



Capitalizing On Innovation: The Case of Japan

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Capitalizing On Innovation: The Case of Japan¹

By Robert Dujarric² and Andrei Hagiu³

Abstract

Japan's industrial landscape is characterized by hierarchical forms of industry organization, which are increasingly inadequate in modern sectors, where innovation relies on platforms and horizontal ecosystems of firms producing complementary products. Using three case studies - software, animation and mobile telephony -, we illustrate two key sources of inefficiencies that this mismatch can create, all the while recognizing that hierarchical ecosystems have played a major role in Japan's success in manufacturing-driven industries (e.g. Toyota in automobiles and Nintendo with videogames). First, hierarchical industry organizations can "lock out" certain types of innovation indefinitely by perpetuating established business practices. For example, the strong hardware and manufacturing bias and hierarchical structures of Japan's computer and electronics firms is largely responsible for the virtual non-existence of a standalone software sector. Second, even when the vertical hierarchies produce highly innovative sectors in the domestic market, the exclusively domestic orientation of the "hierarchical industry leaders" can entail large missed opportunities for other members of the ecosystem, who are unable to fully exploit their potential in global markets. For example, Japan's advanced mobile telecommunications systems (services as well as handsets) suffer from a "Galapagos effect": like the unique fauna of these remote islands they are only found in the Japanese archipelago. Similarly, while Japanese anime is renowned worldwide for its creativity, there is no global Japanese anime content producer comparable to Disney or Pixar. Instead, anime producers are locked into a highly fragmented domestic market, dominated by content distributors (TV stations and DVD companies) and advertising agencies.

We argue that Japan has to adopt legislation in several areas in order to address these inefficiencies and capitalize on its innovation: strengthening antitrust and intellectual property rights enforcement; improving the legal infrastructure (e.g. producing more corporate lawyers); lowering barriers to entry for foreign investment and facilitating the development of the venture capital sector.

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1. Introduction

Japan faces two interconnected challenges. The first one is common to all advanced economies: the rising competition from lower-cost countries with the capacity to manufacture mid-range and in some cases advanced industrial products. For Japan this includes not only China but also South Korea. Though South Korea is by no means a low-wage nation, the combination of lower costs (not only labor but also land and a lower cost of living) than Japan with a very advanced industrial base makes it a formidable competitor in some sectors.

Unlike – or to a significantly greater extent than – other advanced economies e.g. the United States, Japan also confronts a challenge posed by the global changes in the relative weights of manufacturing and services, including soft goods, which go against the country's longstanding comparative advantage and emphasis on manufacturing. A growing share of global value chains is now captured by services and soft goods, such as software, while the percentage which accrues to manufacturing is declining. Many of the new industries that have been created or grown rapidly in the past twenty years have software and information platforms at their core: PCs (operating systems such as Windows); the Internet (web browser such as Firefox, Internet Explorer, Safari); online search, information and e-commerce (Amazon, Bloomberg, eBay, Facebook); digital media (Apple's iPod and iTunes combination); etc.

In this context, it is striking that, as Japan has become more economically advanced, its strengths have continued to be in manufacturing. . When it comes to services and soft goods (software, content), it has either failed to produce competitive companies, or, when it has, these companies have failed to establish themselves in foreign markets. There are, for example, no truly global Japanese hotel chains, nor do any Japanese corporations compete internationally with DHL, FedEx and UPS; there are no Japanese global information services companies comparable to Bloomberg, Google and Thomson Reuters, nor is there any international Japanese consulting or accounting firm. Even more strikingly, Japanese companies are also absent from international markets in sectors which are very strong at home, such as mobile telecommunications and anime production.

The principal thesis we lay out in the current paper is that these weaknesses can be attributed to Japan's hierarchical, vertically integrated and manufacturing-driven forms of industry organization, which are increasingly inadequate in modern sectors, where innovation relies on platforms and horizontal ecosystems of firms producing complementary products. Using three case studies - software, animation and mobile telephony - we illustrate two key sources of inefficiencies that this mismatch can create, all the while recognizing that hierarchical ecosystems have played a major part in Japan's success in manufacturing-driven industries (e.g. Toyota in automobiles, Nintendo and Sony in videogames). First, hierarchical industry organizations can "lock out" certain types of innovation indefinitely by perpetuating established business practices. For example, the strong hardware and manufacturing bias of Japan's computer and electronics firms is largely responsible for the virtual non-existence of a standalone software sector. Second, even when the vertical hierarchies produce highly innovative sectors in the domestic market, the exclusively domestic orientation of the "hierarchical industry leaders" can entail large missed opportunities for other members of the ecosystem, who are unable to fully exploit their potential in global markets. For example, Japan's advanced mobile telecommunications systems (services as well as handsets) suffer from a "Galapagos effect": like the unique fauna of these remote islands they are only found in the Japanese archipelago. Similarly, while Japanese anime is renowned worldwide for its creativity, there is no global Japanese anime content producer comparable to Disney or Pixar. Instead, anime producers are locked into a highly fragmented domestic market, dominated by content distributors (TV stations and DVD companies) and advertising agencies.

Consequently, Japan is facing the challenge of creating a post-industrial exporting base. This in turn requires an environment conducive to innovation. Japanese policy-makers are aware of the issue. Many have called for efforts to replicate Silicon Valley, while others hope that the next Microsoft will be Japanese. These ideas, as interesting as they are, can only come to fruition decades from now. Silicon Valley is the product of over half a century of development. Its foundations include massive levels of high-skilled immigration, well-funded, cosmopolitan, dynamic and competitive private and public universities, a very liquid labor market, a vibrant venture capital industry, an

enormous Pentagon R&D budget, and the common law. Japan's chances of duplicating another Silicon Valley are therefore rather low.

There are however soft good and service industries in which Japan is *already* very strong, such as mobile telephony and anime. These are “low hanging fruits,” which offer far better prospects for Japanese industry internationally than competing with Silicon Valley. We argue that Japan has to adopt legislation in several areas in order to address the inefficiencies described above and capitalize on its innovation capabilities in these sectors: strengthening antitrust and intellectual property rights enforcement; improving the legal infrastructure (e.g. producing more business law attorneys); lowering barriers to entry for foreign investment and facilitating the development of the venture capital sector.

The rest of the paper is organized as follows. In the next section we provide a brief overview and background on the fundamental shift spearheaded by computer-based industries from vertically integrated to horizontal, platform-driven industrial structures. Section 3 describes the historical characteristics of Japanese innovative capabilities. In section 4 we use three industry case studies (software, animation and mobile telecommunications) to illustrate how Japan's manufacturing-inspired modes of industrial organization are preventing the country from taking advantage of its innovative power. Finally, in section 5 we lay out some possible solutions and we conclude in section 6.

2. The new order of industrial innovation: ecosystems and platforms

The rapid development of computer-based industries since the second half of the twentieth century has spearheaded and accelerated the shift from vertically integrated, hierarchical industry structures (e.g. mainframes) to horizontal structures, composed of platform-centered ecosystems (e.g. PCs). While this change has been pervasive throughout most sectors of the economy, it has been most salient in technology industries with short product life-cycles. As a result, the nature of competition and competitive

advantage has shifted *away* from pursuing quality through tightly integrated vertical “stacks” of components and *towards* building scalable “multi-sided platforms” (cf. Evans Hagiu and Schmalensee (2006)), connecting various types of interdependent complementors and end-users (e.g. videogame consoles - game developers; Windows - software application developers and hardware manufacturers).

Personal Computers (PCs): the quintessential ecosystem

Ecosystems are most simply defined as constellations of firms producing complementary products or essential components of the same system. Today’s PC industry is the archetype of modern ecosystems. There are two critical components, the operating system and the microprocessor, which are controlled by two companies – Microsoft and Intel. The other ecosystem participants “gravitate” around the two “ecosystem leaders” (cf. Gawer and Cusumano 2002): hardware manufacturers (OEMs) like Dell, HP, Toshiba and Sony, independent software developers such as Intuit and Adobe Systems, third party suppliers of hardware accessories and, last but not least, end users. Ecosystem leadership is defined by three elements: i) control of the key standards and interfaces which allow the components supplied by various ecosystem participants to work with each other (e.g. the application programming interfaces - APIs - controlled by Windows); ii) control of the nature and timing (pace) of innovation throughout the industry (e.g. Intel’s successive generations of microprocessors and Microsoft’s successive versions of Windows) and iii) ability to appropriate a large share of the value created by the entire ecosystem.

Microsoft in particular has positioned Windows as *the* multi-sided platform at the center of the PC ecosystem. Its power comes from generating network effects through the interdependence between the participations of the other ecosystem members: the value to users increases with the number and quality of independent application developers which support Windows and vice versa, third-party software vendors are drawn to Windows in proportion to the latter’s installed base of users.

One source of restraint (today more so than in the 1990s) on Microsoft and Intel abusing their eco-system leadership is the existence of second-tier players in their

respective markets, who could provide alternatives. Thus Linux, Google's office suite, AMD, and Apple act as brakes on the possible misuse of ecosystem leadership on the part of the Microsoft and Intel. The fear of anti-trust action further restrains Microsoft and Intel from aggressive behavior against the other members of the ecosystem. These factors (competition and anti-trust regulations) are essential. Without them the ecosystem might degenerate into a slow moving institution, more preoccupied with extracting economic rent from consumers than with innovation and price competition.

It is important to emphasize that the horizontal PC ecosystem that we know today has little to do with the structure of the PC industry at its beginning in the early 1980s. And even less to do with the structure of the computer industry in the early 1950s. At that time, each computer was on its own island. Only large corporations, government agencies, and universities bought mainframe computers, and they did so from a few large companies like Burroughs, UNIVAC, NCR, Control Data Corporation, Honeywell and IBM. Customers were buying vertically integrated hardware-software systems. IBM emerged as the clear leader from this pack by being first to adopt a modular and ecosystem-based approach with its System 360: it adopted standardized interfaces and allowed outside companies to supply select parts of the computer system (e.g. external hard drives). Nevertheless, this remained largely a vertically integrated approach as the main components – hardware, processor and operating system - were done in house. The radical change occurred in 1980, when IBM decided that the only way to get ahead of its competitors in the PC business (Apple, Commodore and Tandy) was to outsource the operating system and the microprocessor to Microsoft and Intel in order to speed up the innovation cycle. The strategy worked in that the IBM PC became the dominant personal computer. It backfired when Microsoft and Intel took control of the PC ecosystem and licensed their platforms to other OEMs such as Compaq, HP and Dell, which eventually relegated IBM to “one of the crowd”. IBM's original PC business, ThinkPad, is now a subsidiary of the Chinese computer manufacturer Lenovo.

Economic drivers of vertical disintegration and ecosystem structures

While at first glance it may seem that every step of vertical disintegration in the computer industry was a strategic decision involving real tradeoffs (e.g. giving up some control vs. accelerating investment throughout the ecosystem) that could have gone either way, there is a clear sense in which the process of vertical disintegration was inevitable due to technological and economic factors beyond the control of any single actor. And this process has occurred (or is occurring) in many other technology industries: videogames, smart mobile phones, wireless mobile services, home entertainment devices, etc.

There are three fundamental forces driving vertical disintegration. First, rapid technological progress leads to economies of specialization. Except in the very early stages of an industry, vertically integrated firms cannot move the innovation frontier in all segments of the value chain. As industries grow, there is scope for specializing in some layers (a key strategic decision then becomes which layers to keep in-house and which to open to third parties) and bringing other firms on board in order to develop the others.

The second important factor in the evolution of technology-based industries is modularity and the emergence of standards (cf. Baldwin and Clark 1999). Increasing productivity throughout the value chain naturally drive firms to design their products and services in a modular fashion, with well-specified interfaces, which can be used by different production units within the same company or by third-party suppliers if applicable (this is related to the first factor mentioned above).

The third and final driver of vertical disintegration is increasing consumer demand for product variety. The vertically integrated model works well for one-size-fits-all solutions. As soon as customers demand horizontally differentiated products, it becomes hard for one integrated firm to satisfy the entire spectrum of customer demands. This tension was famously described by Henry Ford: “We are happy to supply any car color as long as it is black.” Therefore, vertical disintegration is more likely to occur in industries with a large number of consumers with diverse needs than in markets with a small number of clients with similar needs.

Thus, ecosystems are the natural consequence of vertical disintegration. They have become the most efficient market-based solution to the problem of producing complex systems in a large variety of technology-intensive industries, satisfying a large variety of end user demands and maintaining a sufficiently high rate of innovation throughout the system. It is important to emphasize however that not every industry will move towards horizontal, platform-centered ecosystems. For example, Airbus and Boeing, the two biggest players in the commercial airliner business, have increasingly relied on outsourcing and risk-sharing partners. Boeing's latest jetliner, the 787, relies on risk-sharing partners involved in key R&D decisions, and much of the plane is actually not made but Boeing itself. Still, neither Airbus nor Boeing have created an ecosystem similar to the PC industry. Both companies sit at the apex of the industrial pyramid, make the key decisions, and sell the product directly to the customer (as opposed to Microsoft and Intel, where PCs are actually sold by the manufacturers such as Lenovo or Dell, which assemble the computers). This can be explained, among other factors, by the small number of customers (airlines and governments) for products with extremely high unit costs; the need to maintain extremely demanding and well-documented safety standards; and the direct involvement of governments in a sector with close links to national defense.⁴

In light of our argument in this paper it may seem perhaps surprising that the best description of the necessity of relying on ecosystems that we have encountered comes from a senior executive at a Japanese high technology firm – NTT DoCoMo, Japan's leading mobile operator. In discussing the reasons behind the success of NTT DoCoMo's i-mode mobile Internet service, he explained: *“In today's IT industries, no major service can be successfully created by a single company.”*

In the three case studies below, we will see that, despite the success of a few remarkable ecosystem leaders in a few sectors (Nintendo, NTT DoCoMo, Sony and

⁴ It should also be noted that some of the outsourcing by Airbus and Boeing is motivated by the need to find foreign industrial partners in order to increase the likelihood of sales to the airlines of those countries.

Toyota come to mind), these were exceptions in Japan's broader industrial landscape. Most of Japan's ecosystems remain strikingly similar to vertical hierarchies and the ecosystem leaders (i.e. the companies at the top of these hierarchies) are predominantly domestically focused, which makes it hard for everyone in the subordinate layers to compete globally. These eco-systems recreate, to some extent, a corporate hierarchy. It is not rare for the eco-system leader (say Toyota) to have equity stakes in some of the subordinate members. In the case of Toyota however, this hierarchical system has produced a highly-competitive international business. This is mainly because value in Toyota's sector (automobiles) still comes largely from manufacturing rather than from services and soft goods.

3. Historical background on Japan's innovativeness

In order to achieve a better understanding of Japan's innovation ways, it is helpful to provide a short historical perspective on their evolution.

Opening to foreign trade

Britain, as the leader of the Industrial Revolution, entered the industrial age on its own terms. Japan had a radically different experience. To preserve their hegemony over the country, the House of Tokugawa, which established the Edo shogunate (1600-1868), banned almost all foreign trade after the 1630s. Despite its isolation⁵, the country was not backward. It possessed a well-functioning bureaucracy and a good transportation network; there was no banditry, and literacy was high by the standards of the age. Commercial activity was modern for the era. Japanese merchants devised some of the world's first futures trading instruments for Osaka's commodities exchanges.

But isolation froze Japanese technology at a 17th century level. There were improvements here and there during the two centuries of shogunal power, but nothing on

⁵ Japan did have some overseas trade through the Ryukyus (Okinawa) and Chinese and Dutch merchants in Japan but foreign commerce was miniscule compared to island nations of similar size such as Britain.

the scale of what occurred in Europe. Whereas Europe embraced innovation, the shogunate was fundamentally committed to a static posture, at least compared to European societies. Therefore, when western gunboats breached Japan's seclusion in the 1850s, the country did not have a single railroad track, whereas Britain, smaller than Japan, already had 10,000 kilometers of railways in 1851.⁶ Nor did Japan have any modern industrial base comparable to the ones being developed in Europe and North America. Japan lacked not only hardware, but also the "software" necessary to succeed during the Industrial Revolution. There was no effective civil law system. "Law" meant government edicts; there was no formal concept of civil arbitration with the state acting as a referee by providing both courts and enforcement mechanisms.⁷ In fact, Japan did not have a bar with lawyers until the late 19th century.⁸

As long as Japan was cut off from other countries, it could live in peace with its 17th century palanquins in a 19th century world of steam engines. Unfortunately for Japan's shoguns, once the Europeans, Russians, and Americans approached the country's shore, its industrial immaturity put the very existence of the nation in jeopardy, as the westerners enforced trade agreements on Japan which gave themselves unilateral advantages in commerce and investment (what are known as the "unequal treaties").

Modernization during Meiji era and intellectual heritage

Japan succeeded in escaping the stagnation of the Edo Era through a program of rapid modernization that transformed the country into an industrialized society (though it remained much less industrialized, especially in heavy industry, than the West until the 1930s). Still, as noted by Katz (1998), although Meiji Japan welcomed the intellectual contributions of free traders as well as protectionists, the Japanese economy developed along lines that were more restrictive of free trade than Britain and more tolerant of oligopolies and monopolies than the United States (after the adoption of US antitrust

⁶ Encyclopedia Britannica Online, "History > Great Britain, 1815–1914 > Social cleavage and social control in the early Victorian years > The pace of economic change", <http://www.britannica.com/eb/article-44926/United-Kingdom> 6 November 2006

⁷ See John Owen Haley, *Authority without Power: Law and the Japanese Paradox*. New York: Oxford University Press, 1991 (1995 Oxford UP paperback).

⁸ See Mayumi Itoh, *The Hatoyama Dynasty*. (New York: Palgrave MacMillan, 2003), p. 21ff.

legislation). By the 1930s, due to the deterioration of the international climate and the beginning of the war in Asia (1931 in Manchuria), Japan moved towards more government involvement in the economy. The post-war economic system did retain important aspects of the semi-controlled economy, especially in the the 1940s and 1950s when the government controlled access to foreign exchange. In later years, many of these controls were removed, but the ruling Liberal Democratic Party, in order to ensure social-stability and its own political survival, followed economic policies that often favored oligopolies, protectionism, and hindered foreign investment. Moreover, the combination of the influence of Marxian thought (at least until the 1970s) and anti-liberal conservatism meant that economic liberalism has been on the defensive since 1945. Thus Japanese economic DNA is far less liberal than America's.

The consequences of this intellectual heritage for innovation are threefold. First, it has fostered a strong manufacturing bias, based on the idea that a nation without production facilities is a weak country. Unfortunately for Japan, many of the recent (last 20 years) innovations which have increased productivity and made possible the development of new industries are unrelated to manufacturing. New ways of dealing with new eco-systems, platform-based industries, legal developments in intellectual property (IPR), new financial instruments (admittedly a field currently enjoying a rather negative reputation) are fundamentally tied to service and soft goods sectors. Japan has been ill-equipped to deal with them.

Second, besides a continued focus on industry, some form of hostility towards outsiders survives. When a foreign takeover beckons, Japanese corporate leaders' first reflex is often, though not always, to band together against the alien, rather than seek a way to profit from the new investor. The merger of Nissin and Myojo, both leaders in instant noodles, orchestrated to prevent Steel Partners of the US from acquiring Myojo, is an illustrative example. It kept the foreigners at bay but deprived Myojo's shareholders of the higher price offered by the Americans. There are, of course, cases of successful foreign investment into Japan (e.g. Renault's acquisition of a controlling stake in Nissan) but overall, among the major developed economies, Japan is the least hospitable to foreign capital, with foreign direct investment (FDI) stock estimated at 4.1% of gross

domestic product (GDP) vs. an average for developed countries of 24.7%.⁹ This form of “business xenophobia” has slowed down innovation by preventing foreign ideas and managers from playing a bigger role in the Japanese economy.

Third, Japan, like some continental European states from which its economic ideology is derived, has historically been far more tolerant of monopolies and oligopolies. Though anti-trust enforcement has gained somewhat in recent years, it remains deficient by Anglo-American standards. This can have a particularly nefarious impact on innovation. Companies that are already actively involved in international markets will continue to innovate, even if they enjoy monopolistic (or oligopolistic) advantages in their home market, in order to remain competitive abroad. But businesses which are not international and benefit from economic rents derived from monopolistic or oligopolistic arrangements domestically will have fewer innovation incentives.

Industrial structures

The US Occupation authorities dismantled the zaibatsu (財閥 - “financial cliques” – same ideographs as the word “chaebol,” used to denote Korea’s family-controlled conglomerates). These were large financial-industrial family conglomerates that controlled Japanese industry and finance. But in the decades following the war, partly as a way to prevent foreign takeovers, Japan developed a complex form of cross-shareholdings known as “keiretsu,” (系列) or “affiliated companies” by opposition to the family-owned zaibatsus. In some cases these keiretsus were vertical, with one large corporation at the top and affiliates in a subordinate position. In other cases, there was no real center, with several corporations linked by cross-shareholdings and informally coordinated by their top managers.¹⁰

⁹ 16.0% for the US, but as a larger economy, the US should, ceteris parabus, have a *lower* percentage of FDI stock than Japan, which is three times smaller. Source: UNCTAD, http://www.unctad.org/sections/dite_dir/docs/wir09_fs_jp_en.pdf (accessed 29 September 2009).

¹⁰ On corporate governance, see Gilson, Ronald and Curtis J. Milhaupt. “Choice as Regulatory Reform: The Case of Japanese Corporate Governance.” Columbia University Law School Center for Law and Economic Studies Working Paper No. 251 and Stanford Law School John M. Olin Program in Law and Economics Working Paper No. 282, 2004; Hoshi, Takeo and Anil K. Kashyap. Corporate Financing and Governance in Japan: The Road to the Future. Cambridge MA: The MIT Press, 2001; Jackson, Gregory.

In the decades which followed the Showa War (1931-45¹¹), Japanese industry showed a great capacity to innovate, both in the area of manufacturing processes and also with the development of new products. Moreover, by breaking the stranglehold of trading companies (sogo shosha 総合商社) Japanese businesses such as Toyota, Sony, and Nintendo were able to conquer international markets. In particular Toyota displayed some of the key strengths of Japanese industry. Its constant focus on product improvement and quality control gave it the credibility to win foreign market share and make its brand, unknown overseas until the 1970s, synonymous with quality. Moreover, Toyota was able to export its industrial ecosystem. As it built factories overseas, many of its Japanese suppliers followed suit, establishing their own plants in foreign countries. In a way, Toyota functioned as a sort of trading company for its suppliers by opening the doors to foreign markets which on their own they would not have been able to access.

Legal systems

A second factor with a significant bearing on innovation is the legal system. “One of the principal advantages of common law legal systems,” wrote John Coffee of Columbia University Law School, “is their decentralized character, which encourages self-regulatory initiatives, whereas civil law systems may monopolize all law-making initiatives.”¹² This is especially true in new industries where the absence of laws governing businesses leads to officials opposing their veto to new projects on the grounds that they are not specifically authorized by existing regulations. In the United States, innovative legal developments based on the jurisprudence of courts and new types of

“Toward a comparative perspective on corporate governance and labour.” Tokyo: Research Institute on the Economy Trade and Industry, 2004 (REITI Discussion Papers Series 04-E-023); Milhaupt, Curtis J. “A Lost Decade for Japanese Corporate Governance Reform?: What’s Changed, What Hasn’t, and Why.” Columbia Law School, The Center for Law and Economic Studies, Working Paper No. 234, July 2003; Miyajima, Hideaki and Fumiaki Kuroki. “Unwinding of Cross-shareholding: Causes, Effects, and Implications.” (Paper prepared for the forthcoming Masahiko Aoki, Gregory Jackson and Hideaki Miyajima, eds., Corporate Governance in Japan: Institutional Change and Organizational Diversity.) October 2004; Patrick, Hugh. “Evolving Corporate Governance in Japan.” Columbia Business School, Center on Japanese Economy and Business, Working Paper 220 (February 2004).

¹¹ To use the term which Yomiuri Shimbun chose among several (Great East Asia War, Pacific War, etc.) to denote the decade and a half of fighting which ended with Japan’s capitulation on 15 August 1945.

¹² Coffee, “Convergence and Its Critics,” 1 (abstract).

contacts have facilitated the development of new industries, something that is harder in Japan and in other code law legislations.

For example, some analysts have noted how U.S. law gives more leeway to create innovative contractual arrangements than German law,¹³ on which most of Japan's legal system is built. Thus entrepreneurs, and businesses in general, are more likely to face legal and regulatory hurdles in code law jurisdictions where adapting the law to new technologies, new financial instruments, and other innovations, is more cumbersome.

3. Three industry case studies

The following case studies are designed to illustrate the two key types of inefficiencies which result from the mismatch between Japan's prevailing forms of industrial structures (vertically integrated and hierarchical) and the nature of innovation in new economy industries such as software and the Internet, where building horizontal platforms and ecosystems is paramount. First, the vertical structures can stifle some forms of innovation altogether (e.g. software). Second, they can limit valuable innovations to the domestic market (e.g. anime and mobile telephony).

From these case studies, we can draw some lessons on the steps which Japan could take to enhance its capabilities to harness its strong innovative capabilities.

3.1. Software

Given the degree of high-technology penetration in the Japanese economy and the international competitiveness of the hardware part of its consumer electronics sector, the weakness (indeed, the non-existence) of Japan's packaged software industry looks puzzling. Indeed, software production in Japan has historically suffered from chronic fragmentation among incompatible platforms provided by large systems integrators

¹³ Steven Casper, "The Legal Framework for Corporate Governance: The Influence of Contract Law on Company Strategies in Germany and the United States," in Hall and Soskice, eds. Varieties Of Capitalism, 329.

(Hitachi, Fujitsu, NEC) and domination by customized software. Despite efforts by the Ministry of the Economy, Trade and Industry (METI, formerly MITI), there are very few small to medium-size software companies in Japan compared to the United States or even Europe. As a result, even the domestic market is dominated by foreign software vendors such as Microsoft, Oracle, Salesforce.com and SAP. Needless to add, there are virtually no standalone software exports from Japan to speak of. There is of course the videogame exception, which we do not include in our discussion here because the videogame market has a dynamic of its own, largely independent of the evolution of the rest of the software industry.

There are two root causes for this peculiar situation: a strong preference for customized computer systems by both suppliers and customers and a long-standing bias (also on both sides) in favor of hardware over software. These two factors have perpetuated a highly fragmented, vertically integrated and specialized computer industry structure, precluding the emergence of modular systems and popular software platforms (e.g. Windows). In turn, the absence of such platforms has thwarted the economies of scale needed to offer sufficient innovation incentives to independent software developers, which have played a critical role in the development of the IT industry in the United States.

The prevalence of customized computer systems and its origins

In the early 1960s MITI orchestrated licensing agreements that paired each major Japanese computer system developer with a U.S. counterpart. Hitachi went with RCA then IBM, NEC with Honeywell, Oki with Sperry Rand, Toshiba with GE, Mitsubishi with TRW and Fujitsu went on its own before joining IBM. The intent was to make sure Japan embarked on the computer revolution and that it competed effectively with then-almighty IBM. Since each of Japan's major computer system suppliers had a different U.S. partner however, each had a different antecedent for its operating system. In fact, even IBM-compatible producers only had the instruction set licensed from IBM in common; their operating systems were incompatible among themselves. Very rapidly, each of the Japanese companies found it profitable to lock-in its customers by supplying

highly customized software, often free of charge, which meant that clients had only one source of upgrades, support and application development. Over time, many of the former U.S. partners were forced to exit the industry due to intense global competition from IBM. However, their Japanese licensees remained and perpetuated their incompatible systems.

Next, in the United States, following a highly publicized antitrust suit, IBM was forced to unbundle its software and hardware in 1969. The IBM System/360 was the first true multi-sided platform in the computer industry, in that it was the first to support third-party suppliers of software applications and hardware add-ons. It marked the beginning of the *vertical disintegration* and *modularization* of the computer industry. Computer systems were no longer solely provided as fully vertically integrated products; instead, users could mix and match a variety of complementary hardware and software products from independent suppliers. This led to the development of an immensely successful software industry. The new industry became prominent with the workstation and PC revolutions in the early 1980s, which brought computing power into the mainstream through smaller, cheaper, microprocessor-based machines. An important consequence was the great potential created for software/hardware platforms, which a handful of companies understood and used to achieve preeminence in their respective segments: Sun Microsystems in the workstation market, Apple and Microsoft in the PC market.

By contrast, in Japan there was no catalyst for such a sweeping modularization and standardization process. Despite the adoption of a US-inspired Anti-Monopoly Law in 1949, enforcement of antitrust in Japan has been weak by US and EU standards (cf. Miwa and Ramseyer (2005)) - no one required the large systems makers to unbundle software from hardware. There were also no incentives to achieve compatibility. During the last three decades, the customized software strategies became entrenched. Clients were increasingly locked into proprietary computer systems and had to set up their own software divisions to further customize these systems, thus increasing sunk costs and reducing the likelihood of switching to newer systems. This vicious cycle essentially locked out any would-be standalone software vendor in the mainframe and minicomputer markets.

Japanese computer manufacturers tried to extend the same strategy to the workstation and PC market, but failed due to competitive pressure from foreign (especially American) suppliers. The best known example is NEC, which until around 1992 held a virtual monopoly on the Japanese PC market with its "PC-98." Its hardware platform architecture was closed (like Apple's) and its operating system, though based on DOS, remained incompatible with the popular MS-DOS PC operating system. In the end, however, NEC's monopoly was broken by Dell, Compaq and low-cost Taiwanese PC makers (1991-92).

There also seems to have been a preference for customized computing systems and software on the demand-side of the market. In Japan, like everywhere else in the world, the first private sector users of computer systems (mainframes in the beginning) were large corporations. However Japanese corporations have traditionally been strongly committed to adhering to internal business procedures, leading to a "how can we modify the software to fit our operations?" mindset, rather than the "how can we adapt our operations in order to take advantage of this software?" reasoning that prevailed in the U.S. For this reason, Japanese companies preferred to develop long-term relationships with their hardware suppliers and to depend on those suppliers, or on vertically related¹⁴ software developers for highly customized software solutions. As major Japanese companies have generally relied on professionals hired straight of college who stayed with the same employer for their entire professional lives, each Japanese conglomerate has developed its own corporate culture to a greater extent than in the United States where a liquid labor means there is a much greater level of cross-fertilization between firms and consequently less divergence than in Japan in their corporate culture.

The prevalence of closed, proprietary strategies prevented the economies of scale necessary for the emergence of a successful, standalone Japanese software industry. No single computing platform became popular enough with users to provide sufficient innovation incentives for packaged application software.¹⁵

¹⁴ That is, belonging to the same *keiretsu*.

¹⁵ Even at its height, the standardized NEC PC-98 platform commanded a market roughly four times smaller than its U.S. counterpart for a population half the size of the U.S. Furthermore, it was incompatible

Government policies and the hardware bias

The second important factor which has shaped the evolution of Japan's software industry is the longstanding bias in favor of hardware over software. Japanese computer companies' business strategy had always involved giving away software for free along with their hardware systems as a tool to lock in customers. Ironically, this bias was probably inherited from IBM, whose success they were seeking to emulate. IBM itself remained convinced that hardware was the most valuable part of computer systems, which led to its fateful (and, with today's benefit of hindsight, strategically misguided) 1981 decision to outsource its PC operating system to Microsoft, whose subsequent rise to power signaled the beginning of the software platform era.

This development was lost on Japanese computer makers, however, for several years. And MITI, which still viewed IBM as Japan's main competitor, was at that time immersed in a highly ambitious "Fifth Generation Project," a consortium that aimed to build a new type of computer with large-scale parallel-processing capabilities, thus departing from the traditional von Neumann model. The drawback, however, was that the project focused everyone's attention on building highly specialized machines (basically mainframes), whereas the computer industry was moving towards smaller, general purpose machines, based on open and non-proprietary architectures (Unix workstations) or on proprietary but very popular operating system platforms (PCs), which greatly expanded the computer market. MITI and member companies of the Fifth-Generation consortium realized only later the potential of making a common, jointly-developed software platform available to the general public rather than concentrating on systems designed for a handful of specialized machines. This led to MITI's next initiative, The Real-time Operating-system Nucleus (TRON). The main idea of TRON was to build a *pervasive* and *open* (i.e. non-proprietary) software/hardware platform in response to the market dominance of Intel and Microsoft. TRON was supposed to be a cross-device platform: computers and all sorts of other devices everywhere would be linked by the

with the MS-DOS PC standard platform, which isolated Japanese PC software developers from the worldwide PC market.

same software, thus finally providing a popular platform for Japanese software developers. Although TRON was a promising platform concept; it unfortunately received little support from the major industrial players, in particular NEC, which viewed it as a direct threat to its PC monopoly. More importantly, it could not break into the crucial education market¹⁶ precisely because it was incompatible with both the NEC PC-98 DOS and the IBM PC DOS standards, both of which had sizable advantages in terms of installed bases of users and applications. Thus, TRON was too little too late: the big winners of the PC and workstation revolutions had already been defined and none of them were Japanese computer companies. Most importantly, the intended creation of an independent Japanese software industry did not materialize.

Other factors

Comparative studies of the U.S. and Japanese software industries also mention several other factors that further explain the phenomenon described above. One is the relative underdevelopment of the venture capital market for technology-oriented start-up companies in Japan compared to the United States, where venture capital had widely supported the emergence of successful small and medium-size software companies. This gap, however, has been recently narrowed due to METI policies designed to improve the availability of venture capital to technology firms. Another factor is the Japanese system of “life time employment” for regular employees of large businesses, which results in low labor mobility and is quite compatible with the “closed garden” approach to technological innovation. By contrast, high labor mobility has been a crucial driving force behind the “Silicon Valley model” of technological innovation, which is based on spillovers, transfers, cumulative inventions and a high degree of modularity. The latter model seems to have been more appropriate for creating a vibrant software industry. “Life time employment” is losing ground, but the top managerial ranks of large Japanese corporations remain dominated, and often monopolized, by those who have been with the company since they joined the labor market.

¹⁶ Callon (1995) contains an informative account of the conflict between METI and the Ministry of Education regarding the adoption of TRON by public educational institutions.

3.2. Animation¹⁷

Few Japanese industries are as specific to Japan and as creative as animation - or “anime”¹⁸. Japanese anime has gained global popularity: it was estimated to account for 60% of TV anime series worldwide (Egawa et al. 2006). And it has significant influence over many creators outside Japan: the setting of *Terminator 2* was influenced by *Akira*, a classic Japanese anime series; the director of *Lilo & Stitch* (Disney’s 2002 animation film) admitted that it was inspired by Hayao Miyazaki’s *My Neighbor Totoro*; *The Matrix* movies owed the starting point of their story to *Ghost in the Shell*, a Japanese anime movie created by Production IG; Disney’s immensely popular *Lion King* (released in 1994) was based on *Kimba the White Lion*, a 1964 Japanese TV anime series.

Yet despite the global influence of Japanese animation, the Japanese anime production companies have never been able to capitalize on the popularity of their creations. The industry is highly fragmented (there are about 430 animation production companies) and dominated by distributors—TV stations, movie distributors, DVD distributors and advertising agencies -, which control funding and hold most of the copyrights on content. As a result, most animation producers are small companies laboring in obscurity. No Japanese animation production company comes even close to the size of Walt Disney Co. or Pixar. In 2005 Disney had revenues of \$32 billion, whereas Toei Animation, the largest animation production company in Japan, had revenue of only ¥21 billion (\$175 million at the average 2005 exchange rate). Whereas Disney and Pixar spend in excess of ¥10 billion to produce one anime movie; Japanese anime production companies’ average budget is ¥0.2-0.3 billion (Hayao Miyazaki’s Studio Ghibli is an exception: it invests ¥1-3 billion in one production). And while Japanese animes are omnipresent in global markets, Japanese anime production companies have virtually no international business presence. Their lack of business and

¹⁷ This subsection draws heavily on Egawa et al. (2006).

¹⁸ In this case study “anime” refers to animation motion pictures, as opposed to manga cartoons.

financial strength can be traced down to the inefficient mode of organization of the Japanese anime “ecosystem”.

Background on Japanese anime

The first animation in Japan was created in 1917 with ten minute add-ons to action films. Thereafter, short animation films were produced for educational and advertisement purposes. In early 1950s, Disney’s animation and its world of dreams became very popular in the aftermath of defeat in World War II. In 1956, Toei Doga (current Toei Animation) was established as a subsidiary of Toei, a major film distributor, with the stated objective to become “the Disney of the Orient.”

Some anime industry experts trace the current plight of Japanese anime production companies back to the 1963 release of *Astro Boy*, the first TV anime series. Its creator and producer was Osamu Tezuka, a successful *manga* (comic book) writer. Being more concerned with making *Astro Boy* popular rather than with turning it into a financial success, Tezuka accepted the low price offered by a TV station in exchange for distributing the series. In order to keep the production cost to a minimum, he reduced the number of illustrations to a third of the Disney standard (from 24 images per second to 8 images). He felt that Disney’s stories were too simplistic and lacked depth, therefore he believed that the complexity of the *Astro Boy* story would compensate for the inferior animation quality. *Astro Boy* became the first big hit in the history of Japanese TV animation, reaching a viewership of over 40% of households. However, due to intensified competition and lack of business acumen, Tezuka’s anime production company (Mushi Production) subsequently ran into financial difficulties and in 1973 filed for bankruptcy.

From the early days, the majority of anime productions had derived their content from *manga*. In 2005, roughly 60% of anime contents were based on *manga* - the rest were based on novels or original stories created by the production companies themselves. The sales of *manga* - comic books and magazines - in 2004 were ¥505 billion, and accounted for 22% of the published goods. This was twice as much as the anime industry revenues, which in 2005 stood at ¥234 billion in 2005.

Contrary to popular perception in the West, Japanese anime extends far beyond cartoons for children: “to define anime simply as Japanese cartoons gives no sense of the depth and variety that make up the medium. Essentially, anime works include everything that Western audiences are accustomed to seeing in live-action films—romance, comedy, tragedy, adventure, even psychological probing of a kind seldom attempted in recent mass-culture Western film or television.” (Napier 2005)

Production committees

The structure of the anime industry has not evolved much since its beginnings. The approximately 430 production companies work essentially as contractors for the powerful distribution companies: TV stations, movie distributors, DVD distributors and advertising agencies. And only 30–40 of the producers have the capacity to become main contractors; the rest work as subcontractors for the main contractors. Main contractors are responsible for delivering the end products to TV stations or movie distributors, and took charge of the majority of the processes. Subcontracting companies can only handle one or two processes. It usually takes 4–5 months to produce one 30-minute TV episode. Production of anime movies is even more labor intensive and time consuming: a 60-minute anime movie usually takes over one and a half years. In both TV anime series and anime movies, the labor intensive process of drawing and coloring animations is often outsourced to Asian countries including China, Korea, Taiwan, Philippines, Thailand, Vietnam and India.

Most anime projects in Japan are done by “production committees,” an institution specific to the Japanese market, which provides financing and coordinates the distribution of the resulting contents through various channels. These committees have been created in the mid-1980s in order to alleviate the scarcity of funding sources for animation. Indeed, Japanese banks had traditionally been reluctant to lend to businesses which were exclusively focused on “soft” goods (content, software, etc.), particularly when they involved a high degree of risk.¹⁹ As a result, TV stations often had to fund the production

¹⁹ Indeed, like for most creative content businesses (movies, novels), only 10 out of every 100 animations make any profits.

cost of TV anime series since production companies were small and financially weak. Similarly, movie distributors used to fund the production of anime movies. As production costs increased and new distribution channels appeared however, production committees emerged as the standard funding vehicles for both TV series and movies. At the same time, they also took control of the creative process, as well as marketing and final distribution of the final products.

Several types of companies come together in a production committee: TV broadcasting stations, the powerful advertising agencies (Dentsu and Hakuhodo), sponsors (e.g. merchandising companies), movie distributors, video/DVD publishers, and the publishers of the original *manga* (comic book) whenever the content is based on it.

The production committee funds the anime projects and shares revenues and profits from the investments. Each member of the committee makes an investment and in exchange receives: (a) a share of the copyrights (and the associated licensing revenues) linked to the anime in proportion to the initial investment; and (b) the right to distribute the resulting content through the particular member's channel—broadcasting right for TV stations, distribution right of videos/DVDs for video/DVD publishers. All committee members contribute to some part of the value chain, but TV stations often lead the committee because television is the primary distribution channel.

Production committees contract the production of anime works with anime production companies. In most cases, anime producers receive only a fixed payment (about ¥10–¥15 million), which oftentimes is barely sufficient to cover the production cost. Due to the lack of financial resources, production companies have to rely on production committees for funding and in exchange give up copyrights to their own work to the production committees. They are usually not a member of the production committees and as a result do not have access to licensing revenue and cannot share in the upside of successful projects. (By contrast, in the United States, Financial Interest and Syndication Rules (Fin-Syn Rules) established in 1970 by the Federal Communication Commission (FCC) state that copyrights belong to production

companies.²⁰) When the anime is the original creations of anime producers, they become a member of the production committee, but typically own a very small stake. Therefore, original creations result in higher profits for anime production companies, but they are also riskier, and it is harder to persuade production committee members to undertake such projects.

This system creates a vicious cycle for animation production companies, which keeps them weak and subordinate to the production committees. Most importantly, the production committee members (advertising agencies, TV stations and DVD distributors) are inherently domestic businesses, which therefore also limits the anime producers to the Japanese market, even though their productions might have global appeal.

Recent developments

Recently, several initiatives have emerged in order to strengthen the rights of animation production companies and to create funding alternatives for anime projects. First, the Association of Japanese Animation was established in May 2002 under the leadership of the Ministry of Economy, Trade and Industry (METI) to strengthen the position of anime producers. Second, intellectual property were made legally defensible through trust arrangements in December 2004. And Mizuho Bank (one of the Japanese megabanks) initiated the securitization of profits deriving from anime copyrights.²¹ This allowed Mizuho to extend financing to anime production companies such as Production I.G, which do not have tangible assets suited for collateral. In turn, production companies can invest the proceeds in production committees. To date, Mizuho has financed over 150 anime titles in this way. Third, the funding sources for anime production companies have diversified. Mizuho raised a ¥20 billion fund to invest in new movies including anime. And GDH, a recently founded animation production company, created its own fund for retail investors to finance its new TV series.²²

²⁰ The Ministry of Economics, Trade and Industry, *Research on Strengthening Infrastructure for Contents Producer Functions: Animation Production*, p. 27, http://www.meti.go.jp/policy/media_contents/.

²¹ "Mega Banks Expanding Intellectual Property Finance," *Nihon Keizai Shimbun*, April 17, 2004.

²² "Rakuten Securities, JDC, and Others Raise Funds from Individual Investors to Produce Anime," *Nikkei Sangyo Shimbun*, July 28, 2004.

3.3. Mobile telephony

Like animation, mobile telephony provides another illustration of a highly innovative Japanese industry, which has not been able to export its domestic success. Unlike animation however, one needs to travel to Japan in order to observe the tremendous unexploited opportunities of Japan's mobile phone industry.

The Galapagos of mobile phones

Japanese owners of cell phones have long enjoyed access to the world's most advanced handsets and services – years ahead of users anywhere else in the world. Mobile email has been offered since 1999 - it only took off in the United States and Western Europe by 2004-2005 with RIM's Blackberry devices. Sophisticated e-commerce and other non-voice services were rolled out in Japan starting with the introduction of i-mode in 1999. i-mode was the world's first proprietary mobile Internet service and to this day remains the most successful one. Launched by NTT DoCoMo, Japan's largest mobile operator (or carrier), it has spawned a diverse ecosystem of over 100,000 content providers, offering i-mode handset users everything from games and news, to mobile banking, restaurant guides and dating services. KDDI and Softbank, the other two major Japanese carriers, have also introduced similar services. All of them were subsequently enhanced by third-generation networks in 2001 – meanwhile, the first functional 3G services in the rest of the world started to appear only in 2004. Since 2004, again thanks to NTT DoCoMo's leadership, Japanese mobile phone users can simply waive their handsets in front of contactless readers to pay for purchases in convenience stores, subway turnstiles and many other places. These payment systems include both debit (pre-paid) and credit (post-paid) functionalities. Finally, since 2005, Japanese mobile customers also have access to digital television on their handsets. These last two services have yet to materialize in the rest of the world (with the sole exception of South Korea).

Given the Japanese telecommunications industry's innovative prowess, one would expect to see Japanese handsets occupying leading positions in most international markets (especially in developed economies). Strikingly enough, not only are they far from leading, they are in fact nowhere to be found (as anyone having tried to buy a Japanese mobile handset in the United States can attest). More precisely, in 2007, Nokia had a 38% market share of worldwide cell phone shipments, followed by Samsung with 14.3% and Motorola with 14.1%. No Japanese companies were in the top 5 - altogether, they made up a meager 5% of the global handset market²³ (Sharp, the largest one, barely made it to 1%).²⁴

Some observers (in Japan) have coined a term for this situation: the Galapagos syndrome.²⁵ Just like the Galapagos archipelago hosts animal species which do not exist anywhere else in the world, so does Japan host an extremely innovative mobile phone industry completely isolated from the rest of the world.

Origins of the Galapagos syndrome

What accounts for this isolation and for Japanese handset makers' inability to build significant presences in international markets? The answer is found in a combination of self-reinforcing factors, the central one of which is a mobile phone industry structure very different from those prevailing in other major markets.

Specifically, in Japan, the mobile operators (DoCoMo, KDDI, and Softbank) hold most of the power in the industry and are able to dictate specifications to the other participants – handset makers in particular. By contrast, carriers in other countries have much less leverage in their relationships with handset makers and are willing to make significant compromises in exchange for exclusive rights to highly popular handsets – e.g. Apple's iPhone or Motorola's Razr. On the one hand, the centralized, top-down

²³ *Economista*, 14 October 2008. "Mega competition in mobile phones," pp. 32-35.

²⁴ *Economista*, 14 October 2008. "Mega competition in mobile phones", p. 42.

²⁵ *Economista*, February 26, 2008, "Japan's economic system losing competitiveness due to "Galapagos phenomenon"".

leadership of Japanese mobile carriers has been immensely successful in producing domestic innovation, as described above. It enabled the rapid roll-out and market adoption of complex technologies, such as mobile payments, which require the coordination of many actors in the ecosystem.

On the other hand however, the subservience to operators meant that everyone in the ecosystem – including handset makers – ended up focused on serving the domestic market. Indeed, mobile carriers are operating in a fundamentally domestic business: telecommunication regulations around the world have always made it difficult for carriers to expand abroad. The only exceptions are Vodafone and T-Mobile, who have managed to build some meaningful presences outside of their home countries - although few and far-between, and with mixed results. Japan's NTT DoCoMo, creator of i-mode, the world's leading mobile internet service, has repeatedly failed in its attempts to export the service in international markets on a significant scale. Today, there are only 6.5 million overseas users of i-mode, roughly 10% of the Japanese total, while DoCoMo's corresponding overseas revenues in 2007 were less than 2% of total sales. Moreover, the majority of these “international” customers and sales were in fact made up of Japanese users roaming while traveling abroad.²⁶

The “home bias” of the ecosystem leaders – the mobile operators – was unfortunately transplanted to the Japanese handset manufacturers. The latter ended up focusing most of their R&D resources on integrating the numerous Japan-specific hardware features demanded by the operators (contactless mobile payment systems, two-dimensional bar-code scanners, digital TV capability, etc.) into their phones. They developed virtually no standalone market research, marketing and sales capabilities, which are critical for competing in international markets (in Japan that was done for them by the operators).

Three additional factors have exacerbated the competitive disadvantage of handset makers in overseas markets.

²⁶ “iMode to retry it in Europe a simple version developed by DoCoMo,” 4 December 2008, Fuji Sankei Business.

First, Japan's large domestic market and the fast growth of its mobile phone sector during the late 1990s and early 2000s was a curse disguised as a blessing. During that period the handset makers perceived no serious incentives (nor urgency) to seek expansion opportunities abroad. The contrast with South Korea is noteworthy here: the domestic Korean mobile phone industry is also largely dominated by the operators (SK Telecom in particular) and has also produced tremendous growth and very advanced services. The difference was that the Korean market was too small (less than half the size of Japan's) for the domestic handset manufacturers to be satisfied serving it, which led Samsung, LG and others to seek opportunities in international markets from early on – today both are in the top 5 global cell-phone makers.

Second, in the late 1990s the Japanese operators chose a second-generation standard for wireless telecommunications which was subsequently rejected in the rest of the world. The early choice allowed the operators to roll out advanced services far ahead of the rest of the world, without having to worry about interoperability (given their inherent domestic focus). For the handset makers, this choice raised further technological barriers to their international expansion, as they became dependent on a technology (through specific investments and resource allocation) which could not be leveraged abroad.

Third and perhaps most important, Japanese handset makers have had a long-standing bias in favor of hardware and “monozukuri” (manufacturing)-driven innovation over software-driven innovation – the same bias as their counterparts in the computer industry, which prevented the development of a Japanese software sector (cf. section 3.1. above). Indeed, most Japanese phones are customized for a specific carrier (DoCoMo or KDDI or Softbank) and manufactured “from scratch”, with little concern for creating standardized interfaces and software platforms, which might have enabled them to spread development costs across multiple phone models and create some cost advantage. Japanese handset makers have neither embraced widely used smart-phone software platforms such as Nokia's Symbian, Microsoft's Windows Mobile or Google's Android, nor created any such platforms of their own. Given that hardware design is the part of a mobile phone which varies the most across international markets (unlike the underlying software platforms, which can remain virtually unchanged), it is then no wonder that

Japanese cell-phone makers are poorly positioned to adopt their phones to different market needs overseas.

The monozukuri bias also explains why, despite their technical prowess, Japanese phone manufacturers have been unable to create a universally appealing device like Apple's iPhone – which they are now desperately (and unsuccessfully) trying to emulate. In fact, this marks the third time in less than a decade that Apple or another US innovator has come up with a successful product way ahead of Japanese electronics manufacturers, even though the latter had the *technological* capabilities required to produce it long before Apple. The first episode was Sony's inability to bring to market a successful digital music player (a category which everyone expected Sony to own, as a natural extension of its widely successful walkman), largely because of an inadequate content business model. This left the gate wide open for Apple's iPod/iTunes combination to take over the market starting in 2001. The second episode also involved Sony, this time in the market for electronic book readers. Although Sony was the first to commercialize a device based on the underlying electronic ink technology, its eBook (launched in 2005) was largely a failure due – yet again – to an inadequate content business model. Instead, it was Amazon's Kindle – launched 2 years later - that has come to dominate the category.

There is a common and simple lesson here, which seems to have repeatedly eluded Japanese electronics manufacturers in general and handset makers in particular. Hardware and monozukuri have become subordinate to software when it comes to most digital devices: the latter are no longer pure products, but in large part services, in which software plays the key role. It is worthwhile to note that more than 90% of the hardware parts in Apple's iPods and iPhones come from Asia – the most sophisticated components from Japan. Apple's only – but essential – innovations are in the user interface and underlying software (QuickTime and iTunes), which allow it to extract most of the value. Although Sony and other Japanese companies clearly understand the importance of content (most visible in the recent Blu-ray vs. HD-DVD format war), they still have not matched Apple, Amazon and others in the ability to merge service, manufacturing and content.

It is thus an unsettling paradox (and presumably a frustrating one for the handset makers themselves) that Japanese cell phone manufacturers do so poorly in international markets, where phones are so basic compared to Japan. The explanation is however straightforward: it is not deep technical expertise that matters most; instead, the key capabilities required are brand power, the ability to adapt in order to serve local preferences (sales and marketing savvy), and cost competitiveness. Those are the attributes that have made Nokia, Samsung and Motorola so successful in international markets – and those are the ones which Japanese manufacturers lack the most. It is more important to obtain economies of scale in standardized parts – through outsourcing and reliance on widely available software platforms – than building ultra-sophisticated, customized phones.

Some observers argue that the peculiar demands of Japanese consumers drew handset makers into making products that do not sell well in the rest of the world. In our view, this is an unacceptable excuse: Nokia, Motorola and Samsung were all able to conquer international markets with very different demand characteristics than the ones they faced in their respective homes. Take the Chinese market for instance: one could argue that Japanese manufacturers should have an advantage over their Western rivals in China, given their experience with ideogram-based characters and the common cultural roots. But even there, Japanese cell-phone makers have struggled mightily. Today, the top three cell-phone makers in China are Nokia with a 30% market share; Motorola with 18.5% and Samsung 10.8%. None of the Japanese makers has more than 1% and they are behind a number of domestic Chinese manufacturers.

Present situation

Unfortunately, it took the current economic recession, combined with the saturation of the domestic mobile user market for Japan's cell-phone manufacturers to realize that their competitive position is profoundly vulnerable and unsustainable. New mobile phone sales in Japan were down 20% in 2008 (compared to 2007) and are expected to decrease even further in 2009. The new government policy requiring operators to clearly distinguish the price of the handset from the price of the service plan

has significantly contributed to the drop in new phone sales. Realizing the high prices of the handsets, Japanese consumers have naturally reduced the frequency with which they upgrade to new phones. The Japanese mobile phone industry faces two additional challenges: the decline in the number of teenagers and young adults (down 6.6% for ages 15-24 from 2010 to 2020) due to low fertility, and the arrival of high-performance foreign products, such as the iPhone, Android-powered devices, and BlackBerries.

The slowdown in domestic sales has had two effects. One is much needed consolidation and shakeout among handset manufacturers: NEC, Hitachi and Casio have merged their mobile phone units as of September 2009, while Sanyo and Mitsubishi are exiting the business altogether. The second one is a much stronger urgency to seek opportunities abroad. Sharp and Panasonic, the domestic market leaders, have both embarked on ambitious plans to expand their business in China, a market where Japanese handset makers have been notoriously unsuccessful (as mentioned above).

These setbacks might turn out to be a welcome wake-up call for Japan's handset makers by providing sufficient incentives (and urgency) to seek to develop competitive advantage at serving other markets than Japan's. That requires breaking free from the subservience to mobile operators and from a model which has worked well (too well) in Japan.

4. Discussion and policy implications

“Inefficient” and self-sustaining industry structures

As we have noted, Japanese industry is surely capable of innovation but it operates in an environment that is not conducive to mobilizing the innovative capabilities of soft goods and service sector businesses, especially in the international arena. Fundamentally, this stems from a mismatch between the country's vertical and hierarchical industrial organizations and the horizontal, ecosystem-based structures prevailing in “new economy” sectors. The former have proven very efficient in pursuing

manufacturing perfection (“*kaizen monozukuri*”) – a domain in which Japan has excelled. As we have argued in section 2 however, the latter have been the far more effective form of “industry architecture” for driving innovation in most of today’s technology industries, on which services and soft goods rely.

This mismatch makes the current organization and performance of some Japanese sectors appear as stuck in inefficient equilibria. Indeed, one important common denominator across the three industry case studies presented above is the prevalence of self-reinforcing mechanisms which have locked the corresponding sectors into highly path-dependent structures. The weakness (or, more precisely, virtual absence) of Japan’s software industry has been perpetuated by large computer system suppliers which have locked their customers from early on into proprietary and incompatible hardware-software systems; as a result, these customers have always found it in their best interest to deepen the customization and rely on the same suppliers for more proprietary systems. Absent any external shock (or public policy intervention), it is hard to see a market opportunity for potential Japanese software companies. In animation, production committees have established a bottleneck over the financing of animation projects, which allows them to obtain most of the copyrights, which in turn deprives anime production companies from the revenues that would enable them to invest in producing their own projects and acquire the corresponding intellectual property rights. Of course, this bottleneck has been perpetuated by the absence of alternative forms of financing: bank loans (Japanese financial institutions have had a long-standing reluctance to invest in businesses with only “soft” collateral) and venture capital (an industry which remains strikingly underdeveloped in Japan). Finally, the wireless communications sector in Japan has developed a top-down way of innovating, in which the mobile operators control end-customers and dictate terms to handset manufacturers, which in turn have never had sufficient incentives to develop their own marketing and independent R&D capabilities.²⁷

The second aspect that needs to be emphasized is that the hierarchical forms of industrial organization that prevail in some Japanese sectors are *not* uniformly less

²⁷ I.e. R&D at the mobile service level, as opposed to R&D that simply pushes handset technology, while taking the level of innovation in service and corresponding standards as *exogenously given*.

innovative than the more horizontal modes of organization. By subordinating everyone to the “ecosystem leaders” (i.e. the companies at the top of the industry structure) however, hierarchical structures can create large inefficiencies by preventing companies at lower levels of the hierarchy from capitalizing on their innovations outside of the vertical structure – in particular, in global markets. Indeed, while software has clearly been the Achilles’ heel of Japan’s high-tech and service sectors, animation and mobile telephony are two industries in which Japan has innovated arguably more than any other country in the world. The problem there is that the “ecosystem leaders” – production committee members such as TV stations and, respectively, mobile operators – have Japan-centric interests (television stations and mobile phone service are essentially local businesses due to regulations). This ends up restraining the other members of the ecosystems to the domestic market, when in fact their relevant markets are (should be) global. Of course, in contexts in which the leader is a globally-minded company - such as Sony and Toyota -, all members of the ecosystem benefit. But those situations are the exception rather than the norm.

Policy measures to break from inefficient industry structures

Extrapolating from the three case studies above, there are several initiatives which Japanese policy-makers could take to remedy the issue of inefficient industry structures.

First, despite recent improvements, Japan remains deficient in the enforcement of anti-trust. Monopolies and oligopolies are particularly nefarious in industries where there is a need for constant and fast innovation. The self-reinforcing mechanisms we described earlier (augmented by the importance of established, long-term relationships in Japan) creates high barriers to entry in most Japanese industries which protect incumbents and make it harder for Japanese innovators to succeed. Related to the question of oligopolies and monopolies is the issue of ease of entry and exit. If there is one lesson from Silicon Valley which Japanese policy-makers should take to heart it is that both the birth *and* the death rate of businesses there are extremely high - as they should be in innovative sectors. This requires not only effective bankruptcy procedures, but also financing mechanisms that accept high rates of failures, liquid employment markets (for those who lose their

jobs when their employer goes out of business), and a socio-cultural environment that favors risks without denigrating those who have failed – sometimes several times – in their quest for entrepreneurial success.

For example, in the US, one essential catalyst of the PC era and the rise of Microsoft and other software platforms was the unbundling of IBM – the result of antitrust intervention. There was no such intervention in Japan to break the stranglehold of the large computer system manufacturers and enable entry of smaller, innovative software companies. Similarly, as we noted earlier in this paper, antitrust has placed significant constraints on Microsoft's ability to extend its PC OS monopoly power to the Internet and/or mobile telecommunications. The objective was to make sure the emergence of new software ecosystems and platforms is not stifled. As it has grown more dominant, Google must now also take into account the risk of anti-trust prosecution. This forces it to tread more carefully in its dealings with partners and potential competitors in online search and advertising than it might otherwise do if the anti-trust regime were weaker.

Second, the development of new industries based on ecosystems which are not defined by hierarchical relationships requires a strengthening of the legal system in other fields beside antitrust. In hierarchical *keiretsu* systems, the controlling corporation (or corporations) which sit at the top of the pyramid performs arbitration and enforcement functions for the entire eco-system. Since what is good for the eco-system is – usually - good for them, they have a built-in incentive to take good decisions, though in some cases the interests of smaller players might be at risk. This cannot be a sustainable substitute however for developing a legal infrastructure which supports and encourages innovation and entrepreneurship. In the more flexible and non-hierarchical ecosystems which define many of the innovative industries we have discussed, there is a need for effective third-party enforcement. In the United States, this is performed by civil courts which can adjudicate contractual disputes, and in some cases may involve criminal law, for example in the case of anti-trust violations. In Japan, these mechanisms are less well-developed. Despite changes to the regulations pertaining to the bar exam, there is still a shortage of attorneys. Moreover, the entire economy has historically been less reliant on legal remedies, making the entire legal system underdeveloped in this area. There is,

both in the United States and abroad, a mistaken view that the US system breeds too many lawyers and litigation. While it may be true that frivolous class action lawsuits hurt the economy, it is America's rich legal infrastructure that lubricates the wheels of its innovation industry.

Third and also part of the legal system remedies is enforcement of intellectual property rights (IPRs). This is perhaps the key institutional ingredient for innovation, especially in the soft goods sector. For many businesses in these industries IPRs are their main asset, in some cases their only one. Japan's weak IPR regime undermines the balance sheet of innovative companies, makes it harder for them to obtain financing, and diminishes their bargaining power. Animation is a case in point: the production committees have emerged to fill in the institutional gap of recognition and enforcement of copyrights, which would enable anime production companies to finance themselves and develop their own projects.

Fourth, venture capital markets, despite some efforts, remain underdeveloped in Japan, which presented an additional hurdle for small companies trying to break away from constraining industry organizations (e.g. animation). Unlike anti-trust and IPRs, this is an area where government action in itself cannot resolve the entire problem. However, the regulatory regime can be altered to make it easier for the venture capital industry to grow faster in Japan.

Finally, a necessary policy measure is to further open the country to foreign investment. The difficulty which foreign investors face in Japan deprives Japanese innovative companies of equity partners and business partners, further locking them into domestic ecosystems which may stifle their development. It also makes it harder for Japanese companies to succeed overseas, since foreign investors could help them capture markets outside of Japan.

5. Conclusions

Japan presents a unique case of industrial structures which have produced remarkable innovations in certain sectors, but which seem increasingly inadequate to produce innovation in modern technology industries, which rely essentially on horizontal ecosystems of firms producing complementary products. As our three cases studies of software, animation and mobile telephony illustrate, there are two potential sources of inefficiencies that this mismatch can create. First, the Japanese hierarchical industry organizations can simply “lock out” certain types of innovation indefinitely by perpetuating established business practices: this is the case with software, an industry from which Japan is almost entirely absent. Second, even when the vertical hierarchies produce highly innovative sectors in the domestic market – as is the case with animation and wireless mobile communications -, the exclusively domestic orientation of the “hierarchical industry leaders” can entail large missed opportunities for other members of the ecosystem, who are unable to fully exploit their potential in global markets.

We have argued that improving Japan’s ability to capitalize on its innovations will require certain policy measures, aiming to alter legislation and incentives that stifle innovation: strengthening the enforcement of antitrust and intellectual property rights, strengthening the legal infrastructure (e.g. related to contractual disputes), lowering barriers to entry for foreign investment. On the other hand, private sector initiative is also critical, which requires the development of the venture capital sector, a key and necessary ingredient for stimulating innovation in modern industries.

Understanding the nature of the new innovation-producing ecosystems which have developed in industries associated with the new economy (software, Internet and mobile communications) will help Japanese policy-makers and managers develop better ways for Japanese business to take advantage of its existing strengths to expand innovation beyond the industrial sphere into the realm of internationally-competitive service and soft goods sector enterprises.

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