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The Pursuit of Shareholder Value: Cisco's Transformation from Innovation to Financialization

Marie Carpenter and William Lazonick*

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ABSTRACT

Once the global leader in telecommunication systems and the Internet, over the past two decades the United States has fallen behind global competitors, and in particular China, in mobile-communication infrastructure—specifically 5G and Internet of Things (IoT). This national failure, with the socioeconomic and geopolitical tensions that it creates, is not due to a lack of US government investment in the knowledge required for the mobility revolution. Nor is it because of a dearth of domestic demand for the equipment, devices, and applications that can make use of this infrastructure. Rather, the problem is the dereliction of key US-based business corporations to take the lead in making the investments in organizational learning required to generate cutting-edge communication-infrastructure products. No company in the United States exemplifies this deficiency more than Cisco Systems, the business corporation founded in Silicon Valley in 1984 that had explosive growth in the 1990s to become the foremost global enterprise-networking

* Marie Carpenter is professor of strategy at Institut Mines-Télécom Business School in Paris and vice-president of the Academic-Industry Research Network. William Lazonick is professor of economics emeritus at the University of Massachusetts and president of the Academic-Industry Research Network. The Institute for New Economic Thinking, Institut Carnot Télécom et Sciences Numériques, and Canadian Institute for Advanced Research (CIFAR Program on Innovation, Equity & the Future of Prosperity) provided funding for this project. We are grateful for the inputs into this project of Bob Bell, Henrik Glimstedt, Matt Hopkins, and Erdem Sakinç as well as comments from Thomas Ferguson, Emre Gömeç, Ken Jacobson, Ken Lipartito, Ed March, Martyn Roetter, and Öner Tulum.

equipment producer in the Internet revolution. This paper provides in-depth analysis of Cisco's organizational failure, attributing it ultimately to the company's turn from innovation in the last decades of 20th century to financialization in the early decades of the 21st century. Since 2001, Cisco's top management has chosen to allocate corporate cash to open-market share repurchases—aka stock buybacks—for the purpose of giving manipulative boosts to the company stock price rather than make the investments in organizational learning required to become a world leader in communication-infrastructure equipment for the era of 5G and IoT. From October 2001 through October 2022, Cisco spent $152.3 billion—95 percent of its net income over the period—on stock buybacks for the purpose of propping up its stock price. These funds wasted in pursuit of "maximizing shareholder value" were on top of the $55.5 billion that Cisco paid out to shareholders in dividends, representing an additional 35 percent of net income. In this paper, we trace how Cisco grew from a Silicon Valley startup in 1984 to become, through its innovative products, the world leader in enterprise-networking equipment over the next decade and a half. As the company entered the 21st century, building on its dominance of enterprise-networking, Cisco was positioned to upgrade its technological capabilities to become a major infrastructure-equipment vendor to service providers. We analyze how and why, when the Internet boom turned to bust in 2001, the organizational structure that enabled Cisco to dominate enterprise networking posed constraints related to manufacturing and marketing on the company's growth in the more sophisticated infrastructure-equipment segment. We then document how from 2002 Cisco turned from innovation to financialization, as it used its ample profits to do stock buybacks to prop up its stock price. Finally, we ponder the larger policy implications of Cisco's turn from innovation to financialization for the competitive position of the US information-and-communication-technology (ICT) industry in the global economy.

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1. Cisco's Path Not Taken

Once the global leader in telecommunications systems and the Internet, over the past two decades the United States has fallen behind global competitors, including China, in mobile-communication infrastructure—specifically 5G and Internet of Things (IoT). This national failure, with the socioeconomic and geopolitical tensions that it creates, is not due to a lack of US government investment in the knowledge required for the mobility revolution. Nor is it because of a dearth of domestic demand for the equipment, devices, and applications that can make use of this infrastructure. Rather, the problem is the dereliction of key US-based business corporations to take the lead in making the investments in organizational learning required to generate cutting-edge communication-infrastructure products.

No company in the United States exemplifies this deficiency more than Cisco Systems, the business corporation founded in Silicon Valley in 1984 that had explosive growth in the 1990s to become the foremost global enterprise-networking equipment producer in the Internet revolution. This paper provides in-depth analysis of Cisco's organizational failure, attributing it ultimately to the company's turn from innovation in the last decades of 20th century to financialization in the early decades of the 21st century. Since 2001 Cisco's top management has chosen to allocate corporate cash to open-market share repurchases—aka stock buybacks—for the purpose of giving manipulative boosts to the company stock price rather than make the investments in organizational learning required to become a world leader in communication-infrastructure equipment for the era of 5G and IoT.

From October 2001 through October 2022, Cisco spent $152.3 billion—95 percent of its net income over the period—on stock buybacks for the purpose of propping up its stock price. These funds wasted in pursuit of "maximizing shareholder value" were on top of the $55.5 billion that Cisco paid out to shareholders in dividends, representing an additional 35 percent of net income.[1] Table 1 shows the extent to which Cisco has focused its resource allocation on distributions to shareholders, particularly in the form of stock buybacks, over the last two decades.

Table 1. Cisco Systems: Dividends (DV) and buybacks (BB), billions of dollars and as percentages of net income (NI), 1993-2022

	Net income (NI), $b	Dividends (DV), $b	Buybacks (BB), $b	DV/NI%	BB/NI%	(DV+BB)/NI %
1993-1997	2.9	0.0	0.5	0	18	18
1998-2002	7.0	0.0	1.9	0	27	27
2003-2007	26.6	0.0	41.3	0	155	155
2008-2012	36.5	2.2	33.0	6	90	96
2013-2017	47.2	21.4	24.1	45	51	97
2018-2022	45.7	30.4	51.5	66	113	179

Source: Cisco Systems 10-K SEC filings, 1993-2022

[1] Net income, or after-tax profit, is a measure of the extra cash that a company generates in an accounting period (quarter or fiscal year) that can be allocated for different purposes, including enhanced investment in productive capabilities and/or higher wages and benefits to employees, or, alternatively, distributions to shareholders in the form of dividends and buybacks. Some or all net income can also be retained in the corporate treasury for future use. Distributions to shareholders that exceed 100 percent of net income over a certain time period may be financed by treasury cash, debt issues, asset sales, employee layoffs, and/or suppressed employee compensation.

At the completion of its $4.5-billion cash acquisition of Acacia Communications in March 2021, Cisco Systems announced that the deal reinforces its "commitment to optics as a critical block that will enhance Cisco's 'Internet of the Future' strategy with world class coherent optical solutions for customers, further enabling them to address the unprecedented scale of modern IT" (Cisco 2021b). Cisco is also a central player in the US OpenRAN Policy Coalition that is advocating for radio-access networks based on open interfaces and community-developed standards (Morris 2020; Cisco 2022). With the United States lacking competencies in communication hardware as the 5G mobile network is being deployed, a bipartisan group of US senators has been supporting this move away from proprietary network technologies and toward software-defined technology to "help spur innovation and create more competition and diversity in the supply chain" (Warner et al. 2020).

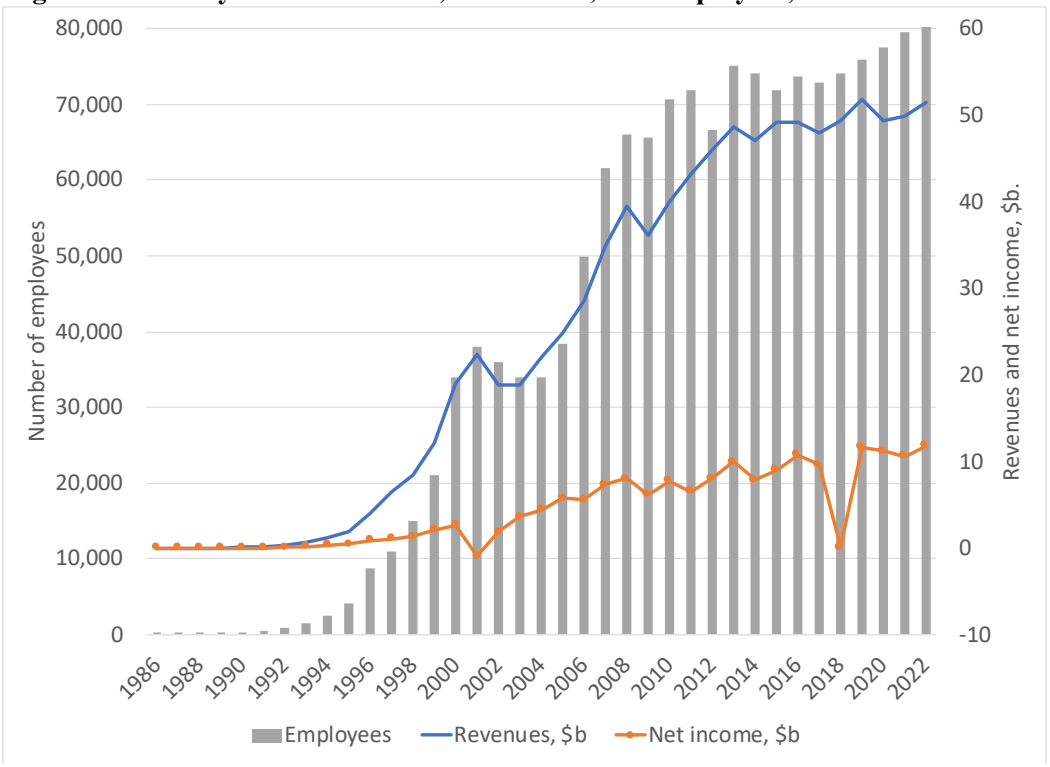
Given Cisco's recent investment into optical networking and US policy moves to encourage the development of a favorable institutional environment for its current technological approach, the company may, at first glance, appear to be well positioned to contribute to future growth in the communication-technology sector. The promise of IoT built on a 5G network requires exponential growth in networking capacity in the coming decade to facilitate unlimited exchange of information across multiple product markets. Cisco is the dominant actor in enterprise networking with a significant installed base, and its future role within the new network configuration would seem assured.

Our analysis of Cisco's historical evolution questions this optimistic outlook. We argue that the organizational structure that enabled Cisco's rapid growth in the 1990s to become the world's leading enterprise-networking equipment company has posed barriers to the accumulation of productive capabilities that Cisco requires to become a major competitor in the service-provider market dominated by Huawei, Ericsson, and Nokia. Specifically, the generation of the high-quality, low-cost communication-infrastructure equipment demanded by carrier-class service providers around the world would require Cisco to reduce dramatically its reliance on contract manufacturers to produce its equipment and value-added resellers to sell these products. With an organizational structure that integrates manufacturing and marketing, Cisco would then have to invest deeply in wired, wireless, and Internet-protocol technologies to become a leading carrier-class equipment company in global competition.

Cisco's specialization in equipment design, to the exclusion of manufacturing and marketing, combined with an aggressive strategy of "growth-through-acquisition" of other networking companies, served it well in the 1990s as it took advantage of the commercialization and growth of the Internet to become the world leader in enterprise-networking equipment. But this organizational structure became problematic for investment in innovation for the higher-quality service-provider equipment markets. We contend that with the appropriate strategic investments in manufacturing and marketing, in addition to research and development, to integrate wired, wireless, and Internet capabilities, Cisco could have become a competitor to Huawei, Ericsson, and Nokia in these high-end communication technologies, thus providing the United States with indigenous capabilities in 5G and beyond.

In the 1990s, Cisco was a phenomenal success, supplying enterprise-networking equipment for connectivity in the Internet revolution. Leonard Bosack and Sandy Lerner, a married couple who both worked at Stanford University, founded cisco (a lower-case c as in San Francisco) from their home in December 1984. In 1987, the two founders hired their first employee and took in $129,000 in sales. Toward the end of 1987, Cisco received an infusion of $2.5 million in venture funds from Sequoia Capital (Bellinger 1989a). On July 29, 1990, the end of the fiscal year during which Cisco did its initial public offering (IPO), the company had 254 employees and recorded annual revenues of $70 million. By the end of fiscal 2001, with the Internet boom turning to bust, Cisco had 38,000 employees and annual revenues of $22.3 billion (see Figure 1).[2]

Figure 1. Cisco Systems: Revenues, net income, and employees, 1986-2022



Source: Cisco Systems 10-K SEC filings, 1990-2022.

In fiscal 2022 (ended July 30, 2022), Cisco had $51.6 billion in revenues and 83,300 employees, both figures well over twice their 2001 levels. While the company has experienced substantial growth over the past two decades, it has not lived up to its potential as a systems integrator for communication equipment to build 5G networks and implement IoT. Cisco put that potential in place in the late 1990s when it moved aggressively into the service-provider infrastructure market in recognition of the inevitable convergence of Internet Protocol (IP) and telecom networks. Beginning in September 2001, however, Cisco's senior executives decided that the company should allocate its resources to boost its stock price rather than invest in the next generation of innovative products.

In the early 2000s, Cisco chose to sabotage its innovative potential as the company wound down investments of almost $10 billion in optical networking and brought to a halt organizational

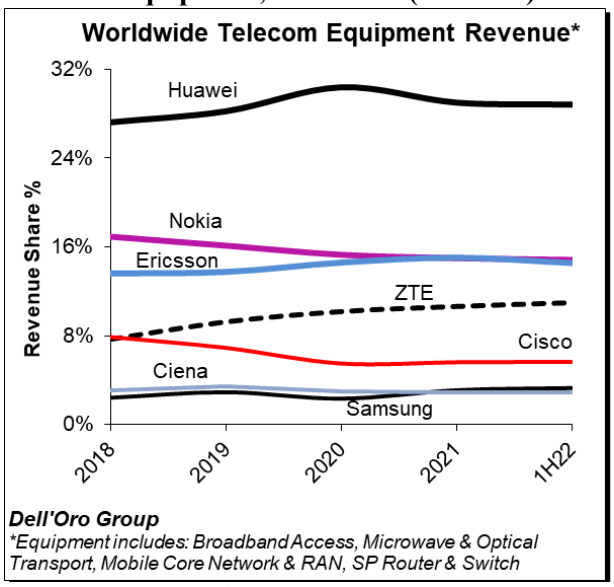
[2] Note that, throughout this paper, all years of Cisco data refer to the company's fiscal years, ending the last week of July.

learning through in-house manufacturing of these complex technologies. Notably, in 2009, Cisco neglected to acquire Nortel's Metro Ethernet Division when the Canadian company went bankrupt. Instead, US-based Ciena purchased the Nortel division for $769 million. In addition to a portfolio of 1,150 patents and patent applications (OND 2010), this acquisition allowed Ciena to grow from a niche rival to one of the leading suppliers of optical-networking systems globally. In 2021, for example, the optical-transport segment was estimated to be worth $15 billion, and Ciena was one of five companies that accounted for almost 80-percent market share along with China-based Huawei and ZTE, Finland-based Nokia, and US-based Infinera (Goovaerts 2022). Ciena, however, is a specialist producer, not a systems integrator, with revenues and employment that, in 2021, were, respectively, seven percent and nine percent of Cisco's.

Cisco's ambiguous attitude to optical networking persisted over the first two decades of the 21st century while a once-obscure Chinese competitor, Huawei, rose to become the world's leading communication-technology company. Over the years that Cisco failed to commit to the service-provider infrastructure market, it also failed spectacularly with several consumer products. In sharp contrast, from 2012, Huawei successfully diversified into smartphones. In the second quarter of 2020, Huawei surpassed Samsung as the global leader in smartphone shipments (Chitkara 2020) before its sales plummeted as US sanctions decimated its access to operating systems and advanced chips (Amadeo 2021; Lazonick & Hopkins 2021).[3]

Over the past two decades, Cisco repeatedly claimed that it was investing in the more complex technologies required to compete in the service-provider market. But, as the third decade of the century unfolds, Cisco is not Huawei—and the United States as a nation finds itself without an indigenous firm that can function as the systems integrator in building 5G networks. As Figure 2 shows, Cisco is an also-ran in the global telecom service-provider equipment market.

Figure 2. Global shares in telecommunication equipment, 2018-2022 (first half)

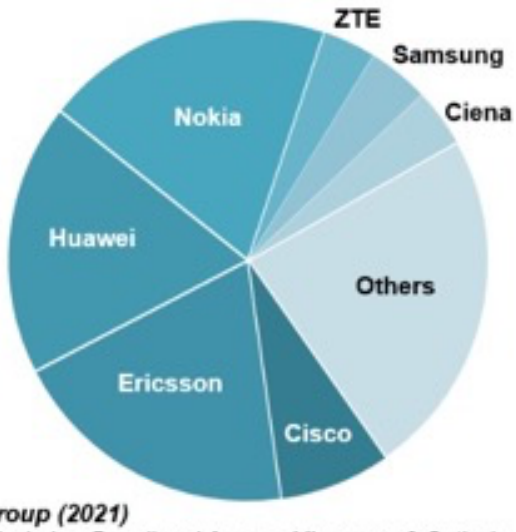


Source: Pongratz 2022b.

[3] As part of our project on innovation and competition in the global communication-technology industry, researchers affiliated with the Academic-Industry Research Network have been engaged in the analysis of the social conditions that have underpinned Huawei's success (Feng 2020; Feng & Li 2020; Li 2022; Li & Lazonick 2022).

Huawei is the leading telecom-equipment firm in the 21st century, despite the impact of US trade sanctions against it introduced in 2012 and expanded significantly in 2019. The Chinese market accounted for an estimated 26 percent of the $100-billion telecom equipment market in 2022. Outside of China, Ericsson and Nokia are joint leaders with approximately 20-percent market share (Figure 3), followed by Huawei with 18 percent. Cisco is in fourth position, followed by ZTE, Samsung, and Ciena, all three of which had similar shares outside of China in 2021.

Figure 3. Telecom equipment market shares outside of China, 2021



Source: Pongratz 2022a.

Section 2 of this paper traces how Cisco grew from a Silicon Valley startup in 1984 to become, through its innovative products, the world leader in enterprise-networking equipment over the next decade and a half. As the company entered the 21st century, building on its dominance of enterprise-networking, Cisco was positioned to upgrade its technological capabilities to become a major equipment vendor to service providers. In Section 3, we analyze how and why, when the Internet boom turned to bust in 2001, the organizational structure that enabled Cisco to dominate enterprise networking posed constraints related to manufacturing and marketing on the company's growth in the more sophisticated carrier-class equipment segment. In Section 4, we document how from 2002 Cisco turned from innovation to financialization, as it used its ample profits to prop up its stock price. Finally, we ponder the larger policy implications of Cisco's turn from innovation to financialization for the competitive position of the US information-and-communication-technology (ICT) industry in the global economy.

2. The Rise of Cisco Systems to Global Leadership in Enterprise-Networking Equipment

Origins

Cisco Systems emerged in the last half of the 1980s from the convergence of the previous distinct industries engaged in information technology and communication technology. The origins of this

convergence go back to the early 1970s when, at Xerox PARC, the Palo Alto-based research arm of the Old Economy copier company, Robert Metcalfe led a team that developed Ethernet, a technology that enabled computers to communicate with one another (Hiltzik 2000). When Xerox declined to commercialize this technology, Metcalfe sought to do so by co-founding 3Com in 1979.[4] With the widespread adoption of the IBM PC and its clones in the early 1980s, 3Com was well positioned to be a leader in providing the hardware and software for local area networks (LANs).

After 3Com acquired the Silicon Valley company Bridge Communications in 1987, it became the largest supplier of LAN equipment, followed by Novell, based in Provo, Utah (Mulqueen 1989). By this time, however, business, government, and civil-society organizations that had installed LANs in geographically dispersed locations wanted bridges or routers that would link their LANs with wide-area networks (WANs). Cisco Systems was the company that, by the beginning of the 1990s, was most successful in developing this internetworking technology, mainly because it wrote software for all possible protocols (Masud 1990).

While working in computing in different parts of Stanford University, Cisco founders Bosack and Lerner had helped to develop the university's LANs and had then taken up the challenge of internetworking them based on TCP/IP protocol (Bellinger 1989b). With sales at about $250,000 per month in 1987, Cisco needed both financial resources and management expertise to expand. The founders turned to Donald Valentine, whose firm, Sequoia Capital, injected $2.5 million in venture finance for a 24-percent stake in the company (Pitta 1992; Clark 1991). Prior to founding Sequoia in 1972, Valentine had gained expertise in the emerging microelectronics industry as a sales executive at Fairchild Semiconductor and National Semiconductor. Given that 75 venture-capital firms had already turned down Lerner and Bosack, Valentine was able to get the founders to agree to hand over executive decision-making power to him.

During 1988, Valentine directed the hiring of professional managers at Cisco, including John Morgridge, a veteran computer industry executive, as Cisco CEO and president. Morgridge stepped down as CEO in 1995 but remained Cisco's chairman of the board until 2006. Valentine also was a board member until 2006. Beyond the initial professionalization of the company in the late 1980s, Morgridge and Valentine oversaw the phenomenal growth of Cisco from less than $28 million in sales in 1989 to $28.5 billion in sales in 2006.

The operating system behind what became Cisco's router was originally developed by Stanford engineer Bill Yeager to link the computer science, medical center, and department of electrical engineering. The code for his original "network operating system" in 1980 optimized the algorithms needed to deal with the scheduling and packet-switching challenges across different mainframes under the constraint of limited memory. In 1981, Yeager integrated the routing of IP addresses in time for the upgrading of the Stanford campus to 10Mbps Ethernet. A third significant step occurred with the integration of a memory board developed by Andy Bechtolsheim[5] as part of his master's program at Stanford. In 1985, Yeager gave Bosack access to the sources for his

[4] Standing for "computer, communication, and compatibility".

[5] In 1982 Bechtolsheim went on to found Sun Microsystems, an acronym of "Stanford University Network". He left Sun in 1995 and founded Granite Systems, acquired by Cisco in 1996 (Morrow 1999). Bechtolsheim is renowned for his early financing of Google in 1998. In 2008, he joined Arista Networks, a Cisco competitor, as chief development officer and chairman.

routing code, and it was refined with more features added. A year later, Stanford's legal department obliged Cisco's founders to pay royalties of $150,000 to the university (Dix 2006).

Unlike its competitors such as 3Com, SynOptics, Wellfleet, and Cabletron, which supplied a range of data-transmission options including hubs and bridges, Cisco was entirely focused on routers and, according to tech journalist Jeffrey Young, "made sure it built the very best ones in the world" (Young 2001, p. 26). An early Cisco engineer, Kirk Lougheed, is credited with improving the IP-support of Yeager's original code, making it more commercially viable. Early-adopters of Cisco's products were also given access to the source code, resulting in further improvements, such as the addition of DECnet by Rutgers University (Bunnell & Brate 2000, p. 9). Cisco's Internetwork Operating System (IOS) was integrated into all new products developed or acquired and became increasingly embedded in enterprise networks as more and more hardware and software providers were granted licenses to include IOS code in their equipment to integrate Cisco networks (Bunnell & Brate 2000, p. 119). Bosack described Cisco's early approach to networking as different than its competitors, contrasting it with those firms which said to customers "forget everything you ever knew. You rewire the entire organization…". Cisco's strategy was to adapt to a customer's existing technology and to provide businesses as partners with "an internetworking solution" to their networking problems (Bellinger 1989b).

Other US companies based in the vicinity of the MIT campus, in Boston's Route 128, were also, at that point, developing IP-based technologies, including, for example, Proteon Associates, which was a credible competitor to Cisco. *Upside* editor David Bunnell argued, however, that "the West Coast's emphasis on open standards and a cutthroat, do-or-die mentality quickly demolished the East Coast competition" (Bunnell & Brate 2000, p. 14). In a sector in which the average product lifecycle was only 18 months for hardware and six for software, Cisco focused on speed to market, aiming to improve performance threefold and halve costs every generation (Chatman, O'Reilly, & Chang 2005).

In 1987, the merger of two Silicon Valley firms, which combined 3Com's LAN expertise and Bridge Communications' networks of terminals and mainframes, posed a competitive threat to Cisco. Post-merger integration problems, however, generated significant internal discord. The founders of Bridge Communications, Bill Carrico and Judy Estrin, left the merged company because they considered it to be too dominated by the 3Com PC-centric view of the world (Breidenback 1990). Bridge Communications' failed integration into 3Com helped Cisco's early rise to dominance in the router sector just as the US government was opening up access to the Internet (Paulson 2001, p. 139). Similarly in 1994, the merger of California-based SynOptics with Massachusetts-based Wellfleet to create Bay Networks was beset by integration issues that reduced its competitiveness (Paulson 2001, ch. 9). Over time, Cisco's dominant market share also allowed it to undercut the competition. In 1996, for example, it dropped the price of its switches to 50 percent of Bay Networks' (Bunnell & Brate 2000).

Cisco's business model

Enabling Cisco's rapid growth through the 1990s was the outsourcing of manufacturing to several contract manufacturers that emerged during that period. Morgridge traces the origins of the "virtual factory" idea to an informal discussion he had in 1989 with colleagues from one of his previous

employers, Honeywell, a vertically integrated Old Economy company. Honeywell was assembling components to build its computers and had spare capacity (Heskett & Morgridge 2000).

From 1992, Cisco began outsourcing manufacturing while maintaining final assembly and testing in-house. As it developed automated test cells that standardized the testing process through software, Cisco also outsourced routine testing procedures (Nolan & Porter 1998). For more complex products, however, Cisco outsourced only as far as subassembly and the final assembly and testing occurred in one of its three manufacturing locations in San Jose, California (Tempest, Halloway & Wheelwright 1998).

In 1994, Cisco introduced its "Single Enterprise Program" to coordinate the supply chain with both a contract manufacturer, Jabil Circuit, and a distributor of parts, Avnet (Elliot 1997). The system was further enhanced with Oracle-based Enterprise Resource Planning (ERP), chosen in part because of the proximity of the software supplier and Oracle's willingness to offer Cisco a "super deal" in order to win the contract (Austin, Nolan & Cotteleer 1998, p. 5).

Cisco was not the only US company that outsourced to contract manufacturers during this period. In the 1990s leading Old Economy information-technology companies IBM and Hewlett-Packard divested their manufacturing operations as part of a broad trend by original equipment manufacturers (OEMs) in ICT to rely upon contract manufacturers, often referred to as electronic manufacturing service (EMS) providers or partners. The leaders among these EMS providers were Singapore-based Flextronics; US-based Solectron, SCI Systems, and Jabil Circuit; and Canada-based Celestica, which had formerly been IBM Canada (Thurm 1998). Increasingly all of these EMS providers established plants worldwide, and especially in Asia (Karleff 1998).

Cisco's high margins of up to 65 percent depended on its ability to concentrate on software-development and product design. The company outsourced activities such as board stuffing and testing, which required high levels of investment in plant and equipment, generating lower returns. It also saw outsourcing as enhancing its flexibility in supplying existing products to the market and speeding up new product development (Spectrum 1999). The company's head of manufacturing and logistics explained: "I want my people focusing on the intellectual portion, establishing the supply base, qualifying new suppliers, and developing better processes, not managing direct labor. We supply the intellect; they supply the labor" (Tempest et al. 1998, p. 5).

In-house Cisco engineers were able to work easily with EMS partners, using a "new product information" (NPI) database that reportedly reduced information gathering from one day to 15 minutes and halved the amount of engineering time spent on new product development (Bunnell & Brate 2000, p. 149). By 1997, NPI had reduced costs by over $20 million (Nolan & Porter 1998). Overall, the outsourcing of manufacturing is estimated to have generated savings of 30 percent for Cisco on the cost of assembling products (Bunnell & Brate 2000, p. 147).

In addition to relationships with its EMS partners for manufacturing its products, Cisco also developed relationships with the distribution companies that supplied these contract manufacturers with their key components. Unlike a typical turnkey model used at the time, Cisco was willing to offer incentives so that the companies supplying its EMS partners retained responsibility for ordering the components for its products as well as ownership until delivered to the EMS warehouses. Cisco coordinated the materials resource planning with key distribution partners who

delivered components to EMS partners and only at this point did the material become Cisco's property. Although Cisco relied heavily on distributors to forecast demand requirements, the company argued that its model offered greater flexibility and lower costs overall than the typical supply-chain model at the time that was coordinated by EMS providers (Carbone 1996).

Cisco's virtual supply chain was not the only way that the company was distancing itself from the vertically integrated model of previous generations of technology leaders. Along with its peers in enterprise-networking equipment, Cisco rejected the idea of a large in-house sales force and began, instead, to rely on downstream partners to interact with the majority of its customers. With the growth of the microelectronics industry in the early 1980s, including both desktop computers and workstations as well as various customized and packaged software options, large numbers of "value-added resellers" (VARs) emerged as specialized distributors of digital electronics products (Ticoll & Tapscott 1989; Mardesich 1991; Kay 1992; Parker, Doke & Acree 1994; Willett 1994).[6]

By the mid-1990s, Cisco had become the fastest-growing OEM in the rapidly expanding enterprise-networking industry, relying upon a vertically segmented business model for both manufacturing and marketing. Within the boundaries of Cisco as a firm, its performance as an innovative company that could generate higher-quality, lower-cost networking products than had previously been available depended upon the operation of three "social conditions of innovative enterprise": strategic control, organizational integration, and financial commitment.[7]

- **Strategic control:** For innovation to occur in the face of technological, market, and competitive uncertainties, executives who control corporate resource allocation must have the abilities and incentives to make strategic investments in innovation. Their abilities depend on their knowledge of how strategic investments in new capabilities can enhance the enterprise's existing capabilities. Their incentives depend on alignment of their personal interests with the firm's purpose of generating innovative products.

  In Cisco's case, as we shall see, when the CEO position passed from John Morgridge to John Chambers in 1995, there was a significant shift in strategic-control *abilities* from internal product development and marketing to growth through acquisitions and the externalization of sales. Subsequently, in the transition from the 1990s to the 2000s, with Chambers as CEO, there was a marked transformation in strategic-control *incentives* from innovation to financialization, manifested by the focus of the company on doing stock buybacks to boost its stock price while neglecting investment in productive capabilities that could have positioned Cisco as a major global competitor in communication-infrastructure equipment.

- **Organizational integration:** Implementation of an innovation strategy requires integration of people working in a complex division of labor into the collective and cumulative learning processes that are the essence of innovation. Work satisfaction, promotion, remuneration, and benefits are important instruments in a reward system that motivates and empowers employees to engage in collective learning over a sustained period of time.

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[6] Value-added resellers (VARs) are companies that resell software, hardware, and networking products, adding value through consulting-type services such as customized software, network design, and training.

[7] "The theory of innovative enterprise" is an analytical perspective that draws its insights from the study of how business firms operate and perform in different industrial sectors, institutional environments, and historical eras. See Lazonick 2019.

During the 1990s, Cisco was an exemplar in the organizational integration of its personnel to serve the rapidly changing requirements of enterprise networking, including a management system for integrating the capabilities of 71 acquisitions that the company did from 1994 to 2001 into Cisco's organizational-learning processes (O'Reilly 1998). As was the case for other New Economy companies, central to organizational integration at Cisco were stock options as a component of rewarding a broad base of Cisco's personnel. As we shall see, this form of remuneration became a problem for Cisco in the early 2000s when the crash of Cisco's stock prices resulted in highly inequitable income disparities among Cisco's personnel, depending upon when and how they had been granted their stock options.

- **Financial commitment:** For collective learning to cumulate over time, the sustained commitment of "patient capital" must keep the learning organization intact. For a startup company, venture capital can provide financial commitment. For a going concern, retained earnings are the foundation of financial commitment. Traditionally, for rapid growth, the firm's retained earnings could be leveraged by long-term bond issues to invest in plant and equipment and do acquisitions. However, a distinctive mode of investment finance in the New Economy business model in the 1990s was the use of a company's stock as a combination currency, as an alternative to cash, to acquire companies.

  Three years after its founding in 1984, Cisco secured $2.5 million in venture-capital backing, and in 1990 it did its IPO, raising $47.3 million—the only time in its history that Cisco went to the stock market for funding. From 1991 to 2000, as it came to dominate the Internet equipment industry, Cisco retained a total of $8.6 billion out of net income while taking on no debt. Given its business model, the company had capital expenditures of only $2.9 billion over the decade. Yet, from 1994 to 2001, Cisco did 71 acquisitions for a total purchase price of over $34.2 billion.

  Cisco financed these acquisitions almost entirely by using its stock as a combination currency (Carpenter, Lazonick & O'Sullivan 2003). Especially in the last years of the decade, in doing acquisitions Cisco had the financing advantage of its soaring stock price. In 2001, however, Cisco's stock price collapsed, and since then the company has largely lost the advantage of using its stock as a combination currency. Indeed, as already indicated, after 2001 Cisco's focus on stock-price performance placed it at a financing disadvantage of its own choosing. In the decade 2002-2011, Cisco spent $71.6 billion repurchasing its own stock, equal to 126 percent of net income, while paying its first dividends in 2011. In 2012-2021, Cisco's buybacks totaled $72.5 billion, 81 percent of net income, along with $47.0 billion paid out as dividends, another 53 percent of net income. In 2022, Cisco's distributions to shareholders were 118 percent of the company's all-time high net income of $11.8 billion, with $6.2 billion in dividends and $7.7 billion in buybacks. Over the past two decades, Cisco's "financial commitment" has been to boost its stock yields, not to invest in its innovative capabilities.

A complete understanding of the strengths and weaknesses of Cisco's business model as it transitioned from its heady growth in the 1990s to its transformation into a highly financialized company over the past two decades requires an examination of the specifics of the evolution of strategic control, organizational integration, and financial commitment in the company.

Strategic control

In the late 1980s, Valentine as the venture capitalist and Morgridge as the CEO took over strategic control at Cisco, pushing Bosack and Lerner, first, to the side and, then after the 1990 IPO, out of the company. Morgridge guided Cisco through the IPO and was still CEO of the company when in 1993 the US National Science Foundation made the Internet freely available for commercial use. A key member of his executive team was John Chambers, who had joined the company in 1991 after leaving a high-level executive position at Wang Laboratories, based in Boston's Route 128 technology district, as that company was heading into bankruptcy. At Cisco, Chambers was senior vice-president of worldwide operations before replacing Morgridge as CEO in 1995.

After completing law school and obtaining an MBA, Chambers worked as a salesperson for IBM between 1976 and 1983, for a time in China. He reportedly left IBM for Wang in part because he realized that his lack of an engineering background would limit his career progress at an Old Economy company like IBM. While recognizing that the customer focus of IBM had been core to its success for decades, it is said that Chambers believed that Cisco and others took market share from IBM because the Old Economy company was overly concerned with large customers and neglected "the bottom" of the market (Paulson 2001, p. 50).

A recognized factor in Cisco's early success was its commitment to consumer satisfaction, termed "customer advocacy" by co-founder Lerner. From the start, the company had a loyal following within large US firms, and it initially used its in-house engineers as salespeople and customer support staff. Morgridge described Cisco's fast growth in the early 1990s as being partly a result of the "the advantage of selling to a peer group" (Bunnell & Brate 2000, p. 27) as it brought together engineers from Cisco and from the customers' technical functions, referred to as "plumbers", with no salespeople in the room (Heskett & Morgridge 2000, p. 3).

Douglas Allred replaced Lerner as head of customer advocacy on her departure from Cisco in 1990. In 1989, Allred had already built a customer-support site to access software upgrades and in 1990 had launched a database that permitted customers to report bugs and share information with Cisco and among themselves. From 1993, large customers were allowed to post queries to Cisco's technical staff, and other customers soon joined the discussions with suggestions. Allred estimated that without this online feedback from customers and others, Cisco would have needed to hire 10,000 additional engineers during its growth phase in the 1990s. The website became one of the first "corporate communities" (Bunnell & Brate 2000, p. 29).

In the early 1990s with Morgridge as CEO, Cisco was still defending a direct-sales model in its North American market while other leading manufacturers were growing indirect sales through VARs. Its corporate marketing manager explained in August 1992: "[O]ne reason we moved away from indirect channels in North America is that it's an extremely complex technology that keeps changing. It requires a great deal of technical expertise on the part of the sales force. We decided direct is a better way to sell the more complex products we have" (Kay 1992).

At this time, however, the systems integration skills of resellers in the United States were improving, as they became more technically capable in building both local and wide-area networks (Bowen 1992). By March 1993, Cisco's vice-president of marketing explained that relationships were being developed with VARs in order to maintain the company's rapid growth (Markowitz

1993). It was not until February 1994, however, that the company formalized the structure of its relationships with channels by defining four levels of reseller and introducing an associated certification program (CBR Staff 1994).

In mid-1994, Cisco's main competitor, Wellpoint, had already increased its indirect sales to 55 percent of revenues from only 10 percent three years previously. The leader in the low-end router segment, 3Com, had worked almost exclusively through indirect sales for ten years and was considered a "master at distribution" (Dunlap 1994a). Cisco appointed its first director of worldwide channel operations at the same time as it launched its first new product targeted at small to medium-sized firms (Dunlap 1994b). Cisco announced plans that such low-end products would be sold "almost 100 percent" via indirect channels in 1995. The two-tier structure to be adopted in the US resellers market was based on the model that Cisco used outside of the United States, where resellers already accounted for 85 percent of its sales (Willett 1994).

Cisco's adoption of VARs as the distribution channel for high-end network equipment coincided with John Chambers' nomination as CEO in January 1995. At Wang, Chambers had been active in developing relations with VARs (CRN 1989; CRN 1990). According to an informed reporter, Morgridge's departure signaled a change in Cisco's "once-contentious relationship with the channel", although the problem was described as one that was "more of omission than commission". Cisco's attitude towards channel members was considered "aloof", notably because the company did not have a formal channel strategy until Morgridge's departure in 1995. With Chambers as CEO, however, Cisco "made a full 180-degree turn in its attitude toward the channel" (VARBUSINESS 1997). A vice-president for enterprise channel sales was also hired in 1995, along with a vice-president of high-volume channels (Cisco 1995).

Cisco did not allow its resellers to have exclusivity to service a particular geographic territory or in relation to a specific technology. Chambers defended this approach by arguing that channel members would accept the trade-off of competition in return for a higher level of opportunity and that resellers would be happier to work with the dominant market player in this context. In a specialist publication for resellers, he is quoted as asking: "[D]o you want a piece of a pie that…gives you a chance at a 40 to 70 percent market share, or would [you] rather align with a partner who might have ten percent market share but gives you the majority of that piece? On one scenario, they have a little bit more channel conflict but a much higher opportunity for reward, or they can choose the other scenario, which has less channel conflict but a much smaller window in which to benefit" (Doyle 1996).

Identifying different competitors in six market segments (IBM, Cascade, Ascend, Fore, 3Com, and Cabletron), Chambers stressed the importance of Cisco's open-standards approach as customers began opting for a single network vendor: "VARs have to decide if they are going to attempt to get anywhere from five to ten different vendors to work together in a fabric with the same [capabilities], or are they more likely to partner with a company that adheres to open standards and who has [a full range] that works together and who moves with the same speed and efficiency of the smaller vendors?" (Doyle 1996).

In 1993, Cisco was still a one-product company that made only routers when one of its big customers, Boeing, said that it was going to develop local area networks that would use lower-cost switches rather than routers. Boeing was about to book an order of $10 million with Crescendo, a

62-person company that had developed this lower-cost solution (Paulson 2001, p. 52). Another of Cisco's customers, Ford, also told it that it was considering the fast Ethernet LAN technology available from Crescendo (Brueller & Capron 2010, p. 6).

Rather than take on the risk of merging with SynOptics, a similar-sized hub and switch supplier based in Santa Clara,[8] Cisco decided on the acquisition route. Chambers convinced the Cisco board to adopt the option of buying Crescendo. In addition to disliking the idea of a merger of equals, according to management consultant Ed Paulson, Chambers "also needed some type of project that would enable him to politically and managerially earn his stripes on his own merits within Cisco" (Paulson 2001, p. 51). Chambers admitted that this decision was difficult to obtain and explained: "it took multiple meetings with me directly affirming that I would probably not stay at Cisco if the board went with SynOptics" (Chambers & Brady 2018, p. 72). It has also been noted that Cisco chairman Valentine was a lead investor in Crescendo (Mayer & Kenney 2004, p. 305).

On Chambers' recommendation, Cisco thus chose to pay $95 million in Cisco shares in September 1993 for Crescendo, then a loss-making switch maker with just $10 million in revenues. At the time of acquisition the price was considered exorbitant, but the bet paid off as Cisco used the acquired technology to launch its Catalyst switch in 1994 (Didio 1994). As demand for corporate switching gear soared, Catalyst sales reached $500 million within eighteen months, with annual sales of $2.8 billion by 1998, five years after the acquisition (Rifkin 1997).

Crescendo has been described not only as Cisco's most successful acquisition financially but also as "the genesis of Cisco's acquisition strategy" (Brueller & Capron 2010, p. 6). In 1995, Morgridge highlighted the complementary nature of the company's acquisition strategy and its distribution network: "at the time we made our first acquisition we had a wonderful asset in the form of a channel to sell, install, and service products for the global market. As a result, there was tremendous leverage in acquiring a product that met the market requirement to put it through our channels. We can take [a new product] and leverage it very dramatically. To a large degree, that has been our strategy with most acquisitions" (Mayer & Kenney 2004, p. 305).

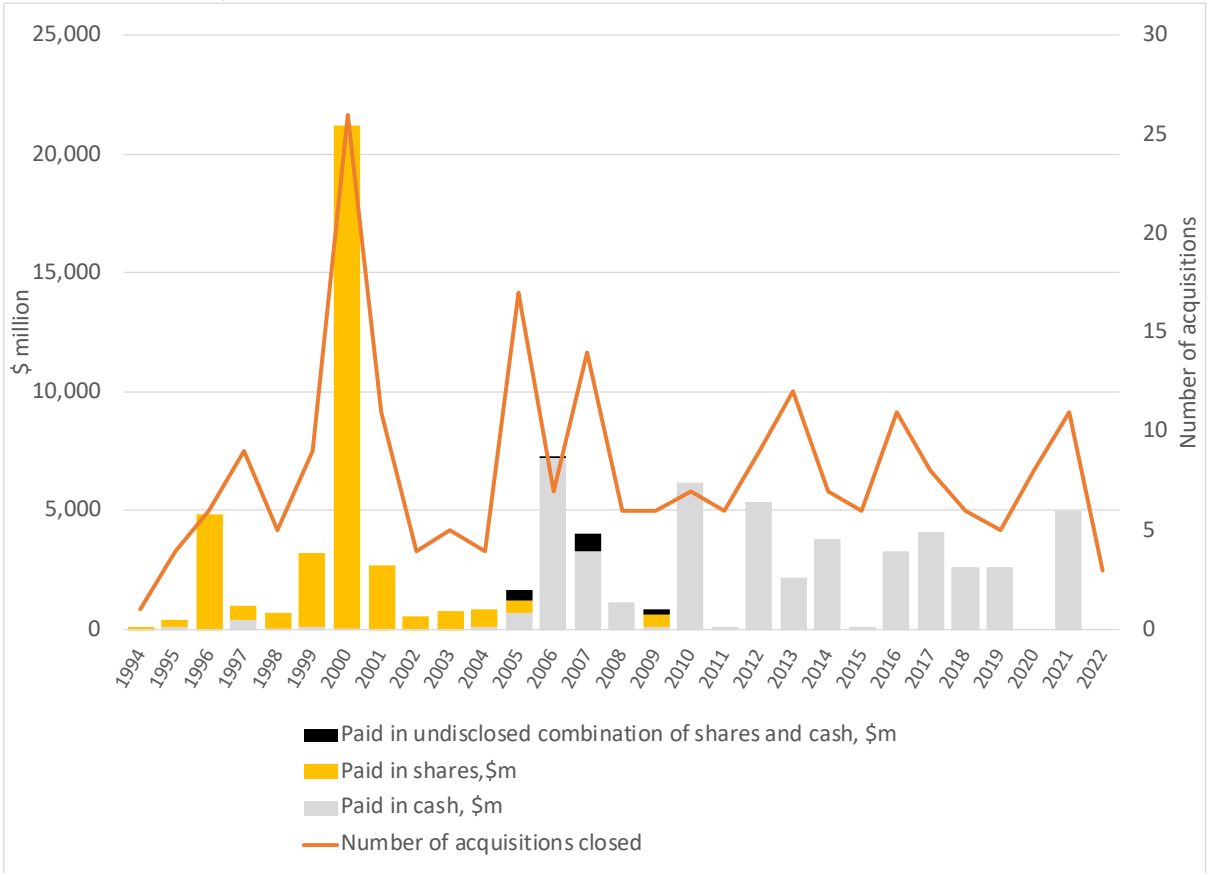
The Crescendo acquisition also introduced the "Mario Rule" as its CEO, Mario Mazzola, had told Chambers he would not be acquired only to find his former employees fired following the deal. As a condition of the acquisition, the Mario Rule stated that none of the 62 employees from Crescendo could be laid off or significantly reassigned without the joint approval of both CEOs, Mazzola and Chambers, for a period of two years following the acquisition (Paulson 2001, p. 53). As revenues from the Catalyst switch flowed in, Crescendo executives moved rapidly up Cisco's ranks (Vance 2006), and Mazzola became chief development officer in 2001 (Caruso 2001). The Crescendo acquisition also created a preference at Cisco for acquisitions that were located in Silicon Valley, although over time the company would add two more areas: Research Triangle (near Raleigh, NC) and Route 128 (near Boston MA) (Rifkin 1997).

Cisco went on to streamline its acquisition strategy over the 1990s with its 71 deals from 1994 through 2001. They were almost entirely stock-based, with a total value of $34.2 billion (Figure 4). The convergence of the "Old World" voice infrastructure with the "New World" infrastructure

[8] SynOptics merged with Wellfleet Communications in October 1994 to form Bay Networks, later acquired by Nortel Networks as part of its "right-angle turn" that Nortel CEO John Roth intended to transform the "telecom" company into an "Internet" company (Carpenter at al. 2003, p. 1026).

for transferring data and video—often referred to as the "triple play"—was seen as a huge opportunity for Cisco (Bunnell & Brate 2000).

Figure 4. Cisco Systems: Acquisitions by number, value ($m), and form of payment (cash or stock), 1994-2022



Sources: Capital IQ and Cisco press releases.

These moves into new technologies via acquisitions have been the subject of "myriad stories glorifying Cisco's A&D [acquisition & development] strategy" (Vance 2006). At the time, in addition to the coverage of its novel approach to R&D, Cisco's share price was benefiting from the perception that it was positioning itself to capture the service-provider equipment market, which was far more financially lucrative and technologically sophisticated than that of enterprise-networking equipment.

Cisco initially used acquisitions to move forcefully into switching as well as adding technologies linked to new forms of access to the Internet. Triple-play convergence changed the types of customers that it was targeting. From 1997, as its acquisition strategy enabled Cisco to move into "Voice over Internet Protocol" (VoIP) and other technologies, including optical networking, linked to convergence (Table 2), Cisco was clearly transcending its origins in enterprise networking to address the telecommunications sector (Table 3).

Table 2. Cisco Systems: Major acquisitions by new technological area (with cost in $m), 1994-2001

Fiscal Year	*Switching (ATM)*	*Access (DSL/ISDN/Wireless/VPN)*	*VOIP /Video/Convergence*	*Optical Networks*
1994	Crescendo (92)			
1995	Lightstream (121)			
1996	StrataCom (4,200)	Grand Junction (348) Combinet (114)		
1997	Nashoba (100) Granite Systems (220)	Telesend (ND) Telebit (200) Dagaz (130)	Ardent (165)	Skystone Systems (92)
1998		Netspeed (252)	Precept Software (92) CLASS Data Systems (51) LightSpeed International (161)	
1999		Clarity (153)	Fibex Systems (314) Sentient Networks (131) GeoTel Communications (2,000) Amteva Technologies (159) Selsius Systems (134) Summa Four (129) American Internet (58)	Pipelinks (118)
2000	ArrowPoint (5,700)	Altiga Networks (335) Compatible Systems (232) Infogear Technology (301) JetCell (203) Aironet Wireless (835) Cocom (66)	SightPath (800) Calista (55) Worldwide Data Systems (26) V-bits (128) Webline Communications (325) Transmedia Communications (407) MaxComm Technologies (143)	Pentacom (102) StratumOne (435) Qeyton Systems (887) Pirelli Optical Systems (2,018) Internet Engineering Group (25) Cerent (6,900) Monterey Networks (517)
2001		IPMobile (422) Hynex (127) CAIS Software (147) Radiata (211) ExiO Communications (155)	Vovida Networks (156) PixStream (395) IPCell Technologies (422) Komodo (175) Active Voice (266)	
Total, $m	**10,433**	**4,231**	**6,692**	**10,207**

Notes: ND=acquisition cost not disclosed

The following acquisitions were not seen as significant diversifications: Newport Systems (1994), Internet Junction and TGV Software (1995), Netsys Technologies and Metaplex (1996), Tasmania Network (1999), Atlantech, Growth Networks, Netiverse and NuSpeed Internet Systems (2000).

Three acquisitions relate to Cisco's diversification into the area of encryption and network security: Network Translation (1995), Global Internet Software (1997), and Wheelgroup (1998).

Sources: Adapted from Bunnell & Brate 2000, pp. 156-160; CapitalIQ and Cisco press releases (when technology area is clear).

Table 3. Cisco Systems: Major markets and competitors, 1999

Target market	Market size, $b	Cisco's share, %	Cisco's major competitors
Large corporations	16.5	40	Cabletron, 3Com, Nortel
Small and medium firms	13.6	18	3Com, Intel, Nortel, Alcatel
Internet service providers	9	33	Lucent, Nortel, 3Com, Juniper
Telephone operators	225	>1	Lucent, Nortel, Alcatel, Siemens, Fujitsu
Consumer networking	>0.25	10	3Com, Intel, Nortel

Source: Adapted from Reinhardt 1999, pp. 130-131; Heskett & Morgridge 2000, p. 24.

Gawer and Cusumano (2002) link Cisco's interest in the telecommunication-equipment sector to the development of Internet-access services for consumers. They describe both the Crescendo and StrataCom acquisitions in September 1993 and July 1996, respectively, as providing "a beachhead for Cisco to sell more equipment to telephone companies" (Gawer & Cusumano 2002, p. 174). For

Chambers, 1993 and 1997 corresponded to two "economic down cycles" when "Cisco became even more aggressive in...investments in existing and new opportunities" (Fryer & Stewart 2008, p. 76). Growth in the LAN market was expected to slow from 1993 with reports of 70 percent of PC users already connected and stronger competition introducing price pressure. The greatest threat, however, was seen to come from the technological possibilities of asynchronous transfer mode (ATM) switching (Savitz & Wyatt 1993). Engineers in the telecom industry developed ATM networks in the late 1980s as a family of standards covering hardware, software, and the implementations protocols[9] to accommodate the explosion in the sizes of files and applications that carriers were being asked to transmit.

An ATM network was a "higher level" network that optimized bandwidth and simplified the management of the transmission of voice, data and video across the different protocols of LAN and WAN networks as well as fiber networks for longer distances (Goralski 2001). Despite being considered one of "yesterday's" solutions by IP purists,[10] Cisco adhered to Chambers' claim of being "agnostic" in terms of technology by moving aggressively into ATM. To enter the carrier market, Cisco was willing to listen "to the wind and [back] away from acting like an IP zealot, and [offer] combined IP and ATM solutions" (Bunnell & Brate 2000, p. 190).

Cisco's most significant ATM-related acquisition was StrataCom in 1996. This acquisition showed that Cisco was capable of "eating its young", as StrataCom ATM switches for enterprise networks overlapped with those of its earlier LightStream acquisition. StrataCom, however, also supplied carrier-class switches and therefore offered Cisco access to the regional Bell operating companies (Lach 1996).

Cisco's acquisitions in the segment of high-speed connections to the home and small businesses began with the acquisition of Telebit in October 1996, with subsequent acquisitions in 1997 and 1998 (Table 2). These acquisitions gave Cisco technology that allowed households and organizations to improve their Internet access via fixed lines, cable, and mobile technology.

By 1998, Cisco had begun to move into two new areas of the telecommunications sector. The entry into VoIP networks was reportedly based on Cisco's own experiment in 1996 with using its in-house network for corporate phone calls. Chambers claimed that Cisco saved $30,000 per month in calls to Japan (Bunnell & Brate 2000, p. 153). In addition to helping firms migrate from legacy phone systems to more cost-effective VoIP networks, Cisco added additional services for businesses, including video, with related acquisitions over the next three years.

Cisco's entry into the optical-networking segment also began in 1997. Dense Wavelength Division Multiplexing (DWDM) transmission both increased the bandwidth capacity of fiber-optic cables and facilitated the integration of different types of networks at local, metro, regional, and long-haul levels. Ciena claims to have commercialized the first optical-networking product, the MultiWave 1600, in 1996, and its hugely successful IPO the following year is judged to have "introduced Photonics to Wall Street" (Berthold 2012). Also founded in 1996, with funding from

[9] The protocols were adopted under the auspices of the Comité Consultatif International Téléphonique et Télégraphique, or CCITT (called since 1993 the International Telecommunications Union Standardization Sector, or ITU-T).

[10] The technological choices underlying ATM networks constituted a "compromise" protocol that allowed for voice and data to be transported on networks that were not yet fully digital. To do so, it adapted to the time-sensitive nature of voice transmission by maintaining sufficient signaling and circuit supervision capacity (Freeman 1999).

Ericsson, Nortel, Siemens, and 3Com, was Juniper Networks, which would become a serious competitor to Cisco in the valuable core-routing segment. Juniper's core-router market share grew to 25 percent by 2001 (Lawson 2002). The company had gone public in July 1999, and its market capitalization rapidly rose to $11 billion.

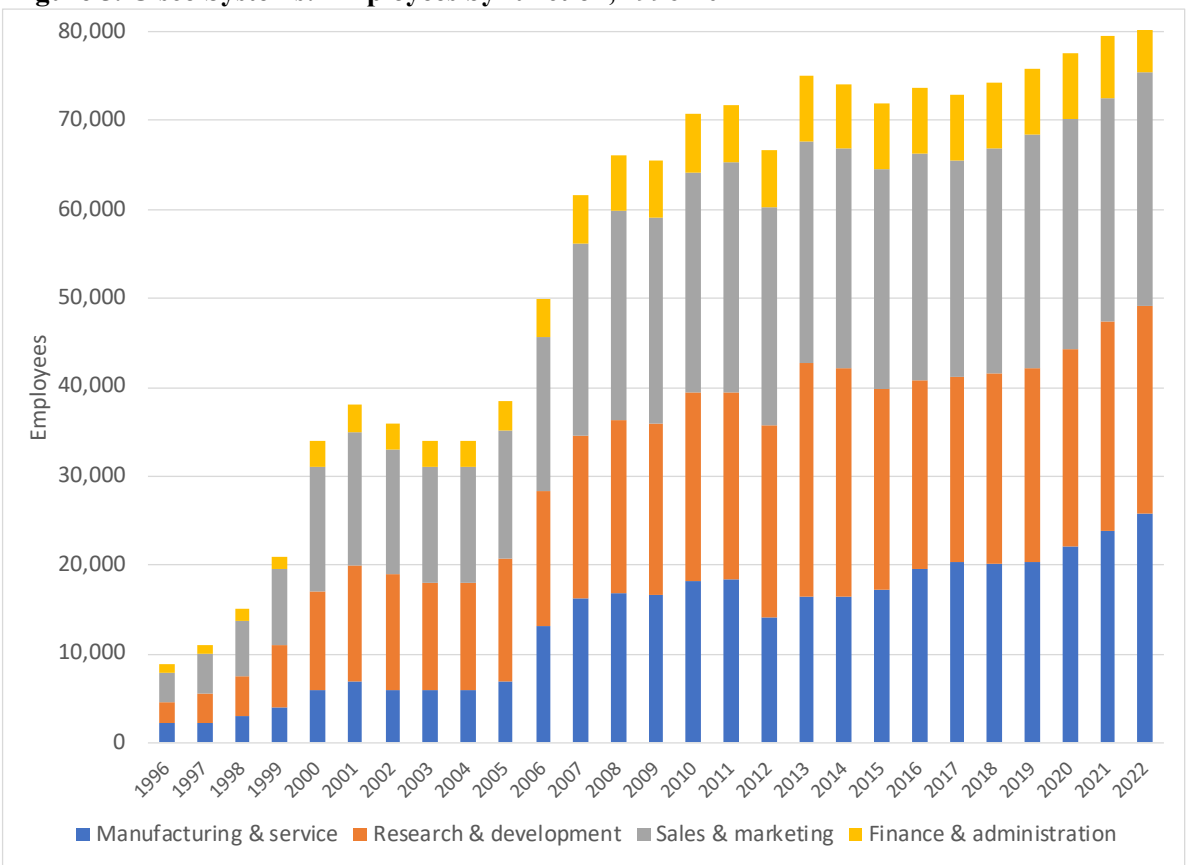
This valuation of Juniper, in turn, inflated the price of the acquisitions that Cisco was making in the optical space in that period (Labarba 1999). But with its own stock price soaring, Cisco possessed its own inflated combination currency. Cisco used 200 million shares valued at $6.9 billion to acquire Cerent, a company with 275 employees and less than $10 million in revenues for the first half of 1999. Cisco also used stock valued at $517 million to acquire Monterey Networks, which, with next-generation hardware for using fiber optics to move large quantities of voice and data over the Internet, possessed capabilities that were complementary to Cerent's technology (Holson 1999). Expectations for the growth of the optical-transport segment were exceptionally optimistic at the time of these acquisitions, with some estimates as high as $57 billion for the global market by 2005, with the prospective North American market accounting for as much as 80 percent of those revenues (Carpenter et al. 2003, p. 1015). The promise of optical networking was such that Cisco also moved far beyond its normal geographic limitations on acquisitions to acquire the optical networking division of Pirelli S.p.A. in Milan, Italy for $2.0 billion (Wirbel 1999).

Addressing the optical-networking opportunity also brought a more fundamental change to Cisco's business model, as the sophistication of the technology required it to engage in more manufacturing activities than had previously been necessary. In late 2000, the company announced the opening of a manufacturing plant in an existing facility once owned by Digital Equipment Corporation, in Salem, New Hampshire, with plans to employ 2,500 people (Howe 2000). The location of this plant, on 110 acres, was just fifteen miles from Lucent's major optical-networking systems-integration facility, Merrimack Valley Works, in North Andover, Massachusetts. Cisco proceeded to lure employees away from Lucent, including the Cisco plant's top managers and engineers. As was the case with Nortel, which also located a systems-integration facility in the region, Cisco was seeking to gain access to the regional skill base and skill-formation system that the Lucent plant, going back to its origins as a Western Electric facility in the 1950s, had played a major role in creating (Lazonick, Fiddy, & Quimby 2002).

Organizational integration

On July 29, 1990, the end of its first fiscal year as a publicly listed company, Cisco employed 254 people fulltime, of whom 53 were in R&D, 63 in manufacturing, 53 in sales & marketing, 46 in customer service, 29 in finance & administration, and 10 outside of the United States. At the end of the 2001 fiscal year, the company employed 38,000 people, with 18 percent in manufacturing and service, 34 percent in R&D, 39 percent in sales & marketing, and eight percent in finance & administration (see Figure 5). Of these employees, 27,000 were located in the United States and 11,000 in the rest of the world.

Figure 5. Cisco Systems: Employees by function, 1996-2022



Source: Cisco 10-K SEC filings

As we have seen, much of the Cisco's growth in terms of technological capability from 1990 to 2001 came from its 71 acquisitions. The total number of employees at these 71 acquisitions was just over 7,400. The five largest acquired companies in terms of number of employees were StrataCom (1,200 employees), Pirelli (701), Active Voice (346), ArrowPoint Communications (337), and GeoTel Communications (310). The average number of employees at the acquired firms was 104, and the median number was 60.

Therefore, the vast majority of Cisco's net addition of almost 38,000 people to its payroll between July 1990 and July 2001 came from direct hiring, with some multiple of that number actually being hired, given the hypermobility of tech labor that characterizes the New Economy business model, especially in Cisco's home base of Silicon Valley (Benner 2002). Yet, it was the people at the acquisitions, most of them still small startups, who possessed the cutting-edge knowledge in communication technology over which Cisco wanted to take strategic control. It was therefore critical to Cisco's growth to, first, identify acquisitions with the technological capabilities that the company needed to enable its product-market strategy; second, integrate the key personnel at the acquisitions into the Cisco organization; and, third, train, motivate, and retain the thousands upon thousands of people that Cisco was hiring directly to develop its innovative products and achieve economies of scale through mass sales.

The first executive to focus on acquisitions was hired by Cisco in 1994. The human-resources department only appointed a full-time manager for this area in 1997 as the rate of acquisitions

picked up. In 1998, a full business-integration unit was established to manage the acquisition-integration process (Mayer & Kenney 2004, p. 306). The acquisitions team rapidly grew to 60 people and included finance and HR specialists as well as business-unit members and technology specialists. Cisco identified a new product segment in which it was confident of securing, as Stanford business professor Charles O'Reilly put it, "an initial 20 percent market share followed by an eventual 50 percent share" (O'Reilly 1998, p. 4). Cisco then pursued an acquisition that it considered likely to generate such success more quickly than an in-house solution or a partnership. Companies that were targets were considered to have "the requisite 'great' technology that can be turned into a product within six months, have a shared vision, and be culturally compatible (e.g. aggressive, focused, entrepreneurial)" (O'Reilly 1998, p. 5).

Cisco was able to conduct both informal discussions and more traditional due diligence procedures within a two-week period (O'Reilly 1998, p. 6). Once the initial agreement was signed, the objective was to have the acquired company's products sold under the Cisco name within three to six months. To facilitate this speed of operation, Cisco preferred to acquire software and pre-production companies that did not yet have a production operation in place. In addition, it was preferable if the acquisition was located in Silicon Valley or near one of Cisco's other sites. Post-acquisition integration of almost all phases of manufacturing was standardized to facilitate the rapid introduction of new products into the company's outsourced production model (Tempest et al. 1998).

Successful integration of newly acquired employees was a central objective of Cisco's acquisition strategy. The human-resources function aimed to maintain the turnover rate of acquired personnel at the same rate as that of the overall Cisco population (O'Reilly 1998, p. 7). Top management asked human resources for retention figures on a "weekly, monthly, quarterly" basis and, with so few "old" employees, no "insider v outsider" distinction was apparent (Mayer & Kenney 2004, p. 316). Nonetheless, to improve integration of new employees, each was assigned a "buddy" to explain the company's systems and procedures. The buddy system for all new employees was part of a sophisticated "orientation and indoctrination process" to achieve "the fastest time to productivity for new hires in the country" (O'Reilly 1998, p. 15). This system also included a reminder after two weeks to all managers of new employees to review the employee's personal goals.

For integration of its acquisitions, there was no ambiguity about the need to impose the Cisco culture. Since choosing the Crescendo acquisition ahead of a merger with SynOptics, Chambers was vocal about the dangers of a merger of supposed equals. He believed that there always needed to be "one culture that really survives and there has to be a clear leader, in terms of who is going to lead the combined companies and which culture is going to be the one you stick with" (quoted in Rifkin 1997a). While not all new employees from an acquisition "fit the Cisco culture", half the chief executives (Mayer & Kenney 2004, p. 317) and 70 percent of the senior management (O'Reilly 1998, p. 7) from acquired companies are reported to have remained with Cisco during this period of intense integration.

Cisco was able to complete the overall integration process for all functions of an acquired firm within a time frame of two to three months (O'Reilly 1998). In 1995, Morgridge described how Cisco's distribution channel complemented its acquisition strategy: "at the time we made our first acquisition we had a wonderful asset in the form of a channel to sell, install, and service products

for the global market. As a result, there was tremendous leverage in acquiring a product that met the market requirement and to put it through our channels. We can take [a new product] and leverage it very dramatically. To a large degree, that has been our strategy with most acquisitions" (quoted in Mayer & Kenney 2004, p. 305). As we have seen, under Chambers, the distribution channels increasingly entailed placing Cisco's products in the hands of VARs. In 2001, Chambers claimed that Cisco had acquisitions "down to a science" and that it could do "ten a month" if needed (Chatman et al. 2005, p. 145). Acquisitions have been described as "an integral component of Cisco's overall competitive strategy and one of its competencies" (Mayer & Kenney 2004, p. 314).

Working for Cisco during this period was compared to joining a cult, and it was recognized that, with an extremely low attrition rate of six percent, it was very difficult to get people to leave Cisco for another opportunity (O'Reilly 1998). During its rapid growth in the 1990s, Cisco became a leader among New Economy companies in implementing a broad-based stock-option program, which covered virtually all US-based employees and many abroad as well (Lazonick 2009a, ch. 3). As we discuss below, stock options could function as an important retention mechanism when the company's stock price was rising at a steady rate, as was the case at Cisco from 1990 to 1998.

When Cisco's stock price exploded from late 1998 to early 2000, increasing from $10.25 on October 7, 1998, to a peak of $74.82 on March 27, 2000,[11] many Cisco employees became extremely rich. Cisco's system for organizational integration, appears to have reduced the tendency, common in Silicon Valley, for newly wealthy employees to retire, found startups, or become angel investors. Cisco's stock price subsequently plummeted from $64.13 on August 31, 2000, to $10.50 on September 27, 2021, and then as low as $8.04 on October 8, 2002. Employees who received stock options in the boom, when exercise prices were high, found their "under water" options to be worthless in the bust. With volatile stock prices, broad-based stock-option programs introduced substantial, and often enormous, inequities, in employee compensation, at points in time and over time.

Stock-option plans for a broad base of employees were an integral element of the "New Economy business model" that Cisco came to exemplify (Lazonick 2009a, ch. 2; Lazonick 2009b). When Cisco was founded in 1984, a "career-with-one-company" still characterized employment relations in the US ICT industry. Rooted in the "Old Economy business model" that prevailed at companies such IBM, AT&T, Motorola, Texas Instruments, and, in the heart of Silicon Valley, Hewlett-Packard (HP), a career with one company provided college-educated white-collar workers with an annual salary, long-term employment security, and the opportunity for promotion up and around the corporate hierarchy, along with company-funded healthcare coverage and non-portable defined-benefit pensions, based on years of service with the company.

Employment at a startup like Cisco was inherently insecure; given the likelihood of failure, a young high-tech firm could not hold out the realistic promise of a career with one company to its personnel. Instead, from the 1960s new ventures in Silicon Valley offered technical and managerial personnel stock options, with exercise prices often at pennies a share, to lure them away from secure employment with established companies. If the startup did an IPO or was sold to an already listed company, these stock options became very valuable, given the low prices at which they could

[11] The stock prices are adjusted close figures, from Yahoo Finance Historical Prices.

be exercised and the ease of selling the acquired shares on the stock market. As a result of the use of company shares as an inducement for a broad base of high-tech personnel to give up secure employment with Old Economy companies for insecure employment with New Economy companies, *non-executive* stock options became a key mode of compensation under the New Economy business model (Lazonick 2009a; Hopkins & Lazonick 2016).

With good reason, both academics and journalists who are critical of high executive pay have focused most of their attention on the excesses of executive stock options (Hopkins & Lazonick 2016). Yet the vast majority of employee stock options in the United States have been granted to non-executive personnel as part of broad-based programs. The high concentration of startups in Silicon Valley meant that increasingly in the 1980s new ventures not only used stock options to induce high-tech labor to leave secure employment with established corporations, but also competed among themselves for personnel, with an emphasis on stock options in their compensation packages. Besides attracting "talent" and giving them a stake in getting the startup to an IPO, ample stock options could substitute to some extent for cash salaries.

The nonportable company-funded defined-benefit pension plans, based on years of service with the company, that had become a characteristic of the Old Economy business model were incompatible with interfirm labor mobility and insecure employment relations under the New Economy business model. Most New Economy companies have portable defined-contribution pensions in the form of a 401(k) savings plan. In 1988, with 29 employees, Cisco introduced a 401(k) pension, with the company's contribution limited to a maximum $1,000 per year for an employee who paid in at least that amount. In 1995, with 4,086 employees, Cisco increased its match to $1,500, at which level it remained until 2003. At that point, with employee gains from stock options having declined dramatically (see below), the company increased its potential contribution to a maximum of $6,150 per year (a 50-percent match of the maximum eligible employee contribution). In 2010, this maximum match was $13,050. In 2020-2022, Cisco contributed an annual average of $7,725 per US employee to the 401(k) plans.

Under the New Economy business model, however, the expectation is that the accumulation of wealth through stock-based pay—initially in the form of stock options although increasingly since the mid-2000s in the form of stock awards—will provide a much more significant financial foundation than a defined-contribution pension for discretionary income that can, if an employee so chooses, provide for retirement. The growing importance of stock-based pay by New Economy companies to attract new employees placed pressure on these firms to use options and/or awards to retain them as well. For this reason, in the 1980s and 1990s the practice evolved in New Economy companies of making annual stock-option grants, with the vesting period for any annual block of option grants being 25 percent of the shares at the end of each of the first four years after the grant date. Stock awards vest after a stated number of years from the grant date.

Once stock options vest, they can typically be exercised for a period of ten years from the grant date, so long as one remains with the company. Within this timeframe, ranging from six to nine years (depending on the vesting date), the employee can then choose the precise day or days on which to exercise vested options and realize the compensation gains from them, provided the market price of the stock exceeds its exercise price. Without creating the Old Economy expectation among employees of lifelong careers with one company, the perpetual pipeline of unvested options functions as a tangible retention mechanism. Indeed, for most employees, the number of options

that an individual can expect to receive is tied to his or her position in the firm's hierarchical and functional division of labor, so that the retention function of stock options is integrally related to the employee's career progress within the particular company (Lazonick 2009a, ch. 2). In the case of stock awards, which unlike options have no exercise price, the realized compensation occurs on the date on which an award vests. Like options, the annual granting of awards to a broad base of employees functions as a retention mechanism (Hopkins & Lazonick 2016).

Old Economy companies such as IBM and HP had traditionally reserved stock options for top executives. In subsequently refashioning themselves as New Economy companies, however, they increasingly and substantially broadened the base of option recipients. For example, HP awarded stock options only to upper-level employees in the early 1980s, but then began to extend stock options to a larger proportion of the labor force from the mid-1980s. At the end of fiscal 2007, the proportion of HP employees holding options was 58 percent, or 99,000 employees (Lazonick 2009a, ch. 3).

In their early years, some Silicon Valley startups like Intel, Oracle, Sun Microsystems, and Cisco Systems granted stock options to substantial proportions of their employees. Many New Economy companies located outside Silicon Valley—for example, Microsoft based in Washington State and Dell based in Texas—did so as well. During the 1980s and 1990s, successful New Economy companies maintained their broad-based stock-option programs even as they grew to employ tens of thousands of people.

Cisco extended annual stock-option grants on a systematic basis to virtually all its employees over the course of the 1990s, even as its average payroll reached 36,000 people during fiscal 2001 (see Table 4). This practice continued through fiscal 2008, when the average number of employees was almost 64,000, after which the company ceased granting new stock options, shifting instead to stock awards, a form of compensation that requires fewer shares granted to achieve a given level of realized gains from stock-based pay. As we explain in detail later in this paper, a stock option yields a realized gain when the exercise price is less than the stock's market price on the date that the option is exercised, whereas a stock award has no exercise price and yields gains equal to the stock's market price on the date that the award vests. In the period 1998-2008, for options, annual averages were 208 million shares granted and 101 option shares exercised, whereas in the period 2012-2022, for awards, annual averages were 60 million shares granted and 47 million shares vested, notwithstanding much higher employment levels in the latter period.

Data that has been available since 1994 in the notes to financial statements in company 10-K annual filings with the US Securities and Exchange Commission (SEC) permit estimates of the average annual realized gains of Cisco employees from the exercise of stock options and/or the vesting of stock awards (also known as "restricted stock units"). We have excluded from these calculations the realized gains from stock-based compensation of the CEO and other four highest-paid Cisco executives named in proxy statements in each year since we have precise individual information on the realized gains of these "Top5" employees from stock options and stock awards (see Hopkins & Lazonick 2016). While we can calculate the average realized gains from stock-based pay per "non-Top5" employee, we have no information on the distribution of these gains among employees by function, geography, years of service, or any other characteristic.

Table 4. Cisco Systems: Average realized gains per non-Top5 employee from stock options and stock awards, 1994-2022

Cisco fiscal year	Average realized gains per non-Top5 employee from stock options, $	Average realized gains per non-Top5 employee from stock awards, $	Average realized gains per non-Top5 employee from options and awards combined, $	Average number of employees during fiscal year
1994	34,719	0	34,719	1,947
1995	60,894	0	60,894	3,265
1996	93,399	0	93,399	6,434
1997	85,159	0	85,159	9,891
1998	92,947	0	92,947	13,000
1999	193,476	0	193,476	18,000
2000	291,048	0	291,048	27,500
2001	105,865	0	105,865	36,000
2002	13,596	0	13,596	37,000
2003	8,917	0	8,917	35,000
2004	32,804	0	32,804	34,000
2005	24,432	0	24,432	36,207
2006	25,487	0	25,487	44,170
2007	73,009	461	73,470	55,731
2008	12,533	1,653	14,186	63,832
2009	2,153	1,063	3,216	65,840
2010	12,975	5,479	18,454	68,125
2011	4,153	7,187	11,340	71,263
2012	4,167	8,827	12,993	69,232
2013	6,120	13,108	19,228	70,844
2014	4,893	16,156	21,049	74,546
2015	5,503	18,697	24,200	72,938
2016	3,351	18,881	22,232	72,767
2017	3,708	22,747	26,455	73,300
2018	3,641	27,978	31,620	73,550
2019	0	32,370	32,370	75,050
2020	0	25,337	25,337	76,700
2021	0	22,387	22,387	78,500
2022	0	23,518	23,518	81,400

Sources: Cisco 10-K and DEF 14A SEC filings, 1994-2022 (calculations by William Lazonick and Matt Hopkins).

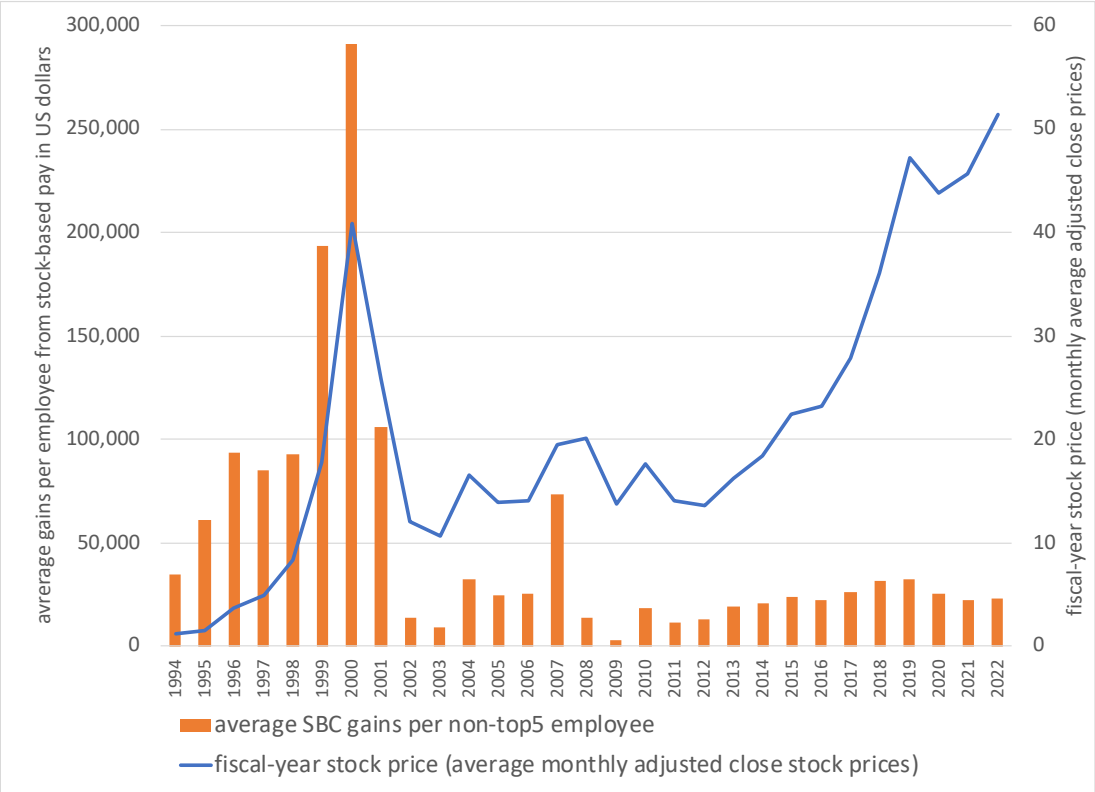
Table 4 shows the large size of stock-based employee compensation at Cisco, with enormous increases in the per employee averages from 1994 to 2000 and remaining high in 2001. Moreover, these gains were going to growing numbers of employees, with average employment increasing more than 14 times, from 1,947 in 1994 to 36,000 in 2001. Undoubtedly, in 2000 there were large numbers of Cisco engineers based in the United States who, reaping even half of the company-wide average of $295,100 in gains from stock options, found that their total compensation was more than double their salaried compensation.

Lazonick (2009a, p. 64) provides estimates for average gains per non-Top5 employees from stock options at selected other ICT companies. In 2000, the figures for other companies were (in descending order of magnitude) Microsoft, $449,100; Intel, $112,000; Sun Microsystems, $60,400; Dell, $84,800; Oracle, $37,200; Lucent Technologies, $23,300; Texas Instruments, $22,900; Advanced Micro Devices, $20,100; Hewlett-Packard, $18,000; IBM, $4,200; and

Motorola, $3,200. Only Microsoft out-optioned Cisco, and realized gains from options at these two companies far surpassed the rest of them.

The reason for the explosion in realized gains from stock options in the 1999 and 2000 is made quite clear in Figure 6. Cisco's stock price was rising throughout the 1990s but took off in a speculative frenzy from October 1998 to March 2000. Anyone who had bought shares of Cisco for $1,000 at the company's IPO in 1990 and held them to the beginning of October 1998 possessed stock valued at $193,000. At that point, stock-market speculators, including growing legions of day traders, took notice of Cisco, and the market value of the $1,000 used to purchase Cisco shares in 1990 soared to $947,500 in March 2000.

Figure 6. Cisco Systems: Stock price and estimated average realized gains from stock options and/or stock awards per non-Top5 employee, 1994-2022



Sources: Yahoo Finance for stock prices; Cisco Systems 10-K and DEF 14A SEC filings, 1994-2022 (calculations by William Lazonick and Matt Hopkins).

A broad base of Cisco's employees shared in the gains from stock options in the Internet boom (during which period the company did not yet grant stock awards). All other things equal, with Cisco's stock price rising, the more years of service an employee had with Cisco, the more he or she could realize option gains. For example, an employee who received $1,000 of exercisable options in March 1996 could realize a gain of about $14,000 by exercising them in March 2000, when they would have become 100 percent vested. An employee who received $1,000 in exercisable options two years later in March 1998 could realize a maximum gain of $3,100—still nice work if one could get it. But an employee who received the $1,000 in options in March 1999 could gain a maximum of only about $460, and one who received them in March 2000 could gain

nothing—the options would be "under water", as it turned out, until after 10 years from the grant date, they expired.

Yet, given the interfirm mobility of labor under the New Economy business model, the employees who joined Cisco in the later years may very well have had equal or superior experience and capabilities than those who had joined earlier. In other words, when the pay of a company's employees is highly dependent on a highly volatile stock price, there can be enormous inequities in the distribution of income, not only in the society of which that company is a part but also among the employees within the company itself. At Cisco, those inequities would be integral to the corporate transition from innovation to financialization that would take place from 2002.

Financial commitment

Cisco's IPO in February 1990 netted the company $47.6 million, representing 11 times its earnings for the 1989 fiscal year. Funds from operations easily covered the company's capital expenditures, not only in 1990 but also for every subsequent year during the decade and into the new era of the post-bubble economy. Cisco only issued stock during those years to employees exercising stock options. It did not pay dividends and, as discussed further below, in the 1990s did stock buybacks only from 1995 to 1997, with the stated purpose of offsetting share dilution that resulted from the vesting of stock options by employees (Carpenter et al. 2003).

Cisco temporarily overtook Microsoft to become the world's most valuable company in March 2000, and one analyst predicted it would become the first company with a market value of $1 trillion (Thurm & Browning 2000). As we have already noted, the explosion in its share price during this period gave Cisco a clear advantage in using its stock as a combination currency, particularly in competition with Old Economy firms such as Lucent and Nortel, which were also seeking to acquire optical-networking startups (Carpenter et al. 2003).

In 1998, Chambers explained: "most people forget that in a high-tech acquisition, you really are acquiring only people. That's why so many of them fail. At what we pay, $500,000 to $2 million an employee, we are not acquiring current market share. We are acquiring futures" (Tempest et al. 1998, p. 5). Mayer and Kenney (2004, p. 316) calculated that the average "price paid per employee" for eleven Cisco acquisitions between 1996 and 2000 varied from $1 million (for Cocom A/S) to $6.2 million (for Geotel Communications). In the period of the stock-market bubble of the last half of the 1990s, the average cost per employee of acquisitions increased from approximately $1.8 million in 1996 to $5.6 million in 2000 (Mayer & Kenney 2004, p. 315).

As we have seen, Cisco was able to use its stock to pay for acquisitions valued at $34.2 billion from 1994 through 2001. Besides using its stock as a combination currency, the company was able to increase substantially the remuneration of its employees by using its stock as a compensation currency, as shown in Table 4 above. In terms of cash, in addition to $5.7 billion in retained earnings from 1990 through 2001, Cisco could also draw on $4.4 billion in depreciation allowances. Meanwhile, the company took on no long-term debt, and at the end of fiscal 2001, with $22.3 billion in revenues for the year, Cisco possessed $4.9 billion in liquid assets.

By using its stock as a currency to acquire new technological capabilities and rejecting the vertically integrated model of previous technology giants, Cisco appeared to redefine the

innovation business model. Its perceived commitment to customer satisfaction and its move into the fast-growing optical-networking sector were seen as evidence of its bright future. It announced major contracts with US carriers Sprint (1998 and 2000) and Qwest (1999) (Waters 2002). Finally, the $5.7 billion ArrowPoint acquisition in May 2000 was viewed as likely to cement its dominance in the server market. By the end of the 1990s, investment bank equity analysts considered Cisco to be "one of the world's preeminent companies…a juggernaut" with "little to lose and much to win as the voice and data networks converge" (Henderson & Anderson 2000). Its ability to integrate large numbers of acquisitions appeared to be enhancing its productive capabilities as a focused data-network player in a growing number of attractive markets that depended on increasingly complex technologies.

3. Cisco's Organizational Structure as a Constraint on Innovation Strategy

Cisco's growth after 2000

In December 2000, John Chambers announced that he had "never been more optimistic about the future of our industry as a whole or of Cisco" (Chambers & Brady 2018, p. 129). But instead of growth accelerating as expected with a continuation of the Internet boom, revenues shrank from $22.3 billion in fiscal 2001 (year ended July 28) to $18.9 billion in both 2002 and 2003—the same level of revenues that Cisco had achieved in fiscal 2000. Chambers described the impact of the Internet bust of 2001-2003 as comparable to a "100 year flood" descending on American business (Slater 2003, p. 35).

Despite record revenues in fiscal 2001, Cisco reported the first loss in its corporate history in that year. The shortfall of $1.0 billion was the result of an excess charge of $2.5 billion, representing the largest inventory write-off in business history. The inventory build-up occurred because of a decision taken by Cisco at the height of the boom, in the summer 2000, when, along with other communication-equipment vendors, it was experiencing severe shortages of components. To eliminate stock-outs that it estimated had cost the company ten percent of its revenues in fiscal 2000, Cisco entered into agreements to buy specific quantities of components from its suppliers. It also helped suppliers to accumulate components that would be available when needed by providing $600 million in interest-free loans. The company had not counted on the market slowdown (Harvey 2001) and, as one Cisco chronicler put it, "failed to plan for anything but growth" (Sidhu 2010, p. 67).

During this period, Cisco also began to pull back from its investments in the optical-networking segment, which was particularly hard hit in the telecommunications downturn. A glut of "unlit" fiber resulted in the bankruptcy of service providers, including new entrants Global Crossing and XO Communications as well incumbent WorldCom (Farzad 2002). In the segment of optical switching alone, for example, industry-wide sales fell from $5.9 billion in the third quarter of 2000 to $3.9 billion in Q3 2001 and to only $1.6 billion in Q3 2002 (Savitz 2002).

Cisco quickly determined that investments in optical networking would be too risky, with prospective returns on these investments taking too long. In 2001, Carl Russo, Cisco's head of optical networking, announced that the company had decided to discontinue a successful optical product, explaining: "it's a tough decision, but the bottom line is that in the current economic climate, Cisco is focusing on business areas that provided immediate revenue growth . . . service

providers are not ready to deploy products like the ONS 15900 as rapidly as we originally anticipated" (Cisco 2001b). Cisco went on to divest itself of its manufacturing facility in New Hampshire in 2001 and discontinued its DWDM products in 2004. The Monterey Networks products were also abandoned in 2001, and Cisco closed the Qeyton Systems plant in Sweden in 2002. In 2005, 80 employees in the optical-networking group were told to apply for other positions that Cisco posted (Matsumoto 2005). A further 40 optical-networking employees were relocated within Cisco in 2006, and the company finally closed the headquarters of its Cerent acquisition in 2009 (Duffy 2009). Also in 2009, as already mentioned, Cisco passed up on the opportunity to acquire the Metro Ethernet business of Canadian competitor, Nortel. Instead it was acquired by Ciena for $530 million in cash and $239 million in stock (OND 2009). In 2010, an article in *Optical Networks Daily* observed that the segment did not offer "the kind of margin and net profitability to which Cisco is accustomed" (OND 2010).

Cisco had neither assembled the technology offerings nor developed the deep relationships with network operators to compete as an equipment vendor to service providers (Doheny, Glaspie, Koval, Leeming & Smyth 2003). It also conceded that the incumbent vendors such as Nortel and Lucent had strong relationships with telecom carriers that were difficult to displace (Avery 2000). Cisco's business model was considered less adapted to telecommunications customers than the vertically integrated capabilities of the traditional suppliers. According to Heskett and Morgridge (2000, p. 15):

> Their concerns centered around Cisco's ability to provide Internet-based system solutions for voice and data communication through its Internet ecosystem, comprising partnerships with suppliers and assemblers. In contrast, Lucent's vertically integrated organization of product development and manufacture, software control, services network and system management, application design and development, integration services and consulting capability, providing a "turnkey" solution within one vertically integrated organization, was considered by many telephone company executives as an attractive alternative to Cisco's solution of using partners to provide the total solution.

Cisco's networking background in the "bleeding edge of technology" (Bunnell & Brate 2000, p. 156) made its systems more flexible but less reliable than what was expected from carrier-class equipment. In addition, incumbent telephone companies were not on board with Cisco's radical approach to transforming their business. Chambers recalls being ridiculed in 1997 for claiming that "voice would be free" (Fryer & Stewart 2008), while service providers hearing this message in 1998 were astonished that Cisco imagined their cash cow disappearing so dramatically. They preferred a gradual transition based on upgrading their existing infrastructure rather than the Cisco preference for "ripping out old networks and replacing them with new ones" (Mehta, Schlosser & Hjelt 2001). Finally, those "next generation" telecom providers who were attracted to Cisco's entirely new networks built from scratch were the first to fail in the 2000s.

In the Internet bust, it was spending on equipment by the service-provider sector that collapsed, while demand from the enterprise sector, in which Cisco still had the vast majority of its business, remained relatively stable. Cisco could continue to develop its enterprise business while its key competitors in the optical-networking space—Alcatel, Nortel, and Lucent—were faced with major revenue shrinkage. As Benn Rossi, the editorial director of *Information Age*, explained:

> [M]uch is made of Cisco's relative financial success versus its competitors, Lucent, Nortel and the European telecommunications giants, all of which are awash with debt. In a conference call announcing the company's [Q2 2006] quarterly results, CEO John Chambers proudly noted that Cisco grew an admittedly modest 7%, while its top competitors dropped a combined 43% in revenue. That success, however, was the lucky result of its failures to make headway in the service provider market. Between 1997 and 2001, Cisco's primary marketing focus was the service provider market, consisting of a global army of telecoms and Internet companies keen to build out their networks to drive the broadband revolution. But Cisco failed to break the incumbents' stranglehold, partly because it would not cede to carriers' demands for tailored solutions and partly because it was advocating a "big-bang" equipment-replacement strategy, while service providers were committed to a more gradual migration approach. Having missed the telecoms spending boom of the late 1990s, Cisco was saved, ironically, by its very inability to become a leading supplier to the carriers (Rossi 2006).

As demand for enterprise-networking equipment did not decline to the same extent as demand from service providers, and with enterprise networking estimated to represent 80 percent of Cisco's revenues in 2003 (Gilpin 2003), growth resumed and the company's total revenues recovered to surpass $22 billion in 2004. Roger McNamee, a partner with one of the company's shareholders, Integral Capital Partners, explained that, with a strong balance sheet, Cisco was able to do "classic market leader things [to build] market share through every conceivable technique. If they find a customer that can't pay, they do a deferred revenue transaction" (Savitz 2002).

The company also concentrated on cost control and further enhanced its commitment to the original business model of vertical specialization. During the first seven months of fiscal 2001, Cisco kept hiring employees as if the Internet boom would never end. The company's payroll of 34,000 regular employees at the end of July 2000 burgeoned to 44,000 at the beginning of March 2001. But with the subsequent collapse of the service provider market, Cisco announced a restructuring plan in mid-April, consisting of 8,500 layoffs, of which 6,000 would be regular employees and 2,500 contract or temporary workers. Chambers was quoted as stating: "This may be the fastest any industry our size has ever decelerated, which has required us to make difficult business decisions at an unprecedented speed" (Martell 2001).

By the end of July, the company had in fact terminated 4,500 regular employees, with an emphasis on those working in optical networking, while another 1,700 left of their own accord (Cisco 2001a, p. 31). This restructuring permitted Cisco, as Chambers would later put it, to "navigate the post-crash world" (Chambers & Brady 2018, p. 125). As part of this program, during 2002, Cisco ramped up its use of contract manufacturers, increasing the percentage of its outsourcing from 60 percent to 90 percent (Savitz 2002).

Despite the inventory loss in 2001, it is hard to describe Cisco as anything other than a successful company in terms of revenues and profitability as it entered the 21st century. Over the next two decades, Cisco overcame two economic downturns and increased its annual revenues from $22.3 billion in 2001 to as high as $51.9 billion in 2019. Cisco achieved its highest headcount ever at the end of fiscal 2022, with 83,300 employees (see Figure 1 above).

The company's financial performance is partly a result of the pricing power it continues to exert from its dominant position in the enterprise market and its ability to bundle software solutions with its hardware. This continued dominance, in turn, is linked to its dense network of VARs in this market. Having successfully built a reseller network from the late 1990s, Cisco under Chambers, who remained CEO until 2015, continued to develop its relationships with VARs.

In 1998, as the enterprise-networking market grew exponentially, more than half of Cisco's revenues were from resellers (Riggs 1999; Kalyanam & Brar 2009, p. 113). Their role was primarily one of fulfillment rather than finding solutions to customers' needs, which is a key source of innovative learning. Instead, leveraging its rapid ascent to dominance in enterprise networking, Cisco concentrated on giving customers higher discounts for higher sales volume. As a result, as former Cisco chief strategy officer for worldwide channels, Surinder Brar, put it in a paper co-authored with management professor Kirthi Kalyanam: "there was very little 'V' or 'A' being provided by the VARs to end customers" (Kalyanam & Brar 2009, p. 101).

In addition, the channel was becoming concentrated with the top 10 percent of the company's 5,000 partners accounting for 30 percent of revenues. These larger resellers were able to leverage their larger discounts to out-compete smaller players, putting downward pressure on prices and margins overall in the channel. In March 2001, Cisco designed a new channel management system to encourage greater attention to customer satisfaction and sales of what the company called its "advanced technologies". Kalyanam and Brar claimed that "it was the first time any major IT company had discarded the legacy volume-based model to manage channel partners" (Kalyanam & Brar 2009, p. 102).

The major objective of the 2001 redesign of channel management was to recognize the potential for resellers to, in the words of Kalyanam and Brar (2009, pp. 102-103),

> contribute to demand generation. Partners are often deeply embedded in the customer's decision-making processes. They typically enjoy significant face time with their customers and develop rich insights into the customer's business situation and technology needs. With this knowledge, a VAR can create a solution […] specific to end-customers who may not otherwise have had any interest in the company's technology, especially the newer technologies that the market is unaware of.

Cisco structured an incentive framework to encourage resellers to engage actively in identifying opportunities. The company used a partner training and certification program as a core part of the process. For each technological "specialization",[12] resellers' employees were classified as Account Manager, Sales Engineer, or Field Engineer and were required to pass annual exams offered as free e-learning modules or by instructors in partner training firms. By 2009, hundreds of courses available in multiple languages meant that over 80,000 people were qualified as Cisco Certified (Kalyanam & Brar 2009, p. 106). This type of organizational learning kept Cisco competitive in existing product markets but was not useful for moving the company into more complex markets that required more integrated learning.

[12] Examples given were Wireless LAN, Security, Unified Communications, Data Center and Routing and Switching.

Reselling partners can develop greater levels of expertise by having their employees become certified at advanced or master level, and they can increase the breadth of their expertise by adding certifications in new technologies. As a signal to customers, resellers can engage in a co-branding program by identifying as Select, Premier, Silver, or Gold partners. To become a Gold partner, for example, it is necessary to have "advanced" level expertise in four of the company's technological areas. In order to maintain this status, it is also necessary to achieve a targeted level of customer satisfaction

In return, Cisco added new incentives to the baseline discount. By upgrading the installed base of a customer, for example, a reseller receives an additional reward from the "Technology Migration Program" (TMP). An additional rebate is added if the reseller returns the older equipment to Cisco, so that it does not become part of the "grey market". If the sale results from an opportunity that had not been identified by a Cisco salesperson, the reseller is rewarded by the "Opportunity Incentive Program" (OIP). Further rebates are available for resellers who had become specialized in advanced technologies under the "Value Incentive Program" (VIP). Different levels of rebates are offered for different technologies, depending on their complexity and the level of investment needed to apply them to develop customer solutions. VIP rebates are only released every six months, based on the level of customer satisfaction in the survey of Cisco customers. Finally, resellers may also benefit immediately from the "Solution Incentive Program" (SIP) if they transform Cisco products to create solutions that differentiate them from other resellers

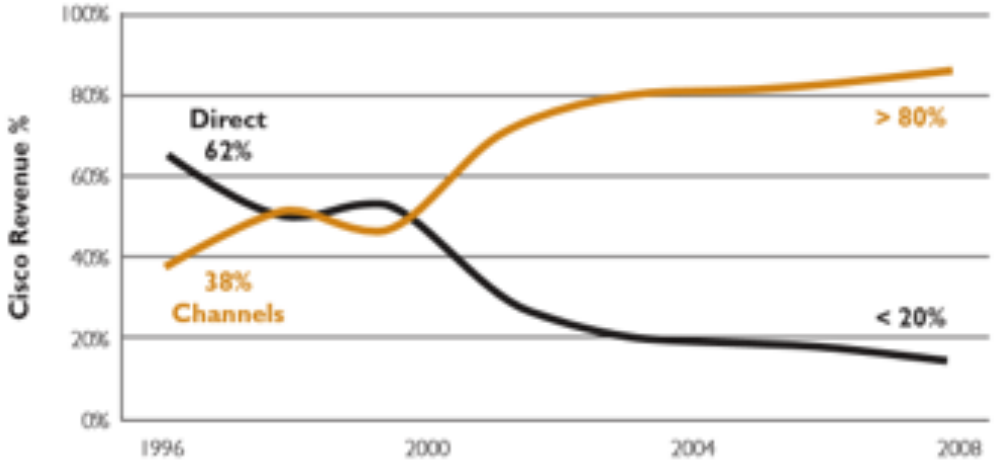
In the seven-year period from the introduction of the training program in March 2001, 17,000 employees of Cisco resellers were certified. The indirect distribution channel grew during this period to represent over 80 percent of Cisco revenues (Figure 7). In 2005, Paul Mountford, Cisco's VP of worldwide channels, requested and received $1 billion from the company's top management to fund an incentive scheme to encourage resellers to engage in certification and specialization and to reward them for selling Cisco equipment (Schwartz 2018).

At the 2001 launch of its model to manage VARs, Cisco introduced a system to monitor the level of customer satisfaction, and results were shared with partners. In addition, according to Kalyanam and Brar (2009, p. 115), between 2003 and 2008, Cisco tracked the annual profitability of its resellers using a model of "Return on Working Capital" and found that resellers who engaged in activities to "add value" were more profitable than those who continued to focus on order fulfillment.

In 2016, Cisco had 60,000 worldwide resellers with 280,000 employees. Cisco itself had a salesforce of 17,000 people. The breakdown was estimated at 85 percent of revenues from the indirect channel and 15 percent from direct sales. Direct sales relationships were established with only 30 of its top customers, which were primarily service providers. In the main enterprise market, a transition was underway from selling to IT departments, which focus on product price, to selling software solutions directly to line-of-business executives, who are more concerned with product value (Haranas 2016). In addition to the obstacle that reliance on VAR channels had earlier posed for a move by Cisco into the service-provider market, the emergence of the cloud-centric network based primarily on subscription payments for software services may mean that Cisco's reseller channel is also in danger of losing its effectiveness in the company's core enterprise market (Schwartz 2018). Brar, who remained Cisco's chief of partner strategy, cloud and managed

services until 2015, claimed that the company missed the cloud opportunity because its channel program remained focused on driving hardware sales (Spencer 2020).

Figure 7. Percentage of Cisco revenue by channel, 1996-2008



Source: Kalyanam & Brar 2009, p. 113.

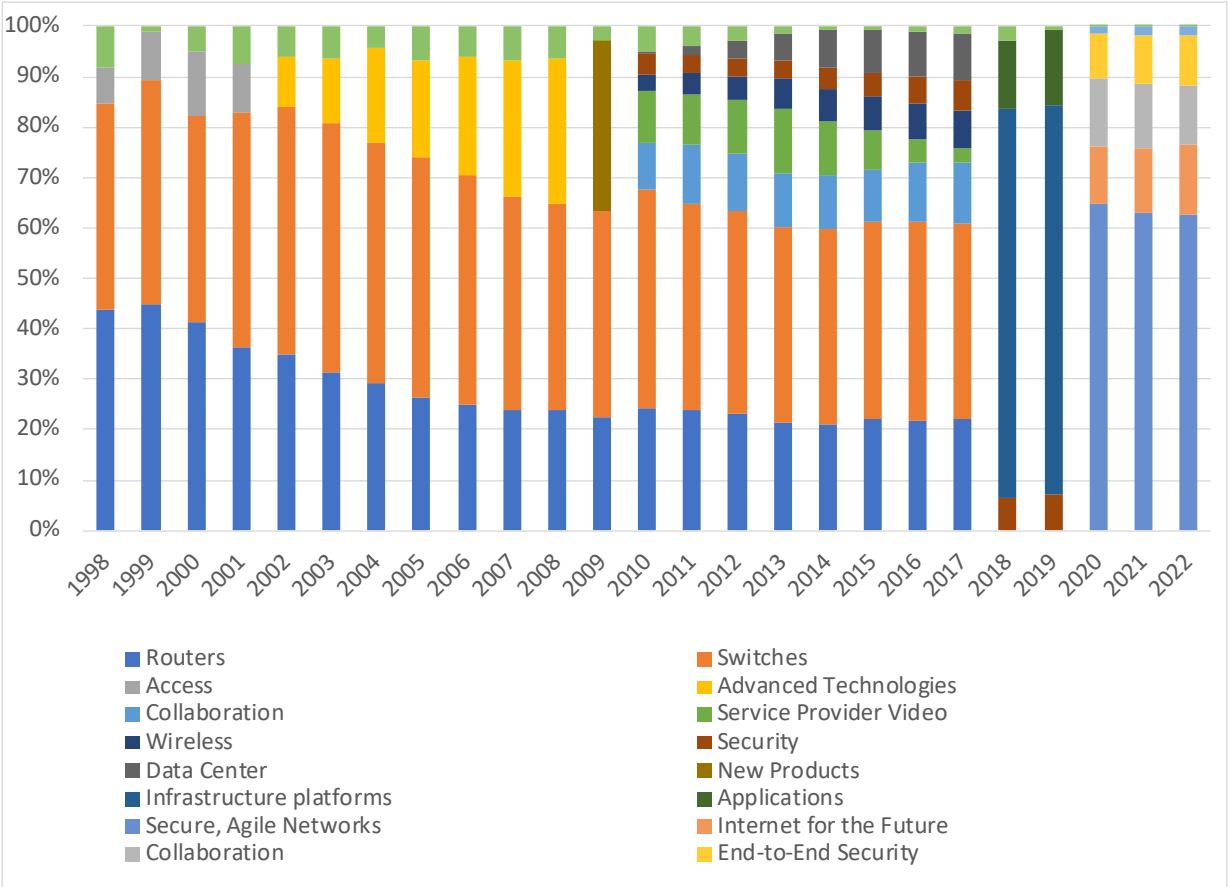
In 2019, Cisco declared that partners would no longer be incentivized simply on the basis of a sale, but that they would need to show that customers activated and implemented Cisco products and that they renewed them when the subscription ran out (Budd 2019). In 2020, Cisco announced that it was moving to a 100-percent subscription business, further disrupting the VAR model built up over decades (McBain 2021). In a "recurring revenue model", renewals are dependent on on-going levels of customer satisfaction, increasingly at the level of individual business functions, such as marketing and finance. This "as a service" approach requires VARs to adapt their traditional business model based on sales of equipment to buyers in IT departments. They therefore need to invest in new sales skills, operational systems, and compensation processes that focus on on-going customer satisfaction rather than sales targets (Goble & Stoll 2020).

Cisco's products

Routers and switches remain Cisco's most significant products, representing about 60 percent of revenues from 2010 to 2017, after which the company stopped reporting them as separate businesses. Reported revenues from routers peaked at $8.4 billion in 2012 and from switches at $14.7 billion in 2015. In 2017, revenues fell below $8 billion for routers and $14 billion for switches. Both businesses were subsequently integrated in the segment called "secure agile networks" (Figure 8).

Without gaining a strong foothold in the service-provider market for networking equipment at the end of the 20th century, Cisco's diversification strategy turned to less technologically sophisticated segments. Over the next two decades, however, Cisco failed to achieve the sought-after dominance in these new activities, from which it systematically withdrew (Table 5).

Figure 8. Cisco Systems: Product segments as a percentage of total revenues, 1998-2022



Note: Cisco broke down its revenues into different product categories for the first time in 1999, including fiscal 1998 data. It subsequently reclassified net product revenues in 2004, 2012, 2020 and 2022.
Source: Cisco 10-K SEC filings.

Table 5. New businesses entered and exited by Cisco, 2013-2018

Acquisition	Type of business	Date of acquisition	Cost; form of payment	Date of disposal
Linksys	Home networking	Mar. 2003	$480m; shares	Mar. 2013
Scientific Atlanta	Set-top boxes	Feb. 2006	$7.1b; cash	Nov. 2015
Pure Digital Technologies	Digital camcorders	Mar. 2009	$533m; shares	Apr. 2011
Tandberg	Tele-conferencing	Apr. 2020	$3.3b; cash	Jan. 2012
NDS	Video software	Jul. 2012	$5.0b; cash	Nov. 2018

Sources: Cisco 2003; 2006; 2009; 2010; 2011; 2012; 2013b; 2018; Technicolor 2015.

The first of these unsuccessful acquisitions was Linksys, acquired in 2003 for $480 million in shares, as a "solid example of Cisco's strategy to broaden its end-to-end portfolio of network solutions into high-growth markets such as wireless, voice-over-IP and storage area networking" (Cisco 2003). The Linksys acquisition represented the first of Cisco's moves into consumer markets, supposedly inspired when John Chambers' son installed a wireless network in the family home (Sidhu 2010). It was estimated that the market for networking products aimed at households and small firms would grow from $3.7 billion in 2002 to $7.5 billion in 2006, and Linksys was the market leader. In 2002, the Irvine, California supplier of domestic wi-fi routers had annual

revenues of over $430 million and 308 employees (Thurm 2003, p. 266). The Linksys acquisition marked a change in Cisco's post-acquisition integration policy as the acquired company was allowed to remain as a separate division (Boulton 2003). It also kept its own name and was the precursor for what were called Cisco's "platform deals". With such deals, Cisco took eighteen months, rather than two months, to integrate companies and adopted a more hands-off approach that allowed acquired firms to keep their brand names and sales force (White & Vara 2008)

When it was purchased, Linksys was estimated to hold 40 percent of the US market, with its closest competitor, Netgear, from San Jose, possessing 12 percent (Duffy & Kistner 2003). Linksys's revenues increased to reach $670 million by 2008, but it was losing market share and could only claim one-third of the US market in 2010, while Netgear's share had risen to 35 percent (Barron's 2013). By the end of 2012, Linksys's market share was estimated to be below 20 percent while Netgear's continued to increase (Barron's 2013). Linksys was also embroiled in a five-year long dispute with the Free Software Foundation for the Cisco division's non-compliance with the requirements of free software licenses (Smith 2009).

In 2009, Cisco attempted to further develop its consumer business from the networking world into the competitive arena of consumer electronics with the acquisition of Pure Digital Technologies for $533 million in shares. The small San Francisco-based start-up had sold two million high-definition video camcorders in less than two years under the brand name Flip. Costing between $100 and $229, with its built-in USB connector, the device could upload easily up to sixty minutes of video either to a computer or directly to social networks. The rapid growth of the product within a shrinking market for digital camcorders was explained by the simplicity and ease of use of the Flip design. By 2011, however, it was clear that the market for consumer hand-held video had been transformed by the take-off of the smartphone sector.

In particular, the iPhone 3GS launched in June 2009 offered equivalent digital video capabilities to Cisco's Flip as part of a multi-functional smartphone. Chambers admitted that "when Steve Jobs held up our Flip video camera at an Apple product launch and said it was a great product but Apple would give it to you for free by putting high-definition video cameras on the iPhone, I knew he had me" (Chambers & Brady 2018). Cisco announced that it was closing the Flip business and "realigning the remaining consumer business to support four of its five key company priorities – core routing; switching and services; collaboration; architectures; and video" (Cisco 2011). The company's new strategic direction was presented as one designed to strengthen its enterprise and service-provider offerings.

With the $3.3-billion acquisition of Norwegian teleconferencing firm Tandberg in 2010, Cisco was still planning to accelerate its push into consumer markets (Cisco 2010). Cisco launched the high-definition teleconferencing platform, Umi, to households in October 2010 at a cost of $600 for the hardware and an annual subscription for unlimited calls at $300. With free alternatives such as Skype and wi-fi video chat available, however, the new product was described as "a joke" (Munarriz 2010). It gained no traction in the market and was withdrawn in January 2012 (Duffy 2012).

With these failed acquisitions, Cisco demonstrated that it lacked the capability to serve consumer markets. The company's first television advertising campaign aimed at consumers was run in 1998. It was inspired by the success of Intel's branding of its processors inside PCs and sought to equate

the Cisco brand with the Internet (Bunnell & Brate 2000, p. 113).[13] Yet, at the time of the Flip camcorder acquisition in 2009, less than five percent of Cisco's revenues were from consumer products (Vance 2009). Stephen Lawson, an industry journalist, noted that "it's a very rare company that can actually have a strong consumer brand and corporate brand…For Cisco to have done that, I think, would have required a much bigger shift in company strategy than they were willing to do" (Lawson 2013).

Lawson believed that Cisco would have more success diversifying with its video-services division, working with service providers to offer the "enabling technology" of set-top boxes as a gateway to the Internet. He was referring to Cisco's major acquisition of Scientific Atlanta in 2006, when the company spent $7.1 billion in cash to acquire a Fortune 500 company, based in Atlanta, Georgia, with 7,600 employees. The company supplied boxes that consumers connected to their TVs to receive digital content from their cable operators. Scientific Atlanta was the second-largest player in the US market after Motorola, with revenues prior to take-over of $2 billion, with $1.5 billion in cash on its balance sheet (Raynovich 2005).

The acquisition of Scientific Atlanta obliged Cisco to adapt its business model, as it acquired both a manufacturing plant and a retail channel business (Sidhu 2010). The saturation of the US domestic market combined with increased competition and standardization of technology in the segment (Silver 2008) led to pressure on margins. At 25 to 30 percent in 2013, gross margins in the segment were already well below what Cisco was announcing as its target of 61 to 62 percent (Carew 2013). Cisco divested itself of the Scientific Atlanta manufacturing plant in Juarez, Mexico, in a sale to Hon Hai Precision (Foxconn) of Taiwan as part of a plan announced in 2011 to improve the company's profitability (Clark 2011).

Then, with annual revenues shrinking to below $1.8 billion, in July 2015 Cisco announced the sale of the Scientific Atlanta division to Technicolor for $600 million, a price that included $150 million in Technicolor shares (Clark 2015). The sale was the first major strategic decision of Chambers' successor, Chuck Robbins, who was described as having "just fixed John Chambers' most expensive mistake" (Bort 2015). Chambers himself defended the acquisition of Scientific Atlanta as being "at the heart of a business that had delivered $27 billion in the decade after we acquired it" (Chambers & Brady 2018 pp. 144-145). Yet Chambers went on to say that "for the first five years, it generated tremendous growth in video. We failed, however, to transition to the next video shift at the scale we needed to make a difference so we sold the business in 2015. We failed in our execution to get the future generation of consumer video to market" (Chambers & Brady 2018, p. 145).

The apparent source of Chambers' assertion of Scientific Atlanta's contributions to Cisco's revenues was a blog post by Hilton Romanski, Cisco's chief strategy officer at the time of the sale of Scientific Atlanta to Technicolor:

> Ten years ago we entered the set top box business because of the role it played in our service provider customers' business. Connected devices have delivered $27 billion of aggregate revenue to Cisco since then. This technology continues to be critical for these

[13] The slogan used was "Virtually all Internet traffic travels along the systems of one company, Cisco Systems. Empowering the Internet Generation" (Waters 2002).

> customers. We are proud of the contribution this business and its people have made to Cisco over many years. This includes providing new innovations, expanding important markets, and deepening our service provider relationships. We now believe that the time is right, and Technicolor is the right partner, to take this business to the next stage of evolution and growth (Romanski 2015).

In his 2010 book, Inder Sidhu, Cisco's VP of strategy and planning for worldwide operations, stated that Scientific Atlanta's business grew by more than 40 percent in the first two years after the acquisition, exceeding expectations (Sidhu 2010, p. 47). He explained that:

> SA boasted a vertically-integrated, custom-built business model that enabled the company to custom-build virtually any set-top box. Managing that kind of operation and measuring its efficacy was completely foreign to Cisco. But SA had perfected it over the years. Among other things, SA developed an intimacy with customers that was new to Cisco. The executive team boasted deep, long-standing relationships with key customers—associations that had long since moved from the boardroom and into the realm of social interactions and personal friendships (Sidhu 2010, p. 46).

With the growth in the digital transmission of video entertainment content to households, Cisco had hoped to become a supplier of video technologies to service providers and media firms. To this end, it paid $5 billion in 2012 to acquire NDS Group, a provider of video and content security solutions with over 5,000 employees based in the UK. With TV consumption habits changing radically, however, the cable and satellite providers, which were the traditional NDS customers, were struggling, and Cisco was not able to contain losses. In May 2018, NDS, renamed Service Provider Video Software Solutions (SPVSS), was sold back to one of its former owners, Permira Fund, for a price rumored to be below $1 billion (Kanouff 2018; Lunden 2018).

In 2014, *Optical Networking Daily* noted that the decade after the Linksys acquisition in 2003 had been hugely expensive and ineffective for Cisco due to the "disastrous and hubristic and ultimately failed moves towards a consumer market" (OND 2014). Between 2002 and 2022, Cisco closed 162 acquisitions with the cost declared for 90 of them.[14] The total cost of all disclosed acquisitions during this time was $52.8 billion (Table 6). At $16.4 billion, Cisco's five acquisitions in the consumer business represented 31 percent of the company's investment in acquisitions over these two decades.

From 2010 to 2017, Cisco reported annually the revenues of five new business segments in addition to its original segments of routers and switches and an "Other" segment. In 2013, revenues for these five businesses grew to over $14.6 billion, representing over 38 percent of the company's total revenues from products (Table 7). The growth rates of these segments varied during these years often in relation to the timing of a major acquisition. By 2016, however, only the growth of the "security" segment was still in double digits (Table 8).

[14] Some acquisitions were made by subsidiaries of Cisco firms. This is the case, notably, for the Tandberg acquisition, closed in 2010 by Cisco Netherlands Holding B.V. and the NDS Group acquisition, closed in 2012 by Scientific Atlanta.

Table 6. Cisco Systems: Acquisitions, 1994-2022*

Fiscal Year	Number of acquisitions closed	Number for which cost declared	Total cost declared, $m	Acquisitions with cost greater than $440m
1994	1	1	92	
1995	4	2	401	
1996	6	5	4,857	StrataCom (4,200)
1997	9	8	1,029	
1998	5	5	680	
1999	9	9	3,196	GeoTel Communications (2,000)
2000	26	26	21,227	StratumOne Communications (435); TransMedia Communications (407); Monterey Networks (517); Cerent (6,900); Pirelli Optical Systems (2,018); Aironet Wireless Communications (835); Qeyton Systems AB (887); SightPath (800); ArrowPoint Communications (5,700)
2001	11	11	2,730	NuSpeed Internet Systems (463); IPMobile (422)
2002	4	4	572	
2003	5	5	755	Linksys (480)
2004	4	4	849	Andiano Systems (732)
2005	17	16	1,672	Airespace (447)
2006	7	7	7,330	Scientific-Atlanta (7,087)
2007	14	6	4,014	WebEx (3,025); IronPort Systems (718)
2008	7	5	1,284	Nuova Systems (678)
2009	6	3	822	Pure Digital Technologies (533)
2010	7	5	6,189	Starent Networks (2,636); Tandberg (3,268)
2011	6	1	95	
2012	9	4	5,372	NDS Group (5,005)
2013	11	8	2,171	Meraki (974)
2014	7	4	3,827	Sourcefire (2,449); Insieme Networks (860)
2015	6	1	149	
2016	11	7	3,266	OpenDNS (545); Acano (528); Lancope (410); Jasper Technologies (1,234)
2017	8	4	4,108	AppDynamics (3,258); vIPtela (487)
2018	6	3	2,649	BroadSoft.(2,179)
2019	5	2	2,621	Duo Security.(2,025); Luxtera (596)
2020	8	0	0	
2021	11	1	4,983	Acacia Communications (4,983)
2022	3	0	0	
1994-2001	**71**	**67**	**34,212**	
2002-2022	**162**	**90**	**52,778**	
Total 1994-2022	**233**	**157**	**86,940**	

*Cisco Inc. acquisitions, plus acquisition of Tandberg and DNS Group (by Cisco subsidiaries)
Source: Capital IQ

The most dramatic fall in revenues during this period was in the service-provider segment. In 2012, Cisco spent $5.0 billion acquiring the NDS Group and added an estimated $1 billion in annual revenues (Worthen 2012a), making the Service Provider Video business the most successful of these five segments in fiscal 2013, with revenues of over $4.8 billion. As mentioned earlier however, from that point revenues began to drop rapidly as consumers switched from cable television, and Cisco pulled out of this activity from 2018.

Table 7. Cisco Systems: Revenues of five of eight product segments, 2010-2017

	Collaboration $b	Service Provider Video $b	Wireless $b	Security. $b	Data Center $b	Total for five segments $b	Total revenues $b	Five-segment revenues as % of total revenues
2010	3.0	3.3	1.1	1.3	0.2	8.9	32.4	27.5
2011	4.0	3.5	1.4	1.2	0.7	10.8	34.3	31.6
2012	4.1	3.9	1.7	1.3	1.3	12.2	36.3	33.7
2013	4.1	4.9	2.3	1.3	2.1	14.6	38.0	38.4
2014	3.8	4.0	2.3	1.6	2.6	14.3	36.2	39.5
2015	4.0	2.9	2.6	1.7	3.2	14.5	37.8	38.3
2016	4.4	1.7	2.6	2.0	3.4	14.1	37.3	37.7
2017	4.3	0.9	2.8	2.2	3.2	13.4	35.7	37.4

Source: Cisco 10-K SEC filings.

Table 8. Cisco Systems: Annual revenue growth rates (%) of five of eight product segments, 2010-2017

	Collaboration	Service Provider Video	Wireless	Security	Data Center
2011	35	6	26	-8	254
2012	3	11	19	12	87
2013	-2	26	33	0	60
2014	-6	-18	2	16	27
2015	5	-26	11	12	22
2016	9	-41	3	13	5
2017	-2	-45	5	9	-4

Source: Cisco 10-K SEC filings.

The next most impressive segment during this time was "Collaboration", with revenues of $4.4 billion in 2016. These sales initially came from the IP phone business and web collaboration tools when the company acquired the leading teleconferencing firm, WebEx, in 2007 for $3.0 billion (Cisco 2007). WebEx had revenues of only $380 million in 2016. In fiscal 2010, Cisco added $800 million in revenues to this segment when, as mentioned earlier, it acquired the Norwegian firm, Tandberg, for $3.3 billion (Vance 2009). Web collaboration is viewed as important beyond its actual size as a means for Cisco to get the attention of new customers (Burbick 2018). Between 2018 and 2021, the Collaboration segment was part of the Applications group. Since 2022, the Collaboration segment was again reported separately, with revenues of $4.47 billion, a decline from $4.83 billion in 2020.

Cisco's inability to satisfy its teleconferencing customers frustrated Eric Yuan, the lead engineer at WebEx at the time of its acquisition by Cisco in 2007. He explained that

> in 2007…I became Cisco's Corporate VP of Engineering, in charge of collaborative software. I often met with customers, and in my conversations with them learned they weren't happy with current collaboration solutions, including WebEx. I firmly believed I could develop a platform that would make customers happy, so in June of 2011, I decided it was time to make the video communications solutions I had imagined…[M]ore than forty fellow engineers followed me in my new venture. We launched the Zoom platform in 2012 (Weiner 2017).

Zoom went public on NASDAQ in April 2019 and raised $350 million in new finance in addition to $145 million secured from venture capitalists. Described as a "relatively under-the-radar tech unicorn" that was mastering the art of profitable growth, Zoom was thus created because, as its founder, Yuan, said: "Cisco would not change its collaboration strategy. I said I had a different view and left Cisco" (quoted in Cohan 2019). In fiscal 2021 (ended January 31, 2022), Zoom's revenues grew by 326 percent to approximately $2.7 billion (Zoom 2022), driven by the Covid-related lockdown across the world. For Cisco's fiscal 2021 (ended July 31), revenues for the segment that includes WebEx actually declined from $5.6 to $5.5 billion (Cisco 2021b). Cisco's executive vice president and general manager of security and collaboration, Jeetu Patel, admitted that Cisco was "actually poor on quality for a while, and we had not innovated very aggressively in a long time" (VIQ FD Disclosure 2021).

In the wireless segment during this period, Cisco revenues grew from $1.1 billion in 2010 to surpass $2.7 billion by 2017. As with its failed entry into the optical-networking space, Cisco struggled to establish itself as a credible supplier to telecom service providers in the area of mobile backhaul. This market was growing rapidly in the mid-2000s with the deployment of the third-generation (3G) mobile network. Cisco hoped to enter it with a radical "all-IP" vision that required operators to "rip and replace" existing 2G infrastructure. Operators, however, resisted such a disruptive option and preferred to continue with either existing suppliers or new entrants from China who had the capability to offer backward compatibility. The incumbents, such as Ericsson, and new players, notably Huawei, were also able to bundle more expensive radio base stations with good deals on equipment for the core of the network. Thus, from both technological and commercial perspectives, Cisco was at a competitive disadvantage in the radio backhaul market (Bell, Carpenter, Glimstedt & Lazonick 2012).

With the acquisition of Starent for $2.6 billion in December 2009, Cisco was able to offer a competitive packet-handling system that operators could integrate into their backhaul networks. Starent had revenues of over $250 million when it was acquired (McConville 2009), and its CEO, Ashraf Dahod, went on to head up Cisco's Mobile Internet Technology group. Dahod left Cisco to create Altiostar in 2011 to supply equipment for cell towers to optimize mobile data transfer. Cisco invested $50 million in the start-up's first round of funding (Harris 2014).

Cisco added to its radio capabilities with the acquisition of Meraki in December 2012. While Starent was a public company with 1,000 employees worldwide, Meraki was a privately held firm that had just turned "cash positive" with 300 employees and was contemplating an IPO. Cisco considered the $974 million cash price as justified by its desire to enhance its cloud-based offering to enterprise customers whose employees were increasingly connected to networks via mobile phones (Worthen 2012b). The Meraki team became Cisco's Cloud Networking Group and, in 2017, the radio segment was integrated into the "Infrastructure Platforms" segment.

The data center segment of Cisco's business also grew significantly during this period, with revenues of $3.4 billion in 2016. LAN storage and switches for data centers, which had been part of Cisco's traditional networking business from the 1990s, started to grow in importance with acquisitions from 2002. As competition increased from Juniper (linked to IBM) and HP, Cisco developed its Unified Computing System in 2009, in partnership with VMware, in which it held 1.6 percent ownership, for visualization. As Cisco continued to acquire firms to build up its server business, server giants like Dell, IBM and HP moved increasingly into data-center networking

(Bell et al. 2012). Dell's $67-billion takeover of EMC in 2016, combined with the growing dominance of "hyperscalers" such as Amazon Web Services, Microsoft Azure and Alphabet's Google Cloud led to a difficult competitive environment in which to develop data-center products (Savitz 2019). From 2018, part of Cisco's data-center segment was moved to the "Infrastructure Platforms" segment, while revenues related to the software platform were transferred to the "Applications" segment.

As was the case with the consumer acquisitions, building up this new area of business also changed Cisco's M&A strategy. In addition to allowing larger acquired firms to retain a certain level of autonomy, Cisco also developed a new form of acquisition during this period which it called a "spin-in", as part of its strategy of "building, borrowing or buying" (Capron 2013). Cisco invented the term "spin-in" to designate a specific form of early stage investment in a start-up that usually entailed the transfer of key employees and the option to acquire the start-up if certain milestones were met (Sidhu 2010).

A key developer of Cisco's spin-in concept was Mario Mazzola, who had been Crescendo's CEO when Cisco made its first acquisition in 1993. In 2004, he was Cisco's chief development officer when the first spin-in, Andiamo, was carried out (Spangler 2002), and he subsequently left the firm to participate with colleagues in a data-center start-up, Nuova, which was spun-in by Cisco in 2008. Once three of the Cisco engineers—Premi Jain, Luca Cafiero, and Soni Jiandani—had received their final milestone payments from Cisco in 2011, they left the company again along with $100 million in seed funding to start a new SDN project, Insieme (Burrows 2012), subsequently acquired by Cisco for $860 million in 2014. The compensation of the executives who were "spun out" into start-ups that Cisco financed and subsequently acquired is not declared. A 2014 article on Cisco spin-ins reported that over the previous two decades the company had funded "three legendary engineers at Cisco"— Mazzola, Jain, and Cafiero—a total of $2.38 billion to carry out the spin-in strategy (Bort 2014).[15]

The departure in 2008 of a key executive, Jayshree Ullal, has been linked to the practice of spin-ins. A vice-president of Cisco's Data Center technology group and a Crescendo veteran (Matsumoto 2008), Ullal explained that the internal effects of such payouts made managing a research team difficult and that she had to deal with many unhappy employees who were not selected to participate in the "spin-in" startups. "It's a nightmare", Ullal complained, "when the guy in the next cubicle is a multimillionaire and you aren't, because you weren't chosen" (Hardy 2008).

Another Cisco executive, who did not want to be named, also claimed that the practice of spin-ins introduced by Chambers and his close colleagues may have also disrupted the innovation process within Cisco's own R&D function by generating "deep resentment" (Waters 2019). Shortly after his appointment as CEO, it was reported that Robbins was not going to continue the practice of spin-ins and was replacing it with internal development teams and justified it as an "internal start-up model… [with] similar environments for [employees], similar benefits for them upon success" (Bort 2015). Mazzola and his three main spin-in colleagues left Cisco for a third and, apparently, final time in June 2016 (Hesseldahl 2016) to create a new firm, Pensando, to develop a dedicated

[15] Collectively, Mazzola, Jain, Cafiero, and Jiandani have become known by their first-name initials as "MPLS", which is also the acronym for Multiprotocol Label Switching, a routing technique in telecommunications networks (see Kiran 2013).

platform for firms to manage their cloud infrastructures. Chambers, as Cisco's ex-CEO, is the chairman of Pensando (Tsidulko 2019). It has been noted that Cisco's spin-in concept has not been widely adopted by other firms (Waters 2019)

From 2018, Cisco reported its results for only three product segments, as well as the "Other" segment (Table 9). Security was the only segment that was carried on from the previous reporting categories. A new reporting segment called "Infrastructure Platforms" was created to report revenues from routers and switches as well as the data center and wireless businesses. A third product segment, "Applications", was created from revenues from various in-house software solutions along with IoT and analytics revenues from two acquisitions, Jasper, acquired in 2016 for $1.2 billion, and AppDynamics, acquired in 2017 for $3.3 billion. A third significant acquisition was completed in 2018 when Cisco paid $2.2 billion for BroadSoft. Both the AppDynamics and BroadSoft acquisitions also contribute to software sales and generate recurring revenues for Cisco (Ray 2017). While the Infrastructure Platforms segment accounted for 77 percent of Cisco's revenues in 2019, its growth was still in single figures at nine percent. The Applications segment represented only 15 percent of revenues but had grown by 15 percent, while the Security segment had growth of 16 percent and represented seven percent of overall revenues. By 2021, however, only the "Security" product category was growing, and only at seven percent (Table 10).

Table 9. Cisco Systems: Revenues for product segments, 2017-2021

	Infrastructure platforms $b	Applications $b	Security $b	Other products $b	Total revenues $b
2017	27.8	4.6	2.2	1.2	35.7
2018	28.3	5.0	2.4	1.0	36.7
2019	30.2	5.8	2.7	0.3	39.1
2020	27.1	5.6	3.2	0.1	36.1
2021	27.1	5.5	3.4	0.0	36.0

Sources: Cisco 10-K SEC filings; Cisco 2019, p.40; Cisco 2021a, p.38.

Table 10. Cisco Systems: Annual revenue growth rates (%) of product segments, 2018-2021

	Infrastructure platforms	Applications	Security	Other products	Total revenues
2018	2	10	9	-14	3
2019	7	15	16	-72	6
2020	-10	-4	16	-52	-8
2021	0	-1	7	-86	0

Sources: Cisco 10-K SEC filings; Cisco 2019, p.40; Cisco 2021a, p.38.

Overall revenues for Cisco fell in 2020 and remained stable in 2021. In reporting its product categories in 2022, Cisco again changed its approach and adopted five categories (Table 11). Cisco's original networking products for enterprise are counted in the new category of "Secure, Agile Networks" along with wireless equipment from the Meraki acquisition. This category grew by two percent in 2021 and five percent in 2022, representing $543 million and $1.1 billion in additional revenues for each year respectively. Over the two years combined, the "Internet for the

Future" category added an additional $1 billion in revenue. This category included the optical-networking products and services that include the Acacia acquisition in 2021. The "Collaboration" category of products and services saw its revenues fall over the three years by $350 million and the "End-to-End Security" category added $540 million during the same period. The final category of "Optimized Application Experiences" showed strong growth of 25 percent in 2021, adding $130 million in revenues, but this growth slowed to 11 percent in 2022 with an additional $75 million. This sector includes the products and services added to the company's offering from its ThousandEyes acquisition to develop its cloud-platform products. Its revenues from the AppDynamics acquisition from 2017, also in this category, declined in 2022.

Table 11. Cisco Systems: Revenues for product segments, 2020-2022

	Secure, Agile Networks $b	Internet for the Future $b	Collaboration $b	End-to-End Security $b	Optimized Application Experiences $b	Other Products $b
2020	23.3	4.2	4.8	3.2	0.5	0.0
2021	22.7	4.5	4.7	3.0	0.7	0.0
2022	23.8	5.3	4.5	3.7	0.7	0.0

Source: Cisco 10-K SEC filing 2022, p. 40.

4. Cisco's Transition from Innovation to Financialization

CEO Chambers described fiscal 2002 as "the most difficult environment Cisco Systems has ever faced" (Cisco 2002, p. 2). Its stock price had soared to an all-time peak of $82.00 on March 27, 2000, at which time Cisco had the highest market capitalization of any company in the world, but then plummeted to $17.99 one year later and dropped as low of $11.04 on September 27, 2001—just 13.5 percent of its level exactly 18 months earlier (see Figure 9 for average fiscal-year stock prices). On September 14, 2001, with US stock markets closed after the 9/11 terrorist attacks, Cisco announced a $3.0-billion two-year stock-repurchase program, portraying it (as did many other US business corporations) as a patriotic response to prevent a stock-market collapse (CBS News Staff 2001).

It soon became clear, however, that the purpose of Cisco's buybacks was to give manipulative boosts to the company's stock price. Buybacks can result in stock-price increases at four different stages of the "buyback process": a) when the company *announces a program* by which the board authorizes the CEO to do a stated value of share repurchases over a stated period of time; b) when, on instructions from the CFO, the firm's broker actually *executes the buybacks* on the open market, which, subject to SEC Rule 10b-18 (which we discuss below), may be done trading day after trading day; c) when the *upward momentum* that the executed buybacks give to a company's stock price is reinforced by market speculation that the stock-price increase will continue; and d) when the company releases its *quarterly earnings report*, with buybacks resulting in a higher earnings per share (EPS) and/or price:earnings (P/E) ratio, even if earnings (i.e., net income) have remained the same or even declined.

Figure 9. Cisco Systems: Stock price, dividends, and buybacks, 1991-2022

Sources: Cisco 10-K SEC filings; Yahoo Finance Historical Stock prices.

As shown in Table 1, above, in the half-decade 2003-2007, Cisco did $41.3 billion in buybacks, equal to 155 percent of net income. Starting with $350 million in buybacks in the first quarter of fiscal 2002 and $1.9 billion for the whole year, Cisco went on to spend $151.7 billion on open-market repurchases over 2002-2022—an annual average of $7.2 billion (see Figure 9 above). In 2011, Cisco also, for the first time, began paying dividends. For the years 2011-2022, Cisco paid out $53.9 billion as dividends, an annual average of $4.5 billion. Whereas dividends provide shareholders with a yield for *holding* the company's stock, buybacks provide stock traders with a yield for *selling* the company's stock. With large-scale buybacks done as open-market repurchases, stock traders can realize gains when the company manipulates its stock price.

In addition to manipulation, there are two other ways in which a company can increase its stock price: innovation and speculation. In the eight years or so after its IPO in 1990, Cisco's stock price rose steadily and substantially, driven largely by innovation related to Internet connectivity. As Cisco increased its revenues and profits by delivering networking solutions in a rapidly growing industry, stock traders observed Cisco's innovative performance and bid up the price of the company's stock. A holding in Cisco bought for $1,000 on March 27, 1990, a month after the company's IPO, had a market value of $124,000 exactly eight years later, as Cisco increased its revenues from $70 million to $8.5 billion and employment from about 250 to 15,000.

Nevertheless, rampant speculation in Cisco's stock was yet to come. In October 1998, Charles O'Reilly, a professor at Stanford Business School, published a case that began with the statement,

"Cisco is a $6 billion high technology stealth company, largely unknown to the general public" (O'Reilly 1998, p. 1). During 1998, however, the Internet boom gained momentum, and as a company that was central to the communication revolution, the rising value of Cisco stock now became very well known to that part of the public that had savings that could be allocated to the stock market. Innovation continued to drive Cisco's stock price as, from 1998 to 2000, the company increased sales from $8.5 billion to $18.9 billion and employment from 15,000 to 34,000. But in in the late 1990s, speculation reinforced innovation in driving the sharp increase in Cisco's stock price shown in Figure 9.

The original $1,000 shareholding that had a market value of $124,000 on March 27, 1998, soared to $925,000 just two years later, when Cisco's stock price reached its all-time high, with a market capitalization of $569 billion on March 27, 2000 (Reese 2010). In May 2000, Thomas Donlan (2000, p. 34), a *Barron's* editor, estimated that, given Cisco's P/E ratio with its stock price at $67.75 on May 5, 2000, the company would be valued at $2.5 trillion in 2010. In 2001, however, even though Cisco's revenues increased to $22.0 billion—up 18 percent from 2000—the company's stock price collapsed as the speculation disappeared. That set the stage, beginning in the first quarter of fiscal 2002, for Cisco to do massive buybacks to give manipulative boosts to its stock price.

From 2002 through 2022, Cisco expended 96 percent of its net income on buybacks and an additional 34 percent on dividends. By enabling stock traders, including senior executives with their stock-based pay, to realize gains by selling the company's shares, buybacks manifest a form of corporate financialization that undermines corporate innovation. The deleterious impacts of buybacks on Cisco's innovation have stemmed not only, or even primarily, from the reduction of the internal funds that Cisco has had available for financial commitment, but more importantly, as we discuss below, from their influence on strategic control and organizational integration.

When Cisco announced its first buyback program in August 1994, the stated purpose was "to meet the Company's common share requirements for its employee stock plans" (Cisco 1994, p. 19). After Cisco had done $70 million in buybacks in 1995 and $116 million in 1996, the company's board rescinded the repurchase program in October 1996 "due to uncertainties regarding the Securities and Exchange Commission's interpretation of Staff Accounting Bulletin 96 (SAB 96)" (Cisco 1996). This SEC opinion stated that, under most circumstances, a company that repurchased its own shares within two years of an all-stock acquisition would not be permitted to use the "pooling of interests" method in accounting for the acquisition on its financial statements (Carpenter et al. 2003, pp. 975-976). With SAB 96, the SEC was willing to let a company use one mode of stock-price manipulation or the other when doing all-stock acquisitions, but not both.

Pooling-of-interests accounting enabled a company to treat the cost of an all-stock acquisition as its book value rather than its (typically much higher) market value, thus avoiding the recording of goodwill on its balance sheet and, hence, subsequent amortization charges on its statement of operations. This accounting trick left the company's actual financial condition unchanged, but by avoiding the amortization of goodwill, pooling permitted the company to report higher earnings, which, it was believed, led stock traders to bid up its stock price. As we have seen, during the 1990s Cisco used its stock as a currency for almost all its acquisitions, and therefore it was able to make ample use of pooling-of-interests accounting. In fiscal 2000, for example, Cisco paid $16.3 billion in stock for "pooling-of-interests" acquisitions. Since all these acquisitions were startups

with little if any prior sales revenues, almost all the $16.3 billion would have been recorded as goodwill in the absence of the pooling accounting method. In 2000, Cisco also spent $5.0 billion in cash and stock on "purchase" acquisitions (including $2.0 billion for the optical-networking business of Pirelli), with $3.5 billion being recorded as goodwill and other intangibles.[16]

Given the extent of its acquisitions in the last half of the 1990s, when the SEC was enforcing SAB 96, Cisco refrained from doing costly stock buybacks to manipulate its stock price, choosing instead to make use of the costless pooling accounting method to achieve the same goal. Nevertheless, Cisco demonstrated that, regulations permitting, it was eager to use both pooling accounting and buybacks to boost its stock price. In April 1997, with SAB 96 still not definitively enforced, the Cisco board authorized another repurchase program, under which the company did $323 million in buybacks in the fourth quarter of 1997. In its 1997 *Annual Report,* however, Cisco warned that "the Company's ability to repurchase shares has been restricted and is expected to continue to be restricted from time to time due to business combinations and limitations under pooling of interests accounting" (Cisco 1997, p. 30). Indeed, with the SEC subsequently clarifying its intention to enforce SAB 96, Cisco ceased doing buybacks through fiscal 2001.

With speculation pushing Cisco's stock price to astronomical heights in 1998, 1999, and the first eight months of fiscal 2000, buybacks might not have added much to the company's market capitalization. The bursting of the Internet bubble and the dramatic decline in Cisco's stock price, however, led the company's board to look to buybacks to financial engineer a reversal. As it happened, in the wake of the Internet boom and bust, the Financial Accounting Standards Board (FASB), in concert with the SEC, banned pooling-of-interests accounting as of July 1, 2001 (Moehrle & Reynolds-Moehrle 2001). Therefore, when Cisco's board authorized a new buyback program on September 14, 2001, the use of the pooling method to inflate its reported earnings for the sake of boosting its stock price was no longer an option. In May 2002, a *Wall Street Journal* article on the progress of Cisco's restructuring noted that "[CFO Larry] Carter said Cisco had repurchased roughly $350 million of its shares during the [third] quarter and said the company might increase the pace of its buyback program in light of its sagging stock price" (Thurm 2002). In total, Cisco repurchased $1.9 billion in 2002, followed by $6.0 billion in 2003, $9.1 billion in 2004, and $10. 2 billion in 2005.

In doing $508 million in buybacks in 1995-1997, Cisco's express purpose had been to offset dilution when employees exercised stock options. In spending $151.7 billion on open-market repurchases from 2002 through 2022, however, the company refrained from stating an operational reason for the buybacks. Yet, with its broad-based stock-option program still in place in the 2000s, the exercise of stock options continued to result in considerable dilution of Cisco's shares outstanding. Cisco's unexercised stock options represented 12.7 percent of the company's shares outstanding in 2000 and then ballooned to as high as 23.7 percent before declining to 22.5 percent in 2007 (with an extraordinary amount of option exercises, as shown in Table 4, above) and 20.2 percent in 2008, as Cisco shifted its stock-based pay from options to the less dilutive stock awards (Lazonick 2008, pp. 506-507).

[16] Goodwill is the accounting measure of the excess of the price that a company has paid for an acquisition over the net fair market value of that acquisition. Intangibles include the value of goodwill as well as other nonphysical assets such as patents, trademarks, and brands.

The cost of employee stock-based pay became of greater concern to Cisco, as to other tech companies, from 2006, when the SEC and FASB began to require expensing it on the company's financial statements (see Hopkins & Lazonick 2016). The shift from options to awards was a response to this expensing requirement because, with awards, fewer shares had to be issued, and hence expensed, to provide employees with the same realized gains as options. Furthermore, in changing from options to awards, Cisco's management was seeking to incentivize employees to continue to hold, rather than sell, the shares acquired from their stock-based pay. When employees exercise options, they must pay the company the exercise price, and may even have to borrow money to do so. In contrast, since awards do not have an exercise price, the employee has less financial need to sell the shares immediately.

The company withholds ordinary personal taxes on the employee's account based on the difference between the market price and the exercise price of the option shares on the exercise date or between the market price and the grant-date price when the award shares vest. In the cases of both options and awards, an employee who holds on to the acquired shares faces the risk that the market price will fall, with the possibility that the gain on the shares could turn into a loss, even though the employee must pay ordinary taxes on the gains at the option-exercise or award-vesting date. Even with stock awards, therefore, the employee might want to lock in the realized gains on the vesting date. So that employees would not feel pressure to sell the shares acquired from the vesting of awards, many companies, including Cisco, adopted the practice of "repurchasing" a portion of the vested shares from the employee for tax withholding. From 2008 to 2022, Cisco took back 204 million shares valued at $6.6 billion from stock awards for withholding purposes, including 13 million shares valued at $692 million in 2022.[17]

Table 12 shows the extent to which common shares that Cisco repurchased on the open market offset dilution of Cisco outstanding shares because of issues to employees as stock-based pay (including stock options, stock awards, and a stock-purchase plan) as well as acquisitions. As it happened, over the 33-year period 1990-2022, the 5,936 million shares that (adjusted for stock splits) Cisco repurchased on the open market were just under one million shares more than the company issued to employees as stock-based pay (4,947 million) and to make stock-based acquisitions (906 million).

But the relation between shares issued and shares repurchased was very different across time periods. In 1990-2001, Cisco repurchased only 110 million shares while issuing 2,295 million for stock-based pay and 740 million for acquisitions. In the period 2002-2022, stock buybacks done as open-market repurchases represented more than double the number of shares issued for stock-based pay and acquisitions. This imbalance was most extreme in the five-year subperiod 2018-2022, when the buyback share count was 3.4 times the pay-plus-acquisition share count. At a total cost of $151.7 billion. Cisco used all 5.8 billion shares repurchased over 2002-2022 to manipulate its stock price, with just 48 percent of these shares offsetting share issues to employees and for acquisitions.

[17] For anyone collecting stock-buyback data from S&P Compustat, this corporate practice of retaining vested shares for employee withholding adds an additional source of imprecision to its variable "Purchase of Common and Preferred Stock". Besides lumping together common and preferred stock repurchases as well as tendered and open-market repurchases, the Compustat variable also includes shares repurchased for withholding purposes. Disaggregated data on the different types of repurchases are available, however, in the company's financial statements, from which we have taken all the Cisco buyback data that we report in this paper.

Table 12. Cisco Systems: Common-share issues for stock-based pay and acquisitions compared with common-share repurchases, 1990-2022 (adjusted for stock splits)

	millions		millions		Ratios of repurchases to issues			
Fiscal year	for stock-based pay (SBP)	for acquisitions (ACQ)	for tax withholding on stock awards	for open-market repurchases (OMR)	OMR/SBP	OMR/ (SBP+ACQ)	OMR, $millions	Employees, end of fiscal year
1990	151	0	0	0	0.0	0.0	0	254
1991	252	0	0	0	0.0	0.0	0	505
1992	221	0	0	0	0.0	0.0	0	882
1993	125	0	0	0	0.0	0.0	0	1,451
1994	124	61	0	0	0.0	0.0	0	2,443
1995	142	244	0	38	0.3	0.1	70	4,086
1996	172	145	0	28	0.2	0.1	116	8,782
1997	170	69	0	45	0.3	0.2	323	11,000
1998	280	48	0	0	0.0	0.0	0	15,000
1999	300	30	0	0	0.0	0.0	0	21,000
2000	219	98	0	0	0.0	0.0	0	34,000
2001	140	46	0	0	0.0	0.0	0	38,000
2002	76	27	0	124	1.6	1.2	1,854	36,000
2003	68	51	0	424	6.2	3.6	5,984	34,000
2004	122	23	0	408	3.3	2.8	9,080	34,000
2005	112	24	0	540	4.8	4.0	10,235	38,413
2006	162	1	0	435	2.7	2.7	8,295	49,926
2007	325	13	0	297	0.9	0.9	7,681	61,535
2008	165	0	1	371	2.2	2.2	10,412	66,129
2009	67	27	1	201	3.0	2.1	3,588	65,550
2010	201	0	6	325	1.6	1.6	7,734	70,700
2011	141	0	10	351	2.5	2.5	6,713	71,825
2012	137	0	12	262	1.9	1.9	4,560	66,639
2013	235	0	16	128	0.5	0.5	2,773	75,049
2014	156	0	18	420	2.7	2.7	9,413	74,042
2015	153	0	20	155	1.0	1.0	4,324	71,833
2016	113	0	21	148	1.3	1.3	3,909	73,700
2017	92	0	20	118	1.3	1.3	3,685	72,900
2018	83	0	20	432	5.2	5.2	17,547	74,200
2019	71	0	17	418	5.9	5.9	20,717	75,900
2020	61	0	15	59	1.0	1.0	2,659	77,500
2021	58	0	14	64	1.1	1.1	2,877	79,500
2022	54	0	13	146	2.7	2.7	7,689	83,300
1990-2022	4,947	906	204	5,936	1.2	1.0	152,237	
1990-2001	2,295	740	0	110	0.0	0.0	508	
2002-2022	2,652	166	204	5,826	2.2	2.1	151,729	
1998-2002	1,015	249	0	124	0.1	0.1	27,153	
2003-2007	789	112	0	2,104	2.7	2.3	35,448	
2008-2012	711	27	30	1,510	2.1	2.0	36,128	
2013-2017	749	0	95	969	1.3	1.3	24,979	
2018-2022	327	0	79	1,119	3.4	3.4	47,485	

Sources: Cisco 10-K SEC filings

From the perspective of productive performance, we can question the practice of using stock buybacks to offset dilution for shares issued to employees for stock-based pay and to finance acquisitions. In a well-managed company, employees, including those who come from acquired companies, should be able, through productive contributions, to generate the future earnings that would yield a return to the stock issued to them as part of their pay. Given that stock-based pay is

in fact an employment expense incurred for the purpose of attracting, retaining, and motivating employees, there is no logical reason why buybacks should be used to offset dilution from stock-based pay—which may be the reason why Cisco has not in fact made that claim as it has engaged in its more than two decades-long buyback spree since 2002. Similarly, if an acquisition is worth making using stock as the combination currency, the company should be willing to wait for the acquired assets to add value over time, which should in turn help boost its stock price through innovation rather than manipulation.

In 2013, Cisco began arguing that, in doing buybacks and paying dividends, the company was "returning" cash to shareholders in the form of "free cash flow",[18] a concept that is central to the ideology that, for the sake of efficiency, a company should be run to "maximize shareholder value" (MSV) (Lazonick & O'Sullivan 2000; Lazonick 2008; Lazonick & Shin 2020; Lazonick 2023). It appears that Cisco began to make this argument at this time because of—notwithstanding buybacks and, from 2011, dividends—the stagnation of its stock price through 2013 in the aftermath of the financial crisis. Although MSV is put forth by financial economists and corporate executives as a theory of value creation, it is in fact an ideology that justifies predatory value extraction by increasing yields to shareholders at the expense of the company's value-creating capabilities and the employees who contribute to them (Lazonick & Shin 2020; Lazonick 2023).

MSV ideology is rooted in the fallacious notion that, among all participants in the corporation, it is only shareholders who make contributions to the company's productive performance without a guaranteed return. But, in contributing their skills and efforts to the accumulation of the company's productive capabilities, employees take the risk of whether they will be rewarded with pay increases if and when the company is successful in generating more profits through innovation. Indeed, employees face the uncertainty of whether they will even continue to be employed by the company to reap the productivity gains that result from the skill, effort, and time that their labor services provided to the company in the past. For their part, shareholders in a publicly listed company such as Cisco take little risk because their "liability" is limited to the funds that they paid for their shares. Moreover, the presence of a liquid stock market—in Cisco's case, NASDAQ—means that they can exit from the company in an instant, at low transaction cost, at any time they choose.

Indeed, if, in stating that it was "returning" cash to shareholders, Cisco's management meant the provision of higher stock yields to public shareholders (as distinct from employees with their stock-based pay), it should be noted that the only funds that, in its history, Cisco raised from public shareholders was $47.4 million in its 1990 IPO. Insofar as those who bought shares at the IPO held on to them over the ensuing decade, they were, as we have seen, magnificently rewarded by stock-price increases without dividends and with a relatively small sum of buybacks. In what sense, therefore, has Cisco been "returning" cash to public shareholders? Returning cash for what?

The term "free cash flow", as Cisco's executives would have been aware, is measured as the cash left over (on an annual basis) after a company has covered operating expenses and capital

[18] In its 2013 10-K filing, Cisco (2013a, p. 6) states: "In August 2012, as part of our capital allocation strategy, we announced our intent to return a minimum of 50% of our free cash flow annually to our shareholders through cash dividends and repurchases of common stock, which objective we accomplished in fiscal 2013." The intention to "return a minimum of 50% of our free cash flow annually" was repeated in each of Cisco's 10-K filings through 2022.

expenditures. The purpose of the measure is to determine the amount of funds that a firm has available to distribute to shareholders in the form of buybacks and dividends (Murphy, 2022). Yet, as Cisco's senior executives have understood, and as we have shown in our analysis, the investments that the company made that underpinned its growth as an innovative enterprise were investments in human capabilities, not investments in plant and equipment. We, therefore, interpret Cisco's statement of "returning free cash flow" to shareholders in its annual reports from 2013 as senior executives' explicit commitment to financialization at the expense of innovation, even though this transition had begun about a decade before.

Corporations can secure additional funds to distribute to shareholders through tax avoidance. Quite apart from the accounting dodges that are business as usual for US corporations to lower their tax bills, during the 2000s Cisco's management had its eye on a growing accumulation of profits abroad on which, given a tax loophole, the 35-percent US corporate tax did not have to be paid until the profits would be repatriated. This tax dodge dated back to 1960 when it was adopted toward the end of the Eisenhower administration to encourage an expanded US business presence around the world (Lazonick 2011).

From 1961 to 1963, President Kennedy tried, without success, to get rid of this corporate tax subsidy, arguing that it resulted in the export of US jobs and deprived the United States of tax revenues. Subsequently, the Democrats tried from time to time to rescind this corporate tax privilege (Lazonick 2011). In the 2004 US presidential campaign, for example, Democratic candidate John Kerry proposed amendments to the tax code that would reward US companies for creating jobs in the United States rather than moving jobs offshore (Crutsinger 2004). The preferred approach of the Bush administration was the Homeland Investment Act, part of the American Job Creation Act of 2004, that provided a one-year corporate income tax holiday on profits repatriated, with the stipulation that this cash had to be used for job-creating investments. The Act expressly prohibited the use of the repatriated funds to pay dividends or do stock buybacks. US corporations responded by repatriating $299 billion in profits in 2005, compared with an average of $62 billion from 2000 to 2004 and a subsequent decline to $102 billion in 2006 (Dharmapala, Foley, & Forbes 2011).

Dharmapala et al. (2011, p. 756) found that the repatriation scheme failed to achieve its intended purpose:

> Rather than being associated with increased expenditures on domestic investment or employment, repatriations were associated with significantly higher levels of payouts to shareholders, mainly taking the form of share repurchases. Estimates imply that a $1 increase in repatriations was associated with an increase in payouts to shareholders of between $0.60 and $0.92, depending on the specification.

They go on to suggest that companies were able to make these distributions to shareholders without violating the terms of the Homeland Investment Act by using the repatriated funds "to pay for investment, hiring, or R&D that was already planned, thereby releasing cash that had previously been allocated for these purposes to be used for payouts to shareholders."

A persistent promise in Barack Obama's campaigns for the Senate in 2004 and the Presidency in 2008 was that he would end tax breaks for corporations that ship jobs overseas (Conrad 2008). In

a speech in May 2009, President Obama declared, "It's a tax code that says you should pay lower taxes if you create a job in Bangalore, India, than if you create one in Buffalo, New York" (The White House 2009). In June 2009, Microsoft CEO Steve Ballmer responded that an end to the overseas tax deferral would make "US jobs more expensive", and that if the Obama administration insisted on changing the tax deferral, Microsoft would be "better off taking lots of people and moving them out of the US" (Donmoyer 2009). In September 2009, in a meeting with US tech executives, Obama agreed to shelve the plan to end the tax dodge (King & Williamson 2009). Nevertheless, in his State of the Union address on January 27, 2010, President Obama insisted that "it is time to finally slash the tax breaks for companies that ship our jobs overseas and give those tax breaks to companies that create jobs right here in the United States of America" (Obama 2010).

In the first quarter of fiscal 2006, under the Homeland Investment Act, Cisco repatriated $1.2 billion from abroad, with a tax liability of $63 million (Shinai 2005), stating "the Company's intention to indefinitely reinvest undistributed earnings of certain of its foreign subsidiaries in operations outside the United States" (Cisco 2005, p. 29). At the end of fiscal 2006, Cisco held $11.8 billion in cash, cash equivalents, and investments outside the United States and another $6.0 billion at home. These amounts were $33.2 billion and $6.7 billion, respectively, at the end of fiscal 2010.

In October 2010, John Chambers published a *Wall Street Journal* opinion piece with Safra Catz, president of Oracle, in which they sought to counter criticism in the press that US corporations were sitting on one trillion dollars in cash held abroad that could be used to create jobs in the United States. The two tech executives contended that these funds "could be invested in U.S. jobs, capital assets, research and development, and more" if US corporations had an incentive to do so (Chambers & Catz 2010). "But", they continued (with emphasis added),

> for U.S. companies such repatriation of earnings carries *a significant penalty: a federal tax of up to 35%.* This means that U.S. companies can, without significant consequence, use their foreign earnings to invest in any country in the world—except here.

Having redefined an existing US government tax subsidy to US corporations as a tax penalty on them, Chambers and Catz then noted that repatriated profits could "provide needed stability for the equity markets because companies would expand their activity in mergers and acquisitions, and would pay dividends or buy back stock." To lure the $1 trillion back to the United States, they proposed a 5% tax on repatriated profits that would yield the US government a quick $50 billion, which could then "be used to help put America back to work . . . [by giving] employers—large or small—a refundable tax credit for hiring previously unemployed workers (including recent graduates)." "Such a program," they crowed, "could help put more than two million Americans back to work at no cost to the government or American taxpayers. How's that for a good idea?" (Chambers & Catz 2010). Along with other business executives, Chambers proffered his "good idea" directly to President Obama at the White House at a meeting on December 15, 2010 (Drucker 2010).

Meanwhile, from 2002 through 2011, Cisco spent $71.6 billion on buybacks, equal to 126 percent of net income. Of this amount, $19.7 billion was offset by stock sales to employees as they exercised stock options, although this source of funds, which peaked at $5.3 billion in 2007, diminished markedly in the 2010s with the shift from options to awards in stock-based pay. In

addition, Cisco took on $9.4 billion in net long-term debt in 2009-2011 and $3.7 billion in short-term debt in 2010-2011—the first borrowing that the company had done in its history, except for a $6.5-billion bond issue in 2006 for the specific purpose of acquiring Scientific Atlanta. Cisco did not state the reasons for its borrowing in 2009-2011, but it clearly became necessary because of the extent of the company's buybacks during a period in which the tax code continued to incentivize the company to keep foreign profits abroad. By 2017, Cisco's cash, cash equivalents, and investments held abroad increased to $67.5 billion, with just $3.0 billion in the United States, while the company's long-term debt balance rose from $16.2 billion at the end of fiscal 2011 to $25.7 billion at the end of fiscal 2017.

Then, in December 2017, the Republicans passed the Tax Cuts and Job Act, which dramatically lowered the tax rate on corporate profits from 35 percent to 21 percent, while freeing the foreign profits of US-based corporations from US taxation. The result was that US corporations in general repatriated massive amounts of foreign profits that they had accumulated. Unlike the Homestead Investment Act of 2004, there are no restrictions under the 2017 Act on how the repatriated profits can be used. In fact, during 2018, US corporations in the S&P 500 Index did close to $800 billion in open-market repurchases—a record that was only surpassed by about $850 billion in 2021 and over $900 billion in 2022 (Lazonick, Sakinç & Hopkins 2020; Lazonick 2023; Yardeni, Abbott & Quintana 2023, p. 3).

Cisco's response to the tax cut demonstrated its commitment to a financialized business model. The company repatriated $70 billion of foreign earnings to the United States in 2018, paying $1.2 billion in US federal taxes (Cisco 2018, p. 52). It also incurred a provisional tax expense of $10.4 billion to be repaid over the following eight years (Cisco 2018, p. 109). From 2011 to 2017, the company had averaged $5.1 billion in buybacks per year. The repatriated funds enabled Cisco to ramp up its buybacks dramatically to $17.5 billion in 2018 and $20.7 billion in 2019—325 percent of its net income over the two years—on top of 102 percent of net income distributed as dividends. For 2018-2022, Cisco distributed $51.5 billion in buybacks, equal to 112 percent of net income, and $30.4 billion in dividends, another 66 percent of net income.

Cisco also used $16.7 billion of the repatriated money to pay off its long-term debt—accumulated since 2009 to support its buybacks habit—reducing it from $25.7 billion at the end of fiscal 2017 to $8.4 billion at the end of fiscal 2022. Comparing 2018-2022, when the US corporate headquarters had access to the accumulated foreign profits, to 2013-2017, Cisco only increased R&D spending to $32.6 billion from $30.8 billion (5.7 percent), while it cut capital expenditures to $3.7 billion from $5.8 billion (-36.2 percent). In the allocation of the company's resources, with the company free to use the $70 billion in repatriated profits in any way it would see fit, Cisco's senior executives chose value extraction over value creation.

Finally, what motivated Cisco's senior executives to turn from innovation to financialization in the 21st century? It could be that, as CEOs, Chambers and then, from 2016, Robbins feared losing control of the company to hedge-fund activists, but there is no evidence that the company was a subject of attack. Both the Chambers and Robbins administrations behaved as if they believed that a company should be run for MSV. As is the case at virtually all other major US business corporations, the stock-based pay of Cisco's senior executives—as displayed in Table 13—incentivizes them to boost the company's stock yields (dividend yield plus price yield). And stock

buybacks done as open-market repurchases are the most potent tool for a company to manipulate its stock price.

Table 13. Cisco Systems: CEO and Other Top4 stock-based compensation (SBC) from realized gains on stock options and stock awards, and ratios to employee average SBC (excluding Top5), 1994-2022

Cisco fiscal year	CEO SBC, $m	CEO SBC as % of TDC	Other Top4 average SBC, $m	Other Top4 average SBC as % of TDC	Employee average SBC, $	CEO SBC/ employee average SBC	Other Top4 average SBC/ employee average SBC
1994	0.0	0	4.6	93	34,719	0	133
1995	8.5	96	3.0	90	60,894	139	49
1996	32.6	98	11.6	96	93,399	349	124
1997	0.0	0	3.9	89	85,159	0	46
1998	0.0	0	7.5	89	92,947	0	80
1999	120.8	99	24.9	96	193,476	624	129
2000	156.0	99	36.7	97	291,048	536	126
2001	0.0	0	14.9	97	105,865	0	140
2002	0.0	0	1.0	52	13,596	0	74
2003	0.0	0	1.6	61	8,917	0	181
2004	38.3	95	8.2	88	32,804	1,167	250
2005	61.3	97	4.4	82	24,432	2,510	181
2006	69.7	98	4.6	75	25,487	2,734	180
2007	50.9	93	15.4	87	73,470	693	210
2008	0.0	0	6.5	73	14,186	0	460
2009	0.5	18	0.9	30	3,216	166	275
2010	32.9	87	3.1	49	18,454	1,783	166
2011	3.0	89	2.5	59	11,340	263	216
2012	15.8	78	3.2	55	12,993	1,216	244
2013	11.1	66	5.2	61	19,228	579	268
2014	12.3	77	7.8	78	21,049	582	369
2015	24.8	83	17.0	85	24,200	1,027	703
2016	7.8	58	12.1	84	22,232	351	543
2017	11.1	74	8.1	86	26,455	419	305
2018	9.0	59	3.4	41	31,620	283	106
2019	23.5	76	7.7	59	32,370	727	238
2020	24.9	86	8.7	86	25,337	982	345
2021	22.9	79	8.9	83	22,387	1,024	396
2022	23.5	84	8.2	82	23,518	998	349

Notes: SBC=stock-based compensation (realized gains from stock options and stock awards); TDC=total direct compensation; Other Top4=four highest-paid executives named on proxy statements other than the CEO; Top5=CEO plus OtherTop4

Sources: Cisco DEF 14A proxy statement filings and Cisco 10-K filings, 1994-2022

Table 13 provides data on the stock-based compensation of the CEO, other four highest-paid executives named in proxy statements (Other Top4), and the average across all Cisco employees (excluding the Top5) for 1994 through 2022. In Cisco's history, John Morgridge, CEO from 1988 to 1994, was reputed to "run a tight ship" with centralized control of spending and relatively low

salaries, including his own.[19] In the three years, 1992-1994, for which data are available when he was CEO, Morgridge got an average annual take-home salary of just over $360,000. He also received stock options on which he realized gains in later years as chairman of the board from 1995 to 2006.

Chambers did exceedingly well from the speculative boom in Cisco's stock price in 1999 and 2000, following its innovative growth in the 1990s. Thereafter, however, Chambers was well rewarded by stock-based pay for manipulating Cisco's stock price with stock buybacks, while the company over which he exercised strategic control became an un-innovative firm. When the Internet boom turned to bust, Chambers took a cut in his annual salary from $268,131 in 2000 and 2001 to $1 in 2002, 2003, and 2004 (Gross 2003). In his 21 years as CEO, the salary component was just 1.9 percent of his total compensation of $682.6 million, whereas the stock-based components (stock options and stock awards) were a combined 88.7 percent.

With Cisco's stock price depressed in the $1 salary years, Cisco's board loaded up Chambers with stock options at low exercise prices. From 2004 through 2015, he exercised 23.7 million options for $287.7 million in realized gains—of which he took home $220.2 million in 2004-2007. In addition, he raked in another $33.0 million from the vesting of stock awards. From 2016 through 2022, CEO Robbins took home a total of $160.3 million in direct compensation, of which 77 percent were realized gains from the vesting of stock awards.

Since 2001, neither Chambers nor Robbins was able to tally annual compensation that came close to the annual average of $139.5 million that Chambers banked in 1999-2000, at the peak of the Internet bubble. In the stock-market boom of 2005-2007, preceding the financial crisis of 2008-2009, Chambers managed to average $63.0 million per annum in total compensation. However much Cisco's senior executives have used buybacks since 2002 to manipulate the company's stock price, they cannot match the bonanza that Chambers was also able to reap in 1999-2000 from speculation that built on innovation. Yet, as CEOs, the stock-based pay of Chambers and Robbins has certainly incentivized them to engage in financialization rather than innovation. Thus far in the 21st century, these two Cisco CEOs have abused their positions of strategic control to waste $157 billion on buybacks rather than deploy this cash to invest in the transformation of Cisco into an integrated communication-technology company, capable of innovating in 5G, IoT, and beyond.

5. Costs of Cisco's Financialization to US Innovative Capabilities in a Critical Industry

Despite financialization, Cisco has grown over the last two decades because of greatly expanded demand for enterprise-networking equipment. In 2022, Cisco had 2.3 times the revenues and 2.2 times the employees than in 2001. In terms of Cisco employees in the United States, the increase was 1.5 times, up from 27,000 in 2002 to 39,900 in 2022. The company has been a job creator.

Yet, the dominance of financialization over innovation within Cisco Systems over the past two decades has had a negative impact on its capacity to develop the capabilities needed to compete as a systems integrator in the communication infrastructure-equipment sector. As a result, as is widely recognized, the United States has fallen behind China and the European Union as a locus of

[19] Sequoia executive and Cisco board member, Donald Valentine said about Morgridge ''one of the things I was warned about…was that when you have dinner with him, don't let him order the wine" (Bunnell & Brate 2000, p. 24).

innovation in 5G and IoT. Particularly in the case of China, the home base for world-leader Huawei Technologies, it is all too easy and convenient to blame unfair competition for the innovation deficit of the United States (see e.g., Atkinson 2020).

Cisco is not the only US-based communication-technology company to succumb to financialization. In the late 1990s, Lucent Technologies, at the time the industry's global leader, adopted Cisco's growth-through-acquisition model, using its stock as a combination currency to acquire optical-networking capabilities (Carpenter et al. 2003). Lucent was unable, however, to achieve the organizational integration required to transform these acquisitions into innovations (Lazonick & March 2011). Then, in the first half of the 2000s, Lucent lacked the financial resources to invest in wireless technology. In 2006, Lucent was acquired by France-based Alcatel, and in 2015 Finland-based Nokia acquired Alcatel-Lucent (Carpenter et al. 2003; Lazonick & March 2011; Carpenter & Lazonick 2017).[20] Canada-based Nortel, which was more advanced technologically than Lucent in the late 1990s, with a large R&D footprint in the United States, suffered the same financialized fate as Lucent and went bankrupt in 2009, with its physical assets and intellectual property being sold off in pieces in its subsequent liquidation (March 2022). Of particular importance was Ericsson's acquisition of Nortel's wireless assets.

In 2005, when the United States still had innovative capabilities in the communication infrastructure-equipment sector at the iconic Old Economy company Motorola and innovative New Economy companies such as Qualcomm and Ciena, Cisco CEO Chambers announced six new strategic "advanced technologies" to be targeted by the company with a view to attaining a number one or number two position in terms of market share. The objective of the diversification was to reduce reliance on the company's core markets of enterprise routers and switches by taking advantage of future high-growth markets (Reardon 2005).

One of these "advanced" technologies was "home networking" and, as we have outlined above, Cisco's acquisitions in this line of business proved to be expensive and unsuccessful attempts to move into the consumer sector over the next decade. Three of the six technological areas—optical networking, IP telephony and wireless—were, however, relevant to the service-provider sector. In 2005, when Chambers announced Cisco's plan to invest in innovation, the company had $5.7 billion in net income but did $10.2 billion in open-market repurchases.

Had Cisco not been so focused on doing buybacks to boost its stock price, it might have joined forces with companies like Motorola, Qualcomm, and Ciena to build a US-based global competitor to Ericsson, Alcatel, and Huawei. But both Motorola and Qualcomm were themselves becoming highly financialized at this time, while Ciena, which had been founded in 1992, had only $427 million in revenues with $436 million in losses in 2005 (Carpenter & Lazonick 2017). Motorola's infrastructure business was acquired by Nokia Siemens Network in 2010, and Qualcomm, the US pioneer in the CDMA wireless standard, focused on maximizing the return from its patent portfolio as a fabless chipset designer (Carpenter & Lazonick 2017; Glimstedt & Carpenter 2023).

[20] In the first decade of the century Nokia had itself became a highly financialized company, especially by European standards, as it frittered away its position as the world's leading cellphone company. From 2003 to 2008, Nokia distributed $24.7 billion as stock buybacks (71 percent of net income), in addition to $12.7 billion as dividends (36 percent of net income). It re-emerged as one of the top three vendors of communication equipment to service providers because it was able to offload its cellphone business to Microsoft for $7 billion in 2013, while acquiring in the same year the infrastructure division of Germany-based Siemens, with which Nokia had had a joint venture since 2006 (Carpenter & Lazonick 2017).

As early as 2006, Cisco removed optical networking from its group of "advanced technologies". The company's vice president and chief development officer at the time explained that this was because "optical is more of an access technology, where the market is not going to grow as aggressively as it had in the past" (Musich 2006). Meanwhile, in 2009, the rising China-based company, Huawei, became the world leader in optical networking (Grubb 2009), which it integrated with wireless and Internet capabilities, succeeding in global competition, where Cisco failed (Wu, Murmann, Huang, & Guo 2020; Feng 2020; Feng & Li 2020; Li 2022; Li & Lazonick 2023). Despite numerous acquisitions in the area, Cisco's focus on a radical "all-IP" solution combined with its lack of radio base stations and "account control" left it without the capability of becoming a systems integrator that could displace the incumbents and counter the growing competitive strength of Huawei (Bell, et al. 2012).

More broadly, the impact of growing financialization in the sector has left the United States without the capability to innovate in the development of a communication-infrastructure network. While failing to recognize the role of financialization within the sectoral dynamics, US policy makers have chosen to respond to the US loss of competitiveness with aggressive protectionist measures against Chinese competitors and by attempting to introduce a new standard that will favor US, Japanese, and Korean competitors without systems-integration capabilities.

During the 1990s, the Chinese equipment manufacturer Huawei had built on its domestic success to become a global leader in the industry. China-based ZTE also emerged as an important global competitor, but with only one-third of Huawei's infrastructure-equipment revenues in recent years (see Figure 1, above). In 2012, US policy makers concluded in the report of an intelligence committee that these Chinese firms were potentially open to influence by the Chinese government for "malicious purposes" (Rogers & Ruppersberger 2012).

Without the capacity to build a 5G mobile network and aware of the importance of IoT for future digitalization and competitiveness, the United States became much more aggressive under the Trump administration. Huawei was added to the "Entity List" in 2019 (US Bureau of Industry and Security 2019), blocking US suppliers and their customers from selling machinery, components, and software to the Chinese company and thus halting its rapid expansion in the mobile handset market. William Barr, the US attorney-general (who, in that position, displayed scant capability in enforcing the law), even suggested that the United States should buy controlling stakes in Nokia and Ericsson to help build a stronger competitor to Huawei (Nakashima & Whalen 2020). Perhaps Barr's perspective on how to attain global leadership in critical technologies was influenced by the demonstration by Cisco, among other US tech companies, of a "core competence" in purchasing their own shares on the market, in this case to manipulate their stock prices (Lazonick 2023).

A RAND Corporation report suggested that counteracting the Chinese threat required a standardization body that could pioneer an alternative to the global standard that had emerged in the 4G era and facilitated the success of the new entrants from China (Bonds et al. 2021). Cisco and Japanese firms, NEC and Fujitsu, have been actively promoting the alternative standard, OpenRan, as an opportunity to challenge the dominance of Huawei, Ericsson and Nokia in the mobile-infrastructure market. By "opening" interfaces at certain points in the 5G mobile network, the new standard seeks to replace the vertically integrated model that has traditionally dominated in the sector and introduce more competition. The White House and the Japanese government

began actively coordinating technology policy in this area with a view to promoting "a transparent and open 5G network architecture to support security and vendor diversity" (METI 2019). The extent of the challenge that operators will face to integrate multiple suppliers within the OpenRan standard is not yet clear (FitzGerald 2022), nor is it evident that a return to the fragmentation of the standardization landscape for mobile infrastructure will lead to cost savings overall for operators.

Deregulated by the Telecommunications Act of 1996, it took about 15 years for the United States to become a has-been and also-ran in a sector that is at the center of the ongoing technology revolution and that is critical for productivity growth, cutting-edge employment opportunity, and national security (Lazonick 2009a; Lazonick 2009b; Lazonick 2023). Despite its original position as the country with the potential to foster global leaders in the converged communications landscape (Spectrum 1999), US policy makers have found themselves scrambling to come up with a solution to the nation's loss of sovereignty in a technology sector that is strategic to both socioeceonomics and geopolitics.

Given its trajectory at the turn of the century, Cisco could have played a central role in an industrial policy aimed at maintaining and enhancing US global strength in this critical sector. Without additional capabilities in wireless and optical networking, it would not have been able to become a systems integrator. But such resources were becoming available in North America as other vendors struggled to overcome the fall-out of the bursting of the Internet and telecom speculative bubbles. Rather than suggesting the unlikely acquisition of European leaders in the 2020s, US policy makers could have recognized the need to develop these innovative capabilites in an era that one might now call America's "lost decades". A company such as Huawei did not impose this loss of global leadership on the United States. Hundreds of billions of dollars wasted on stock buybacks did (Lazonick 2023).

Rather than accusations (often unfounded) against Chinese competitors and an alliance with Japan and Korea to counter the lack of US success in competing as infrastructure vendors in an era of global stardards, US policy makers need to recognize the damage that has been wrought on this sector by financialization over the past twenty years. The future landscape of communication-infrastructure equipment may be influenced by the success or failure of a new US-promoted mobile standard. Its success will only be possible if those firms that have contributed to them continue to maintain the necessary level of investment in productive capabilities to support their development. It is far from evident that Cisco will voluntarily favor investments in building technologies and markets rather than do massive payouts to shareholders.

Companies in the S&P 500 Index, including Cisco within the top ten, did a record of about $850 billion in buybacks as open-market repurchases in 2021 and in excess of $900 billion in 2022 (S&P Dow Jones Indices 2022). The destructive and illogical ideology that, for the sake of economic efficiency, a company should be run to"maximize shareholder value" continues to cripple the United States in global competition in a range of critical technologies. The evolution of Cisco Systems from innovation to financialization is one extremely important case in point.

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