THE McKinsey Quarterly

The strategic value of Web services

John Hagel reports from the edge of the networked company

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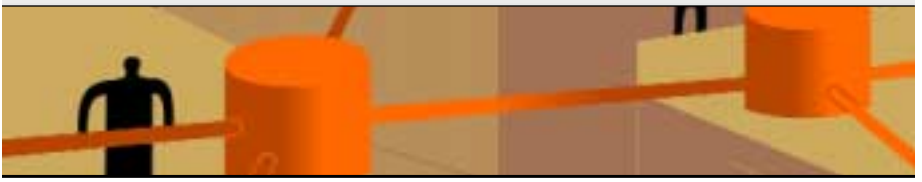

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Introduction

After all the hype around Java, XML, and .Net, who could blame top managers for being a little wary (and weary) of Web services? Although several years of buzz have delivered only the beginnings of easy connections among different IT systems, managers shouldn't lose sight of the opportunity. As John Hagel points out in "Edging into Web services," the lead article in this *McKinsey Quarterly* Reader, the coders will work out the details, and too much value lies at the fringes of organizations, where they interact with their partners, to leave the problem of universal connectivity unsolved. Hagel's article, adapted from his new book, *Out of the Box: Strategies for Achieving Profits Today and Growth Tomorrow through Web Services*, argues that the technology will take off first at the connections among collaborating companies; only after proving its worth there will it be brought deep within the organization.

Web services are part of a process that is well under way: the move from traditional vertical corporations, which often own every link in their supply chains, to networked companies that rely on upstream and downstream connections with other businesses. In "Loosening up: How process networks unlock the power of specialization," Hagel joins John Seeley Brown and Scott Durchslag to offer examples of companies that have built effective networks relying on low-maintenance connections. Such a network, including specialists in a variety of niches, revolves around a process specialist that profits mightily from its efforts.

If you still don't quite understand what Web services are or why they matter, read the brief nontechnical primer "When computers learn to talk." You'll also find a short glossary, which should help you avoid a deer-in-the-headlights moment when you discuss the topic with your CIO.

Edging into **Web services**

John Hagel III

Automating the flow of information among companies is costly and complex. Web services promise to make it cheap and easy.

Companies in every sector have streamlined their internal processes by integrating systems and eliminating the manual activities once needed to coordinate the flow of information across the enterprise. Streamlining processes that involve interactions between companies has been more difficult, however: the automated connections that they currently forge with one another can funnel only certain types of information and require negotiations over the value of these expensive connections.

Web services—new technologies that spring from the Internet and are used mostly to automate linkages among applications—might at last make such connections not only possible but also easy and cheap. Today, connecting systems inside a company (a procurement system and a finance system, say) can require the IT staff to write customized code that "glues" them together. Making connections between companies and their applications exponentially increases the job's complexity and cost. But thanks to the emergence of Web services, programmers can now write a layer of software that sits on top of an application and connects it to any other Web service–friendly application quickly, cheaply, and flexibly.

In the new book Out of the Box: Strategies for Achieving Profits Today and Growth Tomorrow through Web Services, *McKinsey alumnus John Hagel argues that companies will use these technologies first at the "edge" of the*

enterprise—where business activities involve communications and transactions with other organizations, such as trading partners and customers. Companies that had better and cheaper connections with one another could gain cost savings in the short term and look forward in the longer term to collaborating more innovatively to give customers more value.

—The editors

In the decade ahead, companies will pursue strategic opportunities and performance improvements abetted by a new generation of technologies called Web services. Such companies will adopt this novel approach at the edge of their enterprises, where they bump up against customers, dealers, and suppliers, as well as in activities requiring frequent interaction with any number of people and organizations—activities like customer support, marketing, procurement, and sales. As a result, these companies will forge connections among existing systems and applications less expensively and more rapidly and flexibly than they can using today's conventional technologies.

Automating the flow of information between a company and its business partners has always been difficult and expensive. Many interactions thus require human intervention—for instance, employees who key into corporate systems the data retrieved from business partners through faxes, telephone calls, or even lists printed out from the systems of other companies—a practice that leads to human error. Furthermore, many companies maintain larger stocks of inventory than they really need, because the flow of information among partners in the value chains of most sectors just isn't efficient enough. Since activities near the edge of businesses abound in inefficiency, the opportunities for creating near-term value from Web services are substantial there, which makes it likely that companies will apply them in this way before using them to knit together core internal systems.

Until now, though, integrating the systems of one company with those of its partners has been less feasible than integrating internal systems. Web services promise to change that. Better connections among trading partners are going to mean that companies will be able not only to streamline their edge activities but also to collaborate on improving internal processes, such as product development.

But the real long-term prize of business collaboration lies in mobilizing the assets of partners to deliver more value to their customers. When cooperation among different businesses resembles the activity of a network, they can increasingly focus on innovation in their core activities, and the network becomes more efficient and flexible in what it can offer.

Such process networks are powerful tools for unleashing the potential of specialization.[1] Emerging Web services technologies will play a crucial role in facilitating them. Companies will find that they can wrest near-term operational savings from edge activities—in effect, setting the stage for efforts to pursue the longer-term strategic and operational benefits of collaboration. If these emerging technologies come to fruition—and they should—companies will use them to cut costs at the edge and, eventually, to reap still greater advantages.

Web services enable companies to start with small, focused initiatives to **achieve quick wins**

To extract value from these technologies, it will be necessary to make hard business decisions about the way they are used instead of merely treating them as just another new software tool, for their power lies in the ability to make the systems of trading partners interact. Another specific feature of Web services is their ability to let companies start with small, focused initiatives to achieve quick wins at minimal risk and then to build on success as they evolve.

The edge

Technologically, every company is an island, operating with its own assortment of systems, applications (some created in-house), databases, and communications technologies. Within a company, the chief information officer can impose hardware and software standards to promote the sharing of data and the common use of applications across the enterprise; such a company might, for example, develop a proprietary forecasting system that feeds data automatically to a procurement application purchased from a software company. Developers then design a customized connection with that application's function in mind. But when, say, six applications must talk to one another, the expense and the effort increase sixfold. Massive enterprise-resource-planning systems can integrate corporate applications, but these projects may cost hundreds of millions of dollars and take several years to implement.

At the edge—the frontier of IT connectivity—the challenge of integrating systems is even greater. Few companies have the power or the will to force their trading partners to adopt common systems. Conceivably, a company could replicate in-house the IT platforms used by its most important trading partners and thus enjoy a seamless flow of information, but the effort required would be prohibitively expensive and complicated. It is also conceivable, in theory at least, that all of a company's present and potential

[1] *See* John Seely Brown, Scott Durchslag, and John Hagel III, "Loosening up: How process networks unlock the power of specialization," *The McKinsey Quarterly,* 2002 special edition: Risk and resilience, pp. 58–69, as well as John Hagel III, "Leveraged growth: Expanding sales without sacrificing profit," *Harvard Business Review*, October 2002, pp. 68–77.

trading partners would adopt the same enterprise application suite, but this is basically a science fiction fantasy.

The few connections that companies do make among themselves, largely using electronic-data-interchange (EDI) networks, are of limited use. These networks provide only for the exchange of specific transaction data—for instance, invoices and requests for proposals—and can't be used to exchange the quantity and quality of information needed for higher-value collaboration, on product development, for example. EDI connections are also expensive and inflexible. As companies forge more and more links, they will find that using EDI to connect new business partners or to shed old ones is neither quick nor cheap.

Early generations of Internet technology didn't solve the problem. People and businesses can connect easily to World Wide Web sites, but to conduct commerce through a Web front end, companies must forge customized connections between the site and numerous enterprise databases, systems, and applications.

A new approach

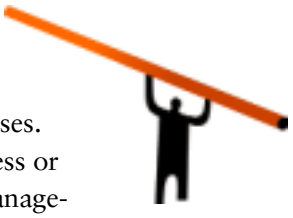
The advent of Web services promises to let a company connect its applications to any number of trading partners relatively inexpensively and easily. Of course, Web services could also be used to link applications inside the company. But these are experimental technologies and for now most companies will prefer to stick to more expensive—but proven and reliable—approaches to integrate key internal systems. The best use of Web services currently lies in edge applications, where connectivity problems are more complex, efficiency gains are greater in the near term, and alternative ways of connecting companies are limited.

These evolving technologies are essentially a number of Web-based standards and protocols that enable companies to connect applications and data directly to one another.[2] The standards can be incorporated in a layer of software (an interface) that companies put atop an existing application, thereby allowing any other application with a similar interface to link up with it and communicate data. Writing this layer of middleware is far less expensive than customized code—about $30,000 for a modest connection between two applications, according to one financial-services company, compared with $800,000 for the customized version. Moreover, code rooted in a feature of

[2] For a more detailed look at what Web services are and how they work, *see* chapter 2 of *Out of the Box: Strategies for Achieving Profits Today and Growth Tomorrow through Web Services*, as well as John Hagel III and John Seely Brown, "Your next IT strategy," *Harvard Business Review*, October 2001, pp. 105–13; and Ayman Ismail, Samir Patil, and Suneel Saigal, "When computers learn to talk: A Web services primer," *The McKinsey Quarterly,* 2002 special edition: Risk and resilience, pp. 70–7.

an application makes for a rigid connection: if the underlying application is changed, the customized connection must also be changed or even rewritten. Web services let companies tinker with the application while avoiding changes to the interface.

What this means for business is that a company like Nike, with many product iterations and a broad range of partners, will be able to connect its own technology to that of its suppliers more efficiently, reducing the need for employees to send, receive, and reenter transaction data manually. Such a company could expand the amount and kind of data it exchanges with trading partners, thus not only improving the way both sides interact and collaborate but also transforming the way they develop, make, and distribute products. By using Web services to enhance collaboration in business alliances, some companies could even expand the value of the goods and services they deliver to customers. In addition, Nike would enjoy greater flexibility, so that when fashions changed the company could add new suppliers and drop others quickly and inexpensively. Similarly, it would be able to connect more readily to the large and fragmented retailer network that sells its shoes.



Web services also help companies outsource business processes. Whenever a company turns over the management of a process or function—manufacturing, logistics, or human-resources management, for instance—to an outside provider, that process becomes an edge activity and thus presents the kind of coordination challenge any other such activity involves. Technology companies that outsource manufacturing, for example, must ensure a seamless transfer of data from their product engineers to the providers' manufacturing engineers. To help such companies, one manufacturing-services provider is launching a Web services tool that will enable both groups of engineers to start collaborating in the development of new products at an early stage. In initial trials, the company and selected clients managed to cut design-cycle times by more than half and to tackle such time-wasting problems as a 50 percent error rate in bills of materials generated by product-development engineers. By making it possible to identify design enhancements earlier, the collaborative approach also promises to reduce manufacturing costs substantially.

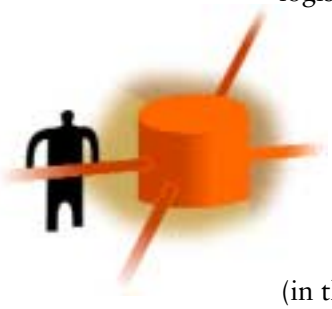
This achievement is just the beginning. Managers should understand that Web services still represent more of a potential boon than a real one. Only a small number of companies, among them Dell Computer, General Motors, and Merrill Lynch, are using Web services protocols to connect selected activities to suppliers, dealers, or customers. Eventually, specialized utilities—companies that offer mission-critical managed services, such as security and specialized messaging, that support applications using Web

services—will be needed to ensure the reliability of these technologies. If collaboration is to work, moreover, companies must define the business terms they share: will product sizes be specified in centimeters or inches, for instance, and defined as a product's height by length by width or in some other way? Without precise definitions, the exchange of information can't be automated.

How quickly these limitations are overcome will determine how quickly Web services can be adopted. Because technology companies, notably IBM, Microsoft, and Oracle, are investing billions of dollars to develop them—and because their value to end users is so compelling—it makes sense to be optimistic about the outcome.

The next step

Web services won't remain on the edge for long; once companies have enjoyed the short-term advantages of reducing the inefficiencies on their boundaries, they will want to connect the edge to the core and to integrate internal applications. A company that has used Web services to automate, say, its procurement transactions might soon find reasons to tighten the integration of data and activities throughout its broader core manufacturing and logistics process. If older legacy systems that support manufacturing or logistics haven't been integrated or are only partially integrated across the enterprise, Web services can provide improvements and promote flexibility to greater effect than conventional technology.



Dell is one of the companies that have already started to expand their use of Web services from an edge activity (in this case, coordinating business processes across the supply chain) to core activities. In 2000, the company began sending components specifications to its suppliers in a Web services format so that the suppliers' inventory-management systems could read the data automatically. That move helped Dell reduce the inventories of components at its many geographically distributed assembly plants by more than 80 percent—from 26 to 30 hours of production down to 3 to 5 hours. This was a huge improvement for a company in which direct materials account for 70 percent of revenues.

Dell didn't stop there. Its suppliers serve many plants, and the company decided that if it could aggregate information across them, it could match production capacity more efficiently to demand and manage supply shipments accordingly. The snag was that because of the company's rapid growth and geographical expansion, each Dell assembly plant had implemented its own manufacturing applications and database-management systems, with

no effort at coordination. Information was thus shared manually. Rather than replace systems to achieve uniformity across plants, Dell used Web services to do the job, vastly improving utilization and cutting logistics costs throughout the production network.

The company used a Web services standard, the Extensible Markup Language (XML), to create a common format for representing data on its inventories and manufacturing operations. Rather than restructure or replace all its existing databases—a massive undertaking—the company converted the data into the common format by creating a front end to each database. This approach facilitated communication across Dell's manufacturing operations at a much lower cost and served as the basis for automated communication with the company's supply chain partners.

Merging companies rarely have the same technology platform, but Web services could **integrate** disparate systems fairly cheaply

Web services could also integrate edge activities with applications that support administrative functions. Selling, for example, is an edge activity, but if a sales representative works on commission, each transaction must be communicated to the company's human-resources and financial-management applications. Finally, companies might deploy Web services to help integrate systems after a merger or acquisition. Merging companies rarely have the same technology platform, but with Web services they could integrate their disparate systems fairly cheaply and reap the benefits of consolidation more quickly.

How to use Web services today

Investments in Web services, on the one hand, and in conventional technologies, on the other, call for different approaches. Because large critical systems, such as enterprise platforms and supply chain or customer-relationship-management (CRM) applications, are hard to modify once they are in place, companies that implement them must assess the long-term competitive implications of the technology and of the organizational and process-related changes needed to capture the investment's value. By contrast, the flexibility of Web services allows companies to change (and to generate new iterations of) applications that use Web services technologies and the processes they support. A company can thus invest modestly at first, focusing on near-term economic returns, and scale up as Web services mature.

When managers plan their investments in Web services, they should follow three principles—leverage existing technology, implement investments in

stages, and plug in new elements of the technology over time—and carefully balance the longer-term strategic and operational advantages that Web services can support.

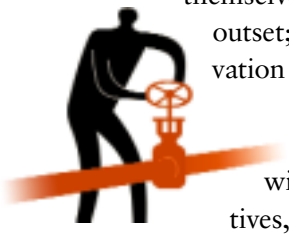
Leverage existing technology

When a company installs an enterprise platform, the sensible course is probably to rip out legacy systems and to replace them with applications that run on the new platform. The reverse is true with Web services. Here, the new technology is essentially an overlay, so the challenge is to get more value out of existing assets. Companies should also consider the additional capabilities that Web services alone can provide.

Stage investments

To benefit fully from a large application, a company must generally redesign many of its core systems. With the more modest and focused Web services approach, little or no restructuring is needed and an installation can be completed in days or weeks rather than months or years. This means that not only companies but also their trading partners can invest in stages.

During the past two years, for example, Dell has implemented several Web services initiatives in clearly defined stages tied to specific aims, including the reduction of operating costs and inventory. This gradual approach enabled Dell's trading partners to implement their own investments in stages, thus keeping the cost of migration low. The partners had no need to commit themselves across the board to a new technology architecture at the outset; they could edge their way in, gaining experience and motivation as benefits materialized.



Initially, companies can invest in edge activities in which the wins will be quick and tangible. Dell started with simple initiatives, such as compressing its cycle of manufacturing-schedule releases and coordinating its interactions with a limited number of vendor-managed distribution centers. Once it had demonstrated the business impact of these early steps, it moved on to more challenging programs—notably, extending its automated connections to include first-tier suppliers.

Plug in new elements over time

The fact that Web services components can be added without redesigning an entire system means that a company can adopt them without having to fear that it will be overtaken by later adopters armed with more advanced technology. Indeed, companies that quickly build the institutional skills (such as

the ability to manage relations with partners) that are needed to harness Web services will probably stay ahead of the curve.

Of course, there is a flip side to this virtue: some elements of the Web services architecture are not in place to date, so companies must be realistic about what they can achieve. Their investments should be based on an objective understanding of the current state of these technologies, and they should avoid initiatives that depend on features not yet available. Any company tempted to fill the gaps with older technologies should be wary of creating hybrids that will limit its options when Web services alternatives become available. Proprietary extensions to fill gaps in the features of Web services, for example, should be implemented as modules with clearly defined interfaces. In this way, it will be easier to replace the proprietary extensions with evolving Web services standards as they become available.

One further word of caution: a staged, pragmatic implementation of Web services at the edge of enterprises is by no means without pitfalls. This approach gives managers time to learn about these technologies and to develop insights into the broader operational and strategic possibilities of business collaboration. But executives lulled into complacency by the simple and mundane nature of Web services and by their early tactical implementations might overlook the broader opportunities and lose valuable time. It is management's attitude that will ultimately determine who creates value with Web services.

A new technology architecture that first emerged from the cloud of the Internet will reshape the IT platforms of enterprises and lay the groundwork for entirely new business opportunities. Assertive managers who recognize the potential of this architecture will use it at the edge of their companies to realize profits today—and explosive growth tomorrow. Q

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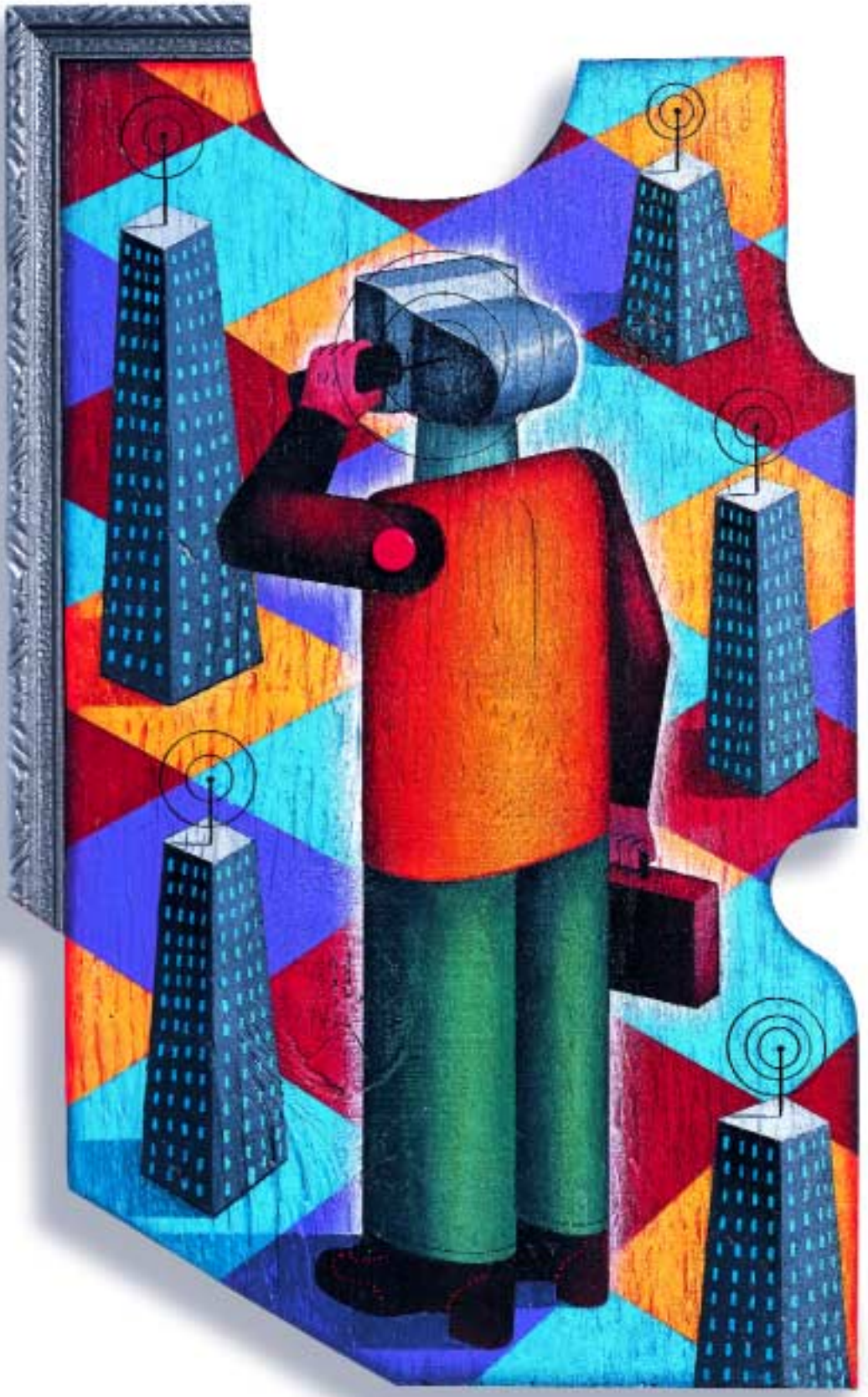


When **computers** learn to talk: A Web services primer

Ayman Ismail, Samir Patil, and Suneel Saigal

What are Web services? Why should you care?

Anyone made leery by the unfulfilled promises of the dot-com era may feel skeptical, or at least confused, about Web services, the latest wave of innovation on the Internet. Sky-high expectations and reams of hype are too often the death knell for emerging technologies. Is this one going to be any different?

At the risk of soliciting conversions to a potentially false creed, we offer a primer on Web services—what they are, what you must know to be conversant with the underlying technology, and why, in the end, you may decide to pay closer attention as they evolve.

To put it simply, Web services are business and consumer applications, delivered over the Internet, that users can select and combine through almost any device from personal computers to mobile phones. By using a set of shared protocols and standards, these applications will permit disparate systems to "talk" with one another—that is, to share data and services—without requiring human beings to translate the conversation. The result promises to be "on-the-fly" (real-time) links among the on-line processes of different companies. These links could shrink corporate IT departments, foster new interactions among businesses, and create a more user-friendly World Wide Web for consumers.

What will it take for this vision to materialize? Although certain aspects of the technology (security, for example) are still maturing, the substantial Web services investments that companies such as IBM, Microsoft, and Sun Microsystems are now making have convinced some observers that this technology will soon be a reality. Others point to the significant remaining hurdles: key technical standards are still incomplete; specific services and new service providers have yet to be defined; and, perhaps most important, major questions about consumer privacy and security remain unanswered.

Despite these obstacles, new and potentially powerful innovations are building behind the buzz.

What are Web services?

The hype around Web services reflects their potential for helping computers talk with one another more easily (Exhibit 1). These conversations will take place through new Internet standards and protocols that allow computer

What does the terminology mean?

Web services have their own rules and assumptions, conveyed through a sometimes bewildering terminology. Here, in brief, is the information you need to hold up your end of the Web services conversation.

Shareable services

UUP: Universal User Profile. A set of user-specific data and preferences stored on the World Wide Web and used by Web sites to perform tasks such as authentication and personalization. The standards have not yet been defined.

Service infrastructure

UDDI: Universal Description, Discovery, and Integration. A set of specifications for creating XML-based directories of Web services offerings. Much as callers consult the Yellow Pages for the telephone numbers of businesses, users of and applications for Web services may find them through these directories.

Message transport

SOAP: Simple Object Access Protocol. A set of rules that facilitate XML exchange between applications. Along with WSDL, SOAP performs message transport functions.

WSDL: Web Services Description Language. A common framework for describing tasks performed by a Web service. Suppliers, for example, could discover what kinds of information a company's inventory system offered them—nothing more than a bare indication that inventory was approaching zero, for example, or possible due dates as well.

Language

XML: Extensible Markup Language. A universal language for defining data schemes. XML makes it easier not only to exchange data among a variety of applications but also to validate and interpret such data.

applications to reach beyond the confines of operating systems, programming languages, and middleware (*see* sidebar, "What does the terminology mean?"). The lingua franca of this machine-to-machine discourse will be the Extensible Markup Language (XML), which "tags" digital content in standardized formats. Once computers have been linked in this way, it will be possible for consumers to access a more seamless World Wide Web from many different devices, while businesses will be able to connect their operations quickly and cheaply and thereby cut their transaction costs and improve their customer service.

EXHIBIT 1

Access and functions

Web services

How Web services are accessed

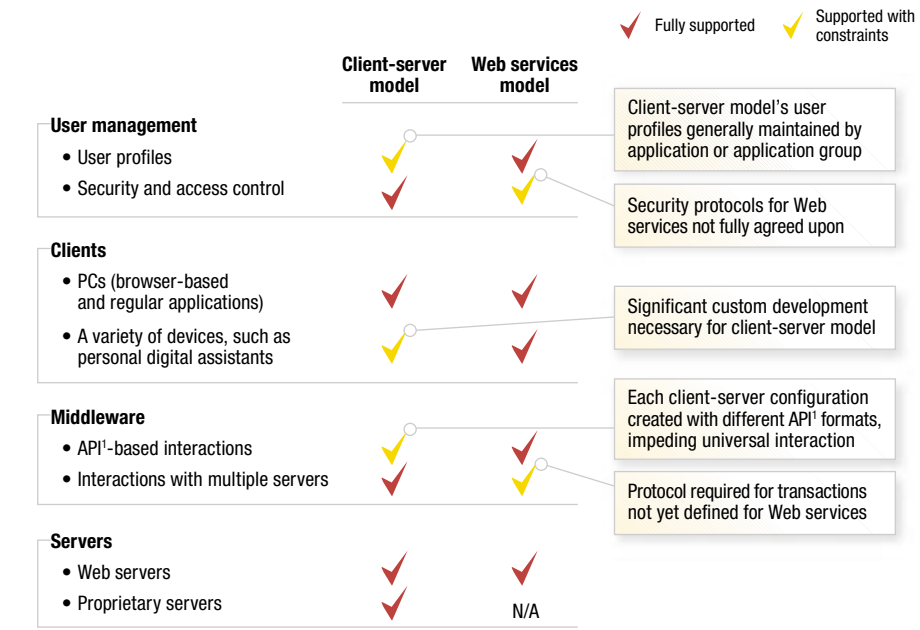
- By human users through Internet browser software or wireless devices, such as cell phones
- By application programs, such as order-management software
- By other Web services, such as credit-check service used by order-entry service

How Web services work

- Support common, consistent Universal User Profiles (UUPs) that are universally accessible
- Use new Internet standards and protocols that liberate applications from need to interface directly with hardware, operating systems, programming languages, middleware
- Communicate through Extensible Markup Language (XML) messages over standard World Wide Web protocols
- Are registered and located via Web services registries such as Universal Description, Discovery, and Integration (UDDI)
- May be delivered by a number of providers, some invisible to human users

EXHIBIT 2

Web services and the client-server model



[1]Application-programming interface; allows applications to communicate with other applications.

Putting client-server computing on the Web

Web services implement the client-server model over the World Wide Web (Exhibit 2, on the previous page). On the client side, for example, they manage the different screen shapes and sizes and the different connection speeds of desktop computers, mobile telephones, and PDAs. On the server side, the various programming languages and middleware technologies at work behind each application or data source become transparent to programmers, so it is a lot easier for them to develop applications.

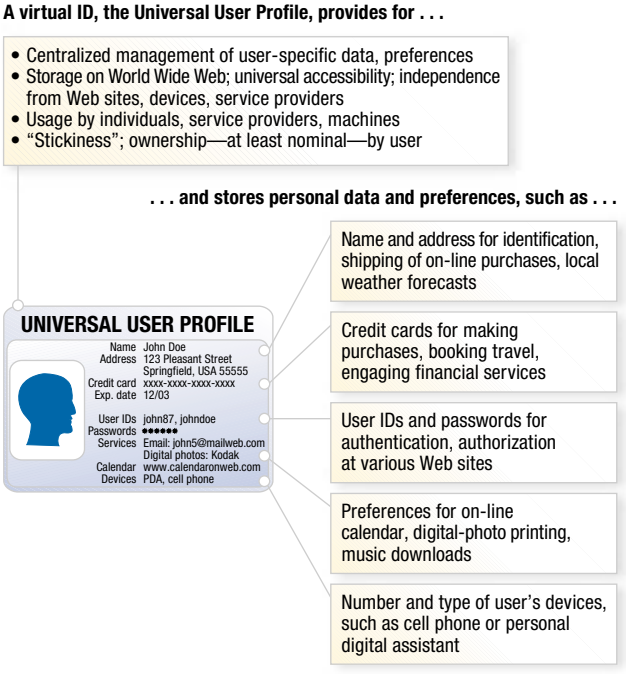
Creating a user profile

Passwords and other kinds of information about users will be stored in the form of Universal User Profiles (UUPs), giving them easy access to any number of Web sites and services, through a variety of devices and in a variety of roles—for example, that of customer or employee (Exhibit 3).

Each UUP will probably be stored with a service provider, such as AOL Magic Carpet (also known, less engagingly, as Screen Name Service) and Microsoft.NET Passport. Once users registered with a provider, they would own this "sticky" information, at least nominally, and other Web sites and services would be permitted to interact with them. To succeed, service providers would have to win the trust of their on-line partners and of consumers—no easy task.

EXHIBIT 3

The Universal User Profile

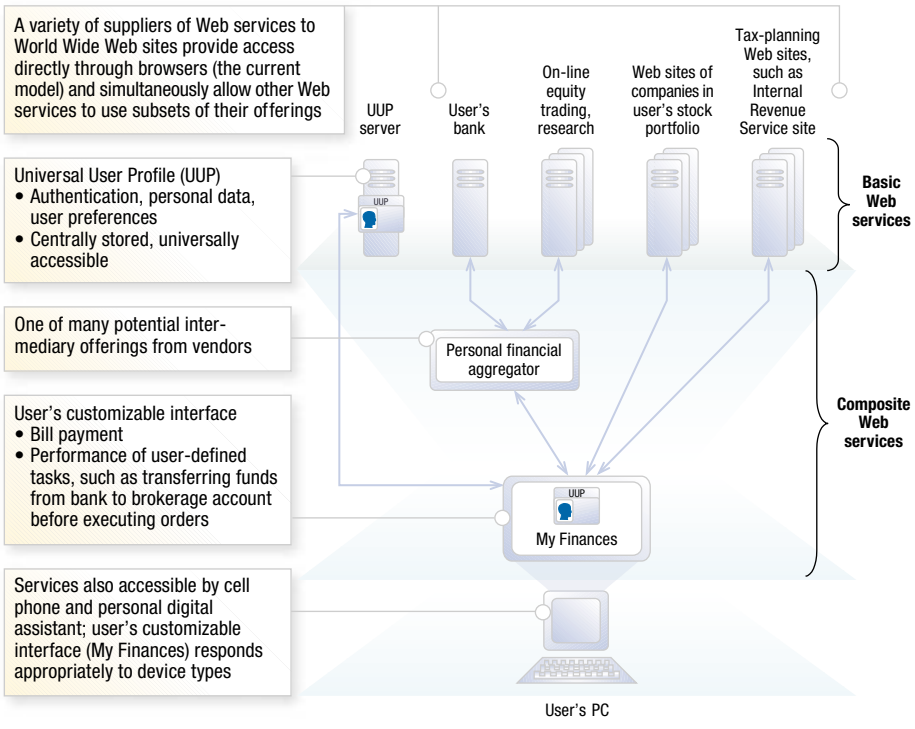


What's in it for users?

Web services not only promise consumers a more consistent and uniform experience but also provide them with means to integrate and personalize data and services from diverse sources (Exhibit 4). Today, for example, a consumer who wants to research a stock, trade

EXHIBIT 4

The user experience



on-line, and plan the tax strategy for that transaction might have to visit several World Wide Web sites. Web services, by contrast, would bring best-of-class offerings direct to the user's desktop. New intermediaries may integrate and deliver these services—some free, some fee based—from a number of vendors.

Why do Web services matter?

When and if Web services reach their full potential, they promise to make significant changes in the way companies do business. Besides reducing the cost of integrating information systems, Web services could further fragment value chains and make brands and reputations even more important weapons for retaining customers.

Faster, cheaper integration

Web services will cut the time and money needed for systems integration (Exhibit 5, on the next page), the single biggest IT expense of most companies. Savings of up to 20 percent are possible, mainly through reductions in the cost of developing interfaces among systems. Systems integration

EXHIBIT 5

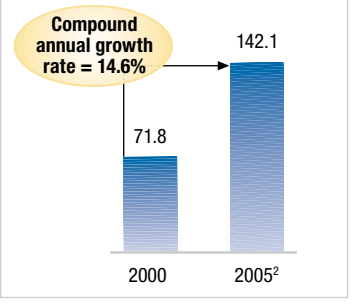
Integration at a discount

Projected impact of Web services on systems integration costs

Category	Share of cost	Fixed cost	Impact of Web services
Systems interfacing • Legacy • Packaged	40–50%	Yes	High[1]
Customization	15–20%	Yes	Low
Configuration	15–20%	Yes	Low
License	15–20%	No	Low

Possible 20% savings

Projected worldwide revenues for systems integration providers, $ billion



[1]Assumes 50% reduction in costs when Web services technology matures.
[2]Forecast.
Source: International Data Corporation; McKinsey analysis

firms may not have to worry, however, since an increase in the volume of integration projects could offset the reduction in unit costs.

New interactions

Web services may also change the way companies interact with customers and with other businesses. On the business-to-business side, the falling interaction costs and greater operational flexibility generated by Web services is going to promote the unbundling of functions and activities within organizations and across supply chains. This development will in turn make it easier and more common to outsource applications, such as order fulfillment and inventory control, that are currently provided in-house by IT staffers. (The remaining IT staff of most companies will then focus on giving them new on-line capabilities and on facilitating and improving their relationships with partner companies.) The likely result: increased fragmentation of value chains and industries as well as more narrowly focused companies.

Meanwhile, Web services will dramatically affect the customer relationships of on-line business-to-consumer companies. E-tailers, e-mail services, providers of financial services, and other kinds of B2C companies stand to lose out to UUP providers, which could control direct access to customers. Companies without strong brand names or reputations could be relegated to the virtual backwaters.

Thorny questions

If past patterns hold, the future of the technology—boom or bust—will become apparent over the next 12 to 18 months. Meanwhile, companies would do well to ponder several questions:

- How can Web services reduce information technology costs and delivery times?

- What new revenue-generating services can the company offer through the World Wide Web?

- What are the new ways to interact with the company's trading partners? What threats and opportunities will emerge?

- Does the company have the organizational and IT capabilities to operate in the Web services world?

- How will each of the competing Web services architectures—for example, Microsoft.NET and Sun Open Net Environment (Sun ONE)—compare in costs, capabilities, and the ability to work within the company's IT environment, such as Windows and Unix?

Web services and the associated development tools are in their infancy and still show more promise than results. Some key standards—most crucially, those involving the rollout of UUPs—remain unresolved. UUP providers must ensure the privacy and security of their users' credit card and other sensitive information, for example, while granting access to all those (and only those) businesses that provide requested services. In addition, businesses interacting with each other must be able to specify the appropriate level of service promised to every user. Despite these uncertainties, as Web services continue to develop, they will warrant careful attention from managers. Q

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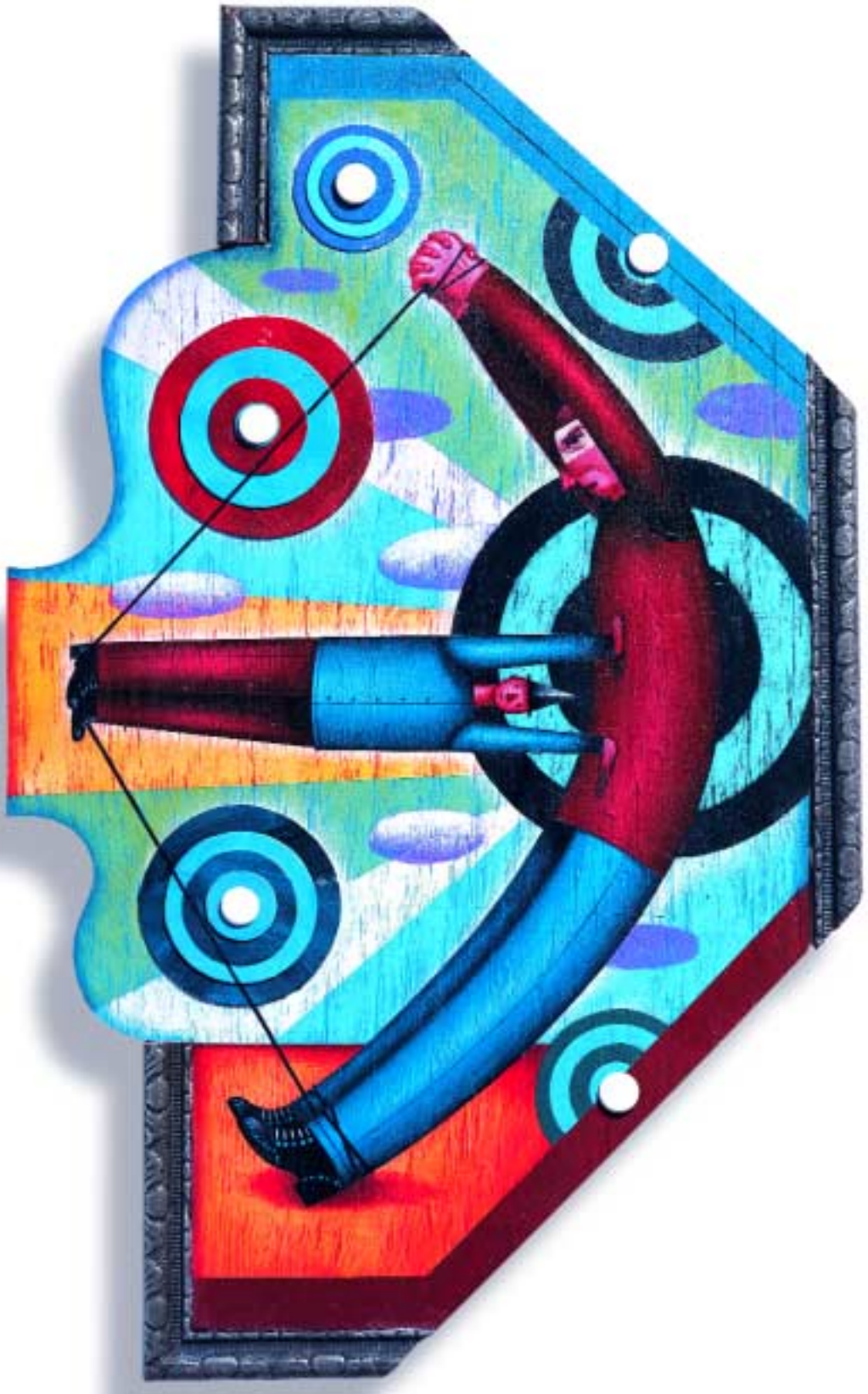


Loosening up: How process networks unlock the **power** of specialization

John Seely Brown, Scott Durchslag, and John Hagel III

Cutting-edge companies are swapping their tightly coupled processes for loosely coupled ones—making themselves not only more flexible but also more profitable.

In the quest for higher performance, what company can ignore the benefits of partnering with business specialists and of outsourcing noncore activities to focused providers? The virtues of business collaboration are clear: innovation and efficiency. Most companies seem to think that the right way to structure outsourcing is equally clear: tightly managing, across corporate boundaries, the process of producing and delivering products or services. Yet most companies also admit that such arrangements involve trade-offs. Tightly coupled processes are often inflexible. Problems with key suppliers—for instance, a plant fire that forces unanticipated delays in the shipping of products—can be crippling.

We believe that executives settling for these trade-offs have made a mistake. Companies at the cutting edge of process management handle critical cross-company processes as though they were networks rather than production lines. For core operating processes such as the management of supply chains and customer relationships and the development and commercialization of products, these cutting-edge companies have swapped their tightly coupled processes for loosely coupled ones, thereby gaining much-needed flexibility and improving their performance in the bargain.

Companies have started to unbundle their corporate structures, but few of them have unbundled the processes that span disaggregated enterprises. Most companies cling to a managerial preference for controlling their activities tightly even if they now contract for—rather than directly own—those activities. But by tightly managing the work of specialists, such companies limit the value that innovative thinking might yield. Managing their processes more loosely would permit them to unlock the full value of specialization for themselves and their partners and to gain flexibility's more strategic value, including the ability not only to make operational changes quickly but also to sculpt customer offerings.

Most companies hold fast to a strong **managerial preference** for controlling their activities tightly

Consider how these goals are achieved at Li & Fung, a Hong Kong–based trading company. Li & Fung makes no products of its own. Rather, it "orchestrates" the production of goods by others, drawing on a vast global network of highly focused providers to arrange for private-label manufacturing, primarily on behalf of US and European clothiers. For a specific product or client, Li & Fung assembles a customized set of specialized providers to handle everything from product development to the sourcing of raw materials, production planning and management, and, eventually, shipping. If glitches pop up at any stage of the intricate process along the network, the company can quickly shift an activity from one provider to another.

Such flexibility promotes high-output performance. Rather than squeeze supply chain costs by tightly integrating activities, Li & Fung gains efficiencies through the specialization of suppliers. The performance of the company has been extraordinary for its sector: Li & Fung's return on equity has exceeded 30 percent a year since the mid-1990s; 2001 revenues amounted to just over $1 million per employee.

Loosely coupled processes are the building blocks of networked companies.[1] We call businesses such as Li & Fung "process orchestrators" because we believe that the key to achievement in this field is the way companies manage processes, not how they structure and monitor outsourcing contracts or implement new Internet technologies in their supply chains.

Few companies will ever become pure orchestrators, for to do so they would have to change the nature of their businesses dramatically. Mind-sets must also shift dramatically if companies are to master process networks. None-

[1] *See* Remo Häcki and Julian Lighton, "The future of the networked company," *The McKinsey Quarterly*, 2001 Number 3, pp. 26–39.

theless, nearly every company can benefit from learning the skills of orchestrators or from converting one or two tightly coupled processes into loosely coupled ones.

A tale of two processes

Today's broad preference for the tight management of relations with partners carries an inevitable corollary: cutting the number of suppliers to a minimum. A narrow partner base makes sense given the effort involved in managing it tightly. The company specifies not only the parts it needs from its partners but also many of the activities required to produce those parts. It might spell out production steps or even get a partner to dedicate a production line, which the company would help design. To ensure that the suppliers' activities mesh tightly with its own, it might share its customer order and production data. The company's aim in taking all of these steps would be to cut costs, speed up cycles, and improve quality. But such tight integration requires resources, the attention of management, lengthy negotiations, detailed contracts, and the extensive monitoring of performance. In short, the coordination costs are steep.

By contrast, consider how a loosely coupled process operates. Li & Fung has relationships with more than 6,000 specialized companies, in 39 countries. To produce a line of garments for a customer, Li & Fung might purchase South Korean yarn that would be woven and dyed in Taiwan, send the fabric to be cut in Bangladesh, ship the pieces for final assembly to Thailand (where the garments would be matched with Japanese zippers), and, finally, deliver the finished product to geographically dispersed retailers in quantities and time frames specified well in advance.

Li & Fung could never manage this extensive array of suppliers if it had to negotiate well-defined activities with each of them. Instead, it manages the interfaces between each specialist's activity and orchestrates the entire process. By "interfaces," we mean the specifications the orchestrator defines for each milestone. Li & Fung gives the Taiwanese dyer specifications for the end product to be delivered—specifications such as the color, the conditions it must meet, and the date when the fabric must be shipped to the cutter in Bangladesh. But Li & Fung doesn't try to influence the way each specialist accomplishes its part of the process.

Having a wide network—and thus more options—provides for considerable flexibility. To meet the specific needs of a customer or even a product, Li & Fung can configure activities as though they were modules in a process. The South Korean yarn provider may be appropriate for one product line, but an

Indonesian supplier that uses different raw materials or a different production technology may be the better choice for another. A product may require three additional steps in the supply chain or two fewer steps. Li & Fung assembles the right modules for each job.

Such modular chains can be quickly reconfigured in response to unforeseen events. Following last September's terrorist attacks in New York and Washington, Li & Fung quickly shifted production from high-risk countries to lower-risk ones. Companies with tightly coupled processes can also re-source production, but not quickly—and only at considerable expense. Li & Fung, on the contrary, moved hundreds of millions of dollars in merchandise in just seven days.

Li & Fung, ensuring its bargaining power, takes 30 to 70 percent of each specialist factory's production. The company monitors quality by verifying that end-product specifications have been met at every milestone of the process. Thanks to the network's very wide span, Li & Fung can leverage global economies of scope to deliver high-quality, low-cost products to its customers reliably and quickly.

Not just for orchestrators

As a pure orchestrator, Li & Fung's only product is the process. Companies that make products or sell services can also use loosely coupled processes to enhance the economic performance of their offerings and to gain flexibility. Two companies that have done so are Nike and Cisco Systems.

Nike's focal point, like Li & Fung's, is the supply chain process. The athletic-shoe business is fraught with uncertainty. Rapid shifts in fashion and changes in tariffs and trade regulations can affect profits significantly. To manage these risks more successfully, Nike developed a loosely coupled supply chain, based largely in Asia, comprising many specialists and logistics providers. These suppliers cover every stage of shoe production, from the sourcing of materials to the assembly of finished shoes and their delivery to retailers. Nike, broadly specifying outcomes for each milestone of the process, manages the interfaces between the suppliers' activities but doesn't attempt to micromanage the activities.

This approach lets Nike move quickly to meet business challenges. If consumers suddenly decide that they want more rubber in the soles of their shoes, for instance, Nike can quickly revamp production, steering activities toward specialists that are better at sourcing, producing, or cutting a particular kind of rubber for new designs. If tariffs on goods from one country rise, Nike shifts production to suppliers in another.

As for Cisco, it has taken a loosely coupled approach to managing a different process: customer relations. The company orchestrates thousands of specialized product and service partners that offer value-added services to its customers. The medium for these interactions is Cisco Connection Online (CCO), an Internet-based platform developed by Cisco to provide customers with detailed information about its products. The site also lets customers shop for related products and services offered by Cisco's outside partners. (A related offering might be software or specialized integration services that help a customer connect Cisco's products to its existing communications networks.)

Through certification and training, Cisco manages the interfaces of its partners to ensure that prospective ones meet its criteria for delivering value to customers.

The value of specialists

Cisco's specialist network provides customer support activities that extend across the full life cycle, from initial contact to product upgrades. Cisco couldn't provide this support effectively on its own, because it could never hope to develop offerings as innovative as many of those from its partners. In this context, Cisco too specializes—in orchestrating complex sequences of support activities.

The power of loosely coupled processes is their ability to optimize the value of specialization and to avoid the compromises inevitable with tightly coupled processes. Partners in tightly coupled processes may be very good at some activities but can't be best of breed at everything they are called on to do. Loosely coupled specialists can, and they are also more likely to innovate, because they focus on their distinctive capabilities and shed those activities that are better performed by others.

Specialists have greater freedom to innovate when their orchestrators focus on outcomes, not on the way the job gets done. Of course, orchestrators may define some of the specialists' activities—prohibiting the use of child labor, for instance, or specifying how the specialist should manage waste products. The essential point is that specialists have strong incentives to

innovate—and to perform well within the network. Both Li & Fung and Nike, for instance, reward high-performing specialists by giving them more business.

All of this suggests that process networks are playing a very different numbers game. Instead of limiting the number of partners, executives learn that the network's value to customers and participants increases as the number of participants grows.[2] The more providers the network includes, the more opportunity each has to specialize.

Executives learn that the value of the network to its customers and participants **increases** in tandem with the number of participants

The value gained by unlocking the power of specialization outweighs the cost of coordination with partners. Coordination costs per supplier are far lower when relationships are managed loosely. Orchestrators, however, may incur aggregate coordination costs as high as or higher than those of companies that manage suppliers tightly, because orchestrators work with so many more of them. Yet the costs of coordination for loosely coupled processes, unlike those for tightly coupled ones, don't rise exponentially as more providers join a network. Thus the benefits of expansion, to both customers and participants, far outweigh the additional coordination costs.

Still, such a network eventually faces a test: it must continue to grow so that service providers within it can continue to expand their own businesses. It will be easier for open process networks, such as the one orchestrated by Li & Fung, to meet this need, since they can potentially serve all customers in a particular industry. Nike and Cisco operate closed process networks focused on their own products. Ultimately, the networks of these companies will grow only as fast as they do.

For this reason, open process networks over time will probably tend to prevail against closed ones. Yet even Li & Fung will need to find new sources of growth. The company is now broadening its role as a supply chain orchestrator by embracing a broader range of high-volume, time-sensitive consumer goods, including fashion accessories, toys and games, sporting goods, home furnishings, handicrafts, shoes, travel goods, and tableware.

[2]This phenomenon is often referred to as the "network effect." The on-line auction site eBay, for instance, benefits from network effects that put it far ahead of rivals. Sellers of goods gravitate to sites that offer the largest number of buyers, and buyers flock to sites with the greatest number of choices. The value of the network for participants increases as it expands. Because participants can be added to the network at no (or very little) additional cost, eBay enjoys increasing rather than diminishing returns.

Orchestration skills

Orchestrators, like suppliers, specialize. Their role in the network requires distinct skills: they must be adroit at recruiting the right providers, configuring the right modules, and overseeing the performance of the network (Exhibit 1). Their ability to do so begins and ends with a deep knowledge of the network's operations.

Orchestrators must have "both an insider's knowledge of problems [of a process] and the authority to develop appropriate solutions," according to John Suh, the CEO of StudioDirect, Li & Fung's US-based e-business subsidiary, which focuses on serving small and midsize retailers. "This requires mastering many details . . . in short, being a savvy operator. The smart novice can't hope to succeed." Suh says that Li & Fung has changed from a smart generalist into a highly specialized operator with deep expertise in its domain.

EXHIBIT 1

What orchestrators do

1. Recruit participants into process network
2. Structure appropriate incentives for participants; encourage increasing specialization over time
3. Define standards for communication, coordination
4. Dynamically create tailored business processes—involving multiple service providers—to meet customer needs
5. Assume ultimate responsibility for end product
6. Develop and manage performance feedback loops to facilitate learning
7. Cultivate deep understanding of processes and practices to improve quality, speed, cost-competitiveness of network continually

Experience has taught Li & Fung's managers the strengths of each service provider. To improve the performance of the network continually, the company's managers give detailed performance feedback to the specialists. Faltering providers may be dropped from a project or, over time, from the network. Li & Fung's managers are constantly looking for new specialists and evaluating the experience and skills of each prospect to determine if it can meet its milestone in the process. The company's managers have developed such thorough insights into the operations of their network that they can assess a prospective provider just by walking through its plant.

Nike learns about its providers' capabilities by sending employees on three-year stints to work with selected providers. The Nike visitors don't direct the partners' activities; they learn how the partners operate so that Nike can make smart choices about which ones to use for particular tasks.

Loosely coupled technologies

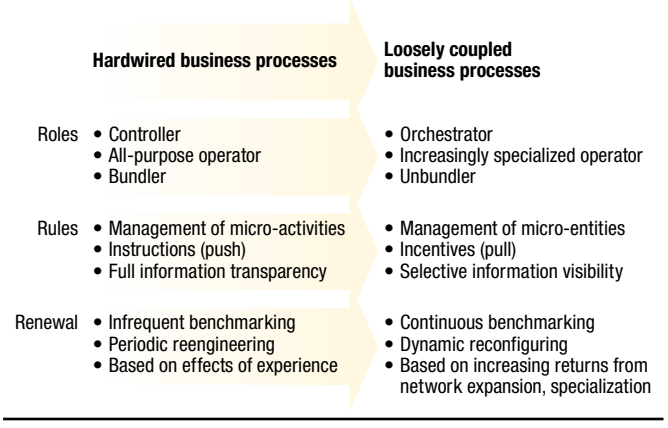
A lot of executives believe that technology will make processes involving collaborators more flexible. Companies can communicate more information

using Internet technologies, and this, many believe, will loosen up tightly coupled processes.

But fostering and capturing the value of specialization isn't a technology project. While Cisco uses its sophisticated Internet technology as a platform for its network of providers, Li & Fung uses telephones and fax machines to communicate with small enterprises in remote areas such as rural China. Management, not technology, is the key to unlocking the value in processes. Technology can improve communications among business partners but doesn't fundamentally change how they manage those processes.[3]

EXHIBIT 2

Cutting the wires



Nonetheless, a new technology called Web services (*see* "When computers learn to talk: A Web services primer," in the current issue) could increase the economic value that can be generated from processes and accelerate the development of process networks. Web services are analogous to loosely coupled business processes: the technology is essentially a bridge, constructed with open standards, that permits businesses to connect their existing systems to other businesses' systems more flexibly and at lower cost.

Innovative market leaders already use Web services to connect partners or customers operating very different technology platforms. Both Robertson Stephens and Wachovia, for example, use Web services to gather investment-related information from Thomson Financial, enrich the information with their own analysis, and then distribute research reports to customers. It would be extraordinarily expensive to reformat incoming data by using conventional technology, which is also inflexible: if a vendor changed its under-

[3]For more evidence that management innovation—sometimes aided by technology, sometimes not—drives value, *see* William W. Lewis, Vincent Palmade, Baudouin Regout, and Allen P. Webb, "What's right with the US economy," *The McKinsey Quarterly*, 2002 Number 1, pp. 30–40, which highlights the findings of a comprehensive McKinsey Global Institute study of US labor productivity from 1995 to 2000. The study concluded that product, service, and process innovations accounted for the bulk of US productivity growth during those years and that more intense competition diffused such management innovations through the economy. IT, the study found, can often be a useful tool for reorganizing core processes, but IT investments alone don't move the needle on productivity.

lying systems, buyers using conventional technology would have to reengineer the software they used to access the vendor's data. But many companies, as they gain experience with Web services, will realize that the technology can help them underwrite a very different approach to the management of business processes. These are the companies that will harness the real economic potential of loosely coupled business processes.

Managerial leaps

Executives must make tremendous managerial leaps to understand, implement, and master process networks (Exhibit 2). Consider the way these networks force executives to change their most fundamental views about process management.

Loosely coupled business architectures will likely emerge gradually, beginning with modest initiatives designed to reap near-term economic benefits. Cisco, for instance, launched CCO to market products to customers, not to manage third-party resellers. But over time, the channel to customers became a platform for orchestrating the partners' value-added services.

While relatively few companies could or should aspire to turn themselves into full-fledged orchestrators (Exhibit 3), we believe that most of them can benefit by working with a handful of their current top-tier suppliers to develop one or more of three basic orchestration skills. The first is the ability to support business processes by aggregating and disseminating selected information across a number of enterprises. Financial-services companies seeking to give customers more information that is most effectively tapped from specialist providers may choose to develop this skill, as many of the early adopters of the Web services technology, such as Robertson Stephens and Wachovia, are trying to do.

EXHIBIT 3

Could you become an orchestrator?

- ✓ Do you have close relationships with customers who honestly reveal their needs, how well their needs are being met, and how those needs are likely to change?
- ✓ Does your organization have detailed knowledge of the broad set of practices and core processes being coordinated?
- ✓ Do you have close, trusting relationships with partners that possess the specialized skills needed to deliver a product or service with a competitive advantage?
- ✓ Do you understand the economics and profit-and-loss hurdles for all partners and customers?
- ✓ Can you create incentives to expand dynamically and move the process network toward increased specialization and continuous improvement over time?

Community building is the second skill. Companies may want to marshal their partner relationships as a way of adding value for their customer base. They must adroitly identify and bring together small communities of business partners with complementary skills and products, as Cisco did when it formed its network and as many other technology companies are

doing. In financial services, Charles Schwab and Intuit are developing communities of specialized financial-information partners and other companies to provide investment services for customers.

Finally, companies may choose to focus on the third skill—the setting of business standards—by learning how to define standards for coordinating activities across a number of enterprises and how to get these standards accepted. Dell Computer, GM, and Merrill Lynch, for instance, are tailoring the broader Extensible Markup Language (XML) standard to address more specifically their business coordination needs. To give one example, the employees of business collaborators, translating on the fly, now usually define the shared meaning of business terms. In apparel, say, what does "red" mean? If a company specifies prices, does this mean prices per unit, per box, or per truckload? To automate these connections among companies, the shared meaning of such terms must be codified.

Companies that focus on setting standards, while not actually coordinating their business processes, are learning the capabilities and economics of specialist businesses. They are also beginning to understand the challenges involved in building and maintaining loose relationships based on trust and long-term incentives, not on the control of activities within a process.

Many companies also could gain the advantages of specialization by transforming tightly coupled customer-management or supply chain relationships—even those with only a top few tiers of suppliers—into loosely coupled ones. Cisco, which is now beginning to establish a number of loosely coupled relationships, in effect manages a hybrid "tight-loose" supply chain. Its relationships with contract manufacturers are integrated, well-defined, and hardwired with expensive technology links. But it has more loosely coupled relationships with many small second- and third-tier component suppliers that lack the ability and the incentive to adopt the expensive technology that would couple them tightly to Cisco.

Few companies will shed their traditional core businesses to become pure process network operators. Orchestrators are "learning organizations" with privileged relationships; their employees may never touch a product. Such organizations mobilize other companies' assets and capabilities to deliver

value to customers. Their primary business focus will be identifying new arenas for them to target with their growing process networks. Most businesses can realize significant near-term savings by adopting the skills of orchestrators or transforming processes. Even greater value lies in unlocking the heightened potential from specialization by taking a new, looser approach to managing intercompany processes. Q

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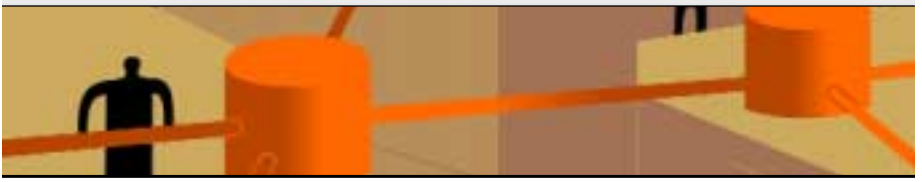

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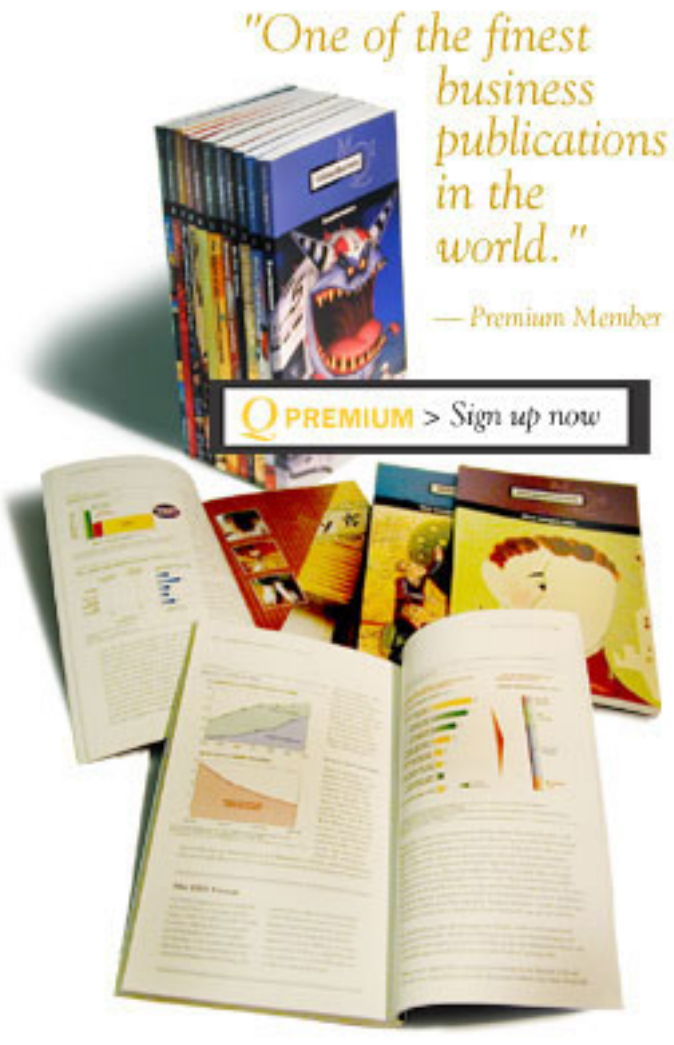

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