DEVELOPING COOPERATION FOR REGIONAL INFORMATION INFRASTRUCTURE: JAPAN'S PERSPECTIVE

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CHINA, JAPAN, AND KOREA

Hajime Oniki
Osaka-Gakuin University, Japan

I. Introduction and Summary

This paper first describes the problems and the difficulties observed in Japanese IT industries, and in business and other organizations in Japan, during the recent years. It is pointed out that a common cause of the problems and the difficulties lies in that, in Japanese organizations, *deep coordination*, as distinct from *wide coordination*, is prevalent. The paper also indicates that deep coordination likely arises from the fact that a certain type of information means is used heavily in Japanese organizations. In conclusion, it points out the possibility that East Asian countries may share the same property that Japan has, and proposes to conduct research on this point.

II. The Present State of IT and Information Infrastructure in Japan—

Today it is widely agreed upon that the world economy has been changed through the development of IT (information technology) and the Internet. The leading country is U.S., where IT industries are rapidly growing with high productivity, and the products and services from IT industries are utilized in many social and economic organizations including governments, business firms, and schools. The Internet, among others, is the central means for utilizing IT. The state of the U.S. economy today is summarized by the term, New Economy.

The importance of IT and the Internet is well understood in Japan; daily newspapers and weekly magazines are filled with topics dealing with IT and the Internet. There is no single day in Japan that traditional media such as television and newspaper do not mention about the world wide web. In fact, the Prime Minister of Japan recently started a special task force, called the Strategic Committee for IT in Japan. A report was delivered by this committee recently with a strong recommendation to the Japanese government that, by the year 2005, each household in Japan should be connected to the Internet through an optical fiber, which can transmit a large amount of information two ways for the household. The report states that, if Japan fails to achieve this goal,

oniki@alum.mit.edu
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the economic and other differences between U.S. and Japan will be intolerably large.

On the surface, new IT products and services appear to emerge one after another and penetrate rapidly to household and business users in Japan. Take mobile telephony, for example. More than one half of the whole population of Japan, and 80% of the youngsters, subscribe to it. It is believed that mobile access will soon replace fixed access in Japan. Further, mobile browsers, an additional service to mobile telephony using a small-sized display attached to the terminal, is used by more than twenty million subscribers. The function of mobile browsers is still limited; however, if this service is successfully deployed over the next-generation mobile telephony (3G), its impacts will be tremendously large.

In December 2000, a new digital broadcast service by commercial providers was started in Japan with a broadcast satellite. Although whether this new business will succeed or not in the future is not known, people in Japan can now enjoy, if so wish, 5 to 20 free SDTV channels (or 3 to 10 HDTV channels) compared to 2 to 10 SDTV channels available previously.

In spite of such seemingly successful development of IT products and services in Japan, however, the performance of IT industries, including computer, communication, and networking, has not been satisfactory. It is true that Japan is still strong in producing electronic parts and products. Japan's net exports of electronic parts and products amounted to a huge sum of 8 trillion yens in 1999. Japanese producers, in spite of high labor cost, can easily export devices such as mobile telephone terminals, mobile computers, and small and medium-sized semi-conductor units. It should be pointed out, however, that Japan imports products such as communications equipment (e.g., routers for the Internet), desktop and mainframe computers, and large-sized CPUs. In short, on the hardware side of IT products, the productivity of Japanese industries is still high and is expected to continue to be high in the near future.

When it comes to network-type products and services, however, the performance of Japanese IT industries is miserable. Take computer software, for example. The ratio of the export of software to that of import in Japan was 1.5% in 1998, and the ratio with U.S. is near zero. The price of telecommunications services in Japan is reported to be 3 to 10 times higher than those in U.S; this difference was one of the major issues at the Japan-U.S. trade disputes in 2000.

Thus, we can say that the state of the supply side of IT products and services in Japan is of mixed trends; some products are internationally competitive and well penetrate, whereas other products and services are quite expensive. In short, however, the productivity of Japanese producers is low in those areas expected to grow in the near future, and it is high in those areas expected to shrink in the near future.

When we turn to the demand side, or rather, the utilization side, of IT products and services in Japan, we likewise see a mixture of advancement and backwardness. Today, in Japanese offices, a majority of workers uses PC for sending and receiving e-mails and for producing documents, not to

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mention for viewing world wide web windows. Heavy utilization of fax, which was a common scene 10 years ago in Japanese offices, may now be considered as a symbol of backwardness. The use ratio of LANs is near 100% in the offices of large and medium-sized corporations and governments. Furthermore, it is now common for business and government organizations to prepare world wide web sites, although many of them are still shallow, composed of a small number of cosmetic pages rarely maintained for several months. Thus, in short, one can admit, if with reservations, an increase in the utilization of IT products and services by means of the Internet in Japan.

When we take a deeper look into business and other organizations in Japan, however, we find that the basic way they are operated has not been changed in spite of the wide use of IT products and services. Important decisions are made not by e-mails but by formal and informal meetings. People use IT and the Internet for those matters which are not so important; important issues are still dealt with direct human communications. One consequence of this is the absence of transparency of the operations of an organization to those outside of it. Government organizations only announce the conclusion of their investigations or considerations; they do not disclose the procedures in which decisions were made. Frequently, information disclosure is called for, but what one obtains is a collection of fragmentary pieces of information not so useful to understand the operation of the organization one is interested in.

A good example is given by comparing the information supplied by FCC of U.S. to that supplied by MPT (the Ministry of Posts and Telecommunications, the counterpart of FCC in Japan). In front of the web database, one sees the items for press releases, both with FCC and MPT. To that extent, the two organizations look similar on WWW. When it comes to the information behind the items for press releases, however, the web database of FCC provides the viewer with some hundred thousand or possibly million pages of documents describing the operations of FCC at the present time and in the past. For the case of MPT, such a database is almost nonexistent. Thus, the ratio of the size of the web database of FCC to that of MPT is probably some hundreds to 1, or even thousands to 1. Consequently, the author of this paper, conducting research in communications in Japan and U.S. while living in Japan, can understand far better what is going on with FCC than understand what is going on with MPT. We can conclude that the penetration of IT products and services to Japanese organizations reaches only to their surface, not to their operations.

In Japan, people expect that new IT products and services will eventually change the whole structure and operations of Japanese organizations, hopefully leading to a new economy and society suitable to the 21st century. From observations we have seen so far, however, such expectations may not be materialized.

In the following sections of this paper, I intend to find factors which prevents IT products and services from penetrating into Japanese organizations; in other words, I will attempt to find a

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route through which IT products and services are adopted in business and government organizations in U.S. to change their operations substantially, and to find why the same has not yet taken place with Japanese organizations.

III. The Performance of IT Industries and Business Organizations in Japan[1]

We first consider the performance of IT industries (typically PC industry) in Japan. In fact, there is a remarkable difference in the overall performance of Japanese producers relative to American ones in the 1970-80s and in the 1990s. Japanese corporations performed very well in manufacturing automobiles and electronic appliances in the 1970-80s, but they did quite poorly in producing personal computers (PC) and IT services in the 1990s.

The development of the Japanese economy during the postwar period depended on the success of a small number of strategic industries. The Japanese economy, at each stage of its development, was able to generate one or two strategic industries having the capability of exporting goods to the world market. Since the beginning of the 1980s, two industries, automobiles and electronic appliances, have been contributing to the Japanese economy as major strategic industries. From this observation arises naturally a question "what industry(ies), if any, will become strategic to the Japanese economy for the coming age?"

Actually, the Japanese economy has not been able to find a new strategic industry; it is merely riding on the momentum from the past. A significant portion of the two strategic industries in the 1980s, i.e., the automobile and the electronic appliance industries, has moved to other East- and Southeast Asian countries. It is clear that Japan is losing comparative advantage in automobiles and electronic appliances; without some new strategic industries, Japan will likely face a squeeze from the international balance of trade in the future. The level of per capita GDP in Japan may stagnate as was in the 1990s, and in the worst case, it may start decreasing.

A. PC and IT industries in Japan

The PC industry was born in the beginning of the 1980s. During the 15-year period after its birth, it grew virtually from nothing to the size comparable to that of the telecommunications industry or of the broadcast industry.

In the 1980s, there was an expectation in Japan that, because the future PC was considered to be a miniature of the mainframe, Japan should obtain comparative advantage of producing PC. Japanese corporations were well known, by that time, for the capability to create and manufacture

[1] For a discussion of the content of this section in detail, see H. Oniki, "Japanese/US Comparative Advantage: Width and Depth of Co-ordination," A Chapter of *Information and Organization: A Tribute to the Work of Don Lamberton*, edited by S. Macdonald and J. Nightingale, 1999, Amsterdam: Elsevier Science B.V., pp.197-214., http://www.osaka-gu.ac.jp/php/oniki/eng/publication/199712b.html.

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miniature products such as transistor radios and portable tape recorders. Although Japanese corporations might not be able to create a new product or service from scratch, they were good in improving and trimming a product which had been produced and sold in the market. The PC in the beginning of the 1980s fitted perfectly to this frame.

Today, we know that this expectation did not materialize. Almost all major software products used in Japan are imported from U.S., though minor changes of rewriting the language from English to Japanese may be made in Japan. The operating system is under the monopoly by Microsoft Corporation. Even in the area of hardware, Japanese products barely compete with U.S. ones. New ideas in designing hardware and software seem to come exclusively from U.S. Only in such areas as portable computers, of which compactification is a key factor, Japan maintains exporting capability. The overall performance of the Japanese PC industry, when it is compared with that of other manufacturing industries such as automobile and electronic appliances, is a disappointment to the Japanese.

Computer software, telecommunications services, and other IT products and services were also considered in the early 1980s to be a candidate for strategic industries to the Japanese economy. In the late 1980s and the early 1990s, a great deal of effort was concentrated on producing computers, software, telecommunications services, etc., in Japan as efficiently as possible. The outcome from these efforts devoted in the PC and other IT industries, as we see it today, was quite different from the outcome in the automobiles and the electronic appliances industries.

B. Characteristics of IT and other products and services

Tables 1 and 2 list the products (and services) we will work on in this section. We are interested in PC and other IT products such as telecommunications hardware/infrastructure and software/services. For the sake of comparison, we also consider automobiles and electronic appliances. We also consider LSI (CPU and memories); Japan obtained *imperfect* comparative advantage on LSI memories in the 1980s. Thus, we will consider eight products altogether: telecommunications hardware/infrastructure, telecommunications software/services, PC hardware, PC software, automobiles, electronic appliances, LSI used as CPU for PC, and LSI used for memories of PC.

In the second row of each of Tables 1 and 2 is entered the location of comparative advantage for each of these products. On one hand, U.S. has comparative advantage on telecommunications software/services, PC hardware and software, and LSI, particularly CPU. On the other hand, Japan has comparative advantage on automobiles and electronic appliances. Comparative advantage on telecommunications hardware/infrastructure and LSI for memories is shared by U.S. and Japan.

We first concentrate on the physical and the functional structure of each of the eight products. It is seen that the first six products in Table 1 are produced by combining parts, i.e., by assembling

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components. Telecommunications hardware/infrastructure is a network system, which is composed of cables, switches, terminal equipment, and others. PC hardware is far smaller than telecommunications hardware/infrastructure, but it is composed of components, too. Telecommunications software/services and PC software are information products, i.e., software-type products.

Automobiles and electronic appliances, too, are produced by assembling parts. Needless to say, they are hardware products. In that sense, they are similar to telecommunications hardware/infrastructure and PC hardware. However, the interface between hardware components is stronger with automobiles and electronic appliances than with telecommunications hardware/infrastructure or PC hardware.

In summary, the degree of the flexibility of interfaces is highest with telecommunications and PC software, second highest with telecommunications hardware/infrastructure and PC hardware, and lowest with automobiles and electronic appliances.

The last two products in Table 1, CPU and memories for PC, are produced in one piece; they are fabricated, not assembled. Hence, there is no possibility of upgrading CPU or memories by replacing a portion of it, though upgrading is possible by replacing the entire unit. When a part of the product is broken, there is no way to fix it. For this reason, we can state that, although LSI is produced for information processing, it is structurally closer to automobiles and electronic appliances than to telecommunications hardware/infrastructure or PC hardware.

IV. IT and Socio-Economic Organizations in Japan

In this section, I will state my observation of information characteristics of Japanese organizations. These characteristics seem to be a main cause of the difficulties encountered by the Japanese during recent years. In a word, the difficulties come from the *rigidity* of Japanese organizations, which has been blocking the reforms needed for the 21st century.

The difficulties are felt by the Japanese in observing the slowness and the stickiness for the desirable reforms not to be taking place as quickly as desired. They are felt when the Japanese encounter barriers and impediments against desirable changes, adjustments, and reforms at individual, group, and society levels. The point is that the very way in which Japanese organizations work makes it difficult to achieve an objective which is good to the society, or the members of an organization, as a whole collectively but goes against the interest of individuals and private industrial sectors.

A. Rigidity of Japanese organizations

Rigidity of Japanese organizations arises in various places. Let us consider typical cases. The

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first arises in the employment of the labor force. It is the system of life-long employment. In a Japanese organization which is typical during the post-war period, it is customary for an employee to stay in his organization for a life-long period; in other words, it is very rare for a worker to change his position from one company to another. This is called life-long employment, and is more common among college graduates and professionals than manual or clerical workers. For life-long employees, wages depend mainly on the durations of employment, not on qualification or performance.

The system of life-long employment worked very well during the postwar period of the Japanese economy. In almost every sector of the economy except a few (such as agriculture), employment simply expanded and there was no need for workers to change positions. It is sometimes pointed out that life-long employment contributed to minimize the cost of labor adjustments, thus contributed economic growth.

In as early as late 1970s, the era of proportional economic expansion started to come to an end. Instead of proportional expansion, inter-sectoral adjustments were called for in the Japanese economy. Because of the dominance of the system of life-long employment (i.e., it is difficult, even illegal, for an employer to fire workers) in Japan, the speed of adjustments needed to restructure a business firm (and other organizations) to fit to new environment has been lowered. The decade-long stagnation of the Japanese economy in the 1990s has been a consequence of this, i.e., of the rigidity in labor market.

The system of the life-long employment has produced undesirable side effects. One is the keen examination for college entrance, and a number of distortions of high school and lower level education. Another consequence of it is the domination of organizations by males; female employees are forced to choose between maintaining their career and maintaining their households with children. Thus, the system of life-long employment has given a number of difficulties to the Japanese demography such as the sharp decline of birth rates during resent years, generating a forecast that the Japanese population at the middle of the next century will be of a size of one half of the current population.

The second case of the difficulties of Japanese organizations is the fact that most Japanese organizations are vertically integrated and horizontally divided. It means that activities within an organization are conducted efficiently as long as the organization is well governed. However, it also means that inter-organizational activities are difficult to conduct. As a consequence, competing organizations in Japan often confront, not coordinate. When an employee works for a company, most of the employees of that company is considered to be his/her friends; on the other hand, those employees working for an organization competing with the organization he/she is working for are considered adversaries. Such a characteristic of Japanese organizations makes it difficult for inter-organizational coordination to take place.

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Thus, in Japan, small-sized organizations can work well, but large-sized organizations (including the country as a whole) do not have the capability of effective decision making. From outside of Japan, this looks as the irresponsiveness of the Japanese government and other organizations to a request from foreign countries.

B. The need for reforms in Japan

The rigidity of Japanese organizations, of which I mentioned two typical examples, namely, the system of life-long employment and the system of vertically integrated and horizontally divided organizations, fitted to the development of the post-war Japanese economy very well. The main reason was that the post-war development of Japan was of what might be called a proportional expansion; there was little need for structural changes during that period.

The rigidity, however, does not fit to the changing environment in the 1990s and the 21st century. In particular, Japan is behind other countries in the investment in IT industries. Further, there is a number of stresses, as seen repeatedly in media, in restructuring organizations, political, industrial, and educational, recently in Japan. The question is: "What are the factors having caused such rigidity of Japanese organizations?" Below, I will attempt to deliver an answer to this question by pointing out an information characteristic of Japanese organizations.

V. Coordination in Organizations

There is a common factor to the disappointing performance of IT industries in Japan (as contrasted to the satisfactory performance of manufacturing industries in Japan) and the disappointing presence of rigidities in Japanese organizations during recent years (as contrasted to the satisfactory performance of Japanese organizations during the postwar period). To explain, it is convenient to introduce two measures to characterize the coordination in organization: *width* and *depth* of coordination. The width is the size of the range of coordination activities; it may be expressed by the number of workers who participate to the coordination in question. The depth is the average intensity of coordination activities; it may be represented by the degree at which coordinating workers understand each other.

In this section, we consider the width and the depth of coordination mainly in terms of business organizations. Similar analyses, however, may be applied to other organizations.

First, it is pointed out that the relative importance of the width and the depth of coordination differs depending on the characteristics of each product or service. On one hand, the depth plays an important role in producing such products as automobiles and electronic appliances. On the other hand, the width is more important in producing network-type products such as PC, hardware or software, and IT services.

In the following, we will compare Japanese corporations with American ones with respect to the

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width and the depth of coordination.. In average, the depth of coordination is greater with Japanese corporations, whereas the width of coordination is with American corporations. Thus, the difference in the performance of Japanese corporations between the 1970-80s and the 1990s can be explained as having come from the shift in the strategic industry of Japan from automobiles and electronic appliances to PC and IT services. Comparative advantage of Japanese corporations was changed in accordance with the difference in the characteristics of coordination between the two countries. The rigidity of Japanese organizations is a consequence of the presence of strong deep coordination, and the absence of wide coordination.

A. Width and depth of coordination

The *width* of particular coordination is the size of the range of coordination activities; it is typically expressed by the number of workers who are directly or indirectly involved in the coordination. For example, when we consider research and development in designing a new type of LSI, the number of workers comprising the team engaged in the development of the new type is the width of the coordination. When telecommunications provider considers offering a new type of service on its network and decides to purchase a software which can realize the contemplated service, then the width is expressed by the sum of the numbers of workers participating to the teams of software venders which can, and are willing to, sell appropriate software to the telecommunications provider. When several software venders compete each other and only one of them can sell a product to the telecommunications provider, we still consider the size of the coordination to be the sum of the numbers of the workers in all of the software venders which could sell their product to the telecommunications provider.

The *depth* of coordination is the average intensity of coordination activities; it indicates how closely the activities for the coordination are combined. It may be called the strength, or the density, of the coordination. Roughly speaking, the depth of coordination is the amount of the information which needs to flow between the workers engaging in that coordination. For example, in a team engaged in research and development for a new type of automobiles, the design work needs a lot of information exchange between the members of the team; thus, the depth of such coordination is very large. In reality, the workers of such a team need to talk a lot each other, need to pass and receive many documents and diagrams, need to meet many times in conferences, and so on.

B. Comparison of coordination in U.S. and Japan

We next compare the coordination on the supply side of production in U.S. and Japan in terms of width and depth. Coordination within a large corporation may, to some extent, be similar between U.S. and Japan. The development of a new product is done in the R&D department. For the case

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of automobiles and LSI memories, a large-sized team is formed within the R&D department to develop a new model. For the case of telecommunications software/services and the case of electronic appliances, multiple teams for developing a new product or a service may be formed in a corporation; in many cases, they compete each other.

When it comes to production management, Japanese corporations are known for their *lean production management*. In many cases, production activities are performed by a number of teams of relatively small size; the number of the workers of a team for production is somewhere between five to fifteen. The width of coordination in such a team is limited, though the depth is large. Every member of a team knows everybody else very well; e.g., not only of what task a team member is assigned to but also how the assignment is performed by the team member is known. Thus, when something unusual takes place, such as the case that a part of the machine being used by the team breaks down, or the case that one of the team members becomes absent for several days, it is still possible for some other team members to take over whatever task is to be done without significantly lowering the efficiency of the team work as a whole.

Thus, a prominent characteristic of Japanese coordination lies in its depth. The cost of having deep coordination, naturally, is the width of coordination, which is usually small in Japanese corporations. Since the workers in a team tend to communicate intimately with a relatively small number of fellow workers, a solid team is formed as a consequence, and it is difficult to form a team of large size. In the typical case, Japanese workers do not communicate with others outside their own team.

In general, coordination in U.S., in contrast to that in Japan, can be characterized by its width. In U.S., the importance of communication with fellow workers in their team is not as high as in Japan. Instead, U.S. workers spend more time and efforts to communicate with workers outside their team.

An implication of wide coordination in U.S. is that the domain of procurement for a product is wide. Thus, U.S. corporations purchase from suppliers outside their own organizations as well as inside. One could say that U.S. producers are more open to outside than Japanese producers are.

C. Explanation of Comparative Advantage in IT and Other Industries

1. Automobiles and electronic appliances

Japan obtained comparative advantage on automobiles and electronic appliances in the 1980s. Automobiles and electronic appliances have more similarities than differences according to the characteristics listed in Tables 1 and 2. These products are assembled from parts, and the interface between the components of a product is strong for both of them. R&D for improving a product and for developing a new model is done mostly within the producer corporation.

Both of R&D and production management in automobiles and electronic appliances fit to

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Japanese-type coordination. The development of a new product is done entirely within the producer by a team of workers coordinating closely; i.e., under deep coordination

In the production management of automobiles and electronic appliances, too, the Japanese-type coordination works very well. The production of an automobile or of an electronic appliance starts with the production of each of its parts. In many cases, parts producers in Japan are subsidiaries of the producer corporation and receive close controls from it. Deep coordination is observed in the relation between the parent and the subsidiary corporations. This is desirable since automobiles and electronic appliances are produced in a large quantity. Once a model is developed and designed, and a production management system is established, the main objective is to maintain a smooth stream of production from parts to the final product. Minor improvements for minimizing the damage from troubles in the production system and for leading to cost reduction are quite effective. In Japanese corporations, such minor improvements are realized through deep coordination.

By exploiting the advantage of deep coordination, Japanese producers of automobiles and electronic appliances succeeded in model development and cost reduction in the 1980s to obtain a large share in Japan's total export. Even today, the comparative advantage with automobiles and electronic appliances still stays in Japan.

2. PC hardware

PC hardware (except for portables) is a physical product assembled from components such as CPU, hard disks, a keyboard, a display, and others. Each component of PC hardware can be designed and produced independently of others, since the interface through which a component is combined with other components is standardized and predetermined. In other words, PC hardware is a single product in the usual sense, but it is not a single product in the following sense: PC hardware is a collection of components (parts) connected each other systematically but loosely. In this sense, a PC hardware is like a network; a component may be replaced or upgraded as long as the interface requirement is satisfied. In this paper, we call such a product a *network-type product*.

What was the reason that U.S. obtained comparative advantage in producing PC hardware? The answer is the efficiency achieved by wide coordination. The fact that PC is a network-type product, and not a product like automobiles or electronic appliances, of which the components are combined tightly and does not allow partial replacement of upgrading, made R&D based on wide coordination very effective. Specifically, PC hardware producers in U.S. seek the source of their components not only within U.S. but also worldwide. In the late 1980s, Taiwan became a base supplying efficient and inexpensive components of PC to U.S. producers. In the early 1990s, Singapore, Malaysia, and other ASEAN countries joined. Japanese PC producers tried hard to develop and produce their own parts for PC. Because of the lack of wide coordination with them,

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they ended up with products far more expensive than the products from U.S. producers.

3. PC Software

Comparative advantage of PC software is possessed by U.S.. Whereas PC hardware is a physical product assembled from components, PC software is an information product assembled from logical components. Software can be replaced partially and upgraded almost freely. The design and the development of a software component can be done quite independently from the entire software product, since, as PC hardware, the interface between software components (i.e., subprograms) and the main software is well established. Thus, software can be produced and improved component-wise, making the presence of wide coordination very effective. For this and other reasons, Japan imports most of the major softwares from U.S., and Japanese export of softwares to U.S. is virtually nil.

4. Telecommunications hardware/infrastructure and telecommunications software/services

When considering comparative advantage in telecommunications hardware/infrastructure and software/services, we should note that there is a couple of differences here from the products we have been analyzing. One difference is that telecommunications services cannot be exported or imported, since it is provided on the spot by combining the productive factors located near to the user. The second difference is that public regulations play an important role in telecommunications. Historical and technological reasons calling for public regulations are well known. In this section, we limit our attention to the implications on comparative advantage in telecommunications to that arising from the characteristics of product or service only.

Telecommunications hardware/infrastructure, when considered logically and functionally, is similar to PC hardware. It is made of physical components of a network-type product (system) for processing (transmitting and exchanging) information. In other words, telecommunications network is like a very sophisticated and large-scale PC of which the components are located separately but connected each other.

In particular, a portion of telecommunications network can be replaced and upgraded freely. Such a partial improvement is a daily matter in the operation of telecommunications network. Since, however, a component of telecommunications network such as local and long-distance switches or cables is large in scale and high in value, a component of telecommunications network itself may be considered as a sophisticated electronic appliance. In producing such a product, not only wide coordination but also deep coordination may be effective. This is a part of the reason that Japan possesses some comparative advantage in producing telecommunications hardware.

Telecommunications software/services are like PC software. They are information products to be designed and improved logically. The reason that U.S. has comparative advantage with PC

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software applies equally to telecommunications software/services.

D. Coordination and Rigidities of Japanese Organizations

It is readily seen that rigidities of Japanese organizations arise from the prevalence of deep coordination and the absence of wide coordination. The system of life-long employment is closely related to deep coordination between workers. Japanese workers are, in a sense, specialized to the situations of the organization they are working for. They devote all of their capacity to understand and master the working of their organization; there is little room left in their capacity to learn the situations of other organizations. Hence, the value of Japanese workers is high when they stay; it becomes low when they move out to other organizations. From the standpoint of employers, it costs a lot to lose their workers who know best about their organizations, and it also costs a lot to hire new workers since a great deal of education and training would be needed before new workers can actually work efficiently.

In contrast to this, labor mobility is higher in U.S. than in Japan; in particular, there is no life-long employment in U.S. There are workers in U.S. who continue to stay in one organization for a long time as a consequence of their own choice and their employer's choice. There is certainly cost to the worker of moving from one organization to another, and also there is cost to the employer of replacing a worker for another. In Japan, both the cost of changing a position to work and the cost of replacing a worker is extremely high. In U.S., it is not so high. The difference is a matter of degree. The high cost of moving and replacing in Japan is a source of, and also a consequence from, deep coordination.

Deep coordination in Japanese organizations tends to produce a vertically integrated and horizontally divided structure. In general, because of the prevalence of deep coordination, it is economical to handle sophisticated matters within an organization. Outsiders do not know the details about how the organization works; it costs time and money to have outsiders learn the details. It is less costly to keep workers dealing with sophisticated matters within the organization. Thus, Japanese organizations do not hire specialists such as lawyers, accountants, economists, public administration specialists, etc., from outside; they have their own " specialists." Sometimes, they even keep medical doctors and sport instructors with themselves.

The structure of vertical integration and horizontal division in Japanese organizations is frequently hierarchical. There are vertically integrated bureaus within a large corporation or a large government ministry, and a bureau may be composed of sections vertically integrated and horizontally divided.

Thus, Japanese organizations are characterized by such terms as vertical integration, horizontal division, closed systems, tightly connected group members, little disclosure of information, etc., all of which are closely related to deep coordination.

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E. Information Characteristics of Japanese Organizations

We first observe that, in general, an organization is operated through exchanging information. Members of an organization communicate each other through information media to run it. Thus, the performance of an organization is heavily affected by the way in which information media are used. In view of this observation, we summarize and classify information media used for operating an organization. Please see Figure 1.

In Figure 1, we consider three levels of communication: low, medium, and high. In addition, the information means at each level is classified into two types, type A and type B. Type A are informal means of communication; at the low level, a typical example is communication by human voice for direct conversation or for dialogues. At the high level, examples are voice agreements, social customs, implicit understandings, and common sense.

In contrast, type B is for formal means of communication. Examples of type B means at the medium level are documents sent and received, ordinary and electronic mails, and web communications. Those at the high level are laws (acts), rules, written orders and manuals, contracts, documented records, databases, and statistics. The basic point of such classification of communication means is that the functioning of an organization is heavily affected by the way in which communications needed for the operation depends on type A means, on type B means, or on both.

Let us now explain the information characteristic of Japanese organizations with respect to the distinction between type A and type B means. It is a strong reliance by Japanese organizations on the informal (type A) means to run organizations. Such a reliance on type A means (and the less reliance on type B means) accompanies direct and non-formatted agreements, emotional and intuitive understandings, a tendency to avoid logical and explicit expressions, rare use of conditional decisions, and the importance of generalists rather than specialists in many areas of social and economic activities.

The strong reliance by Japanese organizations on type A means of communication is a basis for deep coordination and a cause of rigidities of Japanese organizations. As stated previously, life-long employment is a way to avoid the cost of switching jobs or the cost of replacing workers. The reliance on type A means of communication implies that a large portion of the information pertinent to the operation of an organization is embodied in the workers of that organization. Hence, employers try to avoid replacing employees to save the cost of a new employee to accumulate the information from scratch, and an employee tries to avoid changing jobs not to waste the information he has accumulated in the organization for the period of employment. In contrast to this, if the information pertinent to the operation of an organization is expressed by type B means, such as documents and manuals, it is less costly to change jobs or to replace employees, since the

oniki@alum.mit.edu
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information is not embodied in employees but exist in a form independent of particular human individuals.

The dominance of the vertically integrated and horizontally divided structure in Japanese organizations is an outcome from an effort to avoid the cost of maintaining proper relations with other organizations, i.e., to avoid the cost of inter-organizational adjustments. For large organizations or for complicated subjects, inter-organizational adjustments must be done by type B means of communication; the reliance on type A means would generate confusions and mistakes. Thus, if a society or an organization does not use type B means of communication, inter-organizational adjustments have to be given up. A consequence of this will be vertical integration and horizontal division, as seen in Japanese organizations. Another outcome is the slowness of group decisions. The absence of written rules for group decision making (i.e., the absence of type B means) slows down the speed of group decision making. It is particularly so when conflicts of interest exist within a group.

One can explain the slowness of investment and use of IT products and services in Japan by the reliance on type A means of communication. The IT products and services available at the present time is constructed on type B means of communication, as seen easily from the fact that most of the contents through web and mails are expressed by characters and illustrations; the use of human voice, particularly that of two directions, is still rare on IT products and services. (Note that telephone is a type A means of communication and it is widely used in Japanese organizations). In Japanese organizations, the most important means of communication is direct conversation and meetings; hence, the demand for IT products and services is not so strong as in the case of U.S., in which the reliance on type B communication is heavier than in Japan.

It is evident that deep coordination in Japanese organizations is built on type A means of communication for the obvious reason that, in order to coordinate deep in a group of small size, using type B means is too costly; type A means is easier to use. It is for wide coordination that type B means is most useful.

I would like to add that Japan is strong in producing hardware products, but not so in producing software products. The reason can be explained by the reliance on type A means of communication in Japanese organizations; software products (particularly business software) is a representation of logical and formal set of instructions for business activities, which is intrinsically of type B. (Note, however, that software for games, animations, and Karaoke is well produced in Japan; they are basically of type A, not of type B.)

VI. Conclusion: Implications of the Japanese Experiences to Economic Cooperation in East Asia

In the foregoing sections, I have summarized my observation as to an information characteristic

oniki@alum.mit.edu
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of Japanese organizations, which I have argued is a cause of rigidities in Japanese organizations generating a number of difficulties during the recent years; the characteristic is the prevalence of deep coordination, which is closely related to a strong reliance on type A means of communication. I have also argued that the prevalence of deep coordination is a reason of the unsatisfactory performance of IT industries in Japan and the unsatisfactory utilization of IT products and services in Japanese organizations.

In order to explain implications of the Japanese experiences to possible cooperation in East Asia, let me present a hypothesis regarding the pattern of the use of type A and type B means of communication in some selected countries. Please see Figure 2.

We consider a measure of the degree of the use of type A high-level media relative to type B high level media. In this paper, we call it the *AB-measure*. Figure 2 arranges selected countries from horizontally left to right in the decreasing order of the AB-measure. The hypothesis here lies in this ordering. A set of sub-hypotheses follows:

(1) Japan is of the highest AB-measure. Geographically and historically, Japan is the most closed to the outside world. Type A means has been used in Japan most intensively. The recent economic development and the need for a large amount of information exchanges forced the Japanese to use type A means to its limit.

(2) Korea, Taiwan, and China share the same characteristics of using type A means, but not as strongly, as Japan does. They are not so closed geographically to the outside world as Japan. The four East Asian countries share the characteristic that they have been most apart from the English-language world.

(3) The AB-measure is lowest with U.S.. This may be a consequence of several factors: American Independence tradition, English tradition, a consequence of being a multi-racial , malti-ethnic nation, the legal tradition of Roman/Jewish, etc.

(4) It seems that when the main official language of a country is English, its AB-measure tends to be low (English tradition).

It is not the objective of this paper to discuss closely whether or not the hypothesis expressed in Figure 2 is correct. *IT* may be done with research in the future.

The objective of presenting Figure 2 as a hypothesis is to indicate the closeness of the East Asian countries with respect to the AB-measure, which, according to the Japanese experiences, may have a strong influence on the production and the utilization of IT products and services. One way for the East-Asian countries to cooperate, therefore, is to help themselves understand what they are in relation to the production and the utilization of IT and the Internet.

It would be nice if some research is supported to investigate whether the Figure 2 hypothesis is correct, particularly from the East-Asian perspective. That is to say, a research to estimate the AB-measure of the East-Asian countries (e.g., in the area of law). As indicated by the fact that this

oniki@alum.mit.edu
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paper has to be written in the English language, direct communication between the East-Asian countries is virtually impossible. Estimation of the AB-measure of a country must be done by scholars who understand the language of the country.

Finally, let me finish this paper by hastily adding that, in discussing the AB-measure and the reliance on type A and type B means of communication, I have no intention to bring up patriotic prejudices or cultural discrimination or the like whatsoever; the objective of this paper is to contribute to the advancement of all the peoples in East Asia.

oniki@alum.mit.edu
www.osaka-gu.ac.jp/php/oniki/

Table 1
Characteristics of IT Products/Services in Comparison with Other Products (1): Physical and Functional Structures

Products/Services	Telecom hardware/ Infrastructure	Telecom software/ Services	PC hardware	PC software	Automobiles	Electronic appliances	LSI: CPU for PC	LSI: Memories
Location of comparative advantage*	JP, US	US	(JP) US	US	JP	JP	US	JP, US
Structure of products or services								
Assembled from components (?)	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Interface between components	Weak	Weak	Medium	Weak	Strong	Strong	None	None
Standardized interfaces between components (?)	Yes	Yes	Yes	Yes	No	No	NA	NA
Upgrading component	Possible	Free	Free	Free	Partially possible	Almost impossible	Impossible	Impossible
Need for balance between components	Low	Little	Low	Little	Medium	High	NA	NA

”JP” indicates Japan, “US” United States.

Table 2
Characteristics of IT Products/Services in Comparison with Other Products (2): Research and Development

Products/Services	Telecom hardware/ Infrastructure	Telecom software/ services	PC hardware	PC software	Automobiles	Electronic appliances	LSI: CPU for PC	LSI: Memories
Location of comparative advantage*	JP, US	US	(JP) US	US	JP	JP	US	JP, US
Characteristics of R&D								
Size of R&D investment	Large	Medium	Medium	Small	Large	Medium	Very large	Large
Gestation period	Very long	Medium	Medium	Short	Medium	Short	Very long	Long
Pattern of R&D organization:								
Team / Individual	Team	Individual	Individual	Individual	Team	Team	Team	Team
Centralized / Decentralized	C/D	Very D	D	Very D	C	Medium	C	C
Pattern of emergence of new products / services: (Continuous improvement / Discontinuous innovation)	Continuous and partially innovative	Continuous and innovative	Continuous and partially innovative	Continuous and innovative	Continuous improvement	Innovative	Continuous improvement and enhancing	Continuous increase in capacity and speed
Causes preventing free entry and full competition	Remains of natural monopoly/ regulation	Regulation	Patents, copyrights (on bus, BIOS)	Copyrights	None	None	Technological monopoly	Protection of circuit design

”JP” indicates Japan, “US” United States.

1. Low level:

Type A: informal	Type B: formal
Human voice including face communication and gestures.	Letters, characters, symbols, numerals, tables, lists, etc.

2. Medium level:

Type A: informal	Type B: formal
Direct conversations, dialogues, informal meetings, telephone conversations, video telephones, video conferences, etc.	Documents sent/received, distributed, exchanged; mails, electronic mails, web communications.

3. High level:

Type A: informal	Type B: formal
Voice agreements, implicit agreements, social customs and understandings, common sense, implicit majority opinions, informal suggestions, etc.	Laws (acts), rules, orders, manuals, internal rules, contracts, written agreements, documented records, databases, statistics.

Figure 1: Information Media for Operating Organizations

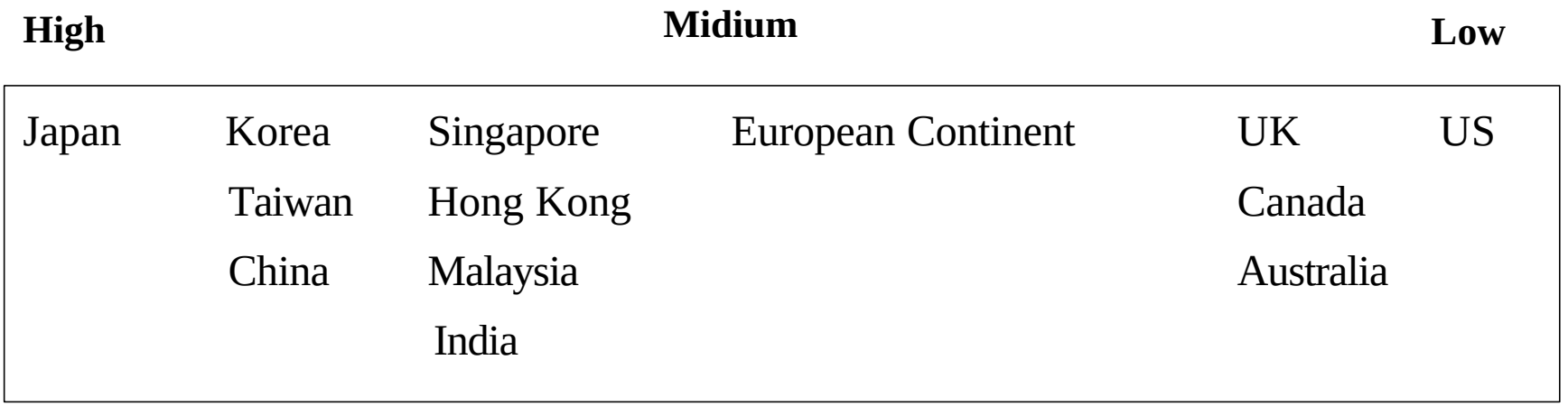

Figure 2: The AB-Measure (The Degree of the Use of Type-A High-level Media relative to Type-B High-level Media) in Selected Countries) (A Hypothesis)