

Japanese Innovation System Restructuring with High-tech Start-ups[†]

- Creative destruction of Catch-up Model, in micro, macro and regional level

Noboru Maeda^{*}

The Japanese economy, which was once admired in the world, is now suffering after the big success of the "Catch-up Model". It is already often pointed out and well agreed that Japan badly needs to transform from the "Do things better" paradigm to "Do different things" paradigm.

The emerging R&D spin-off start-ups in Japan will take the key role of the long waited paradigm change. In this paper, the missions and the effects of the emerging R&D spin-off start-ups in Japan are examined from the micro, macro and regional transformation view points, showing some of the implications to corporate strategy, industry strategy, and national R&D policies.

In the micro level, Corporate Venturing is focused to overcome the "Innovators Dilemma". In the macro level, new Japanese business model, replacing the catch-up business model, is shown in relation to the spin-off start-ups. And in the regional level, the necessary change from the old style industry agglomeration to organic cluster with R&D start-ups is stated.

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[Abstract]

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Industry restructure of Japan is widely behind to US and EU. ‘The lost decade’ is the phrase recently often used in Japan. It, however, could become the lost two decades, unless Japan makes a quantum leap.

Many opinions are stated about the reasons for this, such as finance policy and delay of deregulation. The key reason, however, may be in the micro-level area. Each big corporation is not changing to cope with the tide of the current era. The Japanese closed business model, which generated the value in the catch up business model age, no longer creates value in the IT age. It is no longer capable to create innovation.

The current Japanese situation is very similar to the one in US, in mid 1970’s to 1980’s. It reminds me of ‘Managing our way to economic decline’, the 1980 HBR paper of Hayes & Abernathy. They emphasized the lack of corporations’ innovation effort rather than finance and tax policy. It is time for Japan to learn Japan from US of 20 years ago.

In this paper, the utilization of high-tech start-ups entrepreneurship power to solve the big corporations’ innovation dilemma is proposed. In Japan, for the past three decades, almost none of technology oriented start-ups like Sony, Honda and Kyocera have been successfully established. And the reason is clear. In the catch-up business model society, high-tech start-ups are not needed. It was better not having them for the total effectiveness of Japan. Even if some start-ups were born, the society had no necessity, and they were to die.

After 1990, World business paradigm is rapidly changing to information society. There, ‘what to make’ is more important than ‘how to make’, and the entrepreneurship of start-ups are becoming a very important necessity. In Japan, however, the start-ups are not there. This is the key reason for Japanese industrial structure change delay.

To our surprise however, in these two to three years, something new and incredible is happening in Japan. In the so called lost decade, tens of spin-off start-ups are growing fast and succeeding IPO. Some of them are achieving over \$500 million annual sales within ten years of establishment. The emerging information society needed these high-tech start-ups. This is the sign of Professor Peter. F. Drucker’s so called ‘The future which has happened already’ stated in his book “The Ecological Vision” in 1993 . By 2010, the number of these spin-off start-ups will be over 450, and that would be over 10 % of the total number of companies in the stock market. This is enough as a critical mass to restructure.

In this paper, how big corporations, regional clusters and Japanese government should effectively utilize these emerging start-ups to create innovation is stated.

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1. Summary

The Japanese economy, which was once admired in the world, is now suffering after the success of the “Catch-up Model”. It is often pointed out and well agreed by many papers that Japan badly needs to transform from the “Do things better” paradigm to “Do different things” paradigm. It is a change from the operational improvement oriented industrial age to the strategic positioning oriented information age, which Japan is not good at.

In this paper, the missions and the effects of the R&D start-ups are systematically examined from the micro, macro and regional view points, and show some of the implications to corporate strategy, industry strategy, start-up development and R&D policies.

In the micro level transformation, Corporate Venturing is stated in order to overcome the “Innovators Dilemma¹”. In order to be innovative, big corporations need to purchase start-ups or to keep alliances with start-ups.

In the macro level transformation, new Japanese business model, replacing the catch-up business model, is shown. And in the new Japanese business model, R&D oriented start-ups’ mission is shown. New movements of recent emerging high-tech spin-off start-ups in Japan are shown. It is worth to call “Spin-off Revolution”. It started to change the old Japanese system with the mobility of high level human resources, which never ever happened in Japan before.

In the regional level transformation, the necessary change from the old style industry agglomeration to organic knowledge based cluster is stated. In the new cluster, the role of start-ups is the key factor jointly with local universities and institutions collaboration. Current Japanese Tokyo concentration, which creates negative lock-in effects², is stated. Mega clusters, which are needed to build the national innovation system, are also stated.

Entrepreneurship, which was lost during the catch-up model age, needs to be regained in Japan in micro, macro and in regional level. And developing new national innovation system is the best way to recover Japanese industry, science and technology and regional development.

Because of the emerging high-tech start-ups, it is not a difficult job for Japan. The “lost decade”

¹ Clayton Cristensen, “The innovator’s Dilemma” 1997, Harvard Business School Press

² Masahisa Fujita “Regional development for economic recovery” Nikkei Newspaper 2003.1.29

was not always negative for Japan. Many elite spin-off engineers from big corporations are the triggers to open the new age of Japan.

In the year of 2010, Japan will be the front runner again, leading the world industry. The issue left is how to accelerate this movement with effective supporting policies. Japan should proceed this direction with self confidence, jointly with industry, university and government.

2. Success of the Catch-up Model, and the slack of Innovation Systems in Japan

It is well known that the key success factor of Japanese after-war-success is the concentration of all the Japanese resources and systems to the catch-up business model. Education system, Industry policies, trade policies, infrastructures developments and so on were totally lined up in the same vector for efficiency of mass production. It changed the starving nation to one of the richest nations in 30 years. Probably this Japanese business model will be stated in business administration textbooks as one of the most successful and the biggest business model in the 20th century.

The success experiences, which doesn't match to the recent new business trend, is causing the slump of Japanese economy. Michael Porter, Harvard University, is asserting³ that the reason of the economic slump of Japan is that they are still applying the 30-year-old successful strategy in the new paradigm. "Do things better" strategy matches Japanese nationality, culture and history. Japanese is good at homogeneous group activities, which is needed for operational improvement of mass production.

In the constantly growing mass production system, unique activities are obstacles for the total efficiency. Individual opinion was welcomed only in the area of how to improve. Company dormitory, uniform, new graduate mass employment, in-house education, improvement suggestion system, morning meeting, a seniority wage system, and so on were very useful tools to build up the "How" to improve world.

When we look back in Japanese history to the 6th century, Shoutoku-Taishi, the prime minister of the age, set up the famous slogan, "Consensus and peace is the most valuable" in the oldest constitution of Japan. Thirteen hundred years history of agriculture in a tiny island has created DNA of operational improvement.

After catching up to US and Europe, Japan is stepping into the "What" to create field, passing the "How" field to China. Japan is at a loss in the "Do different thing" age, and still keeping the strategy of the "How" age.

Michael Porter is showing two clear evidence⁴ of Japanese enterprise weakness. One is semiconductor industry, and the other is entrepreneurship.

Japanese semiconductor companies such as Toshiba, NEC, Hitachi, Mitsubishi are producing about 20 kind of semiconductors. On the other hand, US and European companies like Intel, TI, Motorola and Philips are concentrating on 3 to 4 kinds of semiconductors like flash memory, digital signal processors, micro processors and ASIC, and they are gaining high profit ratio.

Japanese semiconductor companies, who can't take the "selection and concentration" strategy, and always following others, can hardly win in the new market which is totally different to the catch up model. Strategic positioning, which is different to others is the key of the strategy.

In the entrepreneur area, Porter is saying as follows: In US, top executives of big corporation

³ Michael porter, Hiroataka Takeuchi "Can Japan compete?" p6-p7 Diamond 2000

⁴ Michael porter, Hiroataka Takeuchi "Can Japan compete?" p126-p131 Diamond 2000

challenge as a CEO of a tiny start-up company. In Japan, this never happens. Elite engineers in big corporations can never start their own businesses by taking a risk.

3. Issues of Japanese start-ups

It is often said that Japanese culture is not suitable to start-ups. The Japanese history of start-ups does not agree to it. Many successful start-ups are born right after the World War II. And recently even after the dot com bubble, IT network related start-ups are very active. Chart-1 shows the history of classified Japanese start-ups.

Chart-1

Generation	Year	Group Name	Industry	Start-up company
First	1945-	Post-War Start-up	Manufacturing	Sony, Honda, Kyocera, Cacio, Rohme
Second	1970-	Guts Start-up	Service	Pasona, NOVA, Doutor, HIS, Takefuji
Third	1990-	Internet Start-up	E-business	Softbank, Rakuten, Asukuru, Manex
Fourth	?	High-tech Start-up	Real+E-business	???

From the first generation to the third generation, Japanese start-ups are enjoying a relatively healthy growth. Anyone in Japan can count some of the names of the successful start-ups. The problem of Japanese start-ups, however, is that no high-tech start-ups are coming out in the past 20 years. R&D oriented start-ups like Incs, Thein, Samco, Megachips are becoming famous among limited specialists, and they are considered as exceptions.

When we talk about Japanese start-ups, the issue should not be “Why is Japan not good at start-ups”, but it should be “Why is Japan not good at High-tech Start-ups”.

They often say the reasons are: No good culture for entrepreneurs, No risk money enough for R&D and manufacturing, No first customers for new technology products, High level engineers’ tendency to work for big companies, and so on. These reasons, however, are minor reasons and not the basic reasons. There are two basic reasons why R&D start-ups are not at all active in Japan.

One is that R&D start-ups were not necessary in Japan, when Japan was enjoying the catch-up business model. It was much more efficient not having start-ups. All the excellent engineers are needed to have operational improvement. Industry and society are not wishing to have start-ups, who will distort the common vision of clear and simple mass production. It is natural to think that even if some unique technology oriented start-ups were born, they would have had no room to develop their business. If the industry or society badly demands for them, start-ups will come up in whatever environment it is in.

The second reason for the absence of R&D start-ups is that most of the high level engineers who are highly educated have no intension to start their own business. This is why even in these years when high-tech start-ups are really needed, no R&D start-ups are developed.

As a matter of fact, the source⁵ of entrepreneurs who can start high-tech start-ups are very limited. They are now located either in universities, in public or private laboratories or in big corporations. The key issue of Japanese start-ups is that these high level engineers have no intension to start business and joining to support the operational improvements in the old style

⁵ Noboru Maeda “From collaboration to combination of university, Industry and government” Organization Science Vol.34 No.1, 2000

catch-up model.

Some⁶ are starting to say that these high level engineers, especially in big corporations, are like slaves who are blindly following their managers' orders, and these slaves should be released for the progress of Japanese industry.

Chart-2 shows the comparison of US, German and Japanese source of start-up entrepreneurs and the level of start-up activity. And the chart-3 is the detail sources⁷ in German start-up entrepreneurs.

Chart-2

Spin Out Source Comparison US-Germany-Japan (Image Chart)			
<u>Spin Out from</u>	<u>US</u>	<u>Germany</u>	<u>Japan</u>
University	many	many	very few
National Laboratory	some	many	nil
Corporation	many	few	few

Chart-3

Number of R&D Oriented Start-ups Established in Germany		
<u>Spin out from</u>	<u>1990</u>	<u>1997</u>
University Professor	140	240
University Student	205	395
University Total	345	635
National Laboratory (FhG, MPG, etc)	73	152
Company	247	458
Total	665	1,245

Source: ATHENE Project Report, ADT, 1998

Unless situations like these change, Japanese R&D oriented start-ups will never develop. All the supporting policies to develop high-tech start-ups are in vain. It is like hens warming wind eggs.

4. Emerging Spin-off Revolution in Japan

Since 1990, the world paradigm of business is starting to change drastically to the information age. "How to improve efficiency", "Do things better" paradigm has changed to "What to produce", "Do different things" paradigm. Risk taking start-ups, challenging even in a niche field, are needed for innovation. Emerging of R&D start-ups is badly requested, and the Japanese government has been blowing a whistle for several years. Japan, however, is suffering from not

⁶ Shuji Nakamura "Break through with anger" 2001 Shueisha, Tetsuya Iizuka "Top niche company" Nikkei Business 2000.1.17, "Techno Garden" Nikkei Business 2002.9.23

⁷ Project ATHENE, 1998, ADT, Innovation Technology Center-Germany, A:Spin-off, T:Technology oriented, H: University, E:Introduction, N:Natural Science

having these high-tech start-ups.

Spin-off Revolution

As shown in chart-4, a very interesting movement is happening. In other words, at last, something is happening to promote high-tech start-ups in Japan in a very different way to US and Germany. Several high-tech start-ups are emerging and so far very successful. Many of them already went public, and others are going to make IPO in a year or so. Two of them are listed in No.1 Tokyo Stock Market. And there is a high possibility that the movement will expand in coming years. This is the initial sign of future trend, which Peter Dragger stated⁸ as “The future which has happened already”.

Chart-4

<u>The New Waver - The Emerging High-tech Start-ups in Japan</u>					
<u>Company</u>	<u>Founder</u>	<u>Ex-company</u>	<u>Founded</u>	<u>IPO</u>	<u>Application</u>
Incs	Mr. Yamada	Mitsui Metal	1990		3D CAD Die Molding
Thine	Mr. Iizuka	Toshiba	1992	2001	LCD System LSI Design
Megachips	Mr. Shindo	Mitsubishi Elec.	1990	1998	Digital Image LSI Design
Samco	Mr. Tsuji	NASA	1979	2001	Thin Film Technology
Yozan	Mr. Takatori	Consultant	1990	1999	Cell Phone System LSI Design
Optware	Mr. Horimai	Sony	1998		Tera-byte Optical Storage
Lattice Tech	Mr. Toriya	Ricoh	1997		Ultra Super Light 3D Software
EC One	Mr. Kayama	Mitsubishi Cor.	1998	2002	Software Parts
North	Mr. Iijima	Sony	1990	2002	Print Circuit Board
Cybozu	Mr. Takasuka	Matsushita	1997	2000	Group Ware
Adtex	Mr. hasegawa	IBM-Japan	1993	2001	Hard Disk
Celartem	Mr. Shindo	Venture Link	1996	2001	Image Processing

Characteristics of the emerging high-tech entrepreneurs / start-ups are as follows: They are Elite Engineers, spinning out from big companies. They are good at Strategic Collaboration with big companies. They produce profit from the first year, with phase management. They utilize government fund cleverly. They aim early stage IPO for further expansion and recruiting. They have close relations with professors. They seek global collaboration from an early stage.

Numbers of these successful spin-off start-ups are still less than fifty, which is not enough to change the structure of industry. Key point to notice, however, is that young engineers of famous big corporations and doctor course students of famous universities are rushing to work for these start-ups. In some companies, it is more difficult to join the start-up than to join SONY, Honda and Kyocera.

Through the interviews with these young engineers, we found that the prime interest joining these IPO start-ups is not for stock options, but for early stage development as a business specialist, who is free from lay off. They may spin-off the start-ups in five years, and challenge to set up their own company like their bosses. In this way, the numbers of R&D start-ups will increase year by year. Young non engineers with MBA degree, who are involved in the

⁸ Peter F. Drucker “The Ecological Vision” 1993

business administration area, are starting to spin-off from big corporations and national government office like METI.

It is now clear that high level human resources has started to show their mobility in Japan, in which it had never happened in the past 50 years. METI and cabinet office are starting to set up committees⁹ to develop supporting policies for spin-off. Japanese government is now starting to take actions to correct the too much concentration of business assets like IPR and engineers to big corporation.

In my simulation, in the year 2010, about 450 R&D start-ups will succeed IPO, and about 80,000 engineers are working in these companies. This number of IPO companies are about 10% of total companies in the open market, and are enough as a critical mass.

5. Micro level transformation ... Enterprises

Japanese industrial restructuring is very much behind to US and Europe. It is often said that Japan had lost ten years. If no actions are taken, it could be a lost 20 years soon. Many opinions are stated about the reasons why, such as finance policy and delay of deregulation. The key reason, however, may be in the micro-level area. Each big corporation is not changing to cope with the tide of current era. The Japanese closed business model, which generated the value in the catch up business model age, no longer creates value in the IT age. It is no longer capable to create innovation.

The current Japanese situation is very similar to the one in US in mid 1970's to 1980's. It reminds me of 'Managing our way to economic decline', the 1980 HBR paper of Hayes & Abernathy. They emphasized the lack of corporations' innovation effort rather than finance and tax policy. It is time for Japan to learn from US of 20 years ago.

Corporate Venturing

In order to break through the big corporation's Innovator's Dilemma¹⁰, collaboration with R&D start-ups of big corporations is highly recommended. Professor David Weber, Director of MOT program, MIT, is emphasizing that the main theme of MOT has been changing every 10 years¹¹. In 1960s., it was "managing R&D", in 1970s it was "Technology transfer", in 1980s it was "Technology innovation", in 1990s it was "Technology Strategy", and it will be "Corporate Venturing" in 2000s.

In line with the business shift from the closed to open society, technologies are needed to combine as a system. Big corporations alone can not meet the business trend. Collaboration with start-ups and with other industries is very much requested for big corporations.

Corporate venturing is to compensate the weakness of big corporations' innovators dilemma, using start-ups' dynamic entrepreneurship. Tools of Corporate venturing are: In house start-ups, Risk money investment as corporate venture capital company, collaboration with start-ups, supporting start-ups activities, joint development with start-ups, incubation of start-ups, MBO/MBI, Carve out and so on.

⁹ METI: "Spin-off study committee" headed by Prof. Ohe, Waseda University, started at end of 2002. The author is one of the committee members. In April 2003, recommendation report "Unchain from the big corporation's closed culture" is published.

Cabinet Office: "R&D oriented Start-up development project committee" started October 2002 assigned by prime minister Koizumi. Headed by Prof. Matsuda, Waseda University. The author is one of the committee members.

¹⁰ Clayton Christensen "Innovator's Dilemma" 1997

¹¹ Prof. David Weber presentation at MOT International Conference at Keidanren Hall, in March 2003

Among these, collaboration with spin-off start-ups is the most important one in Japan. In many Japanese companies, once some one spin-out¹² the company, he or she will be handled as a criminal person. The company will blame the spin-out entrepreneur as a person with less royalty to the company.

SONY, Fujitsu, Recruit, Mitsui Corp. are the few exceptions. These advanced companies are positively trying to cope with the spin-offs. In SONY, for example, once someone with outstanding performance shows intension to spin-off, top managements, even CEO or COO comes to congratulate them. And the top management will say that SONY is wishing to have alliance with your start-up company, so make a quick success.

Smart big corporations are already starting positive alliances with high-tech start-ups. Toyota, for example, put about one million yen to brand new 3D image communication software development high-tech start-up called Lattice Technology in 1999. This start-up's founders are Ricoh spin-offs of 1997. In 2002, this start-up became famous with their excellent technologies, and shooting to the IPO soon. Toyota is utilizing this 3D communication technology for their automobile remote design purpose as a first customer. For the tiny start-up, the big name of Toyota is a powerful support for their business and risk money gathering. Toyota and the Lattice technologies collaboration is a good win-win example of big corporation and high-tech start-up.

It is a good thing for Japanese industry and enterprise that big corporation's sleeping IPR are utilized outside of the big corporation. At NEC, there was a patent not well utilized inside the company. NEC spent about US \$10 million to develop it. The patent inventor wished to utilize the patent outside NEC to expand the market. NEC agreed with him and helped to establish a start-up company, offering monopolized usage of the IPR with a license fee, two years of free support in administration and laboratory equipment usage.

NEC approved to the start-up to approach to even NEC's competitor for sales. NEC, on return, got a right to obtain new stock reserve as a stock option. This is the first case of the newly changed regulation. NEC has no equity to the start-up, and so the start-up has free hand of business with many support from NEC. NEC, utilizing the sleeping IPR, got a chance to enjoy big return in success of the start-up. Knowing the start-up receiving support from NEC, some of the venture capital invested risk money to the start-up. This is another good win-win relation.

Mr. Nishigaki, president of NEC has stated a surprising comment as a big corporation's top management in a newspaper¹³ as follows: "In Japan, too many high level graduates are gathering to big corporations. It is not easy in one corporation that tens of thousand oh high level persons can all show their capability. NEC is starting to put some high level person outside of NEC with IPR as start-up founder, and support them with risk money as their equity. It is not a time to compete with the number of patent inside the company".

SONY set up a Strategic Venture Investment Department in head quarters. In Tokyo, San Jose, Berlin and London, investing hundreds of million dollars risk money to start-ups¹⁴. For companies like Intel, Cisco Systems, Daimler Chrysler and so on, corporate venture capital company or

¹² Prof. Ian MacMilan of Wharton School, University of Pennsylvania, defined spin-off and spin-out at the METI spin-off committee on March 2003. Spin-out: wishing to keep no relation after split. Spin-off: wishing to keep some relation after split.

¹³ Asahi Newspaper 2002.7.9 "Can Japan build up knowledge oriented country?" Interview to Top management and Professors. Interview to NEC President Mr. Nishigaki

¹⁴ For example, Sony is investing to digital contents license control start-up called Inter Trust Technologies about \$200million, jointly with Philips.

department is one of the most important strategic functions. Japanese big corporations are asked to change from the closed operation to much open operation with high-tech start-up dynamic collaboration.

In house start-ups, which many Japanese big corporations are still interested, are not showing big success except a few success like Sony's Play Station, Mitsubishi's Net-One , Plus Stationaries' Askul and so on. Many in house start-ups are not growing fast, and not showing any potential to be a future big business of the company. It seems like a "Start-up game festival" for advanced corporate culture development.

Many control from corporate staff, who do not want to take risks, and no critical risk for the start-up players, are the characteristics of many Japanese in house start-ups. Rather than keeping them in house, let them spin the company off, and try to make a win-win relation. Giving them perfect freedom, and let them act as real independent start-ups. It seems better than playing "Start-up game festival" .

6. Macro level transformation ... National Business Model

In order to have a effective national innovation system, NIS, it is important to know on what national business model the NIS is working. NIS's major three factors, research institutions, accumulated knowledge and research people, should work effectively knowing the business model of the nation. NIS's mission is how to systematically and effectively innovate the business model. NIS without considering national business model will fail.

Research and development investment ratio to GDP in Japan for both private company and government, is always the highest in the world with about 3.2% in 2001. It is often said that the ROI, however, is not sufficient. One of the key reasons could be here. Lots of R&D money have been spending in Japan to develop NIS on the "old" national business model.

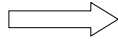
Business Model and NIS, National Innovation System

In order to drastically promote a nation or a region like EU, it is important to have a clear and simple business model, to which all the levels of nation can understand and join. A retailer, a blue worker, an engineer, a management in a big corporation, university professors, laboratory engineers, all levels of the nation facing the same direction is better for national resources efficiency.

Chart-5 is the summary of US, EU and Japanese simplified national business model.

Chart-5

National Business Model



Can Japan recover from the old successful Catch-up Model?

	Old	New	Key Word
US	Big Corp. Model	Silicon Valley Model	E-Business
EU	Each Country Model	Pan Europe Model	Euro Money
Japan	Catch-up Model	?	?

The key word of Japanese national business model was “Catch-up”. This key word is utilized not only to the manufacturing industry, but also to the service, finance, construction and all other industries.

In USA, the key word which is leading the total economic dynamics is Silicon Valley Model or E-business Model based on entrepreneurship. Although there were some overheat in dot com industry, IT industry is combining to finance, service, retail, life science industry and so on. These combinations are creating many start-ups in IT communication and bio industry. Employment in these new industries created more than the massive lay off of big corporations. US will continue the industrial dynamism for the coming 30 years with these key word oriented business model.

In Europe, European Union with 15 countries are on the way to the total Euro land including east European countries. The dream money Euro is successfully penetrated. Many changes are dynamically going on such as; Pan European products development, M&A among European companies, mix of managers’ nationality in a company, restructuring of warehouse, plant and logistics, unification of product quality and safety regulations and so on.

Until 1980, Europe was sick in economy. With the impact of the new business model, the market is trained with the tough competition, creating the innovation through creative destruction. UK companies have changed their slow business culture to competitive culture, and German companies have changed their hard culture to a very flexible culture. All these changes are incredible for the people who know the past.

Small countries like Holland, Ireland and Finland are changing in high speed, taking this change as a big chance to compete with big countries. All these changes have been done due to the Euro business model key word, EU and Euro money.

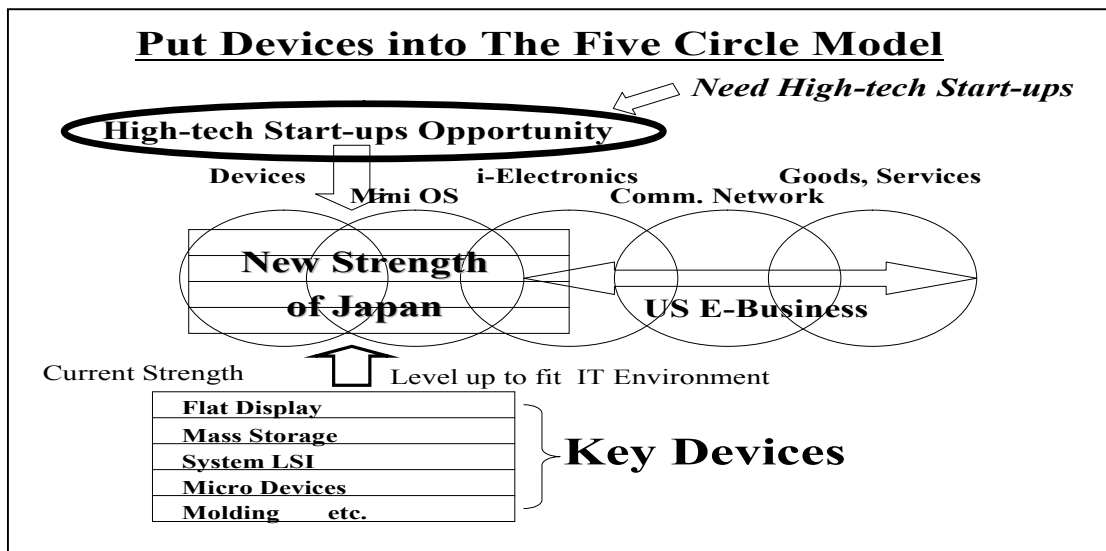
Naturally, the national innovation model of US and EU are working on these drastically changed national business models. It is rather easy to think how research institutes, stored knowledge and researchers should systematically organize to effectively innovate the fast moving and value creating national business model.

Five circle model

What will be the Japanese business model, which can keep Japanese business dynamism for the coming 30 years? Business model of Japan should be in line with the tide of the world business and social movement, and it is better to utilize the strength of Japan, and create value for us.

As a hypothesis of the national business model, the author is proposing “The Five Circle Model” since 1999, improving the logic year by year¹⁵. As shown in chart-6, it is a combination of E-business model and Japanese manufacturing business model. Key devices are combined to E-business model. This is a business platform of the coming information and knowledge age.

Chart-6



Right side of the five circle model is the E-business model. PC- network- contents. Left side of the five circle model is Japanese manufacturing model. Key devices - os - PDA. These two business models are combined into one, and five circles create one model. Japanese industry is strong in the left side, especially the key devices like flat display, storage, system LSI, etc. In the E-business, most important factors are security and easiness to utilize, or man machine interface. These two important factors are controlled by left side. In a PC age, Intel and Microsoft controlled the E-business. However, in the coming mobile age, PDA is not easy to assemble at warehouses like as of today’s Dell module business model. Japanese tiny and complicated non module hardware and software matching technology¹⁶ will be highlighted. This is the area where Japan can take the leadership in building E-business platform, the fast growing business in the information and knowledge age.

Japanese catch-up business model’s key device strength will keep power if these technologies like system LCD, storage, system LSI, molding, print circuit are combined with the Five Circle Model. Key issue of Japan is whether these combinations are possible or not. In this combination field, high-tech start-ups are mandatory. Big corporations and universities alone are not good at

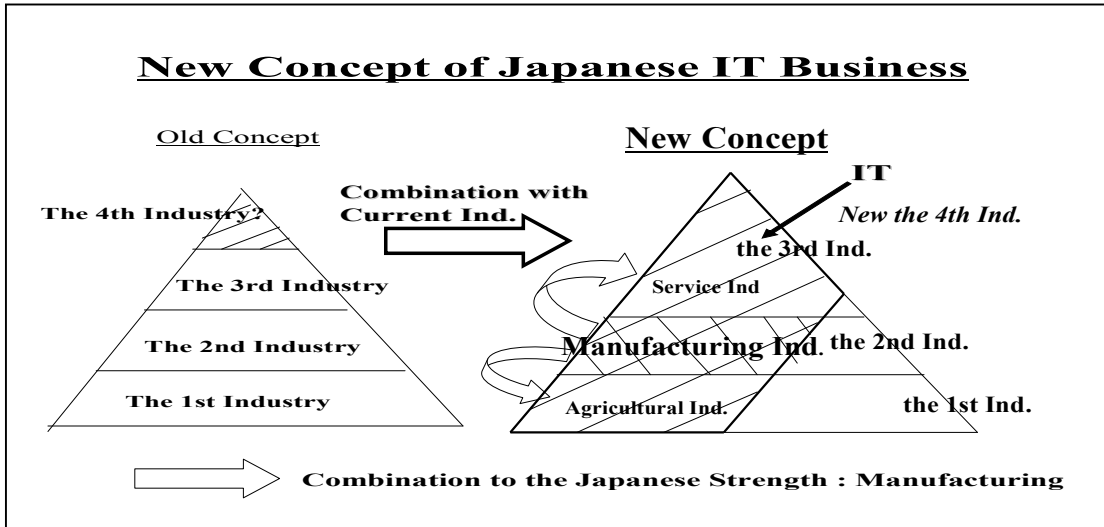
¹⁵ Kiyonori Sakakibara ‘ Entrepreneur Business – Japanese Issue ‘NISTEP Policy Study No. 2, 1999
 Maeda Noboru “ Japanese New Business Model” ‘ NISTEP Policy Study No. 3, 1999
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 Noboru Maeda “R&D start-ups” Japan Venture Academy First Annual Conference 1998
 Noboru Maeda “Spin-off revolution” p176-p188 Toyokeizai 2002

¹⁶ Prof. Takahiro Fujimoto’s “Suri-awase” theory.

these IT related niche and high speed business area. Risk taking start-ups can only promote these combination businesses, with good cooperation of big corporations and universities.

These combinations can be illustrated in Chart-7 in a more generic way.

Chart-7



The Fourth industry is not an independent industry coming after the Third industry. The Fourth industry is a cross section of IT and the current The First, The Second and The Third industry. Because of the key devices strength which Japan holds now, Japan can highlight the cross section of The Second industry, the manufacturing area, and the IT industry. And the combination of the manufacturing and service industry would create a new value.

7. Regional level transformation ... Mega clusters network

Cluster concept, which contains both collaboration factors and competition factors, is very helpful to developing innovation in Japan. It contains the power to change both Japanese industrial structure and regional structure. Japanese government, knowing the power of cluster concept, started to adapt the cluster policies. METI started industrial cluster policy with 19 regions in 2000, and MEXT started knowledge cluster policy with 15 regions in 2001. These two cluster development support policies are asking the regional initiative, and in that sense it is very different to old government policies, which in many cases giving detail directions from Tokyo.

This cluster policy is very different to the 1980s' industry agglomeration policy. Key factors of the cluster is not the plants controlled from head quarters in Tokyo or Osaka. Key is independent local companies and start-ups, collaboration with local universities and local government institutions. Clusters have roots under the ground, and stand still in local areas, and it is a kind of ecological organization living in the region. These two cluster supporting policies continue for five years, and the results really depend on the regional leadership and involvement.

It is interesting to compare the policies to develop and foster clusters. In USA, Silicon Valley, which created a very natural cluster in more than 50years, is a good sample. Seeing the best sample of cluster, Austin in Texas and Research Triangle Park in North Carolina developed

different kind of clusters. Many other regions followed them. COC¹⁷ of US government set up a study team of clusters, headed by Prof. Michael Porter, and showing the success factors of five sample regions to all other regions. As USA has many good examples of clusters all over USA, federal government' job is just to show good examples, and others will follow with their own style of the region. That is good enough.

In Germany, in order to take leadership in EU, economic development with cluster was an important issue. Federal government took a radical cluster development policy for a bio industry called BioRegio¹⁸. Three regions are selected among 16 regions for concentrated support, and in five years Germany succeeded to develop three active bio clusters and exceeded UK in bio start-up activities.

Cluster development should be through bottom-up activities as Prof. Michael Porter shows samples of California win cluster and Italian Shoe making cluster. However, in a country like Germany and Japan, where bottom up clusters are not developed for many years, it is worth to have central government involvement at a certain stage. It depends on the country and region situation. US, German and Japanese policy comparison is worth watching continuously.

Success factors of cluster development...A comparison of US, EU and Japan

In the past three years, we visited various overseas regions to study success factors of cluster development. Especially the clusters where low technology industry successfully transformed to high technology industry were selected.

In USA, Austin in Texas, Research triangle park in North Carolina, San Diego in California and Silicon Valley were selected.

In Europe. Dortmund, the old coal and steel town and Munich were selected from Germany. Sofia Antipolis, often called as a French Tsukuba, in France, and Oulu, a tiny town with a population of only 120 thousand in Finland.

There are some successful clusters in Asia, too. This time, however, we did not include them, because we focused on the clusters in developed countries so that Japan can refer to them.

Through the on site interview and document research, we picked up key successful factors and arranged them in time series like chart-8. Chart-9 shows the 10 items and 20 key elements of common success factors of these 8 regions.

¹⁷ Five regional cluster study reports are available in the COC web.

http://www.compete.org/nri/clusters_innovation.asp

http://www.compete.org/publications/clusters_reports.asp

¹⁸ BioRegio is one of the federal government policies of selecting cities to support through competition. Selection and concentration is the basic policy.

“A study of European start-up supporting policies” Masayuki Kondo, Noboru Maeda, Economic Research center/Kochi university of Technology, 2000 P24-p27, p54-p63

“Spin-off revolution” Noboru Maeda, Toyokeizai, 2002 p124-p131

Chart-8

Cluster History - Austin

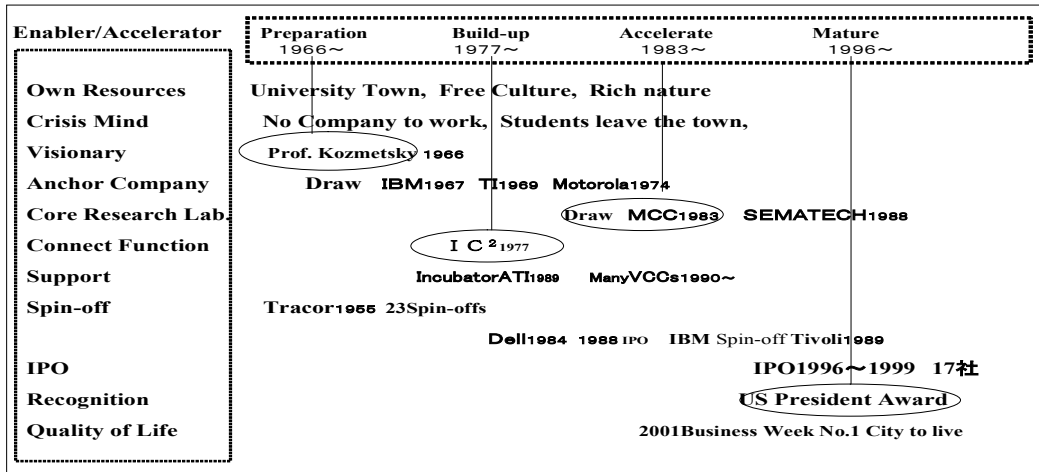
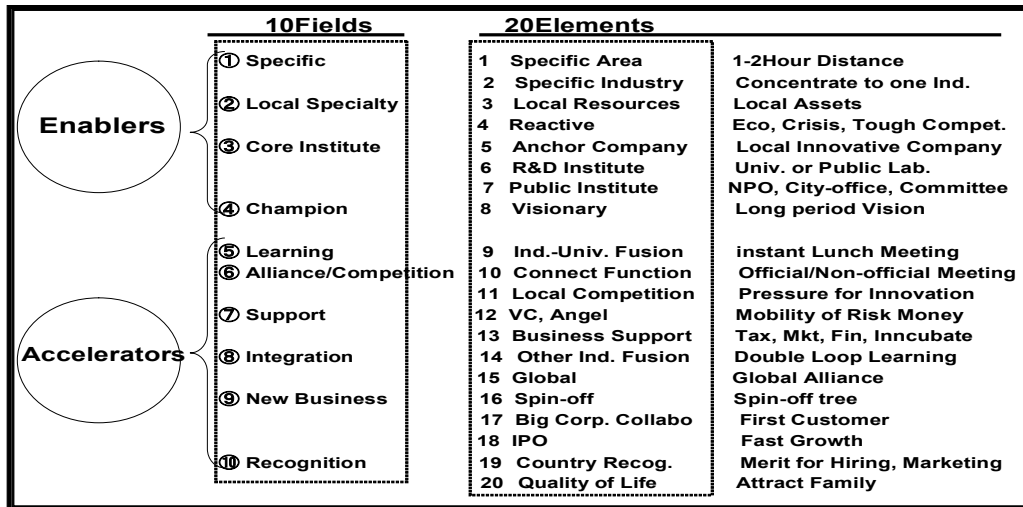


Chart-9

20 Elements of Successful Clusters – US&EU



We made the evaluation standard of the 20 elements. If the element is fully achieved or matches the evaluation standard, 5 points are given, and if they are not achieved or match them at all, 0 points are given. Maximum points are 100 as a total. Chart-10 is the results of my evaluation based on my available data and knowledge.

Chart-10

Cluster Self Evaluation Chart

5pointsX 20=100points

20 Elements	Austin	Oulu	Sapporo
Enabler			
1 Specific Area	5 in a city	5 in a city	5 in a city
2 Specific Industry	5 I T, Software	5 I T, Comm.	5 I T, Software
3 Local Resources	2 Univ. Students	1 Univ. Students	2 Univ. Students
4 Reactive	3 No job for students	4 Population Decline	3 Economic Recession
5 Anchor Company	2 Dell '84	3 Farnos '60	2 BUG '77
6 R&D Institute	4 MCC '83	3 VTT-Electronics '70	2 Hokkaido Univ.-Eng.
7 Public Institute	5 Drawing	3 Collaboration	2 Collaboration
8 Visionary	5 Prof. Kozmetsky	3 Prof. Oksman	2 Prof.Aoki
Accelerator			
9 Ind.-Univ. Fusion	5 SEMATECH	5 VTT, ouli Univ.-Eng.	2 Hokkaidou Univ.&
10 Connect Function	5 IC ² '77	5 technoPolis '82	4 BusinessCaffee 2000
11 Local Competition	3	3	1
12 VC, Angel	5	2	2
13 Business Support	5 ATI	3 Oulu Tech	2
14 Other Ind. Fusion	1 Nano Tech	3 Bio	3 Bio
15 Global	5	3	2
16 Spin-off	4	3	3
17 Big Corp. Collaboration	5	2	1
18 IPO	5	2	2 Soft Front, Open Loop
19 Country Recogniton	5	5	3
20 Quality of Life	4	1	3
Total Points	83	64	51

With the data and knowledge we have, other regions evaluated with same standards, Silicon Valley got 90s points, San Diego, Dortmund, and Munich each got 70s points, and Sophia Antipolis got 60s points. Over 70 points looks to be a successful region as a cluster. Japanese regions trying to become clusters get around 30s points at this moment.

There are three ways to use this self evaluation sheet. One is to evaluate the cluster at the time of five years ago, now and forecast the five years later score. By doing so, you can see the progress of the past and the future. Second method to use this self evaluation chart is to compare with other clusters. Set up some good clusters as benchmark cluster, and compare. The good point of this is you can evaluate different clusters with your understanding, and it is better than comparing to the scores which another person made with a different way of thinking. The Third method is to evaluate the same clusters with different persons. Once you find the difference of evaluation, you can discuss that with the person, and can find out the reasons of different understandings.

Spin-off tree

In US and European successful clusters, spin-off start-ups are almost always playing very important roles. From the local anchor company, many spin-off start-ups were born in 20 to 30 years range. And from the spin-off company, new spin-off start-ups are born. In this way, in some clusters, spin-off tree is clearly shown. This spin-off tree is the evidence of active start-up activities rooted in the region.

Chart-11 is the spin-off tree in San Diego bio cluster. 40 start-ups are born in the 20 years from the anchor company called Hybritech, which set up in 1978. This tells the tough competition and alliance happening inside the cluster. Many varieties of spin-offs: spin-off from bankruptcy, spin-off from confront, spin-off for new business development and so on. Similar spin-off tree can be seen in Silicon Valley and in Research triangle Park.

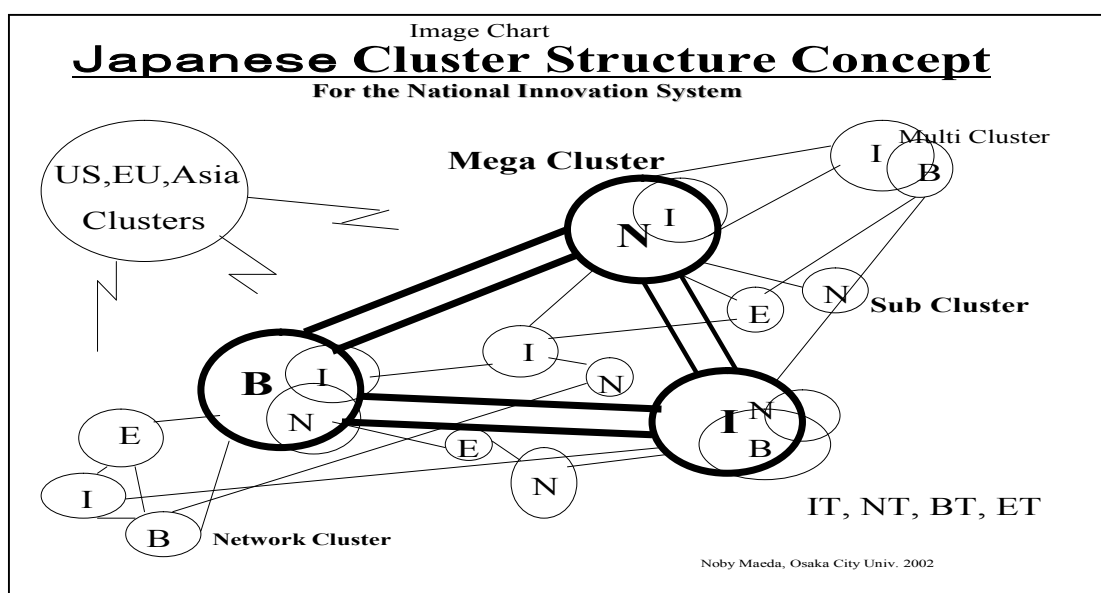
In Japan, Sapporo Valley is the only cluster where we can see the same kind of spin-off tree. Spin-off in Sapporo, however, is very limited from small start-up company, and not showing the

For example, IT Mega Clusters in Tokyo, Bio Mega Clusters in Osaka/Kobe/Kyoto, Nano Technology Mega Clusters in Sendai, and Environment Technology Mega Clusters in Northern Kyushu.

Each Mega Cluster is a multiple cluster of IT, Bio, Nano and Environment, and they compete and collaborate with each other. Local regional clusters will keep good relations with one of these Mega Clusters, and in a relatively narrow range of specialty, try to achieve world class technology and business.

By doing so, Japan can kill two birds with one stone. Mega Clusters concept can change Tokyo concentrated economy, and brings the merits of utilizing local strength. Chart-12 shows the backbone of the Japanese cluster concept.

Chart-12



This Mega Cluster network will act as a national innovation system of Japan. This concept can work on the proposed Japanese Business Model, the Five Circle Model.

8. Implication to Japanese Science and Technology policy

SBIR, Small Business Innovation Research, of USA is effectively involving R&D start-ups entrepreneurship to the government R&D. Majority of government research staff initially ignored SBIR start-ups as a minor power, realized its unique explosive power which big corporation never hold. And the government researchers started to effectively utilize the high-tech start ups. In the US SBIR, there is six to seven years relation with start-ups and government researchers since the phase I, because of the purchasing of start-up products after completing the contracts.

In Germany, BioRegio, the bio model cluster development project, created collaboration of MPG²⁰, the public basic research institute located all over Germany. BioRegio also created a close collaboration with big pharmaceutical companies.

Japanese public laboratories and big corporations need to have experiences working with high-tech start-ups. Japan finally by chance got many high-tech start-ups. It is time to involve

²⁰ Max-Planck-Gesellschaft

them into the Japanese national innovation systems. Government policy makers need to think about this.

9. Conclusion

Japanese lost 10 years were not in vain. Elite engineers of big corporations started to start up their own company as spin-off start-ups, and succeeding IPO in the last two years. They have an outstanding technology and wish to be a world enterprise. Now we can say the second and third Sony, Honda and Kyoceras are born.

Most of the Japanese engineers in the catch-up business model age were wishing to work for the big corporation, but now they are starting to change. They are wishing to work for these high-tech start-ups. And in some years, they will spin-off to start their own company.

In micro level, big companies need to break the innovators dilemma. Now that we have many high-tech start-ups by chance, big corporation can utilize the power of high-tech start-up as a corporate venturing.

In macro level, Japan needs to find out a new business model. Thanks to the high-tech start-ups, we can develop a five circle model, a combination of E-business model and Japanese manufacturing model of key devices.

In regional level, Japan needs to hold a Mega Cluster concept, as a back bone of cluster concept, and as a part of Japanese national innovation systems.

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