

The Internet's Effect on Business Organization: Bane or Boon for Developing Asia?

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S U M M A R Y Because of the speed, flexibility, and efficiency that it offers, the Internet has become the means for conducting growing numbers of transactions between suppliers and large international corporations. In this way, the Internet has opened new markets to developing Asia and has accelerated the diffusion of knowledge throughout the region. It thus creates unprecedented opportunities for developing Asian countries because it can remove barriers to their full participation in the new global economy. But the Internet can also exacerbate current inequalities. Access to the Internet is an issue, as is Asia's dependence on foreign information infrastructures. Weak knowledge bases mean developing Asian countries lack the sophisticated management systems they will need to become equal players. To address such challenges and take advantage of the benefits the Internet offers, particularly knowledge diffusion, Asian governments and companies must make fundamental changes in their policies and in the way they do business.

The Internet can cut costs across all stages of the production process

Since the late 1970s, developing Asia has been a part of a progressive integration of national economies into what are known as global production networks—businesses worldwide that provide large international corporations with low-cost components, skills, and services. The geographic coverage of such networks has expanded from Korea, Taiwan, and Hong Kong to the ASEAN region (primarily Singapore, Malaysia, and Thailand) and, more recently, to China and India. These networks connect developing Asia's geographically dispersed, specialized centers for major export industries such as electronics, textiles, and automobiles. They give the world's leading international corporations, referred to here as "network flagships," a fast and cost-effective way to utilize the region's capabilities. For Asian countries, participation in global production networks has provided not only new markets but also opportunities to acquire new knowledge through exposure to modern management approaches and technologies.

More recently, however, global production networks are being transformed by information technology, especially the Internet. By reducing the cost and accelerating the speed of communication, the Internet has enabled network flagships to manage global production networks in a far more efficient manner. The key is the flexibility and open-ended structure of the Internet, which allows additional participants to be added at any point, creating almost unlimited opportunities for outsourcing and for the diffusion of knowledge. These transformations are redefining the global geography of production and innovation.

The transformations triggered by the Internet in the management of global production networks pose fundamental challenges as well as dramatic new opportunities for developing Asia. Given the vast potential of the Internet to transform business organization and to enhance productivity, no country can afford to remain on the sidelines. This is especially true after the financial crisis of 1997 and the resultant pressure on Asian countries to modernize production and innovation systems.

BENEFITS OF THE INTERNET

The possible benefits from an Internet-enabled transformation of business organizations are enormous. The Internet provides ample scope for cost reduction across all stages of the production process both for the flagship company and Asian suppliers. Procurement costs can be reduced by means of expanded markets and increased competition through Internet-enabled online procurement systems. Another cost-reducing option is to shift sales and information dissemination to lower-cost channels. By moving customer service and technical support online, for example, Cisco Systems, a leading networking equipment vendor, increased productivity by 200–300 percent, resulting in savings of \$125 million in customer service costs.

The Internet can also drastically accelerate speed-to-market by reducing the time it takes to transmit, receive, and process routine business communications such as purchase orders, invoices, and shipping notifications. The Internet has greatly expanded the scope for information management: documents and technical drawings can be exchanged in real time, legally recognized signatures can be authenticated, browsers can be used to access the information systems of suppliers and customers, and transactions can be completed much more quickly.

A further advantage can be found in the low cost of expanding a functioning network. While establishing a network requires large upfront fixed investment costs (purchasing equipment, laying new cable, training), the cost of adding an additional user to the network is negligible. The value of the network thus increases with the number of participants.

An especially important benefit is a reduced trade-off between the richness and the reach of information (Evans and Wurster, Ch. 3). Until recently, more complex, detailed, nuanced information could only be shared by a very small number of people; increasing the "reach" of such information-sharing requires a reduction in "richness." The Internet provides far greater opportunities to share rich information

Access to the Internet: The Global Digital Divide

	Percentage of Total Internet Population	
	1999	2000
North America and Europe	80.2	72.5
North America	57	45
Asia*	15.8	22.6

Source: Nua Internet Surveys (www.nua.ie)

*Includes Japan; these percentages thus do not fully reflect the severity of the divide between developing Asia and the industrialized West.

with a far greater number of people. For developing Asia, the Internet provides a historic opportunity to benefit from enhanced international knowledge diffusion.

CHALLENGES FOR DEVELOPING ASIA

Economic benefits for developing Asia will not occur automatically from the new information technologies. One major problem is an emerging global digital divide between those who have and those who do not have access to the Internet. Developing Asia, with over half of the world's population, accounts for a mere 7 percent of the total Internet population. This is projected to increase to no more than 9 percent by 2003 (IDC, www.idcresearch.com).

But an equally serious challenge is adapting Asian economic structures and institutions to the relentless pace of change now taking place. Recent advancements in information technology will generate turmoil, growing uncertainty, and social dislocation. In one indication of the seriousness of this, the Organization for Economic Cooperation and Development (OECD) is now focusing its efforts on changes in policies and economic governance that will be necessary to respond to these dramatic changes. The severity of coming economic problems was captured in testimony before the U.S. Congress by Andy Grove, former chairman of Intel and one of the forces behind these changes. The Internet, Grove observed, "is about to wipe out entire sections of the economy."

Unless politicians start moving "at Internet rather than Washington speed," America may see "a repeat of the social disaster that followed the mechanization of agriculture" (*Economist*, October 1999). This warning to the world's richest country is even more ominous for developing Asia and highlights the need for concerted action.

There is currently a huge gulf between Asia's excellence in manufacturing and its management of complementary information or knowledge. Manufacturing in Asia combines state-of-the-art, computer-based factory automation with sophisticated work organization. Information management in Asia, however, remains inefficient. For instance, in their transactions with network flagships, many Asian suppliers continue to rely on informal information systems based on personal contacts through meetings, phone calls, and faxes. Further, computer-based information systems remain fragmented, frequently constrained by an incompatible mix of hardware and software packages that are unable to communicate with each other. Such inefficiencies have created a gap between Asia's information management capacities and the increasingly demanding information requirements of manufacturing, supply chain management, and customer relations. To sustain its industrial growth, developing Asia needs to close this gap as quickly as possible. The challenge is to embrace Internet-based technologies and organizational innovations in order to participate more fully in Internet-based global production networks.

Developing Asia accounts for a mere 7% of the total Internet population

GLOBAL PRODUCTION NETWORKS

Global production networks have become such an important organizational innovation because they can integrate the dispersed supply and customer bases of the multidivisional, multinational network flagships. A global production network encompasses global relationships established to meet the needs of a flagship's business activities from research, development, and product design to manufacturing, distribution, and support services. It includes the flagship's subsidiaries, affiliates, subcontractors, suppliers, and service providers as well as its partners in strategic alliances.

Global production networks give rise to hierarchical forms of firm organization because participants differ in their access to the networks and in their position within them. Participants form a layered hierarchy ranging from the large multinational flagship companies that dominate the networks down to a variety of smaller local participants. Each layer faces very different challenges. The flagship at the head of a network provides strategic and organizational leadership. It breaks down the chain of production into a variety of discrete business functions (such as procurement, sales and distribution, and research and development) and locates them where they can be carried out most effectively, where they will improve access to resources and capabilities, and where they will facilitate penetration of important growth markets.

The strategy of the flagship company thus directly affects the growth, the strategic direction, and the network positions of lower-end participants, such as specialized suppliers and subcontractors from developing Asia. The flagship derives its strength and superior capacity for generating profits from its control over critical resources and capabilities and from its capacity to coordinate transactions between different network participants. One critical capability is its access to the knowledge and its control over the intellectual property rights (e.g., patents, copyrights) needed to set, maintain, and constantly upgrade global standards in particular product markets. Maintaining product standards requires continuous improvements in product features, functionality,

performance, cost, and quality, and it is these activities that flagships increasingly outsource. In this way, they disseminate knowledge.

KNOWLEDGE DIFFUSION

Knowledge diffusion through global production networks can propel further participation and innovation: as a global production network increases the length and complexity of a firm's production process, new gaps and interstices are created that can be filled by small, specialized suppliers. While in some cases such network entry may be short-lived, it need not be. Over time, outsourcing requirements may become more demanding and require suppliers to upgrade their capabilities. By transforming themselves from simple contract manufacturers to providers of integrated service packages, suppliers may increase their ability to become longer term network participants.

Once a network supplier successfully upgrades its capabilities, it will likely be to the flagship's advantage to outsource more demanding activities to this supplier. This in turn creates a need for the flagship to disseminate complementary knowledge that the supplier needs in order to deliver the contracted services. The flagship, for instance, may need to share certain key features of the design of a particular product or the source code of a particular software program. For the supplier, this opens up yet another round of knowledge diffusion and upgrading.

The main drivers of knowledge diffusion are the increasingly demanding requirements—most notably speed-to-market and cost containment—for companies to remain competitive. In the electronics industry, for instance, product lifecycles have been cut to six months or less, so it has become crucial to get products to market quickly. For this reason overseas production frequently begins soon after a new project is launched, and this is possible only if design information is exchanged freely between the network flagship and its overseas affiliates and suppliers. To speed the introduction of new products and to accelerate production, engineers across a global production network must participate regularly in the flagship's product design process.

Flagships disseminate knowledge by sharing intellectual property rights with their suppliers

More than 99% of the international Internet traffic in Asia is routed through the United States

The flagship's move to global outsourcing may erode its domestic base of specialized suppliers. The collective knowledge base that formerly characterized the flagship's home locations may have migrated to overseas sites. The semiconductor industry provides a typical example. Since the 1970s, leading American producers have moved most of their final assembly and testing to Asia, with the result that knowledge has had to follow. Over time, much of this knowledge has moved out of individual subsidiaries and has become widely diffused across different production sites, especially in developing Asia. In many ways, then, global production networks are facilitating the dissemination of new business-related knowledge throughout the region.

Participating in Global Production Networks: An Upgrading Success Story

Solectron, the world's largest electronics manufacturing services company, was founded in 1977 as a tiny contract manufacturer of electronic controllers for solar energy equipment. Solectron only began to grow once it moved into circuit board assembly for the PC industry, acting as a low-cost buffer for the periodic capacity deficits of large electronics equipment producers.

However, because entry barriers in this business are low, the market was soon inundated with lower-cost competitors. To survive, Solectron had to focus on quality and speed, which required it to make substantial investments in assembly automation, leading-edge processing technology, and training.

Making these investments was a high-risk strategy, but it paid off because it allowed Solectron to move up the ladder in the contractor hierarchy to become a preferred supplier to leading electronics companies. This in turn required more investments in overseas facilities to provide manufacturing and design services where needed.

Since the late 1990s, the company has further upgraded its capabilities, and it now defines itself as a global supply-chain facilitator. With bases not only in California, Massachusetts, and North Carolina, but in China, Taiwan, Malaysia, France, Germany, Sweden, Mexico, Hungary, and Romania as well, Solectron can now act as a supplier to network flagships almost anywhere in the world.

(www.solectron.com)

THE INTERNET AND ASIA'S FUTURE: TWO SCENARIOS

It is a commonly held view that the Internet will act as a powerful equalizer, restoring an even playing field to the global marketplace. But for developing Asia, as the global digital divide indicates, this is not the case. How will the increasing use of the Internet to manage global production networks affect the diffusion of knowledge internationally? Will developing Asia be able to take advantage of new opportunities? Pessimistic and optimistic scenarios for the future can both be envisioned.

The Pessimistic Scenario. There are aspects of the Internet that may exacerbate the global knowledge divide. Access to Internet-based technologies and organizational innovations is highly unequal at present. Outside of the industrial heartlands of the United States, Europe, and Japan, there are fundamental constraints on Internet access, on methods of connecting to it, and on users' capacity to receive and absorb information. In Asia, for instance, there is only one direct Internet link between two Asian cities: Tokyo and Seoul. More than 99 percent of the international Internet traffic in Asia is routed through the United States.

This has some disconcerting implications for the region's development and welfare. Asia's current dependency upon the U.S. information infrastructure will slow its access to broad bandwidth, which is essential for reaping business benefits from the Internet. Further, it constrains the region's capacity to adjust the evolving Internet architecture to meet the specific needs and capabilities of its own firms and public sectors. Finally, this dependency will make it more difficult to develop a strong regional pool of hardware and software companies to provide networking equipment.

Thus far Japan has failed to act as the region's engine for the rapid spread of Internet-based changes in business organization. This is primarily due to Japan's weak economy, but there are also important structural constraints at work. The Japanese system is resistant to change, and this is amplified by its sluggish

political system, high Internet-access charges, and its lack of a standardized payment system.

Even within developing Asia itself substantial disparities are now emerging. Most notably, Korea's e-business market is projected to be 2.5 times the size of China's by 2005, and larger than the combined markets of Singapore, the rest of Southeast Asia, India, and Hong Kong. This reflects Korea's higher stage of development, its broader knowledge base, and its more robust national information infrastructure.

In some ways the Internet may actually increase inequality by further concentrating power in the upper strata of business networks. Network flagships and first-tier suppliers are under increasing pressure to reduce the high costs of network coordination that result from multiple sourcing, duplication of tasks, and excess capacity. In addition, suppliers are now confronted with much more demanding requirements in terms of performance, efficiency, and speed. All of this will be disastrous for lower-tier suppliers who lack the financial muscle and technology to respond to these pressures. The Internet may also increase network entry barriers: it facilitates a shift from partial outsourcing, which covers the nuts and bolts of manufacturing, to systemic outsourcing, which includes knowledge-intensive support services and calls for capabilities that lower-tier network participants may not possess. We may therefore see an erosion of the broad base of the network pyramids—many of the smaller, lower-tier suppliers of developing Asia may be pushed out of business.

The Optimistic Scenario. Alternatively, there are strong considerations that argue for a more optimistic view. Placing global production networks on the Web creates new entry opportunities for smaller players, providing them with powerful channels for knowledge outsourcing and capability development. Electronic data interchange (EDI), the predecessor of Internet-enabled e-business, was a useful tool but was too expensive for smaller firms. In the United States, while 95 percent of Fortune 500 companies used EDI extensively, only 2 percent of firms overall could afford to do so. The Internet is likely to reduce such barriers by reducing the costs of communication.

Reduced access costs will enable smaller firms in developing Asia to participate in Internet-enabled global production networks while outsourcing most aspects of their information management. There are service providers that offer fee-based access to Internet resources for individuals and companies. Website design and maintenance can be outsourced to specialized third-party companies that can reap economies of scale and scope, while application-service providers offer, on a subscription basis, important applications such as enterprise resource planning and the management of human resources, supply chains, and customer relations.

The opportunity to outsource can make a critical difference, since most Asian suppliers to global production networks have little knowledge concerning information management. Many do not possess the necessary technology and have been handicapped by the financial crisis. They lack the financial resources, the human resources, and the knowledge to develop the necessary critical services in-house. For example, the cost of building and maintaining an e-commerce website averages between \$500,000 and \$2.5 million per year (plus expenditures for training), well beyond the means of small and medium-sized enterprises. Outsourcing such services can thus provide the missing link to reaping the benefits of network participation, especially for lower-tier suppliers in developing Asia.

Another important argument for the optimistic scenario considers the impact of the Internet on the diffusion of knowledge. The Internet not only provides rapid and lower-cost access to information; it can also reduce the friction of time and space for the exchange of knowledge, far surpassing earlier generations of information technology. In principle, closer and smoother interactions can be established between distant industrial sites that are connected within global production networks. In this way, the Internet may enhance the potential for learning and innovation among participants by introducing interactive and real-time transactions or other forms of communication that connect participants—buyers, sellers, designers, production managers, and so on— instantaneously, creating virtual teams that can

Outsourcing website services can make it possible for even lower-tier suppliers to participate in production networks

engage in interactive learning across great distances. With the transition from EDI to the Internet, all network participants can now interact with each and every other participant. For each of these different interactions, it is possible to customize information appropriately. This offers the possibility of increased exposure not only to modern technologies but also to the complex interactions between different stages of the production chain. For suppliers from developing Asia, knowledge diffusion is the key to their becoming innovators positioned to participate actively in the global knowledge creation of the network flagship.

POLICY IMPLICATIONS

While placing global production networks on the Web may create new opportunities for developing Asia to acquire valuable knowledge, benefits will not come automatically or easily. Differences in institutions and their particular stages of development can place significant legal and regulatory constraints on the international diffusion of knowledge. Additional critical obstacles are the massive investments required to develop local skills and human resources and to establish regional Internet backbone networks to facilitate access to broad bandwidth.

There is an obvious need for public policy responses. Participating in Internet-enabled global production networks presents policy challenges in three areas, which can be identified as readiness, social impact, and knowledge diffusion. Readiness refers to challenges to a country's capacity for participating in networks and benefiting from that participation. This engages issues in several areas, including ease of access to national and international information infrastructures and the variety of available linkages; the development of skills and human resources; the willingness to adjust legal frameworks, regulations, and incentives; an ability to change systems of com-

petition as well as national trade and investment policies; and finally the presence of policies that will foster the strong knowledge-intensive support services (including venture capital) that are essential for a successful transition.

The second challenge is to be found in the area of social impact, particularly the socially disruptive consequences that may result from turmoil in production and innovation systems due to the spread of the Internet. Key factors here are the anticipated further decline of once-thriving industries and regions, unemployment, and a resulting erosion of skills and knowledge bases.

The challenge of greatest importance is that of developing national knowledge bases and systems of knowledge diffusion. It is now widely recognized that knowledge and innovation play a critical role in economic development, and today developing countries greatly depend on international knowledge diffusion to compensate for the weaknesses of their domestic knowledge bases. Increasing use of the Internet to manage global production networks accelerates the diffusion process and may eventually reduce this dependence.

This raises the closely related problem of how to ensure that the knowledge acquired by individual local network suppliers will be diffused throughout the local economy. Firms do not grow in isolation but rather emerge from and develop within industrial clusters made up of larger populations of specialized enterprises. This suggests that international knowledge diffusion through Internet-based global production networks will work only if it is supplemented by a strong capacity at national levels to absorb, adapt, and improve upon the disseminated knowledge. Asia's long-term development will therefore require the growth of broad domestic knowledge bases together with international knowledge linkages. This will perhaps be the greatest challenge for developing Asia.

Knowledge diffusion through the Internet requires a strong capacity to use the knowledge at the national level

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