

Spatial Barriers and Development of Capitalism

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Spatial Barriers and Development of Capitalism

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(1) Meaning of Overcoming Space

Capitalism and the overcoming of space

Remoteness is the basis of not only diversity but also large scale- and mass-production. If all commodities were homogeneous, there would be no need to exchange them. Commodities are exchanged because they are heterogeneous. Capitalism commoditized heterogeneous elements. Exotic commodities are a case in point. To Europeans they were presented as Asian goods and to Asians as European goods. Rarity of goods arises because of differences in natural conditions and culture from place to place as well as geographical remoteness between the supplier and consumer.

If people were satisfied with products of their locality, which they consume in a daily life, there would be no exchange of goods with other localities. Precisely because there are products not produced locally, is exchange activity stimulated, division of labor accelerated, and, eventually, cost reduction by large-scale production brought about.

Strong desire to obtain goods that existed in remote areas was the driving force to internationalize commercial activities. European merchants ventured to go as far as Asia to satisfy this desire.

The larger the space to traverse, the higher the risks the traveler and the means of transportation must run. They may meet accidents, natural disasters, or other mishaps. The merchants may fall ill on the way. The farther the destination, the greater the danger of the commodities being stolen or broken on the way.

As regards movement of goods, the differential between the price at the forwarding end (FOB price) and that at the arriving end (CIF price) is defined as "space overcoming cost," which includes the risks involved as well as the transportation cost. It is recalled that damage insurance business began as maritime insurance. This demonstrates not only the importance of maritime transport but also the fact that the risks of transportation by seas went down at a

certain point in time to a level at which transport risks could be covered by insurance.

Space overcoming activities are activities that bring the commodity and the consumer spatially together. Even if commodities have been produced, they would have no meaning if they fail to reach the consumers. If the transport cost were infinitely high, there would be neither trade nor market.

If the spatial barriers were hopelessly high, all efforts to overcome space would end in vain. Conversely, if they were very low and very easily surmountable, space-overcoming undertaking would not make business. It is because the barriers are such that can be lowered to a certain extent by human efforts that new technologies to overcome space have been developed and transport services launched utilizing such technologies.

With the activation of spatial movement of goods, damage insurance was able to become a business branch. The original maritime insurance thus branched out into air transport and car insurance businesses. As for damage insurance covering human beings, most accidents it anticipates are those occurring in the process of spatial movement. Spatial movement of human beings by passenger cars became possible by the introduction of damage insurance systems just as it was made possible by gas stations and repair shops.

What is the spatial barrier?

For its effective operation capitalism need to integrate with it as many heterogeneous elements as possible, which are locationally strewn over a large space, and to integrate them on as favorable terms as possible.

Of the commodities produced in remote areas, only those highly movable and exotic have historically attained the status of international commodities. Pepper, furs, silken textiles, and precious metals were some of such typical global commodities. Whisky and brandy became international commodities at an early time, but beer and Sake wine had failed to attain that status until means of high-speed transportation was developed. This difference is because of the degree of difficulty in transporting them. Different spatial barriers exist for different commodities and these differences determine their respective market areas.

Spatial barriers stand in the way of the fulfillment of strong human desires. If human beings, material goods, and information were to be moved instantaneously, free of charge, and without risks, to anywhere in the world, then you would be able to obtain all kinds of goods and services at the local prices. This is the picture micro-economics paints for us, that is, a spaceless world (one point economy).

But in reality, costs and risks are generated in the process of spatial movement. They

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increase as the distance of travel enlarges. Spatial movement involves not just the direct movement cost but also various risks attending it. Among them are robbery, goods destruction, putrefaction, loss of freshness, additional production cost due to delayed delivery, inventory cost. The last is a means of hedging against risks and against missed merchandising opportunity due to delayed delivery. Missed marketing opportunities reduce the prices of goods involved. In spatial movement of human beings, other costs and risks are involved, such as physical fatigue and low efficiency by jet lag.

I call these costs altogether the space overcoming cost (SOC). It is the cost incurred in our effort to overcome spatial barriers. SOC involving human beings tends to rise in proportion to the distance traveled. SOC incurred in spatial movement of digitalized information by Internet is not distance-proportionate. You can reach any point anywhere in the world just by connecting to your local telephone service. It is therefore a superb form of overcoming space.

Space overcoming activity and economic development

The effort to lower the space barriers is in the core of what we call economic development, industrial structure transformation, and technological innovation. Take, for instance, the steam engine, motorcar, telephone, or mobile phone. Owning and consuming (using) them is not the ultimate purpose they serve. They are there to be used to spatially move human beings, things, or information.

Human activities to lower spatial barriers, which macro-economics has ignored, are nothing else than the dynamic process of economic development itself. For us to acquire a limited number and quantity of goods and services, we need to mobilize a set of gigantic space overcoming systems.

To reduce spatial barriers, we need properly combine five elements that constitute the enormous space overcoming systems.

(2) Five Elements of Space Overcoming Systems

First element: industrialization and mobility

Industrialization increases commodity mobility. The processing of agricultural products, for instance, increases the products' mobility by cutting off their inedible parts, reducing their weight and bulk, and making them antiseptic. Industrialization by nature raises product mobility by means of the processing of raw materials.

Dairy farmers operating in remote areas improve their market access by delivering their products in the forms of cheese, butter, and skim milk, instead of as raw milk whose transport is not as easy. They separate superfluous water content from milk, enrich it, and transform it into less perishable and more transport- and preservation-friendly forms. By this processing, the products can now be hauled over a long distance. Transport technologies developed in the meantime and refrigerator lorries came into use to further lengthen the milk hauling distance. This last factor does not reflect the mobility effect of the production side of industrialization, but does reflect the second phase of industrialization, that is, the development of means of transportation.

The fruit juice concentrate making technology, said to have been developed by Beatrice, is a case well illustrating how industrial technology successfully overcame spatial barriers. Instead of importing Brazilian fruits and make juice in the importing country, this company condensed the fruit juice extracted in Brazil, drastically reduced its weight and bulk by condensation, and imported only its concentrate. This greatly reduced the transport and preservation costs. Adding water to this concentrate in the country of consumption, the company reproduced 100% genuine fruit juice. Here the original water content is completely replaced by water from the importing country. Coke bottling plants are likewise sited over a large space encompassing countries and regions precisely to reduce to a minimum the transport cost of heavy and value-poor water content and to dispense with the bottle and can transport costs. This serves to cut the total cost of the supply chain system from the raw material producers' stage down to consumers' stage.

The key to an optimum space overcoming solution is to reduce movement of things to the lowest limit (particularly of goods whose transport cost is high). Alfred Weber once recommended in his classic theory on industrial location that an industrial site should be carefully chosen so as to do away with the need to transport raw materials whose weight would be reduced in manufacturing process. Coal was the case in point. Ultimately dissolved into carbon dioxide and water through burning, coal used in steel making does not contribute its weight to the weight of the final product, that is steel. So coal is something whose haulage over a long distance should be avoided. The siting of steel mills near the coal basin would reduce to a minimum the total transport cost involved in steel production.

Suntory is now producing beer in its breweries in Kanto district and hauling it to Hokkaido by tank lorries and bottling it there for the local market. In this case, Santory's policy is to cut the transport of heavy and low-valued glass bottles in order to reduce its total transport cost. There are indeed various methods for the reduction of SOC. Proper combination of different transportation and production technologies is an important factor of good management strategy.

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Industrialization has the natural tendency toward reducing the weight and bulk of spatially moved things by means of processing raw materials and introducing new technical contrivances. Similar technological methods are applied to the area of digital communication for transmission of documents, data, and software. The data compressing and defreezing process, comparable to the making of juice concentrate, is a technological process to reduce SOC of information transmission.

The spreading preference for more mobile industrial products changes social life and consumer behavior. Telephone receivers, though not as heavy as a refrigerator or TV sets, were not as light as people would carry with them anywhere. Nor were they small enough to be put into your bag or pocket. They had to be more or less fixed on the same spots that are connected to the telephone line. So you could use a telephone only in a specific place and within a specific range of time.

But the spread of cordless handsets and mobile phones that you can carry with you turned the telephone to a private commodity. What used to be family articles like clocks, stereo sets, computers, and video games, have become private articles such as watches, "Walkman," mobile computers, and "Gameboy". Demand for these goods expanded as their use became personalized.

The transistor radio set, invented by Sony in the late 1950's, was called a pocketable radio - considered small enough to be put into your shirt pocket. In fact, it was not literally pocketable if you mean your shirt pocket. But pocketable radio sets so-called were sold in the United States as Christmas gifts for children. In order to deliver them in time for Christmas sales, chartered JAL planes carried them to America.

Use of mobile units enables users to instantaneously satisfy even their capricious desires. Using a mobile unit you can immediately meet your demand wherever you happen to be. Spatial fixture of the machine restricts the location of your work. You must be sitting at your office desk because you have your shelf with accumulated non-digital documents, personal computer, and telephone (plus, probably your superiors) fixed there.

Once documents are digitalized and organized into a database, you can have access to them whenever you need them and wherever you are. Mobile computers and telephones release white-collar workers from fixture to the office. Informationalization turns the organizational system horizontal, dispenses with middle management whose function is top-to-down information delivery, and sends executive officers constantly flying about throughout the country and the world. Top management will feel less need to tie their subordinates to the office space.

But release from fixture does not mean that the offices are to move from metropolitan centers to the countryside. Equipped with airports, marine ports, highways, and high-speed railways, major cities are the nodes of high-speed traffic, and as such are the most advantageous starting points for spatial movements. Concentration of activities and means of transportation on cities

also heightens the effect of intra-city spatial movements.

Mobilitization has a self-accelerating effect. An executive who is constantly moving carries with him/her a mobile computer and mobile phone. He/she needs for his/her movement a network of the bullet train, company car, taxicabs, private plane, and airline services. If the top executives are mobilers, their subordinates also have to be.

In the case of beer, the differential in the degree space overcoming between canned beer and bottled beer has a tremendous effect. A large bottle of beer usually contains too much beer for an individual to drink at a time. There would be no problem in case friends are sharing the same bottle. But generally, bottles are heavy and vulnerable, taking from their mobility. In contrast, the can is made of a thin and light steel or aluminum sheet. It is easy to carry. The beer can of 350 ml size fits to the palm and can be handled and carried very easily.

Portability has a great significance to beer demand expansion. It helps increase beer-drinking occasions, raise production, transport, and storage efficiencies, and boost product sales.

The availability of beer in personal sizes has transformed the style of beer drinking. Group drinking has given way to personal drinking and even if people drink together each of them now drinks as an individual, rather than as a member of the group.

Asahi Beer, in marketing dry beer, put its force behind the canned version rather than the bottled version. The selling point of dry beer was its dryness, of course. But it impressed consumers as canned beer, too. This was to differentiate the image of the Asahi product from Kirin' lager beer whose image was bottled beer. Consumers felt that Asahi beer is more mobile and individualistic than Kirin beer. The Japanese society was shifting from collectivism to individualism, giving rise to a new desire for more personal beer drinking style. Canned beer perfectly fitted to this desire.

In the hot and dry states of Florida, Texas, Nevada, and California, you may be surprised to find so many people walking in the street holding mineral water PET bottles in their hands. This is a precautionous behavior against possible dehydration. Interestingly, they do not carry canned water, but PET-bottled water. They prefer the light PET container that also has a high content preserving quality. PET bottles are not recommendable from the recycling point of view, but it would be hard to suppress predilection for this high mobility good.

Second aspect: Production of means of space overcoming

Generally speaking, industrialization, if not its every aspect, has mobility increasing

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effects, as was already discussed. It could be argued therefore that industrialization is the manufacturing industry's response to the need of space overcoming. But of the various components of the industry, the production of the means of overcoming space, namely, the means of transportation, emerged as a particularly important industrial branch playing an essential role in the development of capitalism. I mean industries producing ships, electric locomotives, motorcars, motorbikes, aircraft, telephones, facsimile, radio, television, and mobile phones.

These space-overcoming industrial branches are important because the extent of spatial movement in a given historical period is delimited by the then available space overcoming means.

If we were to dismiss space, there would be no need for these industries. Industries producing means of spatial movement of human beings, things, and information are not just some of the many industries. They are the key industries because they are producing the space overcoming means specific to each era.

The capitalist industrial revolution that was launched with the use of steamships and steam locomotives later reached a new stage where motorcars and aircraft came into use as the major means of moving persons and things. The means of movement of information evolved from postal services (in which information is moved in the form of things) through telephone, radio, television, and facsimile to Internet and mobile phones.

The importance of the space overcoming means-producing industry lies, in the first place, in the fact that its products define the mode of spatial movement specific to each era. The restraints levied by the available means of spatial movement in turn determine optimum modes of goods distribution and flow of information particular to the era, which then determine the geographical disposition of factories and business units as well as the modes of trade among enterprises as well as between enterprises and consumers.

Secondly, once the direction of development of space overcoming technologies is decided, chain reaction-type development of related technological innovation will occur in that direction. The spread of the use of automobiles led to the development of technologies in the service of higher speed, safety, and refined designs to satisfy new requirements. These requirements contradicted each other in some cases. Developed in this manner were quite a few products, such as rust-resistant steel plates, durable tires, engine efficiency-raising kinds of gasoline, robots to facilitate mass production of cars, paints keeping surface luster for long, new plugs contributing to engine efficiency, new plastic parts to reduce car weight.

Thirdly, a series of risk-reducing measures become required to facilitate spatial movement, such as services for traffic accidents, car troubles, car maintenance, and repairs. New services and systems developed very rapidly as soon as they came into being. Among them are drivers' schools, car repair shops, gas stations, car parts shops, driver licensing and

automobile inspection systems, and drivers' insurance. Unlike production of foodstuffs, production of space overcoming means causes expansion of various public and private services to meet difficulties and restraints that inevitably accompany spatial movement.

Fourthly, we need to examine problems arising from the forms of ownership of means of spatial movement. Bicycles, cars, motorbikes, radio and television sets, personal computers, mobile phones and the like can be owned by individuals or households. The postwar development of capitalism made it possible for individuals and households to own those space overcoming means that some time before only business firms or the army had been able to own. However, most households cannot afford to own large ships, electric locomotives, and jumbo jets.

In the postwar period it became possible for individuals to spatially move themselves, things, and information for personal purposes by using cars and telephone. Whether a specific space-overcoming means can be personally owned or not largely determines the pace of development of the industry producing it, the ripple-effects of that industry on other related industries, and the transformational influence that particular means exerts on society as a whole. Needless to say, space-overcoming means that can be personally owned has a larger demand and a larger influence on related industries than those not congenial to personal ownership.

One Japanese characteristic about ownership of space-overcoming means is that privately owned airplanes and motorboats are incomparably fewer in Japan than in other advanced countries.

Third aspect: infrastructure that supports the functioning of space-overcoming means

Unlike "Walkman," ships, motorcars, aircraft, and mobile telephones cannot function by themselves. For their functioning, certain infrastructure is necessary, such as ports, roads, airports, telephone lines, antennas, and communication satellites. What kind of infrastructural investment is needed in a specific historical period is determined by the kinds of space-overcoming means used widely. Considering this, the government's duty should be to introduce social capital responding to the needs of the next generation space-overcoming means, and not to undertake public work projects sure to be found useless in the near future, if for the sake of absorbing unemployment.

Students of business logistics are nowadays paying attention to the need to harmoniously and simultaneously develop means of transportation, engines for power generation, and lanes (facilities) of transportation. Mr. Taniichi Tanimoto emphasizes the necessity of balanced development of these three on grounds that the overall transport efficiency is determined by the least developed of these. In reality, the social capital buildup process has to be always slow, meaning that Tanimoto's third requirement is always the last to be met. Japan lags behind other

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advanced countries particularly in building high-speed traffic systems.

Economics has failed to have a theoretical frame whereby it can properly discuss the necessity and potentiality of space-overcoming industries that impart dynamism to economic development. This is because micro-economics ignores the presence of spatial barriers. Macroeconomics itself also fails to adequately recognize the importance of space overcoming and consequently focuses its interest only on macro public investment as a means of saving the unemployed.

Antennas and satellites connected with mobile phones do not require constant, continuous maintenance work. Spatially they are set in fixed positions. Mobile phones are spreading faster in developing countries than in developed countries because antennas can be installed relatively more quickly at a lower cost than telephone wires. From the point of view social capital economy, the mobile phone system is better suited to space-overcoming purposes.

In the same vein sea ports and airports are superior to roads and railways as the former require but spot-maintenance and amenable to global networking while the latter need continual integrated maintenance and are not amenable to flexible networking.

Developing countries are now developing rapidly largely because they can now arrange good space-overcoming environment by focusing their investment on mobile phone networks, airports, and seaports, instead of undergoing time-consuming processes of building integrated social capital.

Fourth phase: supply of services for spatial movement (transportation and communication)

Means of transportation and communication equipment supported by social capital alone would not ensure adequate spatial movement of persons, things, and information. Also needed are transport and communication service providers who mediate between the space-overcoming means and infrastructure.

As was earlier said, the faster the spatial movement, the more difficult (even impossible) is the personal ownership and operation of space-overcoming means. It is true that passenger cars and highways have enabled us to move at 100 km an hour. But the car speed has not increased very much from the pre-war days. To move faster, you should use electric trains, bullet trains, or jet planes. Individuals can hardly own such high-speed means of transportation.

Unless you are moving over a very short distance, you have to depend on transportation and other services offered by service companies. The service level of these firms determines the standards of mobility of persons and things in the economy.

The availability of parceling services offered by companies like FEDEX and UPS or of airline companies such as United, American, and Delta determines the degree of superiority of the

country in which they are based and eventually determines the country's competitiveness. In Japan we, both the government and the people, have paid attention almost exclusively to the buildup of social capital and lacked sufficient recognition of the importance of airline companies and parceling services.

In communication too, you can say that consumers are buying services as they use telephone circuits laid by telephone companies. But even so, in the field of communication, you can personally own telephone units, fax machines, personal computers, mobile phones, or other machine units. These machines logically correspond to bullet train cars in the field of transportation. You can say, if you like, that you are buying Japan Rail's things in the form of the fraction of electric power spent for the operation of the train you ride and the fraction of rails worn away by your use. But your personal ownership of the said communication units could be the logical equivalent of your personal ownership of bullet train cars. Of course, unlike vehicles, the communication units are not intended to move the units themselves.

Fifth phase: Change in the plant site choices and reorganization of spatial structure

Compression of space itself is another method for lowering spatial barriers. High-rise buildings are a case in point. Formation of industrial agglomeration, such as cities, industrial zones and industrial clusters, is a method to compress space in regional terms. But things and activities cannot be compressed to the same degree as juice concentrate, RDF (compressed wastes), or digital data.

All economic and human activities have the human being at their core. As human beings require certain comfort and amenity, it is impossible to compress space beyond a certain limit. Concentration of human activities therefore requires a certain spatial expanse as the site of activities. The site has to be expanded either horizontally or vertically - up into the sky or down into the ground. This expansion raises the cost of horizontal and vertical movement and invites sharp competition over the use of a limited land space (rising land prices).

Competition over the use of land in long-term perspective would eventually result in the re-ordering and reorganization of the disposition of the various functions of land utilization. But real estates are generally privately owned and so it is not easy to change their use in short term. Moreover, the owners of advantageously located land tracts benefit enormously from positional rents they can collect. The sites serving as geographical nodes of traffic and communication are more privileged in terms of space overcoming than other sites. Naturally competition sharpens among those who want to get into such sites, and this raises their prices and rents. The land price and rent represent the fraction of space-overcoming cost that the land

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in question can save.

Small things and information can be spatially moved easily and their spatial locations are easily changeable. In contrast, buildings, houses, and social capital stay where they are over a long time. The disposition of real estates, which cannot be re-disposed in a short period of time, makes it difficult to change their locations. Also difficult is the movement of persons whose lives and productive activities are largely determined by the disposition of real estates.

Company offices and other commercial establishments now located in the city centers functioning as the nodes of traffic and communication are those that either conduct activities involving broader spatial movement or more face-to-face activities, both of them kinds of activities having the effect of economizing on spatial movement cost, than others. Buildings are maintained for a long time, but offices housed in them can be moved in medium term. The buildings are not moved, but their functions can be changed partially to adapt them according to dispositional rationality.

The space-overcoming point of view is relevant to the disposition of the various functions inside the farm, residential house, or the office. Farming families would prefer to grow labor- and attention-intensive plants near their homes and to have forests that do not need daily care located away from home. In the designing a house or an office, the human path of flow should be considered so as to minimize human movement. This is important because the human being is slow to move (by walking) and involves the highest cost per hour.

Krugman and Porter nowadays attach importance to industrial agglomeration and cluster. Agglomeration is meritorious because of relief of the spatial barriers that confront movement of persons, things, and information. Inter-person exchange of person-specific knowledge as well as creation of new knowledge are often facilitated by direct inter-personal contacts. An arena of creative activities is also an arena where creatively working human beings are concentrated.

The tendency of IT contents-producing venture businesses having to be concentrating on the city center was once problematized as an IT paradox. These venture firms outsourced to become slim-bodied, but their very nature impels them to congregate densely in the center of activity concentration.

(3) High Mobility Technology Leads Technological Innovation

Technological innovation toward compression, mini-size, lightweight, and high speed

Requirements of technological innovation for mobilization range from compression, mini-

sization, and light weightization to high speedization, jumboization for mass transport, and safety. These requirements involve a number of difficulties. Moreover, they are often in trade-off relationships. Mobilitization requires mobilitized machine units to operate under all weathers since they are not allowed to sit still, like large computers, in an air-conditioned environment. Mobile units must adapt to a wide range of temperatures and moistures.

The trade-off relations existing between different requirements serve as an incentive to technological innovation. It is said that the direction of technological innovation is always uncertain. But technological innovation is certainly directed toward higher mobility (faster, more comfortable, cheaper, and farther). Innovations otherwise directed are all intended to achieve a more “comfortable” life (medical technologies, air-conditioning, clothes of new materials etc.).

To move persons and things faster, you should take measures to fight heat from friction, air resistance, and shocks. Higher speed and larger size (hopefully with less weight) trade off with lower cost, more comfort, more safety, and less environmental hazards.

In moving things, mobility can be enhanced by transforming the things moved into more transportable forms and rationalizing the packing and transport units to satisfy container standards. But in moving human persons, it is impossible to compress human bodies or pack them into a vehicle to its capacity. In moving human beings, “comfortable” is a necessary requirement, a factor you can ignore in the movement of things. (Moving animals also must satisfy the same requirement to a certain extent).

Chain reaction of technological innovation

Mini-sization and light-weightization spread, like chain reaction, involving parts, materials, and energy sources. The final products cannot be small and light unless their parts are small, light, and thin. We said that the bottleneck of spatial movement is found in the factors that are hard to move spatially. In the same vein, the limit of mini-sization and light-weightization is found in the parts of the system that are most difficult to make small and light. This generates a tremendous pressure on technological innovators, motivating them to make these parts small and light. Various technological innovations toward the small and the light progress simultaneously in various fields.

In many cases, technological breakthrough must be made to make things small and light. Limits are apparent if efforts are confined to incremental improvements, like trying produce smaller and lighter CRTs, vacuum tubes, or manganese batteries.

Similarly, you cannot improve a propeller plane into a sonic jet plane. Schumpeter referred to

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the transition from the horse-drawn carriage to the locomotive-drawn train as a case of non-cyclic, non-continual technological change.

Richard Foster of McKenzie Corporation observes that a company will certainly be hit by a surprise attack should it fail to understand discontinuity in technological development. Likelihood of paradigm shift seems great in space-overcoming technology because here you confront too many contradictory requirements met only by a higher level of technological wisdom, such as light weight, small size, durable, high speed, safe, comfortable, and large capacity.

Major paradigm shifts occurred in the development of new types of small batteries, new semi-conductors, new memory media, and new screen displays.

Conditions of high mobility technologies to survive

Spatial movement is conducted in manifold forms. This means that high-speed technologies do not necessarily exclude low speed technologies. Human beings move on foot in the street and inside buildings though they also use elevators and escalators. Walking is the most frequent way of human spatial movement in the daily life. Jet liners are fast but cannot be used for day-to-day spatial movement.

Generally there is a conflict between high speed and its daily usability. IT is the technology that radically removed this contradiction. It can be used in daily life and at once offers high speed and can send a large volume of information at low cost. The emergence of this space-overcoming means and its accompanying services will certainly compress other space overcoming activities.

Contradiction between spatial barriers and economy

Scale enlargement is the key to cost reduction of production. But if the unit size is larger, the cost of its spatial movement to far-off destinations is bound to increase. How far economies of scale on the production side can be effective is determined by the transportation and communication technologies available at the given time. Even if goods can be mass-produced, mass-production does not meet the purpose if their transport to remote markets costs too high. In such a case, it would be more appropriate to combine small-scale production at high cost with local marketing.

Scale enlargement may be opted for as the direction of technological development. But technologies for extremely large and concentrated production face the barrier of space and may

be defeated by technologies of small-scale locationally dispersed production. The yet unresolved tug-of-war between nuclear power plants versus micro gas turbines present a typical case.

The Ministry of International Trade and Industry for long imposed severe regulatory conditions on the operation of small power generating plants, such as the obligatory round-the-clock experts' attendance and a counter-thunderbolt device fitted to each unit. But now MITI has somewhat eased restrictions. The micro-gas turbine has definite advantages over the nuclear power plant. While the former can use waste heat for air-conditioning, the latter cannot. The former boasts of higher energy efficiency and a lower power generation cost than the latter. Being intransportable, waste heat anyway must be used on the spot of generation, which the former can do and the latter cannot. Also, a large-scale centralized power generation unit requires a power transmission grid for space overcoming, which generates losses in the process of power transmission.

Incidentally, the micro-gas turbine is a mini-sized aircraft jet turbine.

(4) Contradiction in Communication Cost Reduction

Why Internet is the ultimate space-overcoming technology

In the field of communication the emergent formula of global transmission of digitalized information can be seen as the ultimate space-overcoming means we can think of. Directness in linking is a measure to gauge the influence of specific transportation and communication technologies. If you are going to a spot 20 kilometers away, you can more conveniently arrive at your destination, and even faster, by using your car parked in front of your house, than taking a train that runs at a greater speed. You can compress the total moving time by reducing the waiting time and the speed-regulating stage, by cutting the number of transfers to other vehicles, and by taking a short-cut. Usually, high-speed movement and door-to-door movement contradict. Most people do not have a bullet train station or an airport near their homes. The greater the vehicle's speed, the fewer should be the terminals (stops) on the way. This presents a dilemma.

In other words, the faster the vehicle, the larger the distances between the terminals (railway stations, bus stops, and airports). But in the case of Internet, information is delivered very fast and in large quantities to or from your personal computer at home or at your company, or even to and from the mobile phone or portable computer you carry with you. Postal mails travel slowly, and are delivered at your home or company mailbox, not directly to you

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personally.

Internet-carried information, being digitalized, is delivered to you in a form most appropriate to you. It is easy to use, process, and forward digital data again. It is as though you have your favorite foods delivered to your dining table at the time of your choice. All you still have to do yourself is cut the steak or sprinkle pepper. Or if you are sending out a parcel, you need not pack nor unpack. You need not touch the cardboard box. You can use Internet from anywhere in the world. It delivers information extremely fast, spares you various troubles, and is low-cost.

I say Internet is the ultimate means of overcoming space because it carries information at the light speed, everywhere in the world, and at an extremely low cost.

How far things can be digitalized

Information that is usually carried in the form of a thing is likely to be increasingly digitalized in the near future. Internet, as the ultimate space-overcoming means, can carry information all over the world at the local phone call cost. At this moment Internet is reasonably used mainly to deliver documented information. When it comes to music and movies, their downloading through Internet is still too time consuming and expensive. Here more effort is needed to further lower spatial barriers. But the barriers will soon be further lowered, enabling users to get digitalized music, photos, movies, novels, newspapers, and magazines through Internet. Then CDs, videotapes, paper, and other material media are likely to be done away with. But even then you will not be totally free from materials, such as CD-ROM, floppy discs, and hard discs, if you need to save data.

But you will get free from the need to save data if, in the future, you become able to download necessary information instantaneously, from anywhere in the world, and at a cost lower than the data saving cost. At that stage, the spatial barriers will be totally demolished as far as digital data are concerned.

There will be no letup in the process of more information being digitalized though illegal copying and unpaid copying charges may still stay as problems. We will soon see most images, music, and written documents, all digitalized, moving at a high speed by optical fiber. Things, however, will not be moving at any comparable speed even in the future. Nevertheless, if it becomes technically easy to send digitalized information about a material thing, and to assemble its replica at the receiving end on the basis of that information (blue print), that would be almost tantamount to forwarding the thing itself to a remote place, or a kind of space travel by space warping.

The essential point in space overcoming is not try to move things which are difficult to move. If the digital information of the thing desired to be moved is delivered to various places on its way to the final destination, the speed of movement will be drastically raised and the movement cost drastically reduced. This requires the introduction of a dispersed production system under which the same quality products are produced efficiently in many places and in small lots in each place.

The production and distribution systems in the world would undergo a major change if we succeed in building small scale, dispersed, and high speed production systems that will replace the current large-scale production that requires large scale transportation and large scale marketing. Such new systems based on component modularization and standardization will enable, for instance, personal computer production to take place in locations very close to the consumers.

Flows of things and persons

In a complex chemical reaction passing through plural stages, the speed of the aggregate reaction is subject to the speed of the slowest composite reaction. If the whole process is considered, the reactions faster than the regulating reaction speed can be dismissed. If an information delivery system is organized in an ideal way, ensuring speed, low cost, and locational dispersion, then the need will not be felt to discuss spatial movement of information. Low cost would work to cap the development of information industry.

Development of an industry is subject to the co-relationship between the production increase and the demand increase. As long as economic activities cannot be totally free from things, and if face-to-face communication become more important between human beings, the weight of spatial movement of things and persons may come to require much more time, attention, and cost. Paradoxically, such a situation may generate more business opportunities.

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