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The Elements of **Platform Leadership**

With vision that extends beyond their current business operations or the technical specifications of one product, platform leaders can create an industry ecosystem greater than the sum of its parts.

Michael A. Cusumano and Annabelle Gawer

You would think that a company like Intel, which in 2001 provided nearly 85% of the microprocessors for personal computers, would feel relatively secure. But companies holding the keys to popular technology don't live in a vacuum. In many cases, they are dependent not only on economic forces in the wider world but also on the research-and-development activities of partners. David Johnson, one of the directors of the Intel Architecture Labs (IAL) in Hillsboro, Oregon, goes so far as to call that reality desperate. "We are tied to innovations by others to make our innovation valuable. If we do innovation in the processor, and Microsoft or independent software parties don't do a corresponding innovation, our innovation will be worthless. So it really is a desperate situation for us."[1]

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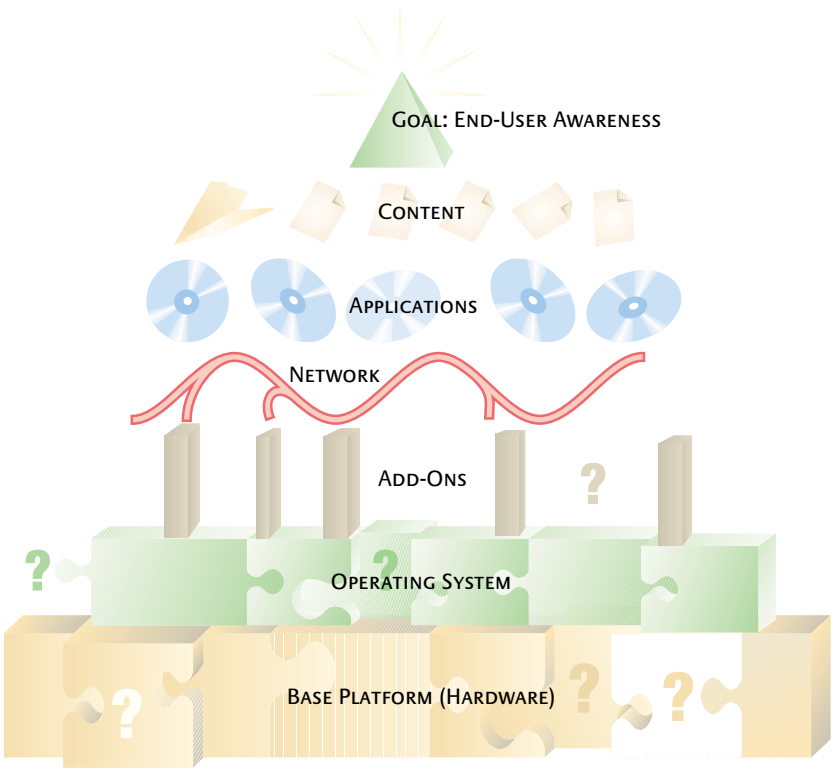
Industry Capability Stack



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The Desperation of Being on Top

Although leading companies from all industries know that business in our interconnected world has become too complex for complacency, the issues are particularly clear in the information-technology industry. There, *platform leaders* (companies that drive industrywide innovation for an evolving system of separately developed pieces of technology) are navigating more frequent challenges from *wannabes* (companies that want to be platform leaders) and *complementors* (companies that make ancillary products that expand the platform's market). To put their organizations in the best competitive position, managers need to master two tricks: coordinating internal units that play one or more of those roles and interacting effectively with outsiders playing those roles.

Intel and its computer on a chip, the microprocessor, illustrate the issues. In 2000, Intel had revenues of nearly $34 billion and net profits of more than $10.5 billion. Even after the economic downturn, with microprocessors still the core hardware component of the personal computer and increasingly in demand for new programmable devices, Intel should feel on top of the world.

But a microprocessor can do little or nothing useful by itself. It's a component in a broader platform or system. Even the PC has no value without other companies' products: operating systems, software applications, software-development tools and hardware (monitors, keyboards, storage devices, memory chips and the like). Those complementary products fueled the growth of the PC market. But Intel considers its situation desperate because it cannot be certain that its own key complementors will continue to produce market-expanding innovations as fast as Intel does. Nor can it be sure that its target platform, the personal computer, will evolve in compatible ways.

That dependency has been seen in other industries as well — for example, with the compact-disc player and the video recorder, also platform products tied to complementary products. Customers would never buy a CD player or video recorder if they couldn't get prerecorded CDs and videotapes. Platform dependency is an ongoing concern. That's why in November 2001, the mobile-phone maker Nokia decided to partner with competitor NTT's DoCoMo on software standards — and with AT&T Wireless, Motorola, Fujitsu and others to create middleware between service and mobile networks.[2] Nokia wanted more players to adopt compatible standards and potentially follow its lead.

Another Intel manager, Bala Cadambi, uses an automobile analogy. "Intel is in the business of providing the engine for the PC, just like Honda would be in the business of providing the engine for the automobile," he says. "That engine is doubling in capacity every 18 to 24 months. ... What we really want is to ensure that the rest of the platform goes with it. This means that, if the engine gets better, the tires get better, the chassis gets better, the roads get better, you get better gas mileage. You can have navigation systems that are scalable. Everything that goes with having a better experience. *The platform around the engine limits the engine. So we want the platform — which is everything that's around the microprocessor — to be keeping pace and improving and scaling, such that the microprocessor can deliver its potential.*"[3]

Intel and Microsoft are simultaneously complementors and platform leaders for the personal computer. They are complementors in the sense that PC makers need them to make critical components. But in the main, they are platform leaders because

of their influence over PC system architecture and over other companies that produce complementary products. For the same reasons, NTT DoCoMo and Palm are platform leaders.[4]

Platform leaders face three problems. First is how to maintain the integrity of the platform (the compatibility with complementary products) in the face of *future* technological innovation and the independent product strategies of other companies. A related problem is how to let platforms evolve technologically (as they must or become obsolete) while maintaining compatibility with *past* complements. A third problem is how to maintain platform leadership. Insights from Intel as well as Microsoft, Cisco Systems, Palm and NTT DoCoMo can help companies manage innovation in industries characterized by platform technologies and complementary products that make the platform valuable to consumers.[5]

Leaders Need Followers

Most platform leaders do not have the capabilities or resources to create complete systems by making all the complements themselves. They need to collaborate. The combined efforts of platform leaders and complementary innovators increase the potential size of the pie for everyone. That was true for the parties that delivered the first PCs to users. And it's true for those trying to improve the PC platform today.

Dave Ryan, director of technology marketing in the Intel Architecture Labs, is typical of managers we interviewed who focus on streamlining Intel's interactions with complementors. He says that the layers of industry groups with which Intel interacts to deliver a complete PC capability are like a stack. (See "Industry Capability Stack.") At the base is the hardware platform. At the top is the goal (the user's awareness of the innovation). The layers appear as orderly and sequential as a stack of encyclopedias. However, interconnectedness makes for complexity, with changes occurring in one layer at the same time that changes are occurring in another.

As Ryan says, "For the user actually to see that new capability, some companies need to make new hardware. Some companies need to make changes in the operating system. There need to be new types of networking or new products developed. … So to get a new use or new capability to occur, we have to work simultaneously across all these layers."[6]

Platform leadership is the ability of a company to drive innovation around a particular platform technology at the broad industry level. Whether the dynamic is called "network externalities," "bandwagon effects" or "positive-feedback effects," the more people who use platform products, the more incentives there are for complement producers to introduce more complementary products, causing a virtuous cycle.[7]

The Four Levers of Platform Leadership

1. **Scope:** Scope comprises the amount of innovation the company does internally and how much it encourages outsiders to do. Managers of companies that are platform leaders — or that want to be (wannabes) — must weigh whether it is better to develop an extensive in-house capability to create their own complements, let the market produce complements or follow a middle road.

2. **Product technology:** Platform leaders and wannabes must make decisions about the architecture of a product and the broader platform, if the two are not the same. In particular, they need to decide how much modularity they want, how open their interfaces should be, and how much information about both platform and interfaces to disclose to outsiders who might become complementors — or competitors.*

3. **Relationships with external complementors:** Managers must determine how collaborative or competitive they want relationships to be between platform producers and complementors. Platform producers also need to work on creating consensus and handling potential conflicts of interest (for example, how to behave when the move to a complementary market turns former collaborators into competitors).

4. **Internal organization:** The right internal structure can help platform producers manage external and internal conflicts of interest. Organizational options include, first, keeping groups with similar goals under one executive or putting them in distinct departments if they have outside constituencies or potentially conflicting goals; second, addressing organizational culture and processes; third, improving internal communication of corporate strategy. Because of the ambiguity of innovative, modular industries, a company culture that encourages debate can accelerate strategy reformulation when it's needed.

* We prefer "complementors" to the longer "developers of complementary products." See A. Brandenburger and B. Nalebuff, "Co-opetition: A Revolutionary Mindset That Redefines Competition and Cooperation" (New York: Currency Doubleday, 1997); and C. Baldwin and K. Clark, "Design Rules: The Power of Modularity" (Cambridge, Massachusetts: MIT Press, 2000), which is about the problem of modularity.

Platform leaders actively solicit innovation on complementary products. But the game is complex and sometimes features fierce standards wars. One company that failed to make its platform the standard was Sony, whose Betamax lost the VCR wars. Apple's Macintosh computers, despite some resurgence, have yet to unseat Windows machines as the mass-market standard. Another platform-type product, Netscape Navigator, declined sharply from its early 90% market share after Microsoft unleashed Internet Explorer.

The Levers of Platform Leadership

After analyzing Intel, Microsoft, Cisco and NTT DoCoMo, we developed some practical guidelines for managing innovation whether the innovator is a platform leader, a wannabe or a complementor. (See "The Four Levers of Platform Leadership," p. 53.) Four distinct but closely related levers of platform leadership can assist managers in both strategy formulation and implementation.

Lever One: Scope Determining the scope of the company — that is, which complements to make in-house and which to leave to external companies — is probably the most important decision. Companies that want to become platform leaders first need to assess how dependent they are on complements. Then they need to determine how to increase demand for their platform. Palm has stimulated the external development of more than 8,500 applications for its operating system. In Japan, NTT DoCoMo has encouraged the creation of 40,000 Web sites to provide content to DoCoMo customers. Since 1993 Cisco has made more than 70 acquisitions of both complementary companies and substitute technologies that it could tie into its Internet router (a specialized computer for sending packets of information across the Internet).

Platform producers should not develop their own complements if they lack the technical, organizational or financial capabilities to compete in the relevant markets. Microsoft did have such capabilities, and — even though its decision to proceed damaged former complementors, including Netscape, Novell, WordPerfect and Lotus — the company developed the most popular applications for Windows by itself. Intel, however, would have trouble competing with Microsoft in making commercial operating systems or software applications. Nor is Intel likely to succeed in consumer mass markets — say, with MPEG music players or digital cameras. Its strengths lie elsewhere.

Microsoft had the technical skills to move from PC-programming languages and operating systems to software applications. Still, Microsoft generally stays with applications that mesh with platform technology such as MS Office or common database-management programs. It remains to be seen if the company can compete long term with a consumer hardware product such as the new video-game console, xBox.

Perhaps the most complex example of external scope is Cisco, which builds few end-user applications itself. Instead, it makes acquisitions when it wants to expand its product offerings' capabilities into different areas — or when it wants to pick

Advice for Complementors

Companies making products that complement platform leaders' products have placed bets on which platform producers to follow and which technical standards to support. Should a company making ancillary software for personal digital assistants use the Palm operating system, Microsoft PocketPC's system or both? Complementors try to assess who will win the war for platform leadership. They look at how actively a platform producer is lining up outsiders to support its platform with complementary applications. They investigate how openly the platform producer is providing technical information to complementary producers.

Is it possible to dance with the elephant — that is, to avoid getting crushed when a powerful platform leader decides to compete? If complementors commit resources to innovations, they should focus on products that the platform producer is unlikely to offer. They need to work at continuous communication because changes occur rapidly. Complementors need to keep alert to a platform leader's product plans and try to get early information on a move onto their turf. They need to react quickly to demands; slow response may give a platform leader an excuse to compete with the complementor later.

Although platform leaders need complementors as a group, usually the balance of power between a platform leader and one lone complementor is tilted toward the platform leader. The trick to being a successful complementor is always to have peanuts to offer the elephant — to create products that continuously enhance the value of the core product even as the core changes.

Complementors also should identify which groups inside the platform company are likely to take the most neutral stance to promote the platform and its innovation ecosystem — and then work with them.

up technologies that, when linked in hybrid networks, might substitute for its routers.

A platform leader or wannabe deciding to work with outside developers should scrutinize others' incentives and capabilities in order to exert influence over the design and production of complements. For example, platform producers can share technical information about their own products and platform interfaces or send engineers to help complementors build compatible products. Intel uses what it calls a "rabbit" strategy — targeting a promising complementor and assisting it in such a visible way that other companies follow. The approach draws the attention of investors and complementors to a potentially lucrative new market and signals that the platform leader aims to stay out of the complementary market.

Product architecture can determine who does what type of innovation as well as how much investment in complementary products occurs outside the platform-leader company.

As Intel has done through its labs, platform producers can develop enabling technologies, such as programming interfaces and software-development kits, and share them for little or no charge to stimulate the development of complements. And sometimes platform leaders or wannabes share market information or offer complementors marketing support.

Venture investments and mergers and acquisitions also help a company influence the production of complements. Platform leaders such as Intel, Microsoft, Cisco and Palm have taken equity positions in some complementors. Intel, Microsoft and Cisco also have acquired complementors. However, when an acquisition makes the platform leader a competitor of former partners, it can discourage other companies from becoming complementors and can mean less competition — and possibly less innovation.

There is no simple answer on whether to make complements in-house; however, platform products do need complements. Platform producers probably should have some in-house capability, not only for producing complements but also to provide constructive direction and competition for third parties.

Lever Two: Product Technology Product architecture — both the high-level platform design and the interface designs that determine how subsystems work together — can have a profound impact on the structure of an industry and on the nature of follow-on innovation. Product architecture can determine who does what type of innovation as well as how much investment in complementary products occurs outside the platform-leader company. Modular architecture (with easily separable components) can reduce innovation costs and encourage the emergence of specialized companies. Specialists often invest heavily and creatively in complementary products and services.

Intel, Palm and NTT DoCoMo use modular architecture. Even the Microsoft and Cisco operating systems, despite their somewhat haphazard evolution, have modular characteristics that facilitate external creation of complementary products.

Modular architectures are particularly useful when the interfaces are open — that is, when the platform leader specifies publicly how to connect components to its platform. However, open disclosure aids competitors spying on the product's inner workings. That's why Intel, for example, jealously guards its microprocessor architecture, even though it is open about interfaces such as the peripheral-component-interconnect (PCI) bus and the universal-serial bus (USB), which link computers to peripherals. Similarly, Microsoft reveals detailed specifications on the Windows programming interfaces but is careful not to give away the source code (internal structure) of the Windows software platform.

Successful companies evolve the core architecture. Intel microprocessors once encountered threats from ultrafast designs that workstation producers such as Sun Microsystems, Apollo, IBM and Silicon Graphics used in their high-powered workstations — and from the superior graphical capabilities of Motorola chips in Apple Macintosh computers. But Intel evolved its microprocessor architecture to compete more effectively on speed, processing power and graphics. Microsoft evolved its architecture too, building Windows NT/2000, a high-end operating system that enabled the company to compete more effectively with Unix and Linux in the corporate server market. Palm and NTT DoCoMo keep evolving their platforms too.

Cisco's platform is essentially the internetworking operating system (IOS), which is based on open Internet communications and networking standards that Cisco did not define alone. The company has had to make its software and hardware products compatible with any new communications technology that emerges and is vulnerable to substitutes competition and specialized players. In 2001, it was not clear that Cisco would keep up with external innovations and maintain its high growth rates.

Keeping control of the architecture is a powerful barrier against companies that might offer a competing architecture

with different interfaces. A competitor to Intel, for example, not only would have to invent a microprocessor with a better price-performance ratio, it also would have to rally complementors and original-equipment manufacturers to change their designs and accept the switching costs.

Microsoft is another platform leader that uses interfaces to align the interests of a coalition of companies. Although it was taken to court for antitrust violations, it retained the right to continue encouraging the platform-specific complements that create an applications barrier to entry for companies with alternative platforms.

Thus if platform producers want to stimulate the development of complementary products, they give the technical specifications of interfaces to third parties. If they want to hinder an outsider's ability to make complements (for example, if a potential complementor is competing with a preferred partner), they keep their intellectual property from that company.

Cisco relies primarily on open standards. DoCoMo is pushing for adoption of a standard for open data transmission. Intel has an open intellectual-property policy on its PCI, USB and advanced-graphics-port (AGP) interfaces. Palm licenses its Palm OS to complementors and even to competitors such as Handspring. Nokia more recently concluded that information about interfaces encourages external innovation. Nevertheless, it's a delicate balance, and disclosing too much information can be dangerous.

Finding ways to stimulate innovation involves a trade-off between secrecy and disclosure. Like a patent, secrecy is good for blocking substitute innovation. It encourages profit-seeking entrepreneurs to innovate on a stand-alone product. But disclosure is best for supporting complementary innovation.

Decisions about product technology — architecture, interfaces and intellectual property — are critical to platform leadership. Successful companies protect their core technology but use modular architectures and disclosure of interfaces to get complementary products and services. Spending resources on design issues such as platform architecture and interfaces — or on promoting industry consensus about interface standards — can help platform producers shape their environment.

Lever Three: External Relationships To be effective over the long term, platform leaders need to pursue two objectives simultaneously. First, they must seek consensus among key complementors about what technical specifications and standards will make platforms work with other products. Second, they must influence partners' decisions affecting how well everything works together through new product generations. Pursuing consensus and control at the same time, though essential, can be difficult, as other companies naturally fear being dictated to.

Consensus among industry players depends on one company driving the process. It must have some degree of control over interfaces between components and between the hardware platform and the software operating system. The company that leads exerts control not over others' specific choices but over the premises of choice. We call that *ecological control.* Control presupposes some degree of consensus, because leadership is possible only when others agree to follow.

Intel designed interface standards defining how the microprocessor would communicate with other components, and it developed the organizational capabilities to encourage other companies to design products. But it was a challenge. Some interfaces, though part of the PC system, were not part of the microprocessor. Thus a critical mass of key players had to agree on interface specifications for the whole product. Without agreement, an industry will not develop enough complementary and compatible products or will innovate too slowly.

Specific management processes can help a platform leader achieve consensus and maintain control at the same time. Intel's experience demonstrates the importance of a carefully thought-out balancing act of collaboration and competition that recognizes mutual dependency. Such a balancing act requires companies to trust the platform producer. But maintaining trust is difficult. It is not always clear if another company is a supplier, competitor or complementor, or if today's supplier or complementor will become tomorrow's competitor. Some companies play multiple roles. For example, IBM bought Intel microprocessors but also made microprocessors that competed with Intel products.

There is a real threat to complement producers that dance with the elephant. (See "Advice for Complementors," p. 54.) Although platform leaders usually avoid partners' markets, they invade often enough to make complementors wary. A platform leader is less likely to intrude into a complementor's turf if the latter can innovate in ways that the platform leader cannot.

Platform leaders should be industry enablers — helping others innovate in ever better ways around the platform. Leaders need to sacrifice short-term interests in favor of the common good. That's why Intel invested in interface standards and relinquished royalty rights for technologies that facilitated evolution of the PC as a system. (See "Ideas From Intel on Managing Platform Leadership.") Intel coordinated the efforts of hundreds of engineers in developers' forums and compliance workshops for ensuring that peripherals and other complementary products worked properly with Intel microprocessors and with one another.

Platform producers should build reputations for not impulsively stepping out of their product boundaries into comple-

mentors' territory. Intel is generally careful not to destroy partners' business models. The same cannot be said of other companies. Microsoft often prefers to crush complementors that start looking like competitors. Cisco tries to acquire them. Palm and its software licensee, Handspring, have a more complex relationship, with Handspring both a complementor to Palm (Handspring's Visor works on the Palm operating system) and a competitor in the PDA market. Palm needs to keep developing its operating system or Handspring could switch to another one.

How do platform leaders manage external tensions? Intel perfected a gradual, low-key approach when pushing a particular agenda. It allows input from collaborating companies — and permits both sides to test the waters. Intel learned from past mistakes. With its first foray into videoconferencing, it incautiously tried to impose a new standard while there was a strong incumbent using a different standard. By giving away its cheaper alternative technology, it nearly destroyed the ability of complementors to make a profit. Intel learned to push an agenda more subtly, with managers assuring complementors that critical technical information would remain open and that there would be adequate protection of intellectual property.

By demonstrating to potential complementors that it is acting on behalf of the whole industry, a platform leader can establish credibility in those technical areas where it wants to influence future designs or standards. Thus in drafting interface specifications, Intel did not insist on complete ownership of all related intellectual property. It also protected others' intellectual property by working with only a few companies at first. Later, when the specifications were almost stable, it involved more companies in setting standards.

The balancing act is tricky: collaborating with external complementors and championing the public interest while competing with those complementors when necessary to stimulate a new complements market. The ambiguity of relationships sometimes generates tensions and conflicts of interest both sides must address. One way is through internal organization.

Lever Four: Internal Organization A platform producer must create an internal organization that allows it to manage relationships with complementors effectively. What happens if some groups within a platform-leader company compete with complementors, while other groups need those same complementors to cooperate and adopt the platform's technical standards? Therein lies the challenge.

Intel has some groups focus on competition with other companies, while other groups focus on consensus building with partners. Intel executives acknowledge the necessity to pursue conflicting goals — which they call "job 1" versus "job 2" or "job 3." Job 1 is selling more microprocessors, which includes encouraging external, demand-enhancing innovation on complementary products. Job 2 is to compete directly in complementary markets. Job 3 involves building new businesses that are potentially unrelated to the core microprocessor business.

Ideas From Intel on Managing Platform Leadership

- Protect the core technology but share interface technology.
- Sacrifice short-term interests in favor of the industry's common good.
- Do not step carelessly onto partners' turf.
- When pushing an agenda, test the waters in a low-key way.
- Help complementors protect their intellectual property.
- Separate internal groups that produce complements from those that assist complementors.
- Leverage internal processes, such as senior-management arbitration of conflicting goals.
- Communicate diligently with partners.
- Communicate diligently with internal constituencies.

Intel's top management acknowledges the conflicts among goals: Entering complementary markets means direct competition with partners but occasionally is necessary; investing heavily in new business development can be a distraction from core businesses but helps Intel diversify.

It is vital to communicate the multiple goals to the whole company and create a process for resolving conflicts. Intel puts up "Objectives" posters everywhere. It keeps groups with different goals separate so that outside companies can more easily entrust Intel people with confidential information.

Microsoft created separate divisions for its applications and operating-systems groups, allowing it to deal with competitors who were also complementors, such as IBM/Lotus, Netscape, Intuit and Oracle. Cisco keeps its product units relatively independent, enabling those units to work with outside companies that compete with other Cisco groups.

In general, platform leaders can appear more neutral if they establish an internal Chinese wall, with different groups playing different roles vis-à-vis third parties. But organizational design is usually not enough. Intel people rely heavily on internal processes, too, such as formal planning and off-site meetings.

They also count on senior executives to arbitrate when conflicts arise among company units — and to foster an organizational culture that encourages debate and tolerates ambiguity.

Intel management understands that a platform is a complex system calling for a neutral industry broker to oversee development of the system through external collaboration. NTT devotes extensive R&D resources to studying technologies of general utility to the wireless industry as a whole. Microsoft, Cisco and Palm also recognize that their platforms contribute to larger systems. But so far Intel may be the best example of how to lead an industry by representing the interests of other companies besides itself.

Managers With Vision

It is possible to be too platform-centric. There are other ways to compete: say, as a niche player with superior quality or service. Not every company can be the platform leader.

Sometimes platform leaders become so tied to certain technologies that they find it difficult to evolve their platforms. Intel, for example, is closely tied to the x86 microprocessor family and is unlikely to move to radically new types of computer architectures. Microsoft continues to have a Windows-centered view of the Internet and might never take full advantage of the open-standards movement. In fact, its leaders have publicly opposed the open-source concept, though Microsoft will now let some complementors view the Windows source code. Cisco depends heavily on its ability to weave multiple technologies together through its IOS software, a patchwork of code and standards that will someday outlive its usefulness. Palm is becoming a hostage to the internal architecture and external interfaces that define the Palm OS. No wonder NTT DoCoMo is partnering with Nokia. It's either collaborate or live with standards for wireless data transmission and content that others don't share.

Thus platform leaders eventually struggle with platform evolution. For some Intel groups, the platform is becoming the Internet — and new devices that run Internet software rather than use Windows and x86 chips. Microsoft is trying to reconcile traditional applications with use of the Internet as a computing platform for Web-based services. Cisco finds itself moving beyond the Internet router as a platform to software linking various types of networking equipment that communicate through Internet protocols.

Platform leaders need to have a vision that extends beyond their current business operations and the technical specifications of one product or one component. The ecosystem can be greater than the sum of its parts if companies follow a leader and create new futures together. Complementors need to understand the vision of the platform leader in their industry and make some bets on what that vision means for their own future. But it is the platform leaders, with the decisions they make, that have the most influence over the degree and kind of innovations that complementary producers create. Platform leadership and complementary innovation by outside companies are not things that happen spontaneously in an industry. Managers with vision *make* them happen.

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4. Platform leader Intel counts as complementors every company that has adopted the Windows-Intel platform for the PC and makes or sells PC hardware and peripherals (for example, Dell and Lexmark) as well as 5 million software developers who make applications (for example, Microsoft and Adobe) and networking or systems software (Microsoft, Red Hat and Netscape). NTT DoCoMo's complementors include every company that provides content to one of the 40,000 Web sites compatible with DoCoMo technology in Japan (for example, Nikkei News and Tokyo Wine News). Palm's complementors are the 145,000 external software-applications developers and 500 hardware developers (as of March 2001) that create add-on accessories: keyboards, voice recorders, digital cameras and GPS wireless-connection systems.

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