

Innovation of IT & by IT

By Akihiko SHINOZAKI

Introduction

Since the 1990s, the development of information technology (IT) and its fast diffusion have greatly transformed the economy, as described by Alfred D. Chandler Jr., a business historian, that “the transformation from the Industrial into the Information Age in the last decades of the 20th century.”

Innovation “of IT” itself has made remarkable progress. But what is more important is innovation “by IT.” Joseph Schumpeter, one of the great economists in the 20th century, called innovation “*Durchsetzung neuer Kombinationen*” (*implementation of new combinations*). What Schumpeter meant is not only technical innovation in the engineering sector in a narrow sense but a wide range of concepts such as production of new goods, introduction of innovative production methods, exploitation of new markets, acquisition of new supply sources, and establishment of new organizations. IT is the very core technology that precisely makes these possible.

Emergence of New Concepts of Economies

Innovation by IT can be achieved with investment in new technologies and resultant reforms of existing systems via a variety of originality and ingenuity linked with them. What is important here is how to make use of new concepts of economies in the information age. An open network environment and advanced digital technologies have evolved IT out of a merely efficient information-processing machine into an effective tool of business communication. “Network effects” and “economies of alliance” have emerged amid such technological progress. (Table 1)

In the industrial age, innovation was beneficial for large corporations which enclose human resources and capital stock under their wing. This is because under the theory of “economies of scale,” the larger an operating unit, the greater its output. If “economies of scale” work, it will eventually lead to the formation of a monopolistic industrial structure that is advantageous to big businesses.

Such “economies of scale” in the industrial age, however, have become not so almighty in the information age. Instead, “network effects” or “network externalities” have emerged. Under the theory of “network effects,” the greater the number of similar users, the higher the convenience. Such network effects do not necessarily require a monopolistic industrial structure of giant firms because the network effects represent “the merit of scale for consumers” who are situated at the other end of the output market while the economies of scale represent “the merit of scale for firms,” or production function, that is situated between the input and output markets.

The network effects represent economies of scale on the side of consumers who are situated beyond the output market. Take a look back at sharp expansion in the personal computer market in the 1980s

and in the mobile phone market in the 1990s. A large number of companies joined the markets and competed in supplying a variety of goods and services without eroding consumers’ merit of scale because those goods and services are compatible for every consumer.

Chances for SMEs & Local Firms

In addition, “economies of alliance” are the obverse of “economies of scope” just as network effects are the obverse of economies of scale. Economies of alliance are generated by sharing outside resources by multiple organizations in various forms of alliance, producing synergetic effects of dynamic “new combinations” through the mutual use of management resources while economies of scope are generated through the joint use of in-house resources in a single, integrated organization.

Therefore, economies of alliance offer broader opportunities for small and medium-sized enterprises (SMEs) and/or local firms. An information network exercises its power in the exchange of ideas, beyond restrictions of not only “time” and “space” but also walls of “organizations,” and makes it possible to start up a business based on those ideas. Good use of such information networks helps expand chances for small entities such as individuals to mobilize various management resources for which they have to rely on organizations such as governments and major businesses.

In the pre-IT era, or the industrial age, scattered individuals were required to shoulder a huge amount of transaction costs for using market mechanism to perform social division of labor. Therefore, hierarchical organizations were formed to save such transaction costs and maximize the power of division of labor. Those organizations grew into mammoth firms (Oliver Williamson who won the 2009 Nobel economics prize is the leading authority in this field as well as Ronald Coase who won the prize 20 years ago).

In the industrial age, major corporations found themselves at an

TABLE 1

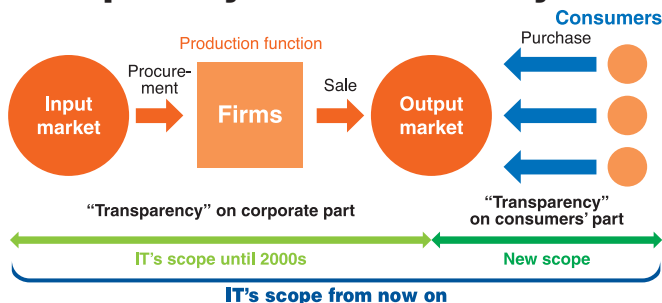
Transformation of concepts of economies

Types of merit	Emerging information age	Matured industrial age
Merit of scale	Network effects (externalities) – consumers’ merit of scale	Economies of scale – producers’ merit of scale
Merit of resources	Economies of alliance – outside resources – multiple organizations – synergy effect – innovation (new combinations)	Economies of scope – in-house resources – single integrated organization – cost saving – learning by doing
Desirable industrial organization	Multiple small players Competitive market Compatibility Modularity	Larger organization Oligopoly, or monopoly Continuity Integrity

Source: Compiled by author

CHART 1

Transparency to consumers' eyes



Source: Compiled by author

advantage in “in-sourcing everything” where they could enclose and integrate all necessary management resources by themselves and could seek “economies of scale” and “economies of scope.” But, in the era of economies at the opposite end where “network effects” and “economies of alliance” can display their power driven by IT, there emerges a fresh environment for excellent human resources, so far enclosed in companies, to be able to break their fetters and act freely as independent entrepreneurs who induce “new combinations” in the emerging markets.

Transparency to Consumers' Eyes

Another route that IT innovation generates for SMEs and local firms to find more business opportunities is “transparency for consumers.” Japan ranks at the top level in the world in terms of mobile and broadband communications. Technological progress in this field has improved the level of “resolution or clarity of market information” for consumers’ eyes as well as businesses. Consumers, who used to be at a disadvantage in access to market information, have finally come to acquire various information, at low cost and more quickly and correctly than ever, on goods and services that are traded in the market. (Chart 1)

Getting a good grasp of such relations between the market and consumers will enable small firms to take a high value-added business strategy under which products and services of high quality are offered. In the “Market for Lemons” theory known for information asymmetry, high-quality goods (e.g. peaches) are driven out of the market because of their higher prices. Accordingly, defective and low-priced goods (e.g. lemons) become rampant. This is because consumers see the market as that of a mixture of wheat and chaff due to insufficient information on quality.

If “market transparency to consumers’ eyes” makes progress, consumers will be able to easily distinguish between lemons and peaches as different products without extensive advertising expenditures by producers. Lemons will thus be traded as lemons and peaches as peaches in their respective markets at their own prices. In other words, peaches, once driven out of the market by their higher prices, will gain fair valuation and turn into high value-added products in the information age.

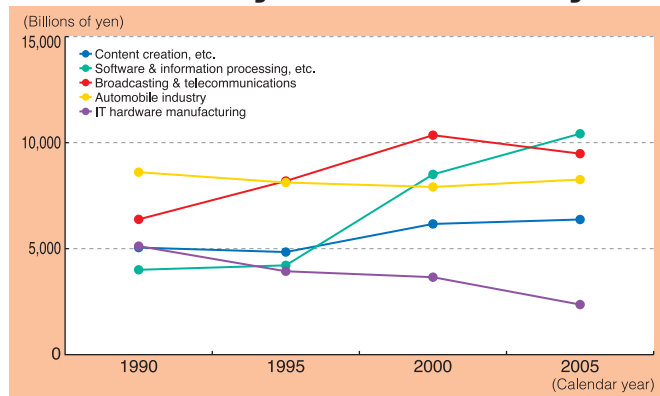
Take Japanese farm products, for example. Their lack of cost competitiveness is often mentioned, but they could find broader appeal because high-quality farm products, such as those grown through time-consuming organic farming, would be recognized by consumers as safe, reassuring, and high value-added products. Turning to the overseas market, especially, Japan would be able to launch the sale of high value-added farm products in emerging economies in Asia which have raised their purchasing power.

Global Power of Media Convergence

Regarding innovation “by IT,” the heaviest user of IT is the IT

CHART 2

Long-term trends of value added by selected industry



Source: Input-Output Table & Linked Input-Output Table, Ministry of Internal Affairs & Communications

industry itself. Innovation is most hoped for in that area. Media convergence has taken place in this field. Japan’s domestic market of IT hardware instruments, such as personal computers and mobile phone handsets, is shrinking in size because of increasing imports. In contrast, application services such as software, information processing and content creation are on a course of steady expansion. The total value added in these areas is now exceeding that of the automobile industry and growing into Japan’s core industry. (Chart 2)

The time has come when further advance of information technology enables the interactive transmission of digitalized high-capacity rich content such as audio and images with quite lower cost. In such an era, not only broadcast images for entertainment but data in all other areas, such as educational and medical information, are turned into digitized content. Individual markets that have been vertically segmented into such limited areas as broadcasting, telecommunications and personal computers by technical restraints so far are expected to merge into a single major market.

As Adam Smith elaborately depicted in “The Wealth of Nations,” division of labor will deepen if the size of the market expands, and productivity will improve if division of labor deepens. In the emerging giant market, there will be fresh business chances involving not only broadcasting and telecommunications but also a variety of related fields such as content creation including animation and films, information services for businesses, and the digital electrical appliance industry.

A better use of innovation stemming from media convergence will help Japanese digital content diffuse around the world. It will produce not only the effect of an increase in content exports that could contribute to economic growth but, in the longer term, the solid effect of expanding the scope of next-generation people well versed in Japanese affairs. Even if Japan becomes a society with fewer children, motivated young human resources will be abundant from a global point of view. Japan will be able to establish foundations for fortune building in the future if it resorts to soft power and deepens international links with the next generation of people through the better use of IT. It must be a promising course for prosperity even though it may be a long-term approach like tree planting.

IT thus offers a variety of possibilities. What is most important in realizing such possibilities is how to encourage and facilitate Japanese entrepreneurship that generates “new combinations” as Schumpeter advocated. **J.S**

Akihiko Shinozaki is a professor, Graduate School of Economics, Kyushu University. A former Japan Development Bank senior economist and a former government economist, he served as a visiting scholar at Harvard-Yenching Institute, the United States, in 2001-2003.