



Professor Chandler's Revolution

by Art Kleiner

**To the world's most renowned
business historian, what you know is
more important than what you do.**

At home in a Cambridge, Mass., apartment overlooking the Charles River, Harvard Business School Professor Emeritus Alfred D. Chandler Jr., 83, is thinking about why some companies succeed, and others fail. The reason, he asserts, has to do with how companies learn and apply what they learn. Pressed for an example, Professor Chandler starts talking about the global consumer electronics industry in the 1980s. His body, which is slight and trim, leans forward passionately. His eyes light up. His speech, which is ordinarily an elliptical mumble (albeit with a deep, South Carolina-flavored timbre), suddenly resonates crisply and energetically.

The story he tells represents a turning point for the industry — the moment, around 1982, when Japan's Sony Corporation and the Dutch Koninklijke Philips Electronics NV were both flush with cash from their

successful cointroduction of the compact disc. Sony's next step, the Digital Video Disc (DVD), also invented with Philips, was a modest advance in the technology. But, on its own, Philips took a much bolder, technologically seductive risk, investing billions in creating and marketing the compact disc interactive (CD-i), a new multimedia accessory for television. If the compact disc could transform audio recordings and computers, the Philips engineers reasoned, couldn't a similar device, with one global operating standard, finally satisfy TV watchers' hunger for digital photographs, video on demand, computer games, and on-screen encyclopedias?

As Professor Chandler tells the tale, the enthusiasm of the engineers blinded them to the realities of the marketplace. Twenty years ago, television watchers were content to be passive. They didn't *want* the CD-i's

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multimedia interactivity. Philips ultimately lost more than \$3 billion on its gamble. “By 1990,” he says, “[Philips is] so broke that they can’t afford to pay a billion dollars to ramp up to meet the demand for CDs or to manufacture DVDs at all. So they license out the manufacturing to firms like Matsushita and Toshiba.”

This move effectively ceded control of CD and DVD manufacturing to Philips’s Japanese rivals, who naturally — Professor Chandler might say inevitably — used that advantage to undercut Philips. Soon after, the electronics business that Philips had spent decades building dwindled to almost nothing.

“It’s extraordinary,” says America’s most eminent business historian. “It’s just a wonderful story.”

The Philips CD-i episode is one of several dozen stories recounted in *Inventing the Electronic Century: The Epic Story of the Consumer Electronics and Computer Industries*. In its pages, this man who still writes on a pad of paper and has never learned to use a computer explains exactly how the cutting-edge technologies of our time have mesmerized corporate leaders, leading some companies to grasp key opportunities and others to miss them entirely.

Among academic business historians, Professor Chandler is regarded as the man who made the field a legitimate course of study at Harvard Business School (and elsewhere). “When he arrived in 1971,” says his Harvard colleague and fellow business historian Richard Tedlow, “there were 13 people taking business history. Now there are 1,300.” The famous Harvard Business School case studies existed before Professor Chandler arrived, but by all accounts, he helped influence such prominent Harvard strategists as Kenneth Andrews to train MBAs to look beyond immediate market and

competitor data to consider the long-term trends.

But the core of Professor Chandler’s work (and the reason he is most relevant to business managers) is his theories about industrial change and the interplay of large corporations that he has spent 60 years articulating. “Al’s data,” says his Harvard Business School colleague Associate Professor Nancy Koehn, “isn’t the kind you call up on an Internet site. In an age of just-in-time analysis, Al Chandler is about getting the story right. Everything he does as a historian legitimates the value of in-depth research, and the study of history, as a calling.”

Professor Chandler is not just a mentor to business historians and the developer of one of the most far-reaching theories of business success; he is also our most prominent fan of big business. He follows the Fortune 500 the way some of his Bostonian neighbors follow the Patriots, Celtics, and Red Sox. His writing can be dense and dry, like that of Fernand Braudel, the great French historian of economic daily life, with whom he is often compared. Professor Chandler generally eschews stories of heroic personalities and instead writes meticulously about comparative economic performance — the impact of organizational decisions on production costs, throughput, and the larger economy. He is fascinated with the fate of corporate titans, from the Erie Railroad to Cisco Systems Inc., as they clash and compete, allying with and betraying each other, continually seeking to control their fields, and shifting the economic landscape around them through their battles and alliances.

Alfred D. Chandler Jr.’s 1977 book, *The Visible Hand: The Managerial Revolution in American Business*, was the first business title to win the Pulitzer Prize; it is only one component of a body of work (more than 25 volumes published over 45 years) that established the nature and influence of large corporations in the modern economy. “He’s the Boswell of American capitalism,” says management writer Andrea Gabor, who devoted half a chapter to him in *The Capitalist Philosophers: The Geniuses of Modern Business — Their Lives, Times, and Ideas*, her survey of management thought.

Integrated Learning Bases

Professor Chandler’s central idea about industrial change is unveiled gradually in each of his books, taking its fullest form to date in *Inventing the Electronic Century*, which is the first of a two-volume set, to be titled *Paths of Learning*. (The second volume, due out next year, will chronicle the chemical and pharmaceutical industries.) Success, Professor Chandler argues, comes to companies

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that cultivate an “integrated learning base,” as he calls it: the capabilities needed to lead in a particular business niche. “The key theme for any business,” he says, “is learning its boundaries: relating the firm, the markets, and the technology to your particular strengths.”

The theory helps to explain why Philips experienced its tribulations with CD-i, while the Sony Corporation recovered not just from the Betamax debacle, but also from a devastating investment in Columbia Pictures. As Professor Chandler writes in *Inventing the Electronic Century*, Sony set the pattern for its success back in the 1950s, when it “commercialized Japan’s first audiotape recorder and became the world’s first-mover in miniaturization technologies.” Sony kept its early lead by continually expanding those miniaturization and marketing capabilities — to integrated circuits and the Trinitron color TV tube in the 1960s, the Walkman in the 1970s, and a variety of disc formats in the 1970s and 1980s. As its reach and resources increased, Sony kept investing in corollary technologies, like plastics, adhesives, components, and picture tubes, which allowed it to build on past success. One by one, its competitors were downed, until, by the mid-1990s, Sony (along with the Sharp Electronics Corporation and the Sanyo Corporation on a smaller scale) became “the chief — indeed, the only — architects of the evolving consumer electronics path in the new Electronic Century.”

An integrated learning base is not just core competence. Sony, for example, maintained the center of a network of Japanese production plants, testing laboratories, components developers, and suppliers “all within a three-hour train ride,” close enough to continually experiment and learn from each other. An integrated learning base does not center on mastering technology;

the Swiss company Novartis AG, currently dominant in biotechnology, developed its base in part through a merger of two major players (Ciba-Geigy and Sandoz) and the subsequent spinning off of its old-line chemical enterprises to concentrate on biotechnology. Each line of business has its own unique puzzle to solve — its own combination of technological challenge, market profile, and distribution patterns to decode and manage. An effective management style for consumer electronics, which requires miniaturization and the right choice of software platform, will not necessarily fit a chemical company trying to choose whether to produce low-margin commodity polymers or high-risk genetically engineered pharmaceuticals.

A company that masters its integrated learning base has an almost natural ability to monopolize its niche. To Professor Chandler, that explains why companies like IBM, McDonald’s, Procter & Gamble, Microsoft, and DuPont stay dominant for decades. “That base, for those who get there first, becomes the barrier to entry for competitors,” he says. This natural tendency toward oligopoly appears as *keiretsu* in Japan, cartels in pre-World War II Europe, and “megamergers” in the U.S., with local variations stemming from differences in antitrust laws.

In the Chandler worldview, it’s inevitable not just that large companies get larger, but also that they become more beneficial to society. Their learning base represents the source of the accelerated industrial creativity of our times, from Thomas Edison’s laboratories (which became General Electric Company’s) to the research labs at companies like the Intel Corporation and the Nokia Corporation today. The real tragedies, to Professor Chandler, are not the monopolies, but the breakups and breakdowns. AT&T, pressured by the

Justice Department, destroyed the learning base of the U.S. telephone system when it separated Bell Labs from the Baby Bells. RCA, pressured by Wall Street, squandered its learning base when it tried to enter the computer business. “They heard about stars and cash cows, and thought they were supposed to be a conglomerate,” says Professor Chandler. “So they bought unrelated businesses, including Hertz and some food manufacturers, to get the money to push into computers. But RCA didn’t know how to run these companies. By 1985, they were all destroyed or spun off, and RCA, it was gone.”

Some might argue that such views are outmoded in the Internet-driven New Economy. After all, when the boundaries between organizations break down, it becomes increasingly difficult to corner the market on skills and capabilities. But to Professor Chandler, the New Economy started not with the Internet, but with the railroads. Business is still adjusting to *that* transition, the one that started 160 years ago; until we understand its imperatives, we won’t succeed in any economy.

A Born Storyteller

The industrial transition from 1840 to now is, perhaps, the Great Epic of our time, and a story that, in an almost literal sense, Alfred Chandler was born to tell. Professor Chandler came from a patrician family in the du Pont country of Delaware. His maternal great-grandmother was raised in the du Pont family after her parents died of yellow fever. His maternal grandfather was chief engineer of the E. I. Du Pont de Nemours chemical company from 1903 to 1916. (The “D.” in Al Chandler’s name stands for DuPont). He is a former Harvard sailing teammate of John F. Kennedy’s; indeed, he comes from a family of passionate sailors. In the 1930s, his father took the entire family on a year-long sail on the route of Charles Darwin to the Galápagos Islands. He is part of a large, close family full of fascinating people in their own right. His wife, Fay Chandler, is a sculptor; one of his sons (Alfred) is a documentary filmmaker. His sisters are Harvard child psychologist Nina Murray and Sophie Consagra, a former director and president of the American Academy in Rome, a distinguished classics and fine arts institute.

According to family legend, Alfred Chandler had announced his decision to become a historian by age 6; and by his teens, he had already developed his analytical curiosity. “I asked Alfred once,” recalls his sister Sophie, “why in all northern Delaware, with all this money, there wasn’t one good painting on anyone’s wall. ‘That’s

easy,’ he said. ‘J.P. Morgan and the other American industrialists all have their headquarters in New York. They compete for the best paintings; the DuPont headquarters is isolated in Delaware, without any peers to compete with.’ That was typical of the way he thought, even when we were children.”

From the standpoint of the Great Epic, however, his most important relative was someone he never met. In 1945, after five years in the Navy, Alfred returned to graduate school at Harvard at age 26 with a wife, three small children, and a graduate study stipend. That year, an elderly great-aunt who lived in the Boston suburb of Brookline died. The Chandlers moved into her Brookline home, where Alfred discovered, in a store-room, a collection of old papers belonging to his great-grandfather Henry Varnum Poor, the original Poor of Standard & Poor’s. Mr. Poor was the first modern industry analyst; for 30 years, he gathered comparative data on the expansion of American railroads, which were more complex in their mix of new technologies, customers, rates, and multiple divisions than any business that had existed before. As Professor Chandler later noted, he was writing “the *Wall Street Journal* of his day. His major customers became investors, so you watch the beginnings of modern management, modern finance, modern labor relations, modern accounting. They all came out of the railroads.”

Fortunately for the young Alfred Chandler, there was a small institute at Harvard Business School where such issues could be discussed, and where he was welcomed as a research associate. The Research Center in Entrepreneurial History had been founded by Joseph Schumpeter, the economist who championed innovation and entrepreneurship as the drivers of capitalist prosperity. “Schumpeter had been dead for a few years,” recalls Peter Mathias, an Oxford University historian and long-time friend of Professor Chandler. “But the atmosphere was such that he might have just gone out to tea and would reappear at any moment.” Al Chandler became immersed in debates about, for instance, why there had been an 18th-century industrial revolution in Britain, but not in France. This set the tone for his own interest in large corporations: not as villainous trusts or economic saviors, but as creative forces that were shaping the economy in ways most people did not recognize.

Over the next 30 years, he produced a series of books on this theme. He based them first on the records of his great-grandfather, and then on corporate papers from DuPont (where family connections helped him

The Long View of the Short Run

Alfred D. Chandler Jr. on the economic issues of the moment.

The Microsoft Antitrust Suit

“The reason there was a lawsuit at all goes back to the original franchise that IBM granted Microsoft in 1982 for the IBM PC software. This generated the highest economies of scale and scope in the history of business. It was Microsoft’s lucky break, and they played it brilliantly. Today, they can undersell anybody. Gates was a master at using his products to improve each other and drive out competitors.

“Compared to the breakup of AT&T, breaking up Microsoft would not be a tragedy, but the question is how to do it. How can the government mandate an agreement to create competing operating systems? The only way is for someone else to develop an operating system that competes with Windows, and the only real candidate is Unix. It’s inevitable that Apple would adopt Unix. They should have done it 10 years ago.”

Enron

“This is a double whammy — the Internet bubble collapse *and* the scandals. The last time that sort of combination occurred was 1929. On the surface, the economy was booming; two years later, in 1931–32, the unemployment rate was 25 percent.

That was the only time in the 20th century when there were net losses of \$2 billion to \$3 billion in market capitalization. Why did it happen then?

Because of the scandals: The head of the stock exchange went to Sing Sing. That can happen again, and I think it may. One major weakness at Enron was a board of directors composed exclusively of outside people.”

Japan’s Economic Problems

“Japan’s long recession reminds me of America after 1929. We never recovered until World War II, and I see

Japan in the same boat. Their situation may even be worse because their market is Europe and the U.S. They don’t have a home market. The most successful Japanese electronics companies, like Sony, are focused on customers in the U.S. and Europe.”

The Chemical Industry

“Outside of biotechnology, I don’t see a new technology coming along to transform the industry. All but two of the top 50 chemical companies were established by the 1920s. The technology hasn’t changed much since the 1950s, with the coming of polymers and the petrochemical revolution. Today, the biggest firms are almost all moving into pharmaceuticals. Out of seven major U.S. chemical companies in 1970, only DuPont and Dow are left.”

— A.K.

gain access, and where he researched a biography of early-20th-century CEO Pierre du Pont) and other large companies. Three books in particular were groundbreaking. First, in 1962’s *Strategy and Structure: Chapters in the History of the American Industrial Enterprise*, he described four large managerial corporations: General Motors, Standard Oil, DuPont, and Sears, Roebuck and Company. In all four companies, he argued, the multidivisional line-and-staff form was not an arbitrary copy of the military. It was an inevitable, natural response to the unprecedented complexity of the business. For example, GM naturally succeeded with its strategy of different cars for every price range, and that, in turn, dictated the company’s structure.

The Visible Hand described how a century ago customers suddenly found goods more plentiful and cheap than they had ever been. The book showed the dramatic impact the railroads had on the modern economy. Although the transition started in the 1840s, its most visible changes occurred between 1880 and 1920. Mass

manufacturers of everything from typewriters to canned goods learned to bypass or swallow up the networks of jobbers, factors, merchants, and other independent middlemen who had controlled the flow of commerce throughout history. One of the fascinating aspects of *The Visible Hand* is the examination of how innovation in distribution and marketing preceded production. For example, the United Fruit Company started in the 1890s not with banana plantations, but with a refrigerated transportation network, modeled after those of meat packers, that kept fruit fresh. American Tobacco, Diamond Match, the National Biscuit Company, and Quaker Oats all built marketing networks (and networks of purchasers of farming goods) and then used the profits from sales to finance their new production. They rarely needed outside financing.

The Visible Hand was also a direct attack (signaled by the title) on Adam Smith’s primary notion of a marketplace controlled by no one, but operating for the betterment of all. Professor Chandler didn’t argue that

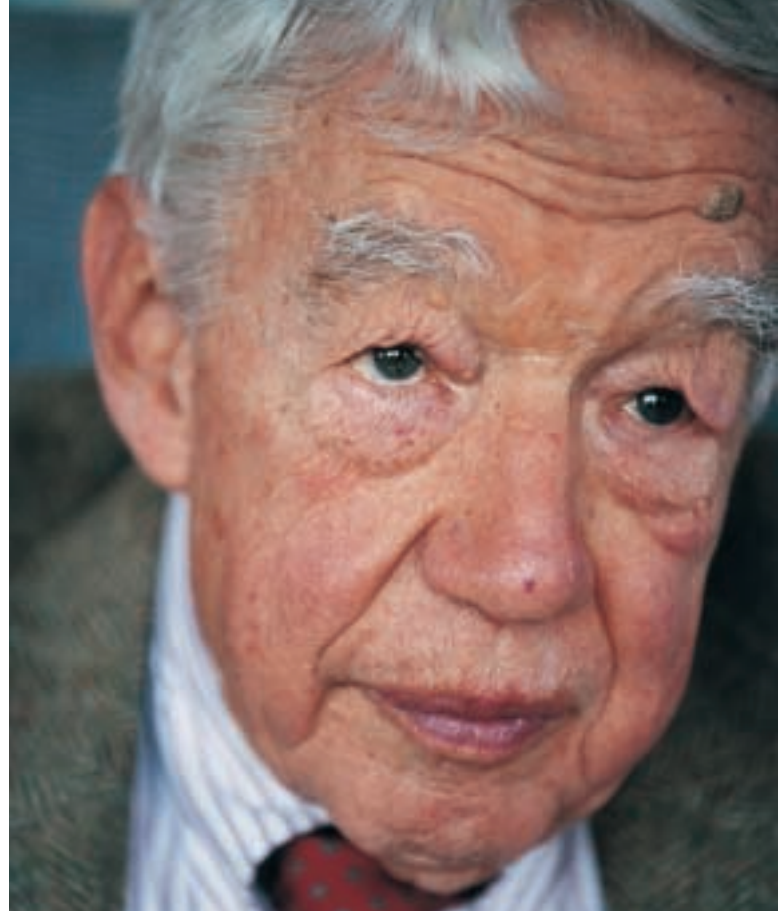
Smith was wrong, but that he was outdated. A global mass market had emerged. In this environment, large corporations had capabilities that smaller, upstart competitors couldn't match; the visible hand of the large corporation had replaced the invisible hand of the market. This heresy may have cost Alfred Chandler a Nobel Prize in economics, or so Peter Mathias believes. (In 1993, when the prize was preannounced as focused on economic history, Professor Chandler was nominated; but it went to Douglass North and Robert T. Fogel.)

In the final book of his trilogy, 1990's *Scale and Scope: The Dynamics of Industrial Capitalism*, Professor Chandler proposed that the same type of evolution took place around the world and was thus an innate feature of capitalism, instead of being some kind of aberration unique to America. Borrowing the phrases of first-mover advantage from economics, he proposed that barriers to entry in a business stem not just from the dominant first-mover's economies of scale, but also from its economies of scope — the expansion of production capabilities to reach several markets at once, usually by capitalizing on already existing knowledge. International Harvester trounced Ford in the tractor business in 1928, even though Ford was a far more efficient manufacturer. The reason? IH knew, from its plow and spreader business, how to sell to farmers, and Ford did not.

In the perennial war for legitimacy between professional managers and investors, all this puts Professor Chandler firmly on the side of managers, particularly those steeped in production. He dismisses the argument that financial raiders improved corporate performance in the 1980s by forcing managers to break up (or merge) their companies. The ebb and flow of financial markets, in Professor Chandler's story, is mere froth on the surface of the fundamental force of real-world technology and production, especially in the hands of the largest mass-market corporations. "He has never paid a lot of attention to banks," notes fellow economic historian Richard John of the University of Illinois at Chicago. Professor Chandler also pooh-poohs the idea that we are moving toward a decentralized, entrepreneurial economy. "If the U.S. thinks it is going to regain global competitiveness through small businesses," he told *Forbes* in 1989, "it is fooling itself."

The Fates Step In

There is a curious passage toward the end of *Inventing the Electronic Century* when Alfred D. Chandler Jr. the analytical researcher steps aside and the epic business fan



steps in. "In Greek drama," he writes, "the gods set the stage for human action but the Fates often intervened to change the course of events." And then he singles out several moments of fate in the history of electronics, moments when destiny seemingly took a hand, with unpredictable consequences and "extraordinary" drama.

For example: In 1982, just as Philips was investing in the CD-i and dooming itself, IBM chose to release a new personal computer, licensing the processor and software production to two unknown firms called Intel and Microsoft. That simple act conferred immense first-mover advantage on both companies — a chance event from which Microsoft, in particular, has never looked back. Or in 1958, the U.S. Justice Department settled an antitrust suit with RCA by agreeing that only foreign companies would have to pay full price for the firm's electronics patents. This gave RCA a dramatic incentive to license technology outside the U.S., "force-feeding" (as Professor Chandler put it) "the maturing of Japan's and Europe's color television sectors."

Professor Chandler doesn't say what specific integrated learning paths would, in his view, be most useful in the near future. "I'm a historian," he says, "and historians don't predict."

And yet the sense of forces that cannot be resisted runs throughout the body of his narratives. For example, biotechnology, consumer electronics, and the computer/

Internet, in Professor Chandler's view, all represent innovations that could shape the pattern of corporate triumphs and failures as profoundly as the railroad did. But that doesn't mean that these innovations, like the railroad, will put industrial society through a sweeping infrastructure transition that changes the fundamental economic game. These new industries are still subject to the same forces of business reality, the same first-mover advantage and scale-and-scope economies, that shaped chemicals, automobiles, and steel.

Biotechnology, still in its infancy, already has two clear favorites for first-mover advantage. They are both Swiss companies, based in Basel, with long-standing American operations: Novartis and Roche Group (operating in the U.S. for more than a century as Hoffman-LaRoche). Both firms gained their advantage in part by acquiring pioneering American biotech research firms, Chiron and Genentech, respectively. If they succeed, they may be impossible to dislodge. Novartis and Roche "seem to understand that time is moving quickly, and this is their opportunity," says Professor Chandler. Their ascent — and its contrast with older-line chemical companies like DuPont and Dow Chemical Company — will be the subject of his next book.

Professor Chandler agrees that the Internet is a "game-changing" new infrastructure — a source of sweeping changes in the pattern and flow of goods, services, and industrial relationships. But so is the bar-code reader. ("The bar code," says Professor Chandler, "was as much a revolution as the post office.") Like the railroads, the Internet was spurred by government investment, but depended for its growth on privately created technology — in this case, the personal computer, the server, and software. If it follows the same pattern as the railroads, then the Internet will continue to foster a volatile investment market, and it will continue to be seen as a "level playing field" promoting diversity and small enterprise. But in the end, the Internet will also make it far easier for a handful of first-movers to dominate their channels.

The Next Epic

What kind of strategy does the Chandler epic suggest in this business environment? The lasting companies will be those that act now, as Sony did in 1950 or Microsoft in 1980. Focus on some key set of capabilities — miniaturization or operating-system software — that interests you and that fits the larger trends you see. Cultivate your capabilities and relationships. Rather than looking for investment capital, look for opportunities to grow your

business from revenues, learning ever more about your customers and distributors in the process. Respect the value of "tacit knowledge" — the profound understanding of the business that pops up in corridor talk and informal e-mail — rather than formal policies and procedures. ("I haven't spelled that out in my books," says Professor Chandler. "And I should.")

Don't be tempted into mergers, like the proposed Hewlett-Packard–Compaq merger, for primarily financial reasons. ("These rarely work in high-tech industries," snorts Professor Chandler.) Above all else, resist cutting back R&D for your core businesses because the development of a high-quality research operation is a clear way to build your own learning path.

This is a hard message to hear, at least for those of us who see ourselves as facing a world of infinite possibilities, where we can do anything we set our minds to. Professor Chandler's work, even down to the book titles — *The Visible Hand*, *Scale and Scope* — suggests that we are not nearly as free to act as we think we are. This is the kind of worldview that you would expect from someone who has spent his life racing sailboats and studying business. We live in a world of continually shifting winds and currents. We cannot go against them, nor can we predict their direction and force. But we can learn to catch them in our sails; and if we are lucky enough to be the first to catch one of them, we can move so far out in front that no one else will come close. At least until the wind shifts. +

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Resources

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