The Internet Revolution

A Global Perspective

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Introduction

The Japanese economy is facing its longest period of stagnation since the 'bubble' burst in 1990, and is experiencing its poorest performance in terms of growth and unemployment in the post-war period. This period is referred to as the 'lost ten years' as the Japanese economy failed to adjust itself to shifting economic trends. As a result, it lags considerably behind the general trend towards the information society.

This is clearly evident in data on the Internet and e-commerce. It is estimated that the number of Japanese Internet users was about 27 million at the end of 1999, compared to the USA's 163 million, and the EU's 70 million. As for the Internet penetration ratio, the USA is about 40 percent, ranked 5th in the world, and the UK 24 percent. For Japan, on the other hand, it is 21.4 percent and ranked 13th, the lowest of the OECD economies.[1] According to the survey carried out by the Electric Commerce Promotion Council of Japan (ECOM), the size of e-commerce, business to business (BtoB) as well as business to consumer (BtoC) is as summarised in Tables 1.1, 1.2a, and 1.2b. Although Japanese e-commerce has achieved remarkable growth, it still lags behind the USA, and the gap seems to be growing.

The long stagnation in the 1990s occurred as the Japanese economy entered a stage of stable, but low growth, with an aging population and in a period of globalization. The Japanese economic system was formed during the rapid growth of the 1960s, and is based on the assumption of continuous economic growth. Once the Japanese economy matured and entered a stable growth era, it resulted in the collapse of the assumptions on which the system was based. The old basis, which had been a source of strength, no longer provided any positive effect. As will be discussed later, the success of the Japanese economy in the 1970s and 1980s was due to the "Japanese system," which was based on economies of scale or economies of scope. Since the 1990s, the efficiency of the system has come from "economies of network," which the Japanese system

Table 1.1 *The size of Japanese e-commerce, 1999–2005 (US$ billion)*

	1999	2000	2001	2002	2003	2004	2005
BtoB	–	220	360	510	670	870	1,110
BtoC	3	8	17	34	56	94	133

Source: ECOM.

Table 1.2a *Comparison of e-commerce in Japan and the USA: EC ratio of BtoB, 1999–2005 (percent)*

	1998	1999	2000	2001	2002	2003	2004	2005
Japan	1.5	–	3.8	6.1	8.5	11.0	14.0	17.5
USA	2.5	–	4.9	7.1	9.7	13.1	17.9	23.1

EC ratio denotes the share of e-commerce to the total charges.
Source: ECOM.

Table 1.2b *Comparison of e-commerce in Japan and the USA: EC ratio of BtoC, 1999–2005 (percent)*

	1999	2000	2001	2002	2003	2004	2005
Japan	0.1	0.25	0.56	1.1	1.9	3.1	4.5
USA	0.6	1.37	2.16	3.16	4.25	5.51	6.99

Source: ECOM.

is not structured to exhibit, and this has led to the low penetration rate of the Internet and e-commerce.

In what follows, we will focus on Japanese economic systems in the areas of employment and production, which are fundamental to Japanese international competitiveness. We then discuss the source and importance of economies of network in the age of the information society. We make a comparison with the US economy, which has an entirely different economic system, and show how the US economy has changed to take advantage of economies of network. Finally, possible reforms of the Japanese system will be suggested.

Economies of network[2]

Definition

A network is defined by nodes and arcs: in economic terms, the former are agents and the latter are channels connecting the agents. Firms, consumers, governments, organisations, and groups of nations such as the EU and APEC are examples of nodes, and telecommunications cables, roads, railroads, airlines, and electricity cables are arcs.

Economic agents connect to a network to receive a service from it: by using a telephone we can talk to someone in a distant place. The merit of subscribing to this service is measured in terms of utility. In addition to direct utility, agents receive extra utility through the network; the more agents that participate in the network, the more utility they gain. This is the definition of economies of network, or network externality. Externality has the standard economic meaning where one person's utility is affected by the action of others.[3] In the business world, economies of network are widely recognised, and competition for subscriptions in the broadcasting, newspaper, and telecommunications industries are typical examples.

A network gives rise to negative as well as positive externalities in the form of congestion. This commonly occurs in a network with limited capacity such as telecommunications and public utilities. Beyond a certain level of participation, negative externality outstrips positive externality.

Basis of economies of network

Economies of network have the following three characteristics:

1 Outsourcing of managerial resources: agents can receive all kinds of information via the network that they themselves do not own. If it is costly to obtain those resources by themselves, they can purchase information from other agents, and thus specialize their own activities. This is a primitive example of efficiency through division of labor.
2 Quick response to changes in the environment: they can receive information on ongoing changes in real time and thus react immediately.
3 Economies of speed: real-time information speeds up decision-making and aids forward and strategic planning.

Economies of network stem from developments in telecommunications technology, especially digitalization and multimedia. Digitalization enables all information to be processed by computer. By combining digitalization and optic

fibers, a huge volume of information can be transmitted all over the world in seconds.

Economies of scale and economies of scope

In this section, other concepts of efficiency will be examined. First, let us consider economies of scale that are related to economies of mass production, that is, where an increase in inputs leads to a greater increase in output. In other words, with the increase of production, the average cost is decreased. Economies of scale arise from: (a) the existence of a fixed cost; (b) indivisibility of production plants; and (c) the nature of physics. Typical industries of this nature are heavy industries such as steel, chemical, and petroleum. These commonly have large-scale production plants.

Secondly, economies of scope: the cost of production of several products within one factory is less than if they are produced separately. The source of this economy is the existence of a common factor of production. Financial institutions typically exhibit economies of scope. Banking and securities are separate activities, but they are quite similar in nature, so if one branch can handle both businesses, it would be less costly than doing them separately. Numerically controlled (NC) machine tools, which are a combination of mechanics and electronics, also share factors of production, as does the assembling and processing industry that includes automobiles, household electrical appliances, and precision machinery.

Japanese employment system

The Japanese system consists of several subsystems (see Figure 1.1): (a) the employment system, which relates to households and firms; (b) industrial groups which connect firms with other firms; (c) the relation between firms and the government sector; and (d) the political relationship of the government sector with the households where there are voters. The first two of these are discussed in this and the following section.

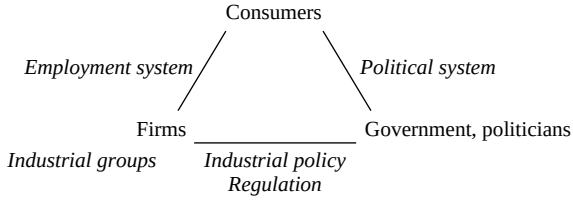

Figure 1.1 The Japanese system

Table 1.3 *Comparison of the employment systems of Japan and the Western economies*

Japanese economy	Western economies
Lifetime employment	Lay-offs
Seniority	Ability
Bonus system	Only for executives
Retirement payment	None
Company union system	Trade union system

Characteristics of the Japanese employment system

The most important system in an economy is the employment system, since it is the basis of not only economic, but also social, life. Table 1.3 compares the employment systems of Japan and the West.[4]

In the seniority system, wage levels and promotions within the firm are based on the number of years employed there. Moving firms results in loss of seniority and a lower wage level. Lifetime employment and seniority systems are meaningful when both are in effect.

Economic foundation of the Japanese employment system

The Japanese employment system is based on a long-term implicit contract relationship rather than the market mechanism of the Western economies. Without signing a formal contract, workers and firm implicitly agree that labor will be supplied and the firm will employ them until retirement. Promotions and wage levels are determined inside the firm, and it is very rare for the firm to recruit middle management, for instance, from outside the firm. Thus, firms serve as a resource allocation mechanism and create an internal labor market. A long-term implicit contract relationship does not use the market mechanism. On the other hand, in a Western firm, vacancies are usually filled by hiring from outside the firm. The allocation of human resources is based on a competitive market.

Thus the economies show a marked contrast. Which is the more efficient? We can compare them from the viewpoint of transactions and information costs in the market. In order for firms to carry out smooth transactions, they have to bear costs, among which is the cost of information. After hiring a worker, it is too late to learn then that they are not very capable. Thus time and energy is spent in examining applicants prior to hiring. On the other hand, when the firm promotes its own employees, it is well informed about their background. This merit of the Japanese employment system thus saves the cost of transaction and information.[5]

In addition, since workers remain in one company over a long period of time, it is worthwhile investing in the human resources that become the basis of productivity growth. This would be a risky investment for a Western firm, as high productivity workers can seek higher wages elsewhere. So firms only invest in non-transferable skills.

The most important mechanisms for maintaining the morale of the workers are incentives and monitoring. In a Japanese firm, the bonus system provides an incentive for workers to contribute to the profit of the firm, as the higher the profit the larger the bonus. Transactions in the market have to be monitored all the time. In a market economy, if there is no concrete monitoring system, moral hazard and adverse selection result from asymmetric information, and overcoming these problems is costly. A long-term relationship between the firm and its workers can save all these costs.

Japanese industrial group

Firms do not exist in isolation, but are interconnected with one another and form groups. Japanese firms form groups in a unique way, and it is these industrial groups that make Japanese management more competitive than those of other economies.

Horizontal group: Zaibatsu *Group*

There are six major industrial groups in this category, namely Sumitomo, Sanwa, Mitsui, Mitsubishi, Fuji, and Ikkan. The historical background of these groups can be traced back to *Zaibatsu* before World War II. When the economy was democratised under the allied forces, the holding companies of *Zaibatsu* were abolished. Soon after the end of the occupation, however, *Zaibatsu* groups reassembled around banks rather than holding companies, and each group was named after its bank. This system is referred to as the "main bank system," and those banks are called the "main bank."

The term horizontal implies that firms from all kinds of industries are members of the group. They make close connections with each other by having interlocking directors and mutual stock holding. The reasons for this formation can be summarized as follows:

1. long-term contract relationship: as mentioned in the previous section, this saves transaction and information costs. CEOs of the major firms in these groups meet regularly to exchange information and discuss new joint projects, etc.
2. risk sharing: by combining with firms of different industries they can diversify the risk of management and takeover;

3 growth sharing: one can never be certain which industry will become a major one in the future.

Since the group has firms in all industries, they can shift funds and human resources to a budding industry from the smokestack sector, and the group as a whole can adjust to new environments and enjoy continuous growth.

Vertical group: hierarchical production structure

Firms in vertical groups are interconnected by a flow of materials, parts, and final products. Typical examples are found in the assembling and processing industry. The key characteristic of these industries is that their products consist of many components. Efficiency of production heavily depends on how these parts suppliers are organized. The solution for Japanese firms is the hierarchical production system. Parts suppliers are called subcontractors or *Keiretsu*. For example, firms related to Toyota can be broadly classified as follows:[6]

1 Primary parts manufacturers: The firms in this category supply parts directly to Toyota. They supply complete items such as air conditioners, clutches, brakes, and shock absorbers. These firms are quite big, and some are independent of Toyota. Toyota owns part of their stocks and sends directors to their Boards. Toyota currently has 168 primary parts suppliers.
2 Secondary parts suppliers: Manufacturers of this type supply secondary parts such as cylinders, brake linings, and thermostats. These firms are generally medium to small. Secondary parts suppliers have a strong tie with primary parts suppliers. There are 5,437 parts suppliers in this category.
3 Tertiary parts suppliers: Firms in this category are small and depend on family labor. As subcontractors of secondary parts suppliers, their main business is of a processing nature such as casting and forging. These are labor intensive and their productivity is low. The number in this category is the largest and totals more than 40,000.

Since certain firms supply parts to firms belonging to the different categories, with the omission of double counting, its is said that Toyota has nearly 36,000 parts suppliers. Toyota, however, purchases parts directly from less than 200 firms. Next, let us compare Toyota with GM. The production structure of GM is non-hierarchical, and it has only 12,000 parts suppliers. This implies that its ratio of domestic production is much higher than Toyota's. A comparison of the two systems is summarized in Table 1.4.

How does Toyota organize its huge hierarchical structure? It can be summarized as follows:

Table 1.4 *Comparison of Toyota's and GM's systems*

Toyota	GM
Low domestic production: 20–25%	High: 40–50%
200 trade partners	Much larger
Dominates parts suppliers	Equal partner
Long-term commitment on quality and price	Market-based relationship
Parts suppliers investment in specific equipment	General equipment

1 *Kanban* method or just-in-time system synchronizes production. This is a system of delivering the right parts to the right places at the right time. This saves the cost of inventories. Because of this, most factories are located close to Toyota production factories.
2 Joint activities such as R&D, quality management (QM), and total quality management (TQM). The last two are known as *Kaizen*. Primary parts suppliers include eleven firms called the 'Toyota Group' whose businesses are related to the automobile industry. Their relationship with Toyota is so close that they engage in joint activities such as R&D and improve the quality of parts through QM and TQM. These are the basis for the high quality of Toyota products.

Toyota also has cooperative organizations of parts suppliers such as *Kyohokai* and *Kyoeikai*. Their ties with Toyota are also strong.

Economic basis of the hierarchical production system

Toyota's relationship with its parts suppliers can be explained by a long-term implicit contract. Once Toyota opens trade with a certain supplier, it is accepted that it will continue that trade over a long period. This saves transaction and information costs, and suppliers can invest in equipment specifically for the production of Toyota parts. In addition to this, the efficiency of the hierarchical production structure can be explained by the "principal–agent model," where Toyota is the principal and parts suppliers are agents. The agent has more skill than the principal in manufacturing components so it is more efficient to subcontract that part of the production process to it. Subcontracting is commonly adopted in industries such as construction, since it improves the efficiency of a large organization.[7]

In order for this type of hierarchical production system to function effectively, two factors are required, namely monitoring and an incentive scheme. Toyota can easily monitor quality and continuously supervizes the suppliers. This is of prime importance as the quality of the parts determines the quality of Toyota automobiles. The incentive for nearly 36,000 subcontractors to support the

hierarchical production system is "growth-sharing." When Toyota grows, the parts suppliers also grow,[8] and most Toyota Group firms are now world-scale enterprises. Toyota is said to be very strict in price negotiations; prices are based on cost calculations, and suppliers' profit margins are based on some historical value, since a severe cut in price would spoil the incentive to work with Toyota.

Economies of network and the Japanese system

In this section, we attempt to analyse the Japanese system from the perspective of networks and information. We also show that the system which fully exhibits economies of scale and economies of scope might not be the best system for economies of network. In contrast to Japanese firms, US firms have been utilizing IT, and tend to take advantage of the information society.

Traditional information interchange inside Japanese firms

Information is largely paper based and passes down through the hierarchy, though importance is also placed on face-to-face communication. In this transmission process, an important aspect that is peculiar to Japanese firms is "groupism," or *Nemawashi* (rooting), which helps to achieve a harmonious relationship between labor and management. Through this system of sharing information, labor can feel that it is participating in decision-making and so has an incentive to contribute to the firm. Japanese workers belong to a specific section of management and they work together as a team. This would not be possible without the lifetime employment and seniority systems.

It should be noted, however, that there is the risk of bureaucratic management and sectionalism when information is kept within a particular group. In this context, the Japanese system is a closed network. As mentioned earlier, the Japanese system makes less use of the market mechanism and tends to be less transparent. Asymmetric information between insiders and outsiders is much greater than in economies with a market mechanism.

Transformation of the US economy and economies of network

Between 1991 and 2000, the US economy enjoyed an economic boom and was said to have entered a new stage of development, a 'New Economy.' This resulted from the IT revolution which exploited economies of network. In what follows, three cases have been selected to examine these phenomena.

Concurrent engineering

During the 1980s, the Japanese automobile industry showed its supremacy over that in the USA. All technological innovations introduced in the US automobile industry in the fifteen years since the late 1970s came from Japan, namely,

just-in-time production and QM (*Kaizen*). In 1993, however, Chrysler shocked the Japanese automobile industry by announcing "Neon" to the market. It had a 2,000cc engine but was priced at only US$10,000. This was half the price of a comparable Japanese car. The secret to this low price was concurrent engineering, that is, sharing information between different sections of the firm such as production, R&D, and design. In the development of Neon, Chrysler cut R&D time and costs dramatically, to thirty-one months and US$1 billion respectively. The average period for Japanese assemblers was forty-two months, and sixty-two months for the USA. R&D for GM's Saturn took seven years and US$3.5 billion, and the Ford Escort required four years and US$2 billion.

With concurrent engineering, different sections engaged in R&D are interconnected through a network of computers, and each can monitor or trace the current stage of development of the others. The usual method of development is linear, that is, results are passed from section to section in sequence.[9] If one section finds an error or something that could be improved, the work is returned to the previous section. Concurrent engineering, on the other hand, is multidimensional, and all sections can be engaged in development simultaneously.

Contract manufacturing

Another factor leading to the recovery of the US automobile industry was sourcing parts from all over the world by establishing supply chain networks. Since they do not have fixed subcontractors, they can choose parts suppliers of better quality and cheaper prices, and can freely extend the network of parts suppliers. The same strategy is also taken by US PC makers, who can sell PCs at far lower prices than their Japanese counterparts.

The key element of US manufacturers' global supply chain networks is contract manufacturing, which handles production needs of manufacturers on contract and organizes their own parts suppliers networks. By aiming to achieve maximum customer satisfaction in each market, the US manufacturers decided to use external (foreign) companies to produce their products (outsourcing) and concentrate company efforts on design, R&D, distribution, and marketing operations. Thanks to advanced IT, particularly the Internet, information can be communicated instantaneously and processed immediately. Speed, resolute decisions, and dramatic reforms have supported the prosperity that US manufacturers enjoy today.[10]

Venture business

Venture businesses, which were also important in the recovery of the US manufacturing sector, are small businesses oriented exclusively to high-tech or R&D activities. They are also young businesses. Large numbers of venture businesses can be found in industries related to computers, computer software,

biotechnology, telecommunications, and new materials. Deregulation of business activity during the Reagan administration of the early 1980s was one factor in promoting venture business. Other factors were the nature of the labor market, the technology transfer and funding.

A large number of entrepreneurs are needed to start a new business. Since a venture business is technology based, its entrepreneurs are likely to be engineering specialists, but they need others to take care of management. The highly flexible labor market can supply these specialists.

Venture businesses require new technology. Universities have technology transfer centres that supply this new technology to the commercial sector. Examples can be found in the relationship between Stanford University and Silicon Valley, or MIT and Route 128.[11] Universities are at the core of research parks, and play a coordinating role by interconnecting university laboratories and entrepreneurs.

The US financial market has already been deregulated and there are many different channels for funding venture businesses. These are angles, venture capitals, NASDAQ, and public funds. Thus, in the USA, there is an abundance of funds for investing in venture businesses that seek high returns by accepting high risk.

Toward the Japanese system in the twenty-first century

Thus far, we have analysed the economic basis of the Japanese system and found that it does not suit the curent economic transformation. Here, we will discuss possible reforms that will enable the Japanese economy to benefit from economies of network.

Transforming the Japanese economy and the Japanese system

The Japanese economy is characterised by a low growth rate, an aging population, and globalization. The Japanese system is not constructed to cope with these factors – on the contrary, they will destroy the basis of the Japanese system.

The lifetime employment and seniority systems are based on the continuous growth of the economy, that is, firms increasing in size with increasing employment opportunities. Under the seniority system, wages increase as workers become older. This is possible since the younger generation receives relatively low wages that subsidize the older generation's relatively high wages; it is an intergenerational subsidy system. However, in an aging economy, as the younger cohorts shrink, total employment costs increase. Due to this, more firms have shifted from a seniority system to one in which wages are based on working ability. In addition, senior workers are either forced to move to affiliated firms, or are simply fired.

Globalization is another challenge. Japanese firms have been shifting their activities overseas by means of direct investment. They have to decide where to build a factory, where to sell a product, where to engage in R&D activity, etc. Globalization makes it necessary for Japanese labor to compete with the low-waged labor of less developing countries (LDCs). This will have a serious effect on the Japanese employment system. Japanese automobile assemblers have been increasing overseas production but in the host countries they are levied on local content, that is, some components have to be purchased from local firms. As a result, it has become harder to maintain *Keiretsu* in Japan. The hollowing-out of the economy is now becoming a reality.

Possible reform of the Japanese system

As shown in the previous section, the US economy recovered from nearly twenty years of stagnation following the oil crises in the mid-1970s, by information innovation and venture business. A key factor was their ability to take advantage of economics of network. We have also shown that the Japanese economy cannot rely on the same strategies since appropriate conditions for their success have not yet been established. The traditional scheme of information sharing in firms is still firmly rooted and the Japanese system is too conservative for ambitious entrepreneurs to emerge from the employment system to start up venture businesses. Students still aspire to a job in a traditional, large firm. Banks do not wish to invest in risky venture businesses, and they ask for real estate as collateral – ideas or know-how is not sufficient. Local, as well as central, governments provide public funds to venture businesses, but the procedure for application is too bureaucratic, and the funds are not in great demand. Typical examples of successful venture businesses are Sony and Honda. Most new or venture businesses emerge from industrial groups, as analyzed previously. They take the form of affiliated companies with funds and manpower supplied by their parent companies. Thus, US-style venture business is very rare in Japan.

Under these circumstances, what reform is possible? As shown previously, economies of network can be fully exhibited in a flexible and diversified economy, since networks interconnect economic agents in many different ways. One essential reform is deregulation. Free and competitive activities by the private sector are the only source of affluent and diversified networks. The government cannot create such flexibility. In the underlying context of an information society, deregulation is urgent in the telecommunications industry and in the labor market. The low penetration rate of the Internet and e-commerce is due to high charges for telecommunications services. Deregulation in the labor market would make it both more flexible and more mobile.

Socio-economic systems change slowly. The strongest obstacle to an information society is our way of thinking, that is, inertia in the old system. We tend to prefer to adhere to tradition, since it is rather comfortable to do so. Friction is encountered when mastering or confronting a new system. This is the true reason why Japanese firms are reluctant to make use of e-mail and intranet systems. It is necessary not only for organizations, but us, ourselves, to undergo change in order to capture economies of network.

Notes

1. Ministry of Posts and Telecommunications 2000.
2. This section is based on Tsuji and Nishiwaki 1996, Chapter 2.
3. This similarity is pointed out by Katz and Shapiro 1985.
4. A concise exposition of the Japanese employment system is found in Ito 1992, Chapter 8.
5. For a more detailed discussion, refer to Aoki 1988, and Aoki and Dore 1994.
6. The reality is much more complicated. More detailed classification of parts suppliers and their relation with Toyota is presented in Tsuji 1991.
7. For more detailed discussions on the economic explanation of the hierarchical production structure, see Asanuma 1992, and Tsuji 1991.
8. The growth of the firms in the Toyota Group in terms of the amount of capital and the number of employees is also analysed by Tsuji 1991.
9. R&D teams of Toyota and its group companies meet regularly on a face-to-face basis when they develop new automobiles. The long-term relationship makes this possible.
10. The top ten contract manufacturers in the world are Solectron, SCI Systems, Celestica, Jabil Circuit, Avex Electronics, Manufacturers' Services Ltd., Dovatron International, Flextronics, NatSteel Electronics, and Venture Manufacturing Ltd. The first seven are US firms, while the last three are located in Singapore. For more details on the relationship between US manufacturers and contract manufacturers, see Kagami and Kuchiki 2000.
11. The Ministry of Education deregulated the activities of universities. Universities have started to commercialize their technology following the US example.

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