384.
[100] Jay R. Galbraith, *Designing Matrix Organizations That Actually Work: How IBM, Procter & Gamble, and Others Design for Success* (San Francisco, 2009), 129.