1

Platforms, Not Just Products

The Principle

Managers (at least in industries affected by digital technologies as well as ''network effects'' more broadly) should move beyond conventional thinking about strategy and capabilities to compete on the basis of platforms, or complements to another firm's platform. A platform or complement strategy differs from a product strategy in that it requires an external ecosystem to generate complementary product or service innovations and build ''positive feedback'' between the complements and the platform. The effect is much greater potential for innovation and growth than a single-product-oriented firm can generate alone.

Introductory

A powerful new idea has appeared in strategy and innovation practice as well as research over the past several decades, with important implications for staying power. The new challenge is to compete in *platform* markets within an industry and to innovate through a broader "ecosystem" of partners and users not under any one firm's direct control. Platform leaders are difficult to dislodge. They can retain dominant market shares for decades, and not only when by chance they design a hit product. But to compete on the basis of platforms, and not only on products, requires a different approach to strategy and business models. It also requires

a broader application of the principles discussed in later chapters—services, capabilities, pull mechanisms, scope economies, and flexibility.

For example, a successful platform strategy benefits from particular skills in product architecture and interface design. It also requires negotiations with other firms to build products and services that complement the platform and make it more useful. We have strong pull effects in platform markets as well, but the most important come from "network effects" between the platform technology (such as the VHS (Video Home System) video recorder, the Windows-Intel PC, or the Amazon cloud) and complements (such as tapes recorded on the VHS standard, or applications written only for Windows or Amazon Web services). Similarly, economies of scope and flexibility play critical roles for platform companies, but in somewhat different ways from products that companies encounter in markets not subject to network effects. Platform leaders or "wannabes" must decide what complementary products or services to create themselves and which ones they will help partners or users—the ecosystem—to provide.

The term "platform" first came into wide usage in the management field as a word meaning foundation of components around which an organization creates a related but different set of products (or services). Toyota's Corolla sedan, Celica sports car, Matrix hatchback, and Rav-4 sports utility vehicle are different products built in separate projects. But they share the same underbody as well as other essential components such as the engine. Microsoft builds the Office suite (mainly the Word, Excel, and PowerPoint products) around shared components, such as the text-processing, file-management, and graphics modules.[1] In the 1990s, many researchers in operations and technology management as well as in strategy and economics popularized this concept of an in-house product platform used to create a family of related products, particularly when discussing modular architectures and component reuse.[2]

This chapter uses the word differently—following my 2002 book with Annabelle Gawer, *Platform Leadership*.[3] In that study and in subsequent articles, we distinguished between an in-house "product platform" and an "industry platform." The latter has two essential differences. The first is that an industry platform is a foundation or core technology (it could also be a service) in a "system-like" product

that has relatively little value to users without complementary products or services. The platform producer often (but not always, as seen in the case of Microsoft) depends on outside firms to produce the essential complements. The Windows-Intel personal computer and a "smartphone" (a Web-enabled cell phone that can handle digital media files as well as run applications) are just boxes with relatively little value without software development tools and applications or wireless telephony and Internet services. Cisco (founded in 1984) has a platform that has evolved from a specialized computer system called a router that connected corporate networks with the Internet to a software layer, the Internetworking Operating System (IOS). IOS has little value by itself but becomes much more useful when customers deploy this software with a variety of networking equipment, such as different types of routers, computer servers, telecommunications switches, and wireless devices, from Cisco and other vendors. For these reasons, a potential industry platform should have relatively open interfaces in the sense of being easily accessible technically and with inexpensive or free licensing terms. The goal is to encourage other firms and user communities (such as for Linux) to adopt the platform technology as their own and contribute complementary innovations. These external innovators form the platform ecosystem.

The second essential difference between a product and an industry platform, as various authors have described, is the creation of network effects (see Figure 1.1). These are positive feedback loops that can grow at geometrically increasing rates as adoption or usage of a platform grows. The network effects can be very powerful, especially when they are "direct," such as in the form of a technical compatibility or interface standard. This exists between the Windows-Intel PC and Windows-based applications or between VHS, DVD, or Blu-Ray players and media recorded according to those formats. The network effects can also be "indirect." Sometimes these are very powerful as well—such as when an overwhelming number of application developers, advertisers, content producers, and buyers or sellers adopt a platform with specific technical interfaces or connection standards. Examples include not only the Windows-Intel PC and the VHS versus Betamax video cassette recorders, but also the eBay marketplace, Google search bar and cloud-computing platform, or the Facebook,

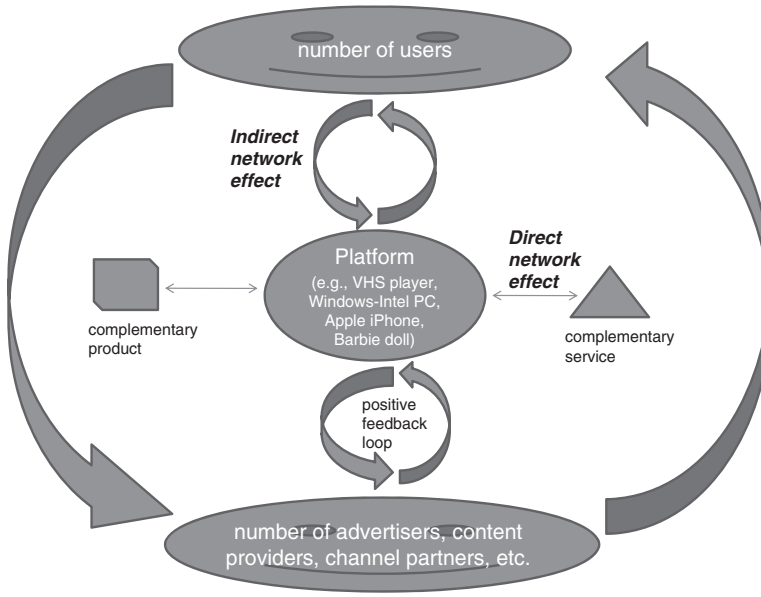

Figure 1.1. The ecosystem of platforms, complements, and network effects

MySpace, LinkedIn, or Twitter social networking portals, among many others.

Perhaps most important, a network effect means that, the more external adopters in the ecosystem that create or use the complementary innovations, the more valuable the platform (and the complements) become. This dynamic, driven by direct or indirect network effects or both, should encourage more users to adopt the platform, more complementors to enter the ecosystem, and more users to adopt the platform and the complements, almost ad infinitum.[4]

We have seen many platform-like battles and network effects in the history of technology, mainly in cases where competitions emerge because of incompatible standards and when a product by itself has limited value. Standards are not platforms either; they are rules or protocols specifying how to connect different products or modules and use them together. Prominent past examples of platforms incorporating specific standards include the telegraph (what format or language to use for coding and decoding messages and sending the electrical signals), the telephone (how to do the same thing as the telegraph but with voice signals), electricity (the battle between alternating versus direct current), radio (struggles over the establishment of

AM and FM standards, broadcasting technology, and content), television (what standards to adopt initially, and then the movement from black-and-white to color), magnetic-tape video recording (VHS versus Beta formats and content), and computer operating systems (from IBM mainframes to PCs, the Macintosh, and Linux).

Other recent hardware and software platform battles have emerged over Internet portals, search, and content delivery; online marketplaces; smartphone operating systems and transmission technologies; video-game consoles and games; electronic payment systems; foreign-exchange trading systems; electronic stockbrokerage systems; electronic display technologies; advanced battery technologies; alternative automotive power systems; and social networking sites. Even the human genome database has become a platform of data and knowledge for researchers and pharmaceutical companies as they compete (and sometimes cooperate) to analyze how genes function and discover new drug products. In fact, the more you look inside modern society and its technological artifacts—the computer, cell phone, media player, home entertainment systems, office equipment, or even the automobile—the more you will see platforms, and platforms within platforms, as well as direct and indirect network effects.

We also can see platform competition and network effects surrounding non-technology products and services—reinforcing the idea that this principle is not simply for high-tech managers. Wal-Mart, for example, has created a global supply-chain platform to feed its retail stores. Marks & Spencer has done the same thing on a smaller scale. Best Buy is doing the same thing in electronics-goods and home-appliances retailing. Suppliers make particular investments to become part of these networks and cannot so easily switch.

Other examples include CVS and Walgreens. They are starting to use their networks of pharmacy retail stores as platforms to offer an increasing variety of customer services from new internal divisions and acquisitions as well as partners. They started with filling prescriptions but now offer photography, flu shots, and basic healthcare in their retail locations, at people's homes, or in their workplaces. There are some network effects and switching costs to the extent that customers register specific medical, insurance, and financial information with these providers. The information may not be so easy to transfer. Moreover, CVS

and Walgreens can build very detailed customer profiles with the data and increasingly improve their ability to add or refine these various services. There is a reputational network effect as well in that, the more customers who use these services and are satisfied with them, the more likely it is that other customers will come to CVS or Walgreens rather than to their doctor or a hospital emergency room for basic healthcare.

Another non-technology example is the Barbie doll. This toy, owned and trademarked by Mattel, Inc., and first introduced in 1959, has become a multi-billion-dollar platform business. It serves as a foundation for many variations of the doll itself as well as a growing variety of complementary products (clothes, fashion accessories, toy cars, toy houses, companion dolls) and services (online videos, games, music, shopping).[5] Mattel makes some of these complements itself as well as licenses to hundreds of partners the right to make these products or to offer new services. Just like Microsoft, Cisco, Intel, Google, Qualcomm, and other high-tech firms, Mattel too has been engaged in a fierce battle over intellectual property rights. MGA Entertainment launched the competing Bratz family of dolls and accessories in 2001, before being stopped by a Mattel lawsuit. MGA-E then introduced the Moxie Girlz family of dolls in 2009.[6]

Not surprisingly, we see a growing amount of research on industry platforms, initially by economists but increasingly by scholars of strategy and innovation.[7] Competition in the consumer electronics and computer industries spurred a great deal of thinking on this topic in the early 1980s, just as the arrival of the World Wide Web did so again in the mid-1990s. Influential early work mostly focused on theory, with few detailed examples and no large-sample studies. But the key concepts are all there and are now familiar to researchers and managers alike: how technical standards and compatibility or user adoption affect the course of platform industries and product designs, the phenomenon of network effects and positive feedback, and the role of switching costs, pricing, and bundling.[8] More recent economics work has focused on models that improve our understanding of how "multi-sided" platform markets function.[9]

In strategy and innovation, recent studies also analyze multi-sided platform competition as well as how to manage complementors, use the ecosystem for innovation, and compete as a complementor.[10] For

example, the battle between Netscape and Microsoft in the browser wars illustrated the use of one-sided subsidies. By this term I mean the strategy of "free, but not free"—give one part of the platform away, such as the Internet browser, but charge for another part, such as the Web application server or the Windows operating system. Adobe has done the same thing by giving away the Acrobat Reader and charging for its servers and editing tools, technical support, and online services. Some firms give one part of the platform system away to some users (students or the general consumer) but charge others (corporate users). Intellectual property too can be "open, but not open" or "closed, but not closed." By these terms I mean that firms can make access to the interfaces easily available but keep critical parts of the technology proprietary or very distinctive. Netscape did this with the Navigator browser and an array of servers, special versions of scripting and programming languages, and intranet and extranet combinations. Microsoft has done this with the entire set of Windows client and server technologies, as well as Office and other Windows applications.[11] At the broader ecosystem level, we see the emergence of "keystone" firms—industry leaders ranging from Wal-Mart to Microsoft and automobile companies that encourage innovation by cultivating networks of firms to make modularized components.[12] We also have important work by Eisenmann, Parker, and Van Alstyne—which I will return to later—on the conditions that make for, and prevent, "winner-take-all" markets.[13]

Given the breadth and growing popularity of this topic, it is important to be clear about what an industry platform is not. Although it is not a technological standard, technology-based platforms usually incorporate existing industry standards and help establish new ones. Microsoft and Intel, by promoting certain standards within Windows and the "x86" line of compatible microprocessors, did this with applications programming and connectivity standards for the personal computer, beginning with the first IBM PC. Cisco, by bundling certain protocols within its operating software for routers and other equipment, did this with networking.

Nor is an industry platform the same as a "dominant design," though a successful platform is, by definition, widely adopted. My MIT Sloan colleague James Utterback, and the late William Abernathy of the Harvard Business School, defined a dominant design as a

particular configuration of a product that wins allegiance from the majority of users and thus influences what subsequent designs look like. The QWERTY keyboard, the Ford Model T, and the IBM PC have all played this role in their industries.[14] But, just as different product designs may compete to become the dominant form, an industry may generate multiple platform candidates that compete for dominance. Some industries never experience a dominant design or a dominant platform. In any case, though, industry platforms differ from dominant designs in that they are part of a system—the platform and the complements—and are not stand-alone products. They also require network effects for the platform to grow in value to users. In addition, the dominant designs of Utterback and Abernathy appear in the latter stage of an industry's evolution as part of the maturation process and managerial shift of attention from product design to the production process. It may happen that platforms emerge later in an industry's development. But they can appear early as part of a competition to establish a dominant platform.[15] And some competing platforms may persist for long periods of time without any one leader emerging.

Even if a company fails to establish the dominant platform or if the market never adopts one platform, platform strategy can still be a valuable tool for *strategic marketing*. Simply thinking hard about whether a firm is in a platform market or a winner-take-all environment provides deep insights into competition and a product's broadest possible potential. Any effort a firm makes to promote adoption of its technology or service by other firms, and to create even a small ecosystem of complementors and users, should enhance its reputation and sales. Moreover, these kinds of strategic insights are as useful for would-be complementors as for potential platform leaders.

As noted in the Introduction, I illustrate the various dimensions of a platform strategy and the capabilities required to become a platform leader with several examples. First, I discuss how a platform strategy differs from a product strategy by reviewing the cases of Apple versus Microsoft in personal computers and Sony versus Japan Victor Corporation (JVC) in video recorders. Next, I describe the platform-leadership model refined at Intel and other established platform leaders. Finally, I look at how relatively new firms can turn a product strategy into a platform strategy as well as help a market "tip" in their direction. Most of my

examples deal with information technology because these are the industries I follow most closely. But, as I have indicated, platform dynamics is a much broader phenomenon and will certainly become more important for managers and policy-makers in a variety of industries going forward.

Product versus Platform: Apple and Sony, et al.

There is no doubt that a product strategy can turn into a platform strategy, and a best-selling product is an excellent start to a successful industry platform. But what managers need to know first is how, in the early stages of competition, a *product* strategy differs from a *platform* strategy, and what are the potential consequences for both the innovator and the users or adopters, such as advertisers and content providers in the case of digital businesses. We can learn a lot about this dilemma from observing the behavior of Apple and Sony—two great product companies where managers have not always thought "platform first."[16]

Apple versus Microsoft

To begin, we must acknowledge that Apple, founded by Steve Jobs and Steve Wozniak in 1976, ranks as one of the most innovative product companies in history. The list of "insanely great" Apple products—Jobs's promotional mantra for the Macintosh personal computer, introduced in 1984—is truly impressive. But, in the past, Apple often chose not to adopt an explicit *industry* rather than a *product* platform strategy, at least initially. Consequently, Apple has missed out on some enormous business opportunities as well as the chance to make our lives much easier than they have been. We all *should have been* users of the Macintosh personal computer and, more recently, the iPod and the iPhone products as well as the iTunes digital media service. Instead, the vast majority of us became users of cheap and powerful but clumsy DOS and then Windows PCs. Apple also trails in the global smartphone market by a large margin, except for the United States. And, though the iPhone is gradually doing better overseas, Google has now entered the smartphone market with its "open" Android software platform and its own line of phones.

My lament is because Apple, with the Macintosh, pioneered graphical user interface technology (albeit inspired by Xerox—another great product company with missed platform opportunities) for the mass market. Other landmark Apple products include the first mass-market PC, the Apple II, introduced in 1977; the PowerBook, which in 1991 set the design standard for laptops; the unsuccessful though still pioneering Newton PDA, first sold in 1993; and the iMac all-in-one "designer PC," released in 1998. More recently, we have seen the iPod digital media player (2001), the iTunes digital media service (2003), the iPhone (2007), and the iPad (2010). Jobs did not himself design these products. He was absent from the company during 1985–97 and returned only when Apple acquired one of his less successful ventures, NeXT Computer. But, even then, NeXT technology and the UNIX operating system provided the basis for another hit Apple product released in 2001, the Mac OS X operating system. Most importantly, Jobs created the design culture and hired or supervised the people (such as Jonathan Ive, chief designer of the iMac, the iPod, and the iPhone) most responsible for the company's historical legacy and recent revival.

The world truly would have been a different place if Steve Jobs earlier in his career had thought a bit more like his arch-rival, Bill Gates. Microsoft, founded a year before Apple in 1975, generally has not tried to develop "insanely great" products. Occasionally, some have been very good—such as BASIC for the Altair PC kit, the 1990 version of Excel, Internet Explorer version 4 (1997), and Windows 7 (which, in 2009, finally caught up to the Macintosh OS, after twenty-five years). Mostly, Microsoft has tried to produce "good-enough" products that can also serve as industry platforms and bring cheap and powerful computing to the masses (and mega-profits to Microsoft). DOS, Windows, and Office have done this since 1981.[17] And Microsoft continues to try with new platform candidates, such as a version of Windows technologies (.NET) for enterprise computing, where it has been relatively successful. In other markets it has made less progress, such as Windows for smartphones and handheld devices or the tablet computer, the Xbox video-game console as a new hardware–software platform, and recent online versions of Windows and Office that come under the rubric of "software as a service" or "cloud computing."

Sony versus JVC

Not only has my experience studying Microsoft and Intel influenced my view of Apple, but so did my first platform-related research. In the mid-1980s Richard Rosenbloom and I examined the race between Sony—another great product company in its heyday—and JVC to introduce a home video cassette recorder (VCR). As the years unfolded, I realized that the development story needed an ending and started a follow-on project to understand why VHS so convincingly dominated Beta in the marketplace.[18]

To explain the outcome, we need to go back to 1969–71. During this period, Sony engineers had compromised their technology goals when designing an earlier device using ¾-inch-wide tape, called the U-Matic. They compromised in order to get the support of other firms in Japan and elsewhere. As a result, the large, bulking, and expensive U-Matic failed to attract home users. But institutions such as schools and police stations did purchase the machines. These customers provided Sony as well as JVC and other vendors with the inspiration to continue and enough feedback to design a more successful home product. When Sony introduced their smaller ½-inch tape machine in 1975, dubbed the Betamax, company executives again tried to persuade other firms to adopt their technology as the new industry standard. Sony's goal was to replace the ¾-inch format as well as competing formats under development at several firms. But this time Sony engineers refused to alter the Betamax design to accommodate other firms in Japan or in the United States. General Electric, for example, wanted a much longer recording time for American consumers. The original Betamax recorded for only one hour.

JVC, backed by its giant parent Matsushita Electronics (recently renamed Panasonic after its US brand name), in fall 1976 came out with its own product, VHS. This offered two hours of recording. Within five months, Sony matched the two-hour time by, for example, using thinner tape. Some observers also thought VHS was technically inferior to the Beta machines. This reputation, along with improvements in the recording time, should have provided Sony with more staying power in this market. But JVC and Matsushita continued to match Sony reasonably quickly with new features and longer recording times, and comparable prices. Sony eventually came out with an unmatched eight hours of recording time in 1982 (see Table 1.1).

Table 1.1. *VHS and Beta recording—playing time comparison*

Year/Month	Beta	VHS
1975 May	1 hour (Sony)	
1976 October		2 hours (JVC)
1977 March	2 hours (Sony)	
1977 October		4 hours (Matsushita)
1978 October	3 hours (Sony)	
1979 March	4.5 hours (Sony)	
1979 August		6 hours (Matsushita)
		4 hours (JVC)
1979 December		6 hours (JVC)
1982 March	8 hours (Sony)	
1982 September	5 hours (Sony)	

Source: Cusumano, Mylonadis, and Rosenbloom (1992: 77, table 7).

Features and prices ultimately mattered little because the VHS and Betamax machines were very comparable technically and hard for users to differentiate. Simultaneously, however, there were powerful network effects. VHS and Betamax, though both based on the U-Matic, utilized different cassette sizes and incompatible signal-encoding formats. At the time, the machines were sufficiently expensive for consumers to be unlikely to own more than one format. We know from research by Eisenmann, Parker, and Van Alstyne that three factors in combination—(1) little room for platform differentiation, (2) strong network effects between the platform and the complements, and (3) the unlikelihood of users buying more than one platform, which they call "multi-homing"—should lead to a winner-take-all or winner-take-most market. Indeed, this is what happened.

Of equal importance, we can see that the market dynamics here did not simply unfold through some natural or random process. JVC and Matsushita deliberately tried to position VHS as a new *industry* standard and worked very hard to make this happen. The JVC executives and development team humbly visited competitors and potential partners, asked for feature suggestions, and did their best to accommodate them. JVC and Matsushita also broadly licensed the new technology on inexpensive terms to some forty firms. They provided essential components (like the helical scanner, which was very difficult to mass produce) until licensees were able to do the manufacturing

themselves. In contrast, the Beta group totaled merely twelve firms at its peak, with Sony doing the bulk of the manufacturing (see Appendix II, Table II.1).

JVC and Matsushita, with great foresight (which was lacking in Sony at the time), aggressively cultivated a complementary market in prerecorded tapes and retail distribution. Matsushita even used its engineering resources to build machines that replicated tapes at very high speeds for the prerecorded market. All of these very deliberate moves—which we called "strategic maneuvering"—helped establish the VHS technology as a new platform for the consumer electronics industry and "tip" the market toward VHS. The network effects increased in strength as the much larger number of firms licensing VHS brought more production capacity to their standard, which encouraged more tape producers and distributors to make many more prerecorded VHS tapes. Retailers increasingly used their limited shelf space for VHS machines and prerecorded tapes. Users responded and bought more VHS machines, which encouraged more firms to license the VHS standard and then more tape producers, distributors, and consumers to adopt VHS. Betamax went from a 100 percent share in 1975, the beginning of the market, to zero by the later 1980s (Appendix II, Table II.2).

Apple's Evolution

The Macintosh story resembles the Betamax story, with a critical difference. Apple's product survived, even though it remained for many years only on the periphery of the PC industry in terms of market share—stuck at a fraction until newer product designs and exploding sales of the iPod and then the iPhone spilled over into higher computer sales, at least in the United States. Poor responses to Microsoft's Windows Vista operating system, introduced in 2006 and then replaced by the much improved Windows 7 in 2009, also persuaded many users to switch over to Apple. Still, the US market share for the Mac peaked at around 10 percent during 2008–9, and seems to have leveled off or dropped. The main point is that Apple's strategy never got the Macintosh beyond 2 or 3 percent of the global personal computer market, compared to 90–5 percent for Windows-Intel PCs.[19] Of course, the Mac's innovative software and hardware designs have attained great

"mind share" or attention in the industry, and forced responses from Microsoft and PC hardware manufacturers. This competition remains vitally important to stimulating innovation and is the reason we now have Windows 7. Nonetheless, there are unfortunate similarities between Sony and Apple.

Like Sony, Apple chose to optimize the Mac's hardware–software system and complete the design on its own as well as control the flow of revenues (and profits) from the product. By contrast, a *platform* strategy would have meant licensing the Macintosh operating system widely and working much more openly and actively with other companies to evolve the platform *together* and create complementary applications. Microsoft and its ecosystem partners have done this for the Windows-Intel PC. Apple did not do very much of this platform evangelism and has remained (with a brief exception many years ago) the only producer of the Mac. This product-centric strategy has kept prices high (historically, about twice the cost of a Windows-Intel PC with comparable levels of power and memory) and diffusion low. Moreover, the relatively closed and expensive Macintosh did not stimulate the enormous mass market in applications that Microsoft and Intel have done for the PC. The Macintosh lived on initially as a minor second standard mainly because it found two niches—desktop publishing and consumers (including institutions such as primary schools) willing to pay more for an easier-to-use and more elegant product.

This brings me to more recent "insanely great" products from Apple that have done much better in the market. They also have enormous industry platform potential—some of which Apple has finally tapped! The iPod, with its unique "click wheel" interface and new touch screen, is the best-selling music player in history, with its own near monopoly—about a 70 percent market share. It has attracted complementary hardware innovations that have made it more valuable, such as connectors for a car or home stereo system, or add-ons that turn the iPod into an FM radio, digital recorder, or camera. Initially, however, Apple introduced the iPod as another "closed" product system that worked only with the proprietary Macintosh computer and the relatively open iTunes music warehouse. It did not support non-Apple music formats or software applications, though any content provider could join iTunes. Eventually, it seems that consumer and market pressure

persuaded Apple to open up the interfaces to the iPod software (but not the hardware) so that it could play some other music formats (but not those championed by Microsoft or Real). Apple also started out with proprietary digital rights management (DRM) technology on the iPod and its iTunes store, creating problems with potential ecosystem partners as well as customers, although the service and the Apple devices have been more open since 2009.

The iPod, and not the Macintosh, seems to have taught Apple how to behave more like an *industry* platform leader. In 2002, it introduced an iPod compatible with Windows and then opened a Windows version of the iTunes online store in 2003. By mid-2008, the iTunes store had become a near monopoly in its own right, with about a 70 percent share of the worldwide market for digital music.[20]

Then, in 2007, Apple introduced the iPhone—what I called "the most exciting electronics product to hit the market since the Macintosh."[21] But quickly the debate ignited again over whether this was a product or a platform. The iPhone was distinctive first because of another remarkable user interface (there is a pattern here!) driven both by touch and virtual keyboard technology. But the original iPhone would not run applications not built by Apple, and it would not operate on cell-phone networks not approved by Apple (initially only AT&T in the USA, but later Deutche Telekom/T-Mobile in Germany, Telefonica/O2 in the UK, and Orange in France). Fortunately for consumers, hackers around the world found ways to "unlock" the phone and add applications. A black market also developed for "hacked" devices. This market pressure again seemed to persuade Apple management that its latest great product was also becoming a great new platform, at least in the United States, and so the interfaces needed to be more open to outside application developers and other complement producers.

It is possible that Apple executives all along planned to open up the interfaces gradually, if the product won broad market acceptance. The facts are that the opening did happen, but slowly and painfully for many users. In March 2008, Jobs announced that Apple would license Microsoft's email technology to enable the iPhone to connect to corporate email servers. By April 2010, there were nearly 200,000 applications available for the iPhone through the official App Store. Some applications were free, and many vendors continued to sell

unauthorized "illegal" applications over which Apple had no control—something to which Apple, unlike Microsoft, is unaccustomed.[22] Apple also had yet to allow consumers to use the iPhone on any service network they chose. Apple's repeated attempts to control applications that work on its iPhone platform led to several very public confrontations with Google, banning of some very useful technology (such as Google Voice), and the resignation of Google CEO Eric Schmidt from Apple's board of directors. Google's expansion into mobile operating system software and applications has transformed it from being Apple's partner in the competition with Microsoft over Internet search and desktop software applications ("the enemy of my enemy is my friend") into Apple's rival in the cell-phone business.[23]

Despite some gaps in its historical strategy, Apple finally seems to have figured out how to play on both sides of the industry platform game and to create platform-like synergies and network affects across several of its product lines as well as complements. The iPod, iPhone, and iTunes service all work particularly well with the Macintosh computer, and have some interoperability with Windows—a kind of "closed, but not closed" strategy. And providing its own essential complements—like Microsoft has always done for DOS and Windows—has become critical to Apple's success. The iPod is not very valuable without external digital content such as music and video files. These complementary innovations also make the versatile iPhone and other smartphones much more valuable than ordinary cell phones. Here, Apple cleverly found a way to provide the key complements—the iTunes Store and the iPhone App Store. Moreover, these are *automated services*, with low costs and high potential profit margins. Apple is being smart and sharing most (about 70 percent) of these revenues with the content owners. Since 2000, Apple has also been creating more software applications for the Macintosh to reduce its dependence on Microsoft, Adobe, and other independent software vendors.[24]

We can see the results of these product and platform efforts in Apple's much-improved financial performance and market value (Table 1.2). Few people probably know that, in 1995, Apple was nearly *twice* the size of Microsoft in annual revenues (about $11 billion to $6 billion). However, Apple's market valuation was only about *40 percent of revenues*, whereas Microsoft's value was nearly *six times revenues*. Not surprisingly, Microsoft's

Table 1.2. *Microsoft and Apple financial comparison*

Year	Microsoft			Apple		
	Revenues ($ mn.)	Operating profits (%)	Year-end market value ($ mn.)	Revenues ($ mn.)	Operating profits (%)	Year-end market value ($ mn.)
2009	58,437	34.8	267,323	36,537	21.0	190,980
2008	60,420	37.2	149,769	32,479	19.3	118,441
2007	51,122	36.2	287,617	24,006	18.4	74,499
2006	44,282	37.2	251,464	19,315	12.7	45,717
2005	39,788	36.6	233,927	13,931	11.8	29,435
2004	36,835	24.5	256,094	8,279	3.9	8,336
2003	32,187	29.7	252,132	6,207	(loss)	4,480
2002	28,365	29.2	215,553*	5,742	0.3	4,926
2001	25,296	46.3	258,033*	5,363	(loss)	7,924
2000	22,956	47.9	302,326*	7,983	6.5	5,384
1995	5,937	35.3	34,330*	11,062	6.2	4,481

Note: Fiscal year data. Market value is for calendar year, unless marked with an asterisk, which indicates fiscal year.

Sources: Company *Form 10-K* annual reports.

operating profit margin was also about six times Apple's (35 to 6 percent). Apple shrank in subsequent years whereas Microsoft's sales exploded, with Windows 95 becoming the basis for a new generation of Internet-enabled consumer and enterprise products, including Office. Not until iPod sales began to catch on in 2005 did Apple's revenues, profits, and valuation turn around. Since 2003, Apple's revenues have risen several times more quickly than the overall PC industry. They jumped from $6.2 billion in 2003, with an operating loss, to over $36 billion in 2009, with a 21 percent operating profit margin. In addition, Macintosh computers in 2009 made up only 38 percent of Apple's revenues, down from 72 percent in 2003. The iPod (including the iPod Touch—in essence, an iPhone without the telephony function) accounted for 22 percent of 2009 revenues, music products 11 percent, and the iPhone about 18 percent. Software and services as well as hardware peripherals (the rest of the complete user experience) generated the other 12 percent of sales. It is particularly striking how Apple's market value remained less than its annual revenues for so many years, whilst Microsoft's market value was 8–13 times revenues. But here too, by 2005, the tide had turned. Apple's value has risen, reaching nearly five times revenues in early 2010—now in Microsoft territory,

since Microsoft's valuation has been on the decline, owing, at least in part, to commoditization in PC hardware and software markets.

Most important for our purposes in this chapter is to recognize that Apple's resurgence reflects, at least in part, the value of a *platform company* compared to a product company. The remarkable financial turnaround since 2005 began with some new "hit" products, and this demonstrates the importance of having a strong product strategy to go along with a platform strategy. But Apple also now has a portfolio of products that have become or are becoming industry platforms, including essential complementary services platforms (iTunes, App Store and iBooks). They all work together and reinforce each other, through strong direct and indirect network effects. Moreover, Apple now benefits from a vibrant ecosystem around the iPod and iPhone, which means it no longer has to do the lion's share of innovation itself! It is finally allowing ecosystems to form that can rival the Windows world, even though Apple at times is clashing with Google, Palm, and other partners and users with regard to how open to make the iPhone and iTunes. In 2010, Apple also introduced the iPad. This is a more elegant tablet computer than Microsoft's earlier design, and uses the same remarkable touch-screen technology as the iPod Touch and the iPhone. The iPad has some technical limitations—such as the inability to run more than one application at a time, and the lack of support for Adobe's rival Flash video technology (which the iPhone does not support either, even though Flash is used for the vast majority of videos and advertisements on the Web). But Apple was also reaching agreements with major book and newspaper publishers as well as encouraging iPhone developers to build applications that will make the iPad a new platform for surfing the Internet and handling digital content (music, photos, books, magazines, newspapers, videos, and documents).

Apple's recent successes illustrate my general point: if Steve Jobs and Apple had tried to make "insanely great platforms" first and "insanely great products" second, then most personal-computer as well as smartphone users today would probably be Apple customers. We would have lived much more in an Apple, rather than a Microsoft world. Apple has grown from being merely a fifth of Microsoft's size in terms of sales as late as 2003 to just over half in 2009. Apple's rate of growth suggests that it may once again surpass Microsoft in revenues,

though this may not be so important. It is sobering to realize that General Motors in 2008 had revenues of about $150 billion—two and a half times that of Microsoft—along with billions of dollars in losses and then a US taxpayer bailout. Revenues are only part of the story for a firm; the real bottom line for investors is market value, which is driven by elements other than sheer scale.

On these dimensions, Apple has improved markedly in just a few short years. But it still is much less profitable than Microsoft and is not likely to reverse this situation any time soon. Apple will always struggle to maintain the distinctiveness of its products and to convince new customers beyond the first wave of early users to pay those premium prices. Customers will spend more for a product when it is new and path-breaking. The difficulty arises when the novelty wears off and cheaper copy-cat products appear that are "good enough." Bill Gates learned this lesson early on in his career and ruthlessly (effectively?) exploited this characteristic of the market. We can see this not only in the way Windows mimicked the look and feel of the Macintosh, but also in how Word and Excel in the 1980s and 1990s mimicked the functionality of WordPerfect and Lotus 1-2-3. The Windows NT and Windows 2000 server also took billions of dollars in revenues from Novell and UNIX vendors.

Apple probably has the world's happiest and most loyal customers, but that is not enough to keep its growth rates high. It needs more new customers, especially outside the United States. Apple probably cannot charge higher prices than it has done already in the past few years; in fact, it dropped prices on the iPhone significantly in 2008–9. Prices on this and other products such as the iPad will probably fall as well whenever there is a recession and as competition intensifies.

The Microsoft-Intel ecosystem has at least one advantage: its customers do not have to love their product to buy it and do not have to pay premium prices. Most users do not even choose Microsoft or Intel products directly. For example, in fiscal 2009, only about 20 percent of Microsoft's Windows desktop (client) revenues were direct sales to consumers, and this amounted to a little more than 5 percent of total revenues.[25] Overall, only 30 percent of Microsoft's sales were directly to consumers (20 percent of Windows desktop and 20 percent of the Office division, and all of Online Services and Entertainment and

Devices sales). Most of the Windows desktop and server as well as Office sales were either to OEMs (the PC makers) or to enterprises and other large organizations (Appendix II, Table II.3). This remains true in 2010, despite open-source and "free" software. In addition, Apple has still not created the enormous recurring revenues that Microsoft's ecosystem and enterprise customers generate, with those continuing sales of Windows and Office to PC manufacturers and corporations, as well as individuals—who will mostly upgrade their PCs if not their software products, eventually.

More importantly, Microsoft has those wonderful profit rates generated from the software product business.[26] The cost of reproducing a software product is essentially zero. Since 2000, Microsoft has typically had gross margins of 65–80 percent and operating margins (profit before taxes and investment income) of around 35 percent. This compares to gross margins for Apple of 34 percent and operating profit margins of 18–19 percent in 2007–8, after years of much lower profit (and revenue) levels. In addition, though Apple won the battle for digital media players with the iPod, that product, like personal digital assistants (PDAs), is likely to disappear in favor of smartphones. Apple may yet win the global smartphone battle, but the iPhone still trails RIM's Blackberry and Symbian/Nokia smartphones by a wide margin, especially outside the United States, where the Macintosh has a tiny following. Nokia, Samsung, Palm, and other firms using Google's Android software platform are also introducing products that look and feel similar to the iPhone. Google has even designed its own phone, called Nexus One and introduced for marketing in 2010, to mimic the iPhone features and take special advantage of the Android software.[27] In addition, RIM, Nokia, and Palm have growing online stores for their smartphones. And Windows 7 is an important step forward for Microsoft in reducing the usability gap between PCs and the Macintosh.

In the long run, if hardware and software products both continue to experience commoditization and declining prices, then the most valuable part of the Apple franchise might end up being iTunes. The hardware products may simply become platforms to sell high-margin automated digital services, including music and video content. The acquisition in December 2009 of Lala, the streaming Web music service, also gives Apple the technology to allow users to store their

music and listen to songs from different devices, anywhere and anytime.[28]

Platform or Product—or Both?

Perhaps the most challenging question for managers gets into the heart of strategy and innovation: is it possible for a firm with Apple's creativity, foresight, and independence to think "insanely great platform" first and still produce such great products? Based on Sony's experience with VCRs, or Microsoft's with DOS and Windows, it appears that platform companies do need to make technical and design compromises in order to work effectively with other industry players and encourage them to be partners and complementors rather than competitors. Nokia has done this reasonably well by convincing some competitors to join its Symbian consortium to develop an alternative mobile operating system to Microsoft and then making this an independent non-profit as well as open-source entity. I hear from Apple people that Steve Jobs and other executives have been acutely aware of the product versus platform distinction and deliberately chose not to follow an open platform strategy until recently. They have preferred to control "the user experience" and take most of the revenues and profits for Apple, though more recently with a "closed, but not closed" approach. It appears that a more open industry-platform strategy is only a secondary consideration. But the fact that Apple did open up its platforms eventually without losing their distinctiveness as products suggests the company could have pursued product and platform leadership simultaneously. The challenge here is to be open, but not so open that the platform leader makes it too easy for competitors to imitate the essential characteristics that make the original product so appealing.

Of course, despite the many examples, not every market is or will become a platform industry (though most related to information or digital technology are) and not every product can become an industry platform. Annabelle Gawer and I considered this issue in a recent article and concluded that, for a product or component technology to have platform potential, it should satisfy two conditions.[29] First, the product or technology should perform at least one essential function as part of a "system," like the scanning mechanism and playback format in a home video recorder, or the operating software and microprocessor hardware

in a personal computer. The function is essential if it solves a critical system-related problem for the industry, such as how to encode video signals or control the operations of a personal computer or a smartphone. Second, the product or technology should be relatively easy for other companies to connect to with their own products, components, or services in order to improve or expand the functionality of the overall platform system, for both intended and unexpected uses.

Some complementors also become platform leaders within a platform. Adobe, founded in 1982 to make laser printer software for Apple computers, falls into this category. It has become one of the most profitable software companies in the world—with 2009 revenues of $2.8 billion, a gross margin of 90 percent, and an operating profit rate of 23 percent. It rivals Microsoft in sales productivity and profitability. Adobe gives away or sells platform technologies and tools (Acrobat readers and servers, Photoshop, Illustrator, Flash and Dreamweaver, Cold Fusion, Air, etc.) for printing and editing digital files, including text, photos, and videos, as well as for creating Web content. Other firms build complementary hardware and software products such as laser printers, special font sets and editing tools, or applications with Flash video clips that use Adobe technology. Still more firms use Adobe products to offer their own digital content and online services. But Adobe's main products (though not those using technologies that directly threaten alternatives from Microsoft and Apple) are also wonderful complements for the most common platforms in the software business—Windows personal computers and smartphones from Apple, RIM (Blackberry), Microsoft, and Google.[30]

It is important to realize as well that a company does not have to be the first to market or to have the best technology to become the platform leader and achieve the dominant market share in its industry. But platform leaders and wannabes do need to encourage innovation around their platforms at the broad industry level. The reason is that platform leaders usually do not themselves have the capabilities or resources to create all possible complementary innovations or even complete systems in-house. Yet the value of their platforms depends on the availability and innovativeness of these complementary products and services. In addition, based on the history of other platform technologies, where wars over incompatible standards often led to

market confusion and wasted innovation, we can say that platform industries generally need architects. This is where platform leadership becomes important.

The Concept of Platform Leadership

In 2002, Annabelle Gawer and I described the concept of "platform leadership" as motivated, at least in part, by "a vision that says the whole of the ecosystem can be greater than the sum of its parts, if firms work together and follow a leader."[31] We identified four "levers" or strategic mechanisms that companies such as Intel, as well as Microsoft and Cisco, used to influence producers of complements.[32] The lever terminology and the four categories are from us. But the dimensions of platform leadership came from our observations over several years. We also believed that firms who wanted to become platform leaders (wannabes) needed to figure out a coherent strategy along these four dimensions, though it was equally clear from our research that there were different paths to this "holy grail" of platform leadership.

The Four Levers

The first lever we called the *scope of the firm*. By "scope" in this context, we meant a kind of corporate diversification, or the breadth of what the platform leader does itself: specifically, what complements does the platform leader or wannabe make in-house versus what it encourages outside firms or partners (or users) to make. This dilemma resembles the "make versus buy" debate in vertical integration strategy. But, rather than buying complements, platform leaders generally try to influence other firms to decide on their own to produce products or services that make the platforms more valuable. The key idea is that platform leaders or wannabes need to determine whether they can or should develop an in-house capability to create their own complements or whether they are better off letting "the market" produce complements. They can also take an intermediate approach, such as to cultivate a small in-house capability.

For example, since 1980, Microsoft has encouraged many third parties to develop applications using the interfaces embedded in its part of the PC platform—DOS and then the Windows operating systems. At the

same time, Microsoft has developed the capabilities to make many complements—including the most important complements—itself. Thus we see Microsoft introducing a DOS version of Word and the predecessor to the Excel spreadsheet in 1983–4. Microsoft also introduced a mouse in 1983 for the DOS version of Word, which was especially useful later on for graphical versions of these applications. Microsoft started designing these products in 1981, at Apple's request, and then began selling them for the Macintosh in 1984.[33]

With its forays into the other "side" of the PC platform—from the operating system to the complementary applications—Microsoft was able to ensure that new generations of DOS and then Windows (which was good enough to start selling well from version 3, released in 1990) had the most critical complements available and were optimized for the next generation of the platform. It is very different for other platform companies and wannabes, such as Apple, Nokia/Symbian, IBM (WebSphere), Palm, and Red Hat/Linux. They rely much more heavily on third parties to provide complementary products. Intel also has been Microsoft's partner as the PC platform leader. Intel and Microsoft took over this position in the 1980s from IBM, which designed the original PC but did not control rights to the operating system or microprocessor design. But Intel lacks the in-house software capabilities (though it employs thousands of programmers) to develop mass-market consumer applications and systems software. So even a firm as powerful and wealthy as Intel has to rely on Microsoft and other firms to produce new generations of operating systems, hardware peripherals, and software applications that take advantage of new generations of its microprocessors—a dilemma that David Johnson, a senior Intel manager, described as "a desperate situation."[34]

The second lever is *product technology (modularity of the architecture, and openness or accessibility of the interfaces and intellectual property)*. Platform leaders need to decide on the degree of modularity for their product architectures and the degree of openness of the interfaces to the platform. In particular, they must balance openness with how much information about the platform and its interfaces to disclose to potential complementors, who may use this information to become or assist competitors. We know from various studies that an architecture that is "modular" and "open"—rather than "integral" and

"closed"—is essential to enable outside firms to utilize features or services in the platform and innovate around it. The original Macintosh, as well as the early versions of the iPod and the iPhone, are all good examples of closed integral architectures, in both their hardware and software. For the PC, application developers use programming interfaces that are essential parts of Windows, which Microsoft owns. But detailed information and examples for how to use these interfaces to develop applications are open to anyone and free with the Windows Software Development Kit (SDK).

The third lever is *relationships with external complementors*: platform leaders need to determine how collaborative versus competitive they want the relationship to be between themselves and their complementors, who may also be or become competitors (such as the relationship between Microsoft and IBM/Lotus, Apple, SAP, Oracle, Adobe, Intuit, and many other software product firms). Platform leaders need to worry about creating consensus among their complementors and partners. The biggest concern is that they may have to resolve conflicts of interest, such as when the platform company decides to enter complementary markets directly and turn former complementors into competitors. Microsoft generally limited the scope of its business, but it has always maintained it would compete with complementors if the market seemed sufficiently attractive. Accordingly, from programming languages and operating systems, beginning in the early 1980s, Microsoft has moved into desktop applications (to compete with WordPerfect and Lotus) and personal finance software (to compete with Intuit, though not very effectively), in addition to networking software (Novell), databases (Oracle and IBM), browsers (Netscape), media players (Real and Apple), online content (Yahoo!), search engines (Google and Yahoo!), video games (Electronic Arts and many others), mobile operating systems (Nokia/Symbian, Palm, and the Linux community), and business applications (SAP and Oracle)—to name only a few examples. Microsoft's strategy is generally to enter any "horizontal" (as opposed to industry-specific or "vertical") business, because anyone with a computer potentially becomes a customer. Its strategy for Windows has also been to ward off potential competition by enhancing the operating system with numerous features that complementors often sell as separate products—sometimes bringing

Microsoft into conflict with the antitrust authorities as well as its complementors.

The fourth lever is *internal organization*. More specifically, platform leaders can reorganize to deal with external and internal conflicts of interest. They may decide to keep groups with similar goals under one executive, or separate groups into distinct departments if they have potentially conflicting goals or outside constituencies. For example, Intel established a virtual "Chinese wall" to separate internal product or R&D groups that might have conflicting interests among themselves or clash with third-party complementors, such as chipset and motherboard producers. The latter relied on Intel's advance cooperation to make sure their products were compatible. When Intel decided that these chipset and motherboard producers were not making new versions of their products fast enough to help sell new versions of microprocessors, Intel started making some of these intermediate products itself—to stimulate the end-user market. But it still kept its laboratories in a neutral position to work with ecosystem partners.

By contrast, Microsoft claimed not to have such a wall between its operating systems and applications groups—despite the potential conflicts. Microsoft also insisted that "integration" of different applications, systems, and networking technologies (such as embedding its own Internet browser, media player, and instant messaging technology into Windows) was good for customers because it improved performance of the overall system. There is some truth to this. It is one reason why the user experience with the far more integral Macintosh system is better than the Windows-Intel PC experience, which has always mixed and matched hardware and software from many different vendors. But Microsoft leveraged the market power of Windows and its other platform, Office—which by the latter 1990s had evolved into another set of services and tools used by various companies to build their own desktop application products—to influence the direction of the software business.

It is not illegal under US or most other antitrust regulations to have a monopoly or any particular share of a market. Microsoft has controlled as much as 95 percent of the desktop operating systems market. Intel has produced 80 percent or more of PC microprocessors. Cisco has sold perhaps 70 percent of basic Internet routers in its peak years. ARM PLC

licenses the microprocessor designs in some three-quarters of all smartphones. Qualcomm has had a similar dominant share in cell-phone wireless chips using the Code Division Multiple Access (CDMA) technology. In recent years, Apple has gained a dominant market share with the iPod and iTunes. But it is illegal to utilize a monopoly position to harm consumers and competitors, such as through predatory pricing or contracts that impede competition and supply of the product. It is also illegal to use a monopoly in one market to enter an adjacent market by tying products together and thereby limiting consumer choice and restraining competition. Microsoft, as we know, committed these kinds of violations when it bundled Internet Explorer with Windows and did not charge extra for it. Microsoft also pressured PC makers not to load Netscape Navigator on their machines—essentially destroying Netscape's browser business and reducing competition in this market. Microsoft argued that the browser was an integral part of Windows. But Microsoft also sold or distributed the browser as a separate product, as did Netscape and several other companies, so this argument made little sense. Again, antitrust enforcement in the United States, Europe, and Asia has frequently forced Microsoft to adjust its behavior, though usually too late to make much difference in the current market. In browsers, for example, in December 2009 Microsoft reached a settlement with the European Commission to update versions of Windows used and sold in Europe through to 2015. The software update offers users the ability to select from several alternatives, including browsers from Apple, Google, and Mozilla Firefox (the open source successor to Netscape Navigator).[35]

A major focus of the *Platform Leadership* book was to dissect the case of Intel and then compare it to other established platform leaders that had followed somewhat different paths, such as Microsoft and Cisco. Gawer and I also analyzed several leader wannabes—Red Hat (which was pushing Linux), NTT Docomo (which was trying to export its dominant i-mode cell-phone platform overseas), and Palm (which was pushing both the Palm operating system as an industry platform and selling its own PDAs as early handheld computers). Based on these examples, we came to several conclusions with regard to the four levers.

How a platform leader or wannabe should position itself on Levers 3 and 4 seems relatively clear. Although they have many organizational

and strategic options to choose from, firms in a potential or actual leadership position with a platform technology need to rely on cooperation (as JVC did) to encourage outside innovation around their platforms. They also need to deal internally with potential conflicts of interest if they make their own complements that compete with partners such as OEM licensees or complementors.

How to deal with the choices inherent in Levers 1 and 2 is more complex (see Figure 1.2). Whether or not to make complements yourself, and how open (or how closed) to make your platform—and thereby subject your technology to the scrutiny of potential competitors as well as complementors—has continued to vex platform leaders and wannabes. We have seen managers struggle with this issue not only at Apple but also in recent years at SAP (with NetWeaver, a "middleware" software program that integrates externally built enterprise applications with SAP's internally built applications and development tools) and EMC (with WideSky, another middleware software program designed to control different data storage systems).

Various cases, especially that of Microsoft, suggest that the "best place" to be, first, is to have a strong capability to make your own complements, whilst still offering incentives to encourage outside firms to do the same. And, second, to have a platform open enough for

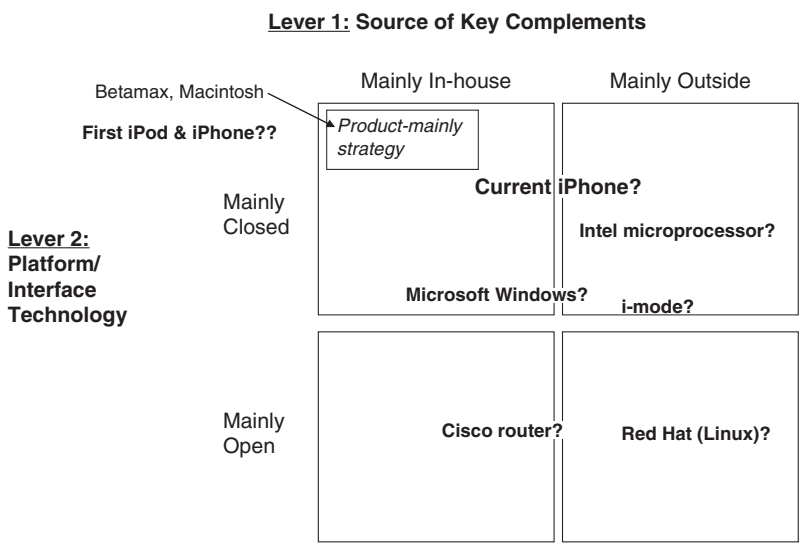

Figure 1.2. The strategy spectrum for Levers 1 and 2.

complementors to thrive but closed enough to protect the core technology from easy imitation, such as through patents or proprietary ownership with special licensing agreements. Cisco is vulnerable, because its platform evolved from the router to the IOS operating system. It contains proprietary technology but relies heavily on open networking standards and technologies—primarily the Internet. Red Hat, as the primary distributor of Linux, is probably in the *worst* place. The platform technology is completely open, not to mention free (if you download Linux from the Web); and most of the complementary innovations that make Linux valuable as a platform (such as Apache or Web server hardware) come from outside firms or the open source community, over which Red Hat has limited influence. Red Hat does have options, though. It built a service capability to make money, and used its own programmers to enhance Linux and build special utilities (such as for installing and updating the system) as well as to create some open-source applications.[36]

Somewhere in the middle is probably the best place strategically, because then a firm can benefit from the best of both worlds. For example, Microsoft makes its own key complements and it has cultivated an enormous ecosystem of hardware and software manufacturers that has kept it ahead of Apple. As Apple has moved closer to a similar position of multiple platforms, and complements, and more balance between being open versus closed, it has greatly improved its financial performance.

With regard to how to *behave* as a platform leader, Intel has generally been a good role model for other firms.[37] It did not flaunt antitrust regulations as openly as Microsoft did before losing the antitrust trial, though Intel has recently attracted a lot of antitrust scrutiny, particularly because of clashes with rival microprocessor manufacturer AMD. Be this as it may, Intel has provided an excellent model for the *process* of platform leadership. Job 1 should always be to sell your basic products (in this case, microprocessors) and protect the core platform technology from imitation. But Job 2 has been to encourage complements. In so doing, Intel has taken risks to open up its microprocessor interfaces, assist complementors, and give away a lot of important technologies. It has also tried to help key complementors and partners make money—necessary to keep the ecosystem vibrant and to reduce the potential of

complementors becoming competitors. In retrospect, we can see that Intel, through the 1990s and early 2000s, followed a specific set of measures to encourage complementors to adopt and continue supporting its microprocessor platform:

- Create and communicate a *vision* of platform evolution.
- Build a *consensus* among a small group of influential firms for the vision and new initiatives.
- Identify and target *system bottlenecks*.
- Distribute *tools and enabling technologies* to help outside firms develop complements fitting the vision.
- Highlight business opportunities and help leading firms to stimulate the market in different areas (Intel called these firms "rabbits").
- Facilitate *multi-firm initiatives* to reduce system bottlenecks and promote new standards, interfaces, and applications.

Challenges for Platform Leaders or Wannabes

Intel as well as other established platform leaders such as Microsoft and Cisco have maintained their market positions for decades. This kind of staying power is impressive, because new companies continually emerge that want to become the next generation's platform leader. These wannabes encounter special challenges when they tackle incumbents. For example, they may need to turn a product market into a platform market, such as by gradually becoming at least an architectural leader for the next-generation technology or new, broader applications. Hence, the four levers themselves may not be enough for wannabes to develop specific action plans, such as in two particular areas: becoming "core" or essential in an emerging platform market, and helping a market tip in their direction when there is more than one competing platform.

How to Become "Core" to a New Industry Platform

The first challenge, which Gawer and I called "coring," requires a leader-wannabe to resolve a major technical problem affecting a system-like product with industry platform potential. Most companies choose to protect proprietary knowledge if this approach is likely to

help them get a high return on their investment. But platform-leader wannabes must also encourage other firms to adopt their solution, join the emerging ecosystem, and alter their R&D plans to develop complementary applications rather than a competing platform or incompatible complements. Netscape and Microsoft faced this problem when they tried to convince Web masters and developers to optimize their websites and Web-based applications for Navigator versus Internet Explorer. It is therefore useful for the leader-wannabe to introduce a platform that is "open, but not open" or "closed, but not closed," as well as "free, but not free." That is, the platform should appear open enough in the sense of adopting as many publicly available standards as possible and be easy or cheap enough for outside firms to connect to, but still contain enough protected or proprietary technology to facilitate some way for the leader to make money. It is also essential for the new platform technology to generate direct or indirect network effects with any complementary products or services, such as through technical standards and compatibility-dependent formats or interfaces that make it difficult for complementors and customers to switch to another technology.

Managing the *technology side* of the platform is one problem; the leader-wannabe also has to manage the *business side* by creating the appropriate economic incentives for companies to join the ecosystem of another company and a potential rival. To understand these issues more fully, our follow-up research looked at numerous cases of successful, failed, and inconclusive coring initiatives. We hoped these would lend some insight into how best to implement a platform strategy for an industry that did not yet have a core technology or a platform leader.

Google provides an excellent and commonly understood example of successful coring. It started off as a simple search engine company in 1998, founded by former Stanford graduate students in computer science Larry Page and Sergey Brin.[38] They went on to establish their proprietary technology as a foundation for navigating the Internet. The company's algorithms solved an essential technical problem—how to find anything on the World Wide Web, which, even in the late 1990s, was adding millions of websites, documents, and other content each year. Most cleverly, Google distributed its technology to website developers and users as an "automatically embedded" toolbar that was easy

to connect to and use, and free. Then Google made its search content available to various outside parties for their own products and services, such as an application combining search information with local maps and restaurants or other location-specific information. It was essential that Google found a way for itself and partners—mainly advertisers in the beginning—to make money on the Internet by linking focused context-specific advertising to user searches in a way and on a scale that earlier search engines could not. Some 70 percent of Internet shopping begins with search, and Google gets paid whenever users go to websites its posted ads recommend.

Moreover, everything that Google does is reinforced by network externalities—the "increasing returns" or positive feedback generated by advertisers, users, and affiliated websites that embed the Google search bar—even without the benefit of strong direct network effects. It is now obvious that the more users and advertisers who use Google, the better the searches and the advertising information, and the more money that flows to Google and its partners. And Google can continue to expand its automated services, which have evolved into a broad platform. The strongest network effects are indirect, and the benefits are mostly around advertising. Google refines its search algorithms and results every time somebody does a search, so there are network effects here, though probably with some diminishing returns. But advertisers want to advertise where there is the most search traffic, and that by far is Google. So the more search traffic Google acquires, the more advertising it acquires, and the higher the prices it can charge. In fact, advertisers bid for priority listing for their sponsored ads!

There are different ways to measure market share (search volume, number of hits), but they all show that Google continues to grow, mainly from its base in the United States. It started 2007 with a US share under 55 percent and ended 2009 with around 65 percent. Meanwhile, Yahoo! dropped from 28 percent in 2007 to under 20 percent in 2009. Microsoft has remained with about 10 percent, though it was also actively trying to increase its share. In 2009, Microsoft introduced a new search engine, called Bing. This did not seem superior in general features but supported more refined searches than Google. Microsoft also reached a ten-year agreement with Yahoo! to provide search technology in return for 12 percent of Yahoo!'s add revenue. In addition,

Microsoft was negotiating with content sources such as News Corp., publisher of the *Wall Street Journal*, to give exclusivity to Bing.[39] And Google's overseas market share, comparable to that in the United States, was not growing as fast. It may even contract as specialized and language-specific search engines gain momentum, especially after Google moved its Chinese search operations to Hong Kong in March 2010.[40]

It is worth re-emphasizing that Google did not start out as a *platform* company; it was not even first to this market. The founders simply wanted to produce a better search engine *product*, which they delivered as an automated service over the Web. Page and Brin discovered how to rank website pages in terms of popularity measured by linkages to other websites. Nonetheless, the Google founders and senior executives, led since 2001 by CEO Eric Schmidt (formerly of Sun Microsystems and Novell), realized that search technology was not "sticky" enough by itself. Anyone can switch search engines with a simple click of a mouse, even though they get attached to their list of favorites (which users can export to other search engines). Google itself exploited the lack of stickiness in Internet search when users switched over from earlier search engines—Altavista, Inktomi, Yahoo!, and others.

But, to counter the absence of strong direct network effects such as benefited Microsoft, Intel, and JVC, Google gradually adopted a platform strategy to attract and keep users. It leveraged the search technology to create a broad portal for various products and services, as well as applications from third parties. Google now offers everything from email to basic desktop applications (competing with Microsoft Office) and cloud-computing services. In addition, clearly heading toward a direct confrontation with Microsoft, in 2008–9 Google entered the infrastructure software business. It released the Chrome Internet browser, then the Android operating system and development platform for smartphones, and finally the Chrome operating system for small "Netbook" computers connected to the Internet.[41] All these software products are free and open source, and supported by Google's search advertising revenue.

Yet, despite various initiatives to draw users to its platform and to grow its product and service offerings, Google is unlikely to turn Internet search into a global "winner-take-all" market. This occurred with PCs and VCRs, with the dominant firms ending up with

90–100 percent of the market. Search more likely will remain a case of "winner-take-most," more like Internet routers and microprocessors. Going back to the Eisenmann, Parker, and Van Alstyne framework, we can see why. First, there is room for differentiation and niche strategies; in China, Brazil, and a few other countries, local search engines were gaining market share in 2009, whilst Microsoft's Bing was gaining attention. There are also many specialized search engines, such as for video content, that should become more important in the future. Second, the network effects for search are more indirect than direct. However, the more Google adds products and services, the "stickier" the platform becomes, and the more search users it acquires, the greater its share of Internet advertising revenue. And, third, users still can almost effortlessly switch or use more than one search engine (multi-homing).

Qualcomm is another prominent case of successful coring. This company, founded in 1985 by former MIT engineering professor Irwin Jacobs, quickly became a leader in wireless communications technology for the cellular phone industry and then gradually diversified into PCs and other devices.[42] Like Google, Qualcomm solved a basic technical problem for the industry—the incompatible and inefficient wireless technologies of the late 1980s and early 1990s. Irwin's company invented the CDMA technology, which lets many users operate on the same channel by assigning specific codes, breaking the signals into small bits, and then reassembling them later, much like the Internet does with data packets. Qualcomm also sold chipsets that were easy to adopt and customize. Similar to Google though not as fast or as much, Qualcomm became a multi-billion-dollar firm with enormous profits and some astounding years—2003–5 in particular (see Table 1.3). On the business side, unlike Google, Qualcomm has not allowed its ecosystem partners to earn very much money. It has charged very high license fees (this technology is not free!) and vigorously enforced a large number of patents. In response, competitors such as Nokia and Broadcom, and overseas governments such as China, have sought technical alternatives and challenged Qualcomm's patents and fees in court.

Of course, there have been many failed attempts to disseminate a core technology or service and create a new industry platform. One

Table 1.3. *Qualcomm and Google financial comparison*

	Qualcomm			Google		
	Revenues ($ mn.)	Operating profits (%)	Year-end market value ($ mn.)	Revenues ($ mn.)	Operating profits (%)	Year-end market value ($ mn.)
2009	10,416	31.2	77,744	23,651	35.3	197,141
2008	11,142	33.5	62,724	21,795	30.4	116,684
2007	8,871	32.5	68,728	16,594	30.6	104,596
2006	7,526	35.7	79,774	10,605	33.5	98,268
2005	5,673	42.1	56,519	6,139	32.9	53,030
2004	4,880	43.6	48,251	3,189	20.1	27,286*
2003	3,847	40.9	28,304	1,466	23.3	n.a.
2002	2,915	28.8	27,785	440	42.3	n.a.
2001	2,680	1.5	38,831	86	12.8	n.a.
2000	3,197	22.6	45,529	19	(loss)	n.a.
1999	3,938	10.6	56,212	2	(loss)	n.a.

Notes: Fiscal year data, except when marked by asterisk, which indicates calendar year.
n.a. = not available (Google went public in 2004).

Sources: Company *Form 10-K* annual reports.

such example involves General Motors, which launched OnStar in 1995 with the goal of giving wireless capabilities to the automobile for navigation systems, directions, accident notification, remote diagnostics, maintenance reminders, Internet connectivity, remote opening of locked vehicles, and other services. GM established OnStar as a wholly owned subsidiary in collaboration with its EDS and Hughes Electronics subsidiaries before selling them off. The technology platform consists of hardware, software, and service agreements with a wireless provider. Initially, GM convinced several automakers (Toyota/Lexus, Honda, Audi/Volkswagen, and Subaru) to adopt the OnStar platform. Fairly quickly, however, these firms concluded that the OnStar capabilities and, in particular, the information on the customer that the system generated about driving habits, was too valuable to let a competitor control. Consequently, they decided to build or buy other systems and stopped licensing OnStar. In retrospect, GM created impressive technology but failed to create proper economic incentives for its service to become a neutral industry platform. It might have spun off OnStar as an independent company. Or GM might have followed Intel and created the equivalent of a "Chinese wall" around OnStar.[43]

Consulting firms create these kinds of walls all the time, to protect client confidentiality. GM continues to sell OnStar as an in-house service, but the lost opportunity to create a new industry platform is enormous.

Another problematic example involves EMC, a market leader in data storage technology founded in 1979. It launched an effort in the early 2000s to establish its WideSky technology as a new industry-wide platform.[44] EMC invented this middleware software layer to integrate and manage third-party storage hardware. In theory, WideSky solved an important technical industry problem—how to connect a growing assortment of storage systems from different vendors. In practice, EMC was unable to convince competitors—principally IBM, Hewlett-Packard, Hitachi, and Sun Microsystems—to adopt this technology as their own. Instead, these firms collaborated by establishing a new open-standards platform managed by their own "neutral" organization, the SNIA (Storage Networking Industry Association). EMC eventually joined SNIA as well. Like GM, EMC succeeded on the technology side by creating a potential core for a new platform but failed at the business side.

A potentially enormous market that lacks both a platform leader and a core technology is the digital home. Many technology vendors are vying to become a force here, but the market is still in a very early stage. The goal of several firms since the mid-1990s has been to connect entertainment devices (for example, television, stereos, and music players) and appliances (for example, heating or air conditioning systems, refrigerators) with a home computer network to enable centralized or remote control as well as billing. To further this vision, several companies in 1999 formed a group called the Internet Home Alliance, including Sears, Panasonic (Matsushita), General Motors, Intel, and Cisco.[45] Many other firms have joined this and a successor organization in later years. At the moment, Microsoft and Intel are once again trying to become the leaders, though it is not clear that either will succeed. Apple, Sony, Hewlett-Packard, Samsung, and several other firms already produce key software and hardware components, some of which could become core elements in a digital home platform. But the market is so diverse that it may never converge around one hardware or software technology. Or the industry might require a different type of

platform leader, such as a government agency or industry organization with the ability to influence regulation. We can already see signs of this happening. A large non-profit industry coalition for home builders, the Continental Automated Buildings Association, has taken over the Internet Home Alliance and continues working on the long-term platform goals. Key directors of this organization include executives not only from builders such as Tridel and Leviton but also from technology companies, including Bell Canada, Honeywell, Hewlett-Packard, Microsoft, AT&T, Invensys, Cisco, Siemens, Panasonic, Whirlpool, and Trane.[46]

How to "Tip" a Market

The second challenge for a leader-wannabe is to help a market "tip" or move to a strong market share for its platform—when at least two platform candidates compete. As with coring, successful tipping requires managing both the technology and the business sides of the platform. Most commonly, firms have used price to attract users, but this is rarely sufficient. Our view of the tipping problem is broader.

At the simplest levels, leader-wannabes can use their R&D skills not only to create a core technology that solves an important industry-wide problem, but also to create a high-demand feature or product (a "killer app") that is compelling to users. Apple is superb at doing this—a major reason why the company has several times put itself in an excellent position to tip a market toward its product as the industry platform. Another common tipping strategy is bundling—leveraging a strong position in one market in order to move to an adjacent market. Microsoft has often done this, such as to enter the browser, Internet server, media player, and enterprise computing markets on the backs of Windows and Office. It has also run into antitrust violations. Other companies that have used bundling with fewer legal controversies include Cisco, Intel, Qualcomm, and Nokia, among others. Each has expanded the capabilities of one platform to move into adjacent or similar platform markets. (Eisenmann, Parker, and Val Alstyne call this strategy "platform envelopment."[47]) Other tipping strategies include economic incentives for adopters, such as inexpensive or free licensing terms; subsidies that help one side of the market in order to attract the other, such as providing money or technology assistance to application

developers in order to get them to build applications that attract users to the platform, or subsidies that make the platform inexpensive for users. There are also coalitions, such as the group that opposed EMC, or those promoting non-Microsoft technology. Well-known examples of the last technique include Symbian, a consortium Nokia formed to develop smartphone software, as well as the open-source communities behind Linux and Eclipse (a Java development platform and common user interface, originally developed by IBM).

There have been a number of successful tipping efforts. JVC and Matsushita used broad licensing terms to OEM producers and aggressive promotion of content (prerecorded tapes) to push the market toward VHS. IBM, Microsoft, and Intel all worked hard (and together) in the 1980s to recruit application developers such as WordPerfect and Lotus as well as makers of printers to the PC. In the 1990s, Microsoft created the Office bundle and eventually convinced users to switch from WordPerfect, Lotus 1-2-3, and Harvard Graphics over to the Word, Excel, and PowerPoint applications. Microsoft also beat Netscape in the browser market, even though it lost the antitrust case, by bundling Internet Explorer with Windows 95 and later versions. More recent examples include Linux in the back office as a Web server operating system (but not as a desktop operating system, where the overwhelming availability of complementary innovations in the form of application software and cheap PCs based on the Windows standards has limited its diffusion).

Palm is another case of failure to tip, at least in part because management could not decide early enough whether to be a product company or a platform company. It was founded in 1992 by Jeff Hawkins and Donna Dubinsky and in 2000 spun out of 3Com as a separate public company. The firm is most known for pioneering the PDA market with the Palm Pilot, which it sold to great acclaim during 1996–9. But Palm tried to do two things at once, and did neither well enough: (1) establish its Palm device as the pre-eminent PDA product, and (2) promote the Palm OS as an industry software platform available for license to PDA competitors and later on to smartphone producers. Palm has suffered as well from digital convergence—the PDA market is being absorbed by the smartphone market.

Complement producers seem to prefer neutral platforms so that they do not have to compete so directly with the platform leader. Not many

firms can get away with what Microsoft does by competing aggressively on both sides of the platform; more common fates would seem to be what GM experienced with OnStar and EMC with WideSky. Palm also did poorly and recognized the conflict. In 2003, the board of directors split the company into two pieces: palmOne for the PDA devices and PalmSource for the OS. But this was too late to overcome momentum behind competing systems and PalmSource became increasingly dependent on palmOne as its main customer. In 2005, a Japanese firm bought the software company, though a newly unified Palm (which had merged with Handspring, maker of the popular Treo smartphone) repurchased rights to the operating system a year later. Then a private investor came in with a major cash infusion in 2007 to keep the company afloat. Today there is less confusion between Palm as product and Palm as a platform, but other platforms still have much more market share in this space. At the end of 2008, Palm announced it would no longer make PDAs and would concentrate instead on smartphones and a new operating system. In mid-2009, Palm finally introduced a competitor to the iPhone.

We can see tipping in action in another arena as well: "Web 2.0" social networking websites, which are characterized by user contributions and support from advertising. These sites make it possible for individuals and for-profit companies to post content (text, video, audio, blogs, advertisements for products and services, and even some application programs) on a main site, using tools such as simple create-and-upload menus. One of the early leading sites was MySpace, founded in 2003 by Tom Anderson and others and then purchased by Rubert Murdoch's News Corp. (Fox Interactive Media) in 2005. This site was overtaken in membership during 2008 by Facebook, a similar site co-founded in 2004 by Harvard student Mark Zuckerberg. This remains an independent company, though Microsoft became a minority investor in late 2007.[48] We also have YouTube, which Google purchased in 2006, as the most prominent site for video-posting. These Web 2.0 platforms compete but differ in their approach to openness.

For example, MySpace in the past has strictly controlled the features embedded in its site and loosened this hold only gradually. By contrast, Facebook learned quickly from Microsoft and, since 2007, has been functioning very much like a software development company—hosting programmer conferences and sharing its mark-up technology (a special

version of HTML) as well as its application programming interfaces (APIs) so that outsiders can develop and post applications. Independent developers can also sell advertisements or incorporate tools for conducting online transactions and keep all the resulting revenue.[49] Another new entrant, and the fastest-growing player in this space, is Twitter, the short-messaging and blogging site created by Jack Dorsey, Evan Williams, and Biz Stone in 2006 and funded primarily by venture capital. By the end of 2009, there were some 2,000 third-party applications available for the Twitter platform.[50]

Then we have a highly competitive market that has consolidated over time but may never tip toward one permanent leader—video-game consoles. Sony (PlayStation), Microsoft (Xbox), and Nintendo (the Wii) are the three remaining contenders. Every several years new generations of these consoles appear with different features, triggering a new series of investments and competition. The key complements are software games, some of which work on all three platforms. More importantly, the three leader-wannabes have followed very different platform strategies, reflecting their varied histories as consumer electronics, PC software, and game companies.

Sony won the round prior to the Wii, with a 70 percent market share for PlayStation 2. This company has focused on the high end of the market and "hard-core" players. PlayStation 3 (PS3), not surprisingly, is the most sophisticated and expensive system. In the past, Sony was slow to adopt a platform strategy and did not work very hard at encouraging outside game developers. In 2008–9, this changed. But PS3 was late to market because it incorporated too many state-of-the-art technologies, including the new Blu-Ray DVD format, which was expensive and slow to catch on as the new standard.[51] Sony has also frustrated software companies such as at FixStars in Japan, which used the open characteristics of PlayStation 3 to load its special parallel-processing (multi-core) version of Linux and then build supercomputer-class applications for a relatively inexpensive array of hundreds or even thousands of the consoles. (Full disclosure: I have been an advisor to FixStars since 2008.) Inexplicably, the latest version of PlayStation 3 (called "Slim") no longer permits the loading of a second operating system.[52]

Microsoft, the newest player in consoles, has approached games much like the PC market. It has developed a highly modular software

architecture based on Windows and early on disseminated Windows-like programming tools to facilitate game development. It has tried to rally the largest possible number of developers. Microsoft is also strong in online gaming and designed the Xbox console to work well with PCs and the Internet. So far, Microsoft has subsidized one side of the platform (the consoles). It appears willing to lose money on each box but someday recoup its losses from the software complements side of the platform—the license fees that game developers pay. Microsoft's Entertainment and Devices Division, which makes the Xbox, lost some $3.3 billion in 2006–7, but finally made a small profit in 2008 and 2009 on annual revenues of around $8 billion (see Appendix II, Table II.3).[53]

Nintendo, the loser in the prior round of console wars, started out as a manufacturer of playing cards and has always focused on the gaming business.[54] It generally sells the cheapest platform whilst developing in-house or through a tightly controlled network of developers a smaller number of games but potentially bigger hits. Its consoles share a lot of technology with previous generations, making new games cheap to develop. In the most recent round, Nintendo thrilled consumers with a clever system-level innovation combining hardware and software that changed the player's experience: a wireless remote control for its Wii console. This new technology has attracted first-time users ranging from children to the elderly who are interested in exercising and "virtual" versions of golf, boxing, and baseball. Since mid-2007, the Wii has been outselling competitors by a large margin.[55]

If we again apply the Eisenmann, Parker, and Van Alstyne framework, we can see why the video-game console market is unlikely to tip permanently in favor of one platform. There are strong network effects for content exclusive to the individual platforms. But the other factors seem even more important. The consoles have not yet become commodities, and the vendors have quite different backgrounds, capabilities, and market strategies; no one seems vastly superior in this market. As a result, there is differentiation in performance, features, and available complements (the games). Furthermore, the consoles are inexpensive enough for many users to buy more than one (multi-homing) and take advantage of the different features and content (games).

Lessons for Managers

First, implementing a platform strategy or a complements strategy requires a very different mentality and set of actions and investments compared to a product strategy. There are different risks and higher short-term costs. But the long-term economic rewards from a successful platform or complements strategy—especially when one firm creates both, like Microsoft and now Apple have done—can be enormous. Second, managers must still invest in their own innovation and have a strong, multi-generation product strategy. But it is no longer necessary to have the "best" product all the time to win a platform contest. Platform leaders win their battles by having the best platform, and that requires attracting the most or at least the most compelling complements, which will then attract the most users.

On this first point, we can say that platform leaders and wannabes have clear tasks ahead of them. The four levers define the basic game plan: they must design relatively open product architectures and correctly manage intellectual property rights. They must decide what components and complements to build in-house versus allowing the ecosystem to provide. They must work closely with external partners and share the financial pie with them. They must figure out how to organize internally to minimize potential conflicts when stimulating and competing with partners. At the same time, platform wannabes need to solve system-level problems for users and competitors that draw them to the platform, and they must do whatever they can to help the market tip in their direction. Lots to do!

Complementors have a similar agenda, with equal or even greater risks: if there are competing platforms, they must decide which ones to support and how fully to give their support.[56] They have to select which complements to produce and which to let other ecosystem partners or the platform leader make. They need to work closely (but not too closely) with the platform leader or multiple leader-wannabes, and always have something compelling and proprietary to offer. Otherwise, if the business opportunity is large enough, or if the complementor is too independent, the platform leader will probably try to absorb their product or service into its platform. This can be a delicate balancing act. But complementors also have their own

power. It can be their product or service that causes a market to tip and stay tipped.

The benefits of success are clear. Platform leaders can have significant leverage over an entire industry for decades—like Microsoft, Intel, Cisco, Google, Qualcomm, and Adobe, or Wal-Mart and Mattel. They benefit from innovation across an entire network of firms, not just within their own boundaries. Moreover, even if one firm does not take a dominant share, platform initiatives can be invaluable for cultivating broad strategic partnerships to improve sales, profits, and innovation capabilities. If the market is growing and becomes very large, platform leaders will also grow and become large. Initial scale by itself, though, is not essential to establish a platform. It is obvious when you think about it, but all the leaders cited in this chapter began as small firms. In fact, Microsoft, Intel, Apple, Cisco, Google, Qualcomm, and Adobe *became large and enormously valuable* precisely because—and when—their platform or complement strategies became so successful.

But, whilst we can distinguish a product from a platform strategy, my second point emphasizes the need to connect the two. It seems hard to succeed with an industry platform strategy if you do not first have a very good (though not necessarily the "best") product. No amount of strategic maneuvering can make up for a product that customers do not want to buy or use. At the same time, platform-leader wannabes do not always have to produce the industry's best product generation after generation to get a market to tip and stay tipped. To strive for "insanely great" products like Steve Jobs has done at Apple is a wonderful way to compete for a firm with unique design capabilities. But, for most firms, it is probably smarter to adopt a strategy that does not depend on always having the most elegant or sophisticated product in the market. Again, the best product does not necessarily win a platform competition; rather, the winner is more likely to be the platform that ends up with the most support from complementors. Complementary products and services create value for the platform and draw in users. In a platform market, garnering support from a broad ecosystem of innovative partners and users is far more important than winning a features contest or a product design award. And it generally requires a specific set of actions that come under the heading of a platform strategy.

Then there is the practical question: if focusing on platforms (or complements to an existing platform) rather than on stand-alone products has such obvious benefits, why do not *all* managers and firms embrace this principle? One reason surely is that managers in the past have not always fully understood the opportunity. Sometimes they preferred not to exploit the opportunity—which I think describes the behavior of Apple before the mid-2000s. Some managers may believe that platform dynamics apply only to high-tech companies. But examples such as Mattel's Barbie doll, Wal-Mart, Marks & Spencer, Best Buy, and CVS and Walgreens demonstrate this is not true.

Some managers may hesitate because they realize how difficult it is to become a platform leader and maintain this position; they may think they are better off selling a product, keeping it relatively closed, and reaping the revenues and profits for themselves and not risking opening themselves up more to possible imitation. Most firms also find it safer to complement some other firm's platform. Platform leaders have to invest heavily in R&D as well as perform a delicate balancing act: whenever a company creates dependence on its technology—as Microsoft, Intel, Qualcomm, Cisco, Nokia, ARM, and others have done—then they also create resentment among their customer partners and, frequently, invite antitrust scrutiny. Nonetheless, when we look deeper, we see platform battlegrounds emerging almost everywhere, in products and in services. What is more, each platform seems to contain other more specialized platforms, which means that many platform companies are also complementors of some larger platform. This is true of all the platform companies mentioned in this chapter. Adobe, for example, has its own platforms for handling text and graphics. But its technologies are also wonderful complements for Macintosh and Windows computers, and a variety of smartphones as well. Even Google search is really a complementary application for any type of Internet-enabled computing and communications device. Google is also perhaps the most compelling complement for Internet service providers and makers of netbooks.

When thinking about platforms and complements, it is important today to think not only about software and hardware products, but also about services. These include both a wide range of value-added services as well as automated or semi-automated services delivered over the Internet. I take up this topic in the next chapter.

Notes

1. See Cusumano and Selby (1995: 384–97) and Cusumano and Nobeoka (1998).
2. There is an enormous literature on product platforms. I usually begin with Sanderson and Uzumeri (1996) and Meyer and Lehnerd (1997). For more academic treatments, see Meyer and Utterback (1993), Ulrich (1995), Sanchez and Mahoney (1996), Baldwin and Clark (1999), Meyer and DeTore (2001), and Meyer and Dalal (2002).
3. See Gawer and Cusumano (2002).
4. I say "almost," because Kevin Boudreau of the London Business School has presented some evidence that suggests too many complementors can reduce the incentives of new complementors to invest. See Boudreau (2006).
5. See http://barbie.everythinggirl.com (accessed Nov. 12, 2009).
6. See the Wikipedia entry for "Barbie," www.wikipedia.com (accessed Nov. 12, 2009).
7. Annabelle Gawer recently published a book containing the latest platform-related research from multiple disciplines. See Gawer (2009).
8. See, e.g., David (1985), Farrell and Saloner (1986), Farrell and Shapiro (1988) Arthur (1989), Katz and Shapiro (1992), Langlois (1992), Shapiro and Varian (1998), Bakos and Brynjolfsson (1999), and Nalebuff (2004).
9. See Rochet and Tirole (2003, 2006). Also Bresnahan and Greenstein (1999) and Schmalensee, Evans, and Hagiu (2006).
10. See Yoffie and Kwak (2006) and Adner (2006).
11. Cusumano and Yoffie (1998).
12. Iansiti and Levien (2004).
13. See Parker and Van Alstyne (2005), Eisenmann (2006), and Eisenmann, Parker, and Van Alstyne (2006, 2007).
14. Utterback (1996).
15. My thanks to Michael Bikard for this observation.
16. This section elaborates on an earlier discussion in Cusumano (2008b).
17. See the discussion of Microsoft's strategy in Cusumano and Selby (1995: 127–85).
18. See Rosenbloom and Cusumano (1987) and Cusumano, Mylonadis, and Rosenbloom (1992).
19. Yoffie and Slind (2008), and other public sources.
20. Yoffie and Slind (2008: 11).
21. Cusumano (2008b: 24).
22. Kane (2009) and Wortham (2009).
23. See Vascellaro and Kane (2009). Also, e.g., Schroeder (2009).
24. Yoffie and Slind (2008: 6).
25. According to its 2009 10-K report, Microsoft estimated that about 20% of Windows client sales of $14.7 billion or about $2.94 billion were directly to consumers. This is 5.0% of total revenues in fiscal 2009, which were $58.4 billion.

26. Cusumano (2004: 43–6).
27. Vascellaro and Sheth (2009).
28. Stone and Cain Miller (2009).
29. Gawer and Cusumano (2008).
30. See all the various Adobe products, activities, and partnerships at www.adobe.com (accessed Nov. 20, 2009). For a detailed description of Adobe's platform strategy, see Adobe Systems Inc. (2009), *Form 10-K*.
31. Gawer and Cusumano (2002: 269).
32. Gawer and Cusumano (2002: 8–9). In addition, the four levers are also summarized in Cusumano and Gawer (2002). This section closely follows another summary in Cusumano (2004: 75–7).
33. For the specifics of this chronology, see the Appendix to Cusumano and Selby (1995: 451–9), as well as p. 140.
34. Gawer and Cusumano (2002: 1). Also quoted in Cusumano and Gawer (2002: 51).
35. O'Brien (2009: B2).
36. Cusumano (2004: 124–5).
37. See Gawer and Cusumano (2002) for a detailed discussion of Intel.
38. The general ideas in this discussion of Google follow Cusumano (2005a).
39. See Arango and Vance (2009), Lohr (2009), Needleman (2009), and Singel (2009). Also Sullivan (2009).
40. CBC News (2008).
41. Vascellaro and Morrison (2009).
42. This discussion of Qualcomm is based primarily on Yoffie, Yin, and Kind (2005).
43. This description of OnStar benefited from public information as well as my informal discussion with the president of OnStar, Chet Huber, at the MIT Sloan School on Apr. 4, 2007.
44. Saghbini (2005).
45. See Thurrott (2001).
46. See www.caba.org (accessed Apr. 19, 2009).
47. See Eisenmann, Parker, and Van Alstyne (2007, 2008).
48. Perez (2007); Shankland (2006).
49. See Allison (2007) and Auchard (2007).
50. See http://oneforty.com.
51. *The Economist* (2007).
52. See Carnoy (2009). For more information on FixStars, see www.fixstars.com/en/index.html.
53. Microsoft Corporation, *Form 10-K* (annual).
54. Sheff (1993).
55. *Boston Globe* (2007).
56. In software, which platform to support was an issue with Netscape, and it decided to support Microsoft Windows as well as the Macintosh and UNIX. See Cusumano and Yoffie (1998, 1999).