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I. INAUGURAL LECTURE FOR OPENING THE ACADEMIC YEAR 2010/2011

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ORGANIZATION ACCUMULATES AND MARKET UTILIZES

1. A TALE OF THREE INNOVATORS: APPLE, MICROSOFT AND GOOGLE

Innovation is the engine of progress of our society. Today, I would like to talk about the knowledge dynamics behind innovation, i.e. how knowledge is accumulated and how knowledge is utilized to **MAKE** innovation possible.

We can define innovation as "the dramatic changes of people's life through the introduction of new products or services." Thus, innovation is not a mere technological discovery nor an experimentation of a new product idea. Unless it impacts on people's life, its social significance is minimal. Only when some dramatic changes in people's life occur, does deserve to be called innovation.

Nowadays, the pace of innovation worldwide is accelerating. For example, many amazing innovations have been occurring surrounding the personal computer in the last three decades, truly changing our lives dramatically. Among the firms who have led this innovation, all of us know that three innovators stand out, Apple, Microsoft and Google. Apple brought one of the first commercially successful personal computers to our lives and then led the innovation on the user-friendly PC with a mouse and icons. It is now changing the way we read books with iPad. Microsoft is another innovator in the personal computer software, bringing the first widely used operating system for the Intel chip PC, DOS, and then introduced the user-friendly Windows operating system with huge success. Actually, it is not too much to say that these two firms have been writing the history of personal computers.

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After the PC became everybody's tool, the internet age came to communicate among the PCs, and it brought the famous Google, which made the PC the gateway to the wide world of information on the internet. Google's innovation was the fabulous search engine and super-powerful data centres with so many servers to do searching on the web all the time. Those data centers are now the source of the next generation of computer-related innovation, cloud computing.

All three firms started as small ventures not too long ago, each led by quintessential entrepreneurs, Steve Jobs at Apple, Bill Gates at Microsoft, and Sergey Brin (together with Larry Page) at Google. Nonetheless, these individuals are not the single-handed warriors to make their innovations possible. Behind their entrepreneurial activity was a huge amount of knowledge accumulation done by large organizations. Both for Jobs and Gates, the large organization was Xerox corporation and for Brin, it was Stanford University.

The basic technology for the user-friendly personal computer that we know today was developed by the Palo Alto Research Center (PARC) of Xerox Corporation. That technology was first applied in a workstation called "Alto", which was the precursor of the modern personal computer. However, despite the technical success of this technology, Xerox failed to allocate sufficient resources to this project as a result of various administrative troubles within the company and poor financial success forecast that the corporate marketing department and the accounting department conveyed to the management. Thus, unfortunately, Xerox failed to become the market innovator for the personal computer. Even though the technology development for the personal computer was successful because of the large amount of resources that Xerox could afford, the accumulated knowledge was not utilized well by Xerox for a commercial success.

Feeling disappointed, many engineers left PARC. One group went to Steve Jobs of Apple and created Lisa and Macintosh, the forerunner of today's personal computers with Jobs. Another group of engineers from PARC were invited by Bill Gates and joined Microsoft, where they developed the Windows operating system. Thus, Xerox, a large organization, accumulated at PARC most of the necessary basic knowledge for the personal computer age, which was later utilized for commercialization by the small venture firms in the Silicon Valley. Entrepreneurs with acute business sense smelled the potential of the technology accumulated by large organizations and tried to capitalize on them by snatching the accumulated knowledge through the market mechanism.

In the case of Sergey Brin, the co-founder of Google, the main large organization whose knowledge accumulation he could capitalize was Stanford University. Wikipedia describes his life story until he began Google as follows.

"Brin immigrated to the United States from the Soviet Union at the age of six. Earning his undergraduate degree at the University of Maryland, he followed in his father's and grandfather's footsteps by studying mathematics, double-majoring in computer science. After graduation, he moved to Stanford to acquire a PhD in computer science. There he met Larry Page, whom he quickly befriended. They crammed their dormitory room with inexpensive computers and applied Brin's data mining system to build a superior search engine. The program became popular at Stanford and they suspended their PhD studies to start up Google in a rented garage."

Education at Stanford and the network of professors and students there provided both the accumulated knowledge he could utilize and the seedbed of ideas and feedbacks for the technological development for the Google search engine.

2. TWO KNOWLEDGE DYNAMICS FOR INNOVATION: ACCUMULATION AND UTILIZATION

The tales of three innovators all indicate that for an innovation to succeed, the two functions about the knowledge for innovation, the accumulation of the necessary knowledge and its utilization, are often done by two separate groups of people or organizations. There are those who do knowledge accumulation and the others who do knowledge utilization. Of course, there may be happy cases where the same individuals or organizations do both accumulation and utilization, but that may be an exception rather than a rule.

Why so? The reasons seem to lie in the nature of the innovation process itself. Usually innovation is a long process and has to go through three very different stages. First, there is a technology nurturing stage. A new technology is nurtured and developed, using a variety of knowledge which has been accumulated in society. Second, the new technology must find an entry point into the market in the form of a new product. Let us call this second stage, the market entry stage. Third, the new product introduced must be accepted by a large number of people in society so that a small entry into the market becomes a huge outpouring of demand. Only when this outpouring occurs, the new product is actually used by many people and thus

changes the lives of many people. In a sense, society agrees and moves with the new product. Let us call the third stage the societal moving stage. Only when the third stage is successful does innovation finally become a reality.

Knowledge plays an essential role in all the stages of innovation. In the first stage, the technological nurturing stage, technological knowledge has to be created and accumulated to make the new technology applicable in reality. Knowledge accumulation dynamics is the key for the first stage. Note that we include knowledge creation in knowledge accumulation dynamics, since knowledge accumulation presupposes the creation of new knowledge to be accumulated. In the second stage of innovation, the market entry stage, knowledge utilization dynamics is the main knowledge activity. Here, not only the technological knowledge that has been accumulated in the first stage, but also the market knowledge would be necessary to develop a new product. In the third stage of innovation, the societal moving stage, large scale knowledge diffusion has to occur so that many people will recognize the new product and show interest to try it. This would be a kind of knowledge utilization in that many people end up sharing the knowledge about the new product and the result of knowledge utilization is its wide dissemination. Thus, knowledge utilization is the central activity in the last two stages of the innovation process.

Although we categorize the knowledge relating activity into knowledge accumulation process and knowledge utilization process here, each process is a very dynamic activity and linked closely. For example, knowledge accumulation itself includes some form of utilization of old knowledge to create new knowledge and then the combined total of all knowledge, old and new, would be accumulated. On the other hand, in the process of knowledge utilization, one often faces a situation in which the knowledge one starts to utilize is not enough to develop a new product for market entry and thus is forced to create new knowledge to fill the gap. The newly created knowledge will not disappear after it is utilized. It will certainly be accumulated in some way after creation. In this sense, knowledge utilization may be the beginning of another round of knowledge accumulation.

Viewed this way, we can find at least two reasons why two separate groups are often necessary for the entire process of innovation completed. One reason is that it usually takes a long journey from the beginning of an innovation, the technology nurturing stage, till the end, the societal moving stage. Since it is such a long process, a single group of people often cannot endure the entire process alone and people have to take turns between different groups like a baton-handing relay game. Another reason is the

character difference between knowledge accumulation and knowledge utilization. Those who are good at knowledge accumulation may not be fit for knowledge utilization in the marketplace.

Even though knowledge accumulation and knowledge utilization are intertwined, it is still meaningful to conceptualize both knowledge accumulation dynamics and knowledge utilization dynamics as two separate concepts. Our main point here is that, in order for innovation to occur, both knowledge accumulation dynamics and knowledge utilization dynamics are necessary and these two dynamics are often carried out by two different groups of people or in two different places.

3. ORGANIZATION ACCUMULATES AND MARKET UTILIZES

The tale of three innovators also tells us that knowledge accumulation dynamics often occurs in large organizations, like Xerox and Stanford University, and knowledge utilization is done by the entrepreneurs, like Jobs, Gates and Brin, in the marketplace. It looks like that an organization accumulates knowledge and then the market utilizes the accumulated knowledge.

Organizations are the places where people get together and form teams, constructing a stable human-network. In that network, people learn and accumulate together and from each other. Organizations are good at knowledge accumulation. Nonetheless, they are often not very good at utilizing the accumulation themselves, like Xerox. Organizations, both corporate and non-corporate, have hierarchical mechanisms of decision-making and resource allocation within its boundary. This hierarchy often becomes an obstacle for free experimentation with entrepreneurial spirits inside the organization, especially when it involves a large amount of investment. But that kind of investment is inevitable in the second stage of innovation, the market entry stage. The amount of money involved often becomes huge, whereas at the technology nurturing stage it is much less costly. In a sense, the organizational hierarchy is not good at selecting the good risk and thus is not so good at knowledge utilization.

Xerox's failure in investing in the personal computer is an example of such a hierarchical failure. Xerox is not, however, an abnormal example. Many large IT firms, like IBM and ATT (American Telephone and Telegraph) accumulated much basic knowledge we have today in IT and communication technology in their labs, at the Watson Research Center for

IBM and the Bell Laboratory for ATT. They could not realize, however, the full business potential of their knowledge. Entrepreneurs and spin-offs from these organizations, like Steve Jobs at Apple, Bill Gates at Microsoft, Scott McNealy at Sun Micro Systems, Larry Ellison at Oracle, John Chambers at Cisco Systems, reaped the huge economic benefits from the knowledge that IBM and ATT accumulated.

Moreover, those entrepreneurs who succeeded in the final two stages of innovation, the market entry stage and the societal moving stage, are often former employees of these big firms. Among the entrepreneurs I have been mentioning here, McNealy, Ellison and Chambers all worked once either for IBM or ATT. Only Jobs and Gates have been entrepreneurs from the beginning. Ironically, IBM and ATT not only contributed greatly in basic knowledge accumulation for today's IT industry, but also supplied many entrepreneurs who completed innovation in this industry.

Restructuring at IBM and ATT in the 1980s under the pressures from the US Government for anti-trust break-up was the major trigger for the spin-offs of these entrepreneurs. Thus, the IT revolution in the US would have been impossible without the basic accumulation in those large firms. But it would also have been impossible without the restructuring of these firms that not only released many future entrepreneurs into the new business market but also supplied many engineers who had to leave these big organizations into the labour market.

A significant merit of the market in knowledge utilization comes from its ability to broaden the possibility of combination of various pieces of knowledge accumulated in different organizations across organizational boundaries. Entrepreneurs are not constrained by the organizational boundary and they are also free from hierarchical control. When they smell an innovation opportunity, they can fetch the accumulated knowledge in other large organization in the form of recruiting talents from these organizations or in the form of learning themselves by working for these organizations. Through their alert moves, resources are recombined and allocated so that the innovation opportunity they envision becomes a reality. Markets work as the places for experiment. However, the market is not very good at knowledge accumulation. For knowledge accumulation, we need a stable human network, like a team, in which learning takes place among many individuals with solid common grounds. Markets are not easily equipped with the capacity to foster such a stable human network since the freedom of actions by the market participants, and in particular the freedom of entry and exit, is the basic principle of market transactions.

In any market economy, we have corporate organizations as its main economic players and we also have non-corporate organizations like universities who specialize in knowledge accumulation. These organizations are linked together by the markets through market transactions to complement their division of labour. Markets also link corporate organizations with consumers. Thus, organizations and markets are two very basic units in any market economy, be it a national economy or a regional economy.

If we imagine the total picture of knowledge accumulation dynamics and knowledge utilization dynamics in the entire economy, our discussion so far implies that organizations, both corporate and non-corporate, function as the main arena for accumulation dynamics. Organizations are the places where accumulation occurs. For utilization dynamics, however, the main arena would be the market. The market is where utilization occurs. Obviously, the actual player who utilizes accumulated knowledge for the purpose of innovation is the entrepreneur and the corporate organization he or she leads. That utilization, however, occurs in the context of the market. In short, "organization accumulates and market utilizes," or a little more precisely, the market lets a firm utilize other organizations' accumulation.

Certainly in the tale of three innovators and in many other cases, the market mechanism makes it possible for the entrepreneurs to utilize various knowledge accumulated somewhere in the economy. However, it is important to note that there must be someone who accumulates knowledge in the first place. There is no utilization of knowledge unless it is accumulated beforehand.

In summary, knowledge accumulation is done through learning by a team of people who deeply share a common goal and a common knowledge base. An organization is good at this. Knowledge utilization for innovation is done through experimenting a new combination of knowledge across organizational boundaries and providing the right resource at the right timing to this combination. The entrepreneurs who have some unique visions are the people who utilize. The market is the place for this kind of experiment to happen.

4. US EXPERIMENTS AND JAPAN DEVELOPS

Although there are both the corporate organization and the market in any market economy, the ways they actually work and the relative share of importance in the total economy vary from country to country. Any market economy is a mixture of the organizational (hierarchical) resource allocation mechanism and the market mechanism.

Within the corporate organization, resources are allocated to the organizational members through the organizational mechanism of hierarchical authority and coordination. In the market place, the market mechanism of competition and price regulates the demand-supply relationship and allocate resources among the market participants. Both mechanisms can vary from time to time, from one country to the other, in their actual details and the basic patterns of behavior of the participating actors.

In terms of the mixture of the organization and the market, many research and the stylized facts seem to indicate that Japan is a more organization-oriented market economy than the US and the US is a rather market-oriented economy. For example, in the Japanese intermediate goods market, buyers and sellers tend to maintain rather long term transaction relationships and often cooperate for innovation over the long run. The relationship of automobile parts transaction in the Japanese automobile industry is its typical examples and often called the Keiretsu relationship, whereas in the US auto parts market, shorter term and more at arm's length relationships are the norm. I once termed the pattern of market mechanism with these close relationship as the 'organizational' market (one kind of market mechanism with certain features of the organizational mechanism), compared with the more free competitive markets in the US.

If so, it then follows that Japan would be better at knowledge accumulation dynamics and the US would be better in knowledge utilization dynamics. Certainly it seems to be the case and it shows, among other things, in the different characters of innovation activities of the two countries. The US is the country of industrial experiments and Japan is the country of industrial nurturing or development.

In fact, the US seems fit for various experimental activities to try a new business or a new business model in many industries. In order to supply resources to such experiments, both the capital and labour market are very mobile in the US and there is ample venture capital and the large public offering market for new companies in the US. Being attracted by such markets, both capital and labour flow into the US from all over the world, for example at Silicon Valley.

In the course of history, there have been many episodes when the US played a very dominant role at the early stages of commercialization of innovation. Even if we limit our scope to the last forty years when Japan came to approach the US in industrial strength, the US led the world in semiconductors, liquid crystal display, information technology and biotechnology, among others.

Japan has not been too far behind when it comes to the development of an industry after the seed is planted. Both in semiconductors and liquid crystal displays, Japan has led the world at various stages of industrial development after the initial experimental stage is over and the pace of technological innovation matures. Another historical example would be the automobile. Japan is overtaking the US as the main player in this industry after the US established this industry so many years ago. In so doing, the Japanese Keiretsu system of interfirm cooperation, a kind of 'organizational market', played an indispensable role.

Why can the US keep doing this? The American knowledge utilization dynamics seems to be active at full power even now, Google being one of the latest examples. As I noted before, any knowledge utilization presupposes knowledge accumulation. Without accumulation, there is nothing to be utilized. Then, where does knowledge accumulation come from for the American knowledge utilization dynamics?

Perhaps it is not so much from the American corporate organizations' accumulation as before. For example, the famous Bell Lab disappeared after ATT was broken up and the Watson Research Center at IBM is said to be losing the glory of old days.

There are at least two sources of knowledge accumulation that American firms and American entrepreneurs can still use. One is the open knowledge base accumulated in American universities. The other source is knowledge accumulation done in other countries, both in corporate organizations and non-corporate organizations. The US can tap into and attract those accumulation sources outside its national border.

5. THE US AS THE MARKET ARENA FOR THE WORLD

A particular strength of the American economic system seems to lie in its very openness of the system. One of the clear ways for American firms to capitalize on this openness is to broaden the scope of the open knowledge base they can tap into. American firms have been actually much more active in international sourcing of their knowledge base, either in the form of foreign R&D activities or inviting foreign university resources to various American organizations, universities or the firms. This is in a sense an effort to broaden the open knowledge base for American firms.

Another example of broadening the open knowledge base is to have centres of active venture activities for innovation as a marketplace, like

Silicon Valley, within the US. The existence of these marketplaces attracts many people from all over the world to go there with their accumulated knowledge. People from all corners of the world flock to the American shore in order to capitalize on their knowledge accumulation in the market arena that the US provides. In a sense, the US is tapping into the large open knowledge base throughout the world by providing the market arena for the knowledge holders outside the American border to come and play.

As we have already mentioned, this is made possible partly because a very mobile labour market and a very active venture capital market exist in the US. There are, however, three more basic conditions why the US can function as the market arena for the world.

The first condition is that the native language of the US, English, is the lingua franca of the world. People from other parts of the world can come to the US without fearing the language problem, as long as they can speak at least broken English. English has become the lingua franca thanks to the British Empire. The second condition is that the American dollar is the international key currency. People who earn money using the American market system do not have to worry too much about the international value of what they earn, at least until the Lehman shock. The third condition is that the US is a country of immigrants not only in its origin but also in terms of the current immigration policy. The US is thus a melting pot of many people with different ethnic origins where anybody can come from various parts of the world. Those who come to the US do not have to worry too much about their origin.

In a sense, Google is a good example of the US attracting the knowledge accumulated originally elsewhere in the world. Sergey Brin came to the US at the age of six from the then Soviet Union, where his father was a mathematics professor at one of the major universities. Brin followed the tradition in the family and the father educated his son to become another mathematician, in a sense utilizing the knowledge accumulated in the university system in the Soviet Union. The rest of the story is now history.

These three conditions, i.e. language, currency and ethnic origin, are something that no other country can currently emulate. Only the US is in a very special situation that no other country's historical and ethnic circumstances allow. And for that very special reason, the US can maintain its knowledge utilization dynamics.

6. THE ROAD AHEAD FOR POLAND

In a sense, the US is so unique, an exception rather than a rule. If other countries try to repeat the glamour of the knowledge utilization dynamics without a substantial effort for the knowledge accumulation dynamics within their national borders, failure is rather likely. Knowledge utilization does not work without knowledge accumulation in the first place.

Behind the knowledge utilization dynamics in the US lies the very active market mechanism. Economists tend to overemphasize the merits of the market mechanism. And after the fall of communism and the planned economy in the 1990s, the American ideology seems to have swept the world. Is that such a good thing?

It is one thing to use the market mechanism to allocate resources in a stable economy where the knowledge base or technology base does not change very much. The basic theory of a market economy almost always assumes a given technology set. It is another thing, however, to believe the market mechanism too much when we have to consider how to broaden our knowledge base in the society by accumulating new knowledge, like in the case of innovation. Who will accumulate knowledge if too many economic actors are too busy in trying to utilize what they already know?

Innovation is essential for economic growth, be it a national economy or a regional economy. Poland is no exception and Lower Silesia is no exception. We have to be deeply concerned about the mechanism to make innovation more active in the economy as a whole. As I have been emphasizing, organization accumulates and market utilizes. We have to pay a fair amount of attention to the organizational knowledge accumulation mechanism in both corporate and non-corporate organizations. Too much market orientation may be detrimental to the economy and society in the long run, both in Poland and Japan.

Good luck to Poland, the country I love.