Innovation and Clusters: The Japanese Government Policy Framework

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Abstract

This study aims to clarify the different innovation policy frameworks adopted by the Japanese government since the middle of the 90's in order to develop new industries or to revitalize declining industrial regions and further to increase the country international competitiveness. Incubation and Clusters initiatives being nowadays at the core of all industrial but also science and technology policies in Japan, the paper gives a special emphasis to their implementation based on two case studies: The Kyushu Silicon Cluster (industrial cluster) and the Saito Life Science Park (knowledge cluster). They illustrate the interconnection or networking between research institutions, firms and government, the importance given to incubation to foster innovation and link research seeds with industrial needs. They also show the interdependence between clusters (industrial and knowledge ones) at the regional level although supported by the national framework. The first results are discussed in conclusion.

Key Words: Clusters, Innovation, Incubation, triple helix (or san-gaku-kan), science and technology.

The development of a knowledge-based economy in the context of globalization has caused innovation to become the primary driver of growth and competitiveness. Hence, an innovation policy boom has recently occurred all over the world. The importance of innovation in economic development is of course not a new issue but due to increased competition from emerging countries, the pace of innovation has to be accelerated and the former linear model of innovation be reconsidered. At a time of “Mega-Competition of Knowledge”, involving the USA, Europe and Japan, but also other advanced Asian countries like Korea, or developing giants like China, networking appears as the ‘one best way’ to innovate, whether to develop new industries, to revitalize declining industrial regions, or to upgrade technologies and industries as for example in the emerging countries. Following Michael Porter’s competition model, with Silicon Valley as an

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illustration, the priority given to the constitution of robust networking between all actors of a specified territory or regional area, has led to the implementation of cluster initiatives worldwide. Linkages between firms, research institutions and academics, government agencies, or the triple helix (*San-Gaku-Kan* in Japan) are now at the core of all projects aiming to strengthen the interconnection between process and product innovation and interactions between research, development and production without forgetting related functions such as financing, marketing etc. Indeed, while the common objective of all countries is to increase competitiveness, most of the measures taken since the 90s-00s aim to put clusters at the core of their National Innovation System.

Due to both the impact of the post-bubble crisis and the effect of globalization, Japanese international competitiveness has largely eroded in the past decade. It pushed the government to address directly the innovation issue by enacting laws and initiating programs as early as the 90s. The efforts were further reinforced in the 00s, with the implementation of two clusters plans from METI and MEXT, which led to the creation of two types of clusters: industrial clusters and intellectual or knowledge clusters.

1. The position of clusters in the innovation framework

In Japan the process of 'clustering' began in the early 2000s with the implementation of the Industrial Cluster Plan by the METI[1] in 2001, in order to revitalize industrial districts[2] that were left behind because of increased global competition and with the Knowledge Cluster Initiative set up in 2002 by the MEXT[3] mainly to strengthen the development of new industries. Although those two initiatives cannot be considered as the first policy device to enhance competitiveness through increasing innovation, they constitute the major achievements of recent policies. Other laws initiated since the 90s are worth mentioning though as they have contributed to their creation or contribute to their support.

1.1. The Science and Technology framework

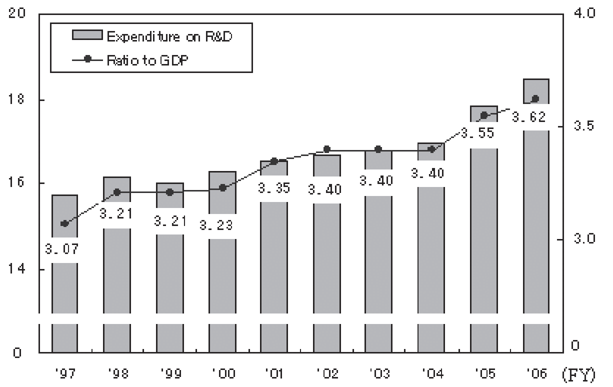
The most important one is probably the Science and Technology Basic Plan[4] enacted in 1996 for 5 years until 2001, to promote the construction of a new R&D system by

1) Ministry of Economy, Trade and Industry
2) Industrial districts have a long history in Japan, for more details see among others Whittaker (1997), Yamawaki (2001).
3) Ministry of Education, Culture, Sports, Science and Technology
4) For more details on the Basic Plans, see Hattori (2006).

increasing funding for competitive research with a budget of 17.6 trillion yen. This law was introduced during a period of economic crisis, nevertheless the Japanese government tended to increase R&D expenditure to strengthen the potential (chart 1). At the end of the program Japanese authorities decided to extend the plan for 5 more years but focused this time on promoting basic research and giving priority to R&D on national and social issues[5] with a budget of 21.1 trillion yen. This second phase was associated with the knowledge cluster plan set up by the MEXT. Further, in 2006, the "Mega-competition of Knowledge" caused the government to give priority to the reinforcement of the knowledge clusters' competitiveness. Using the policy framework built during the previous programs, it decided to launch the third phase of the Science and Technology Basic Plan with a budget of 25 trillion yen, aiming at:

- increasing by 30% the amounts dedicated to the creation of sophisticated research area enhancing industry-academia-government collaborations through the promotion of joint research programs
- reinforcing University's competitiveness by upgrading 30 world-class universities[6] on one hand and on the other hand by revitalizing local area universities[7] in order to stimulate regional Science and Technology development
- strengthening emphasis on the role of "wisdom" and increasing overseas research collaboration; in 2005 only 51 projects over 13,020 were common researches between Japanese universities and overseas firms (0.4%)

Chart 1: Growth of R and D expenditures (trillion yens, %)



Source: Statistic bureau, http://www.stat.go.jp/english/data/kagaku/1534.htm, viewed on November 2007

During the periods covered by the Science and Technology Basic Plans, complementary

5) Four domains of activity were selected: life science, IT, environment and nanotechnology
6) Today about 10 universities are in the top 200
7) Local Brain Restart Program, revitalizing a region by revitalizing the local brain university

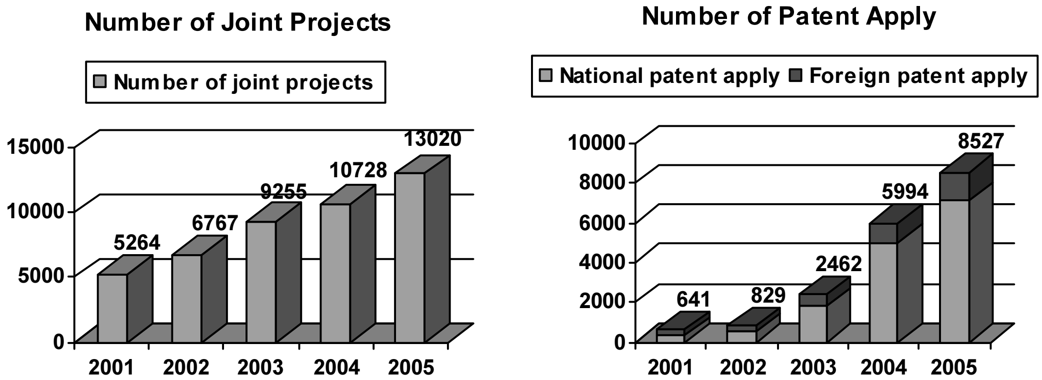
measures to support innovation were enacted by concerned ministries (related agencies or bureaus). Those measures mainly concerned intellectual property and reinforcement of collaboration between actors.

The TLO Law (1998) was enacted before the clusters were launched. It is used to facilitate the transfer of university technology to industries through an intermediary institution, the Technology License Organization (TLO). It aims at upgrading industrial technology and at activating research activities within universities. TLO provides supporting services for faculty-owned patents in obtaining government subsidies, loan guarantee, and exemption of patent related fees. Entrepreneurs may benefit from advice from the National Center for Industrial Property Information (NCPI), and from free access to national university facilities. Between 1998 and 2003, 32 TLOs were approved but some had been operating at university level before that. The Development of new technologies by universities and the transfer to industries led to the commercialization of new businesses supported by a credit guarantee system.

The Law to Strengthen Industrial Technology (2000) reinforces the collaboration between industry and academia. It aims to give industries an opportunity to get advice from university professors, on a monetary reward basis, and to encourage them to hold management positions in companies that commercialize their inventions. This law also allowed TLOs to freely use national universities' infrastructure for the promotion of industrial development projects. Conditions have been laid down in order to more easily allow 'optional contracts' for the transfer of government-held patents to industries and the granting of exclusive licenses.

Through the enactment of the two cluster plans the Japanese authorities intended to further enhance the central position of research institutions such as universities in the innovation process. To give them more responsibilities and abilities, the Basic Law on

Chart 2: Evolution of joint research projects and patent application



Source : Naikakufu (Cabinet of Prime Minister): http://www8.cao.go.jp/cstp/tyousakai/ip/haihu33/siryo5.pdf, viewed on November 2007

Intellectual Property was introduced in 2003. Under this law, 89 national universities were given a legal status allowing them to create competitive venture-businesses. All these policies, combined with increases in incubation facilities and moreover the implementation of clusters, led to a growth in the number of joint research projects and patents: 641 patents application in 2001, 2462 in 2003 and 8527 in 2005 (chart 2).

1.2. Incubation as a means of nurturing new innovative business

Business or technology incubators have been developed in the US and Europe since the 80s, eventually with public support. The justification varies from case to case, but stems from a market failure making it difficult for people wishing to start a business to achieve that goal, leading to a disincentive to new firms' creation[8]. In the French case for example, incubators started as a mean to address the problem of a high rate of unemployment. The objective was therefore to promote numerous firms creation without necessarily limiting the support to highly innovative cases in terms of technology etc. Original projects or ideas, whether high or low tech, were welcomed, provided that their feasibility was proved[9].

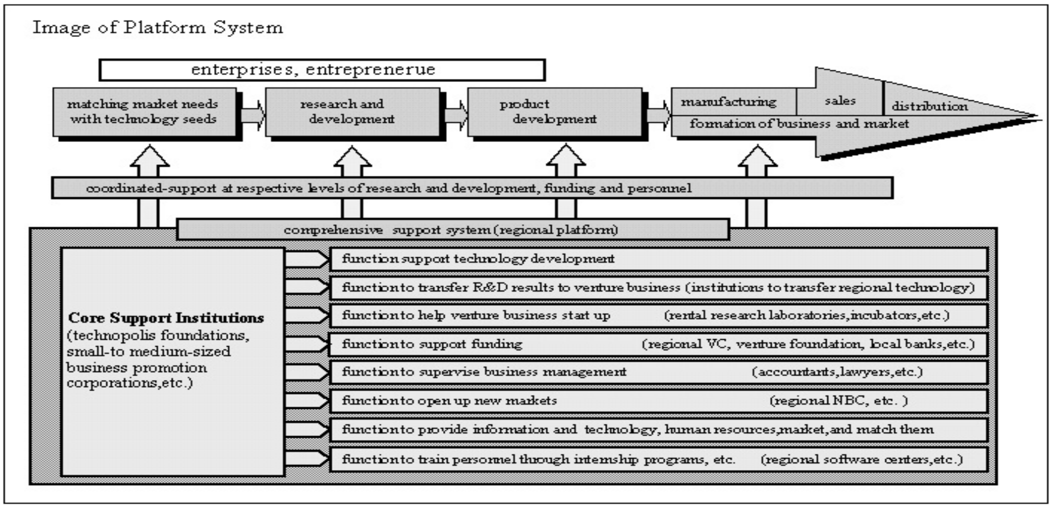
Incubation started slowly in Japan but the need to revitalize regional economies led to an acceleration in that direction, even though as in the French case, facilities created at the beginning were not necessarily dedicated to innovation. Incubation strategy started in fact in the 80s, but with very few incubation facilities created at that time: 7 between 1983 and 1987 according to SMEs White Paper 2005 (p. 120). A first move toward the establishment of such facilities occurred at the end of the 80s and throughout the 90s when the closure rate of firms in Japan started to exceed new creations: 32 were created between 1988 and 1992, and 28 more between 1993 and 1997 (p. 120). The increase is remarkable in the late 90s and early 00s, when firms' reduction in number and the low rate of new firms' creation really started to be addressed. 181 facilities were created between 1998 and 2002 (p. 120) through the revitalization law (1997) and the creation of the Japan Association of New Business incubation Organization (JANBO) by the METI in 1999 under the law for facilitating the creation of new business (see figure 1 for JANBO missions). The cluster plans including incubation in their disposition, new facilities creation was accelerated after their implementation, as the JANBO October 2006 survey shows (Table 1).

According to this survey, of the 345 responding Business Incubation structures, 323 are

8) for more information see OECD 1999.

9) French distinguishes two types of incubators: the so called "pépinières" which refer to new business creation without explicit linkage to highly innovative projects, and "incubateurs" to qualify recent facilities created within clusters or in relation to them.

Figure 1: the JANBO Regional Platform[10)]



Source: JANBO homepage, http://www.janbo.gr.jp, viewed on October 2006

proposing offices and are centred on support and research activities. Among those, only 190 are meeting the 4 elements of the JANBO definition of Business Incubators though. These elements are the following:

- Providing an office to starting businesses
- Providing support through the appointment of incubation managers (people in charge of supervising the birth and growth of the business)
- Defining targets at entrance
- Having a differentiated graduation system for successful firms and others at the moment of their departure.

Table 1: Number of incubation facilities with date of creation (190 cases meeting JANBO definition)

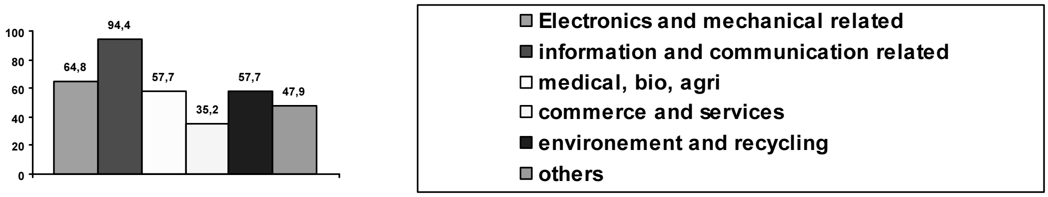
Before 89	1990-1999	2000	2001	2002	2003	2004	2005	2006	Total
4	26	9	30	27	41	24	12	12	185

N.B.: Among the 190 cases, 5 did not answer
Source: JANBO Survey October 2006; http://www.janbo.gr.jp/bidb/BIabstract.pdf, viewed on January 2008.

Although more in depth study would be necessary, it seems possible to consider, by comparing these two data sets that facilities created before the clusters plans were rather limited in term of services and support offered, most of them not being among the 190 cases meeting JANBO definition and taken into account in the survey.

10) The objective of JANBO that serve as coordinator is to promote networking between industry-assisting organizations, support-providers and entrepreneurs in a one-stop service according to its regional platforms.

Chart 3: Industries covered by specialized incubators (Unit: %)



N.B. Due to multiple answers, the total is >100
Source: JANBO Survey October 2006; http://www.janbo.gr.jp/bidb/BIabstract.pdf, viewed on January 2008.

Table 2: Initiator of incubation facilities

Creating organization	% of 189 cases
Central government agency	1.1
Prefecture government	20.1
Local municipalities	30.7
Foundations	11.6
Universities and educational foundations	7.4
Private enterprises	7.4
Third sector	10.1
NPO	0.9
Public corporations	8.5
Other	2.1

Source: JANBO Survey October 2006; http://www.janbo.gr.jp/bidb/BIabstract.pdf, viewed on January 2008.

Cluster plans have recently reinforced their incubation objectives and attribute increasing funds for these activities, therefore the number of incubators should continue to grow in the coming years. The growth will also be sustained in the future by the need to enlarge the facilities or the available surfaces in existing ones as the Saito case discussed later will show. In its 2001 visions, JANBO estimated that the number would be 400 in 2010.

While 59.2% (over 174 cases) of incubators are generalist, meaning that they accept all type of activities, 40.8% (or 74 cases) are dedicated to specific industries even though generally more than one, with emphasis on priority ones as shown in chart 3.

To stimulate entrepreneurship, promote industrialisation of research seeds and nurture newly created firms, providing them the necessary funds, advise and services, local authorities also took measures favouring the creation of incubation infrastructures. These are therefore generally initiated by or with the support of public authorities, even though private structures are also involved in facilities creation as table 2 show.

Incubation is most required in territories needing to be revitalized. These are mostly areas where firms were agglomerated or where research activities are concentrated. Although Incubators are situated all over Japan, they are more numerous around Tokyo

(14.2% of the 190 cases meeting JANBO definition), followed by Osaka prefecture (6.8%) and equally by Kanagawa, Aichi and Fukuoka (4.7% each). Including other facilities (323 cases of JANBO survey), the geographical repartition remains almost the same. The incubation lasts on average 28 months but it is strongly correlated to industries. For example, firms tend to incubate longer in electronics and mechanical related activities (42.8 months), in medical, bio, agribusiness (32.5 months), or in environment, recycling (32.3 months), while information and communication related activities are below average (24.4 months), as are commerce and services (18.4 months). According to the afore-mentioned JANBO survey of October 2006 (134 answers among the 190 facilities), 1582 firms had graduated with 93% surviving at least for one year, 91.8% for 3 years and 88.9% for 5 years. At the time of the survey, 88.3% of graduated firms still existed.

The importance now attributed to incubation in Japan is emphasized by the place given to such infrastructures within cluster or sciences parks. Of course all incubation facilities are not created within clusters or sciences parks but all clusters necessarily have incubation centres, often at the core of the organization.

1.3. The Clusters plans

Japan's originality, compared to the other cluster initiatives in the world, is that, as previously mentioned, the government has enacted two different policy measures leading to two kinds of cluster labels.

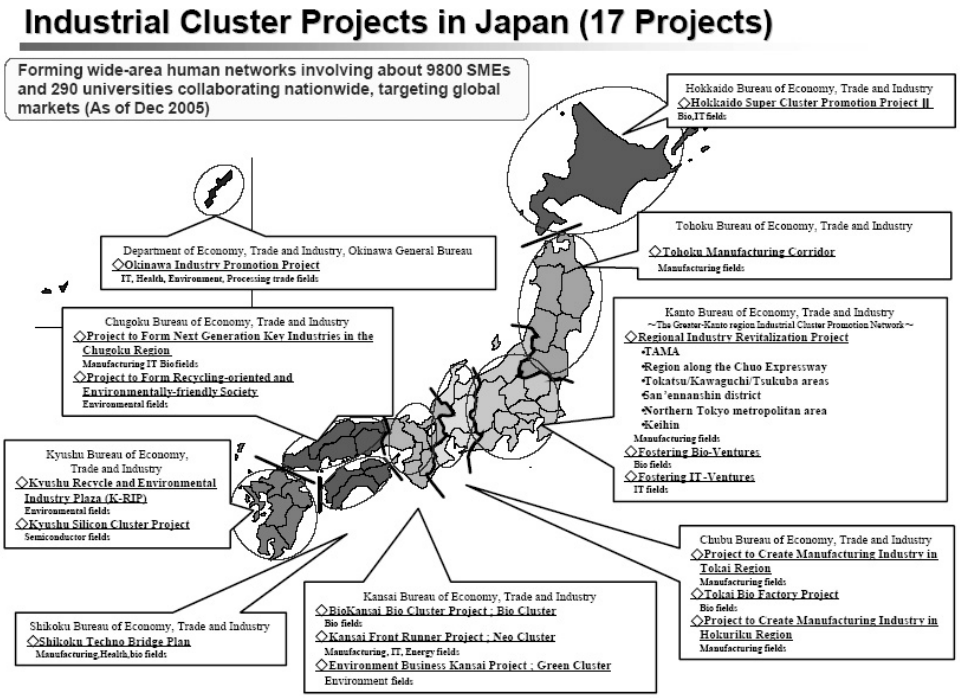
In 2001, the Industrial Cluster Plan started with the objective to create "networks where every face is visible" between industries, universities and public research institutions to allow them to join their respective resources, materials and knowledge. METI first labeled 19 clusters gathering around its Regional Bureaus (RBETIs) about 9800 regional SMEs, to create new businesses based on projects coming from a total of more than 290 universities. In April 2006 the Second phase of the Industrial Cluster Plan began with 17 industrials clusters[11] (see figure 2) having new objectives: to develop technologies leading to practical applications in the regions and to reinforce the function of incubation to establish 40 000 new businesses by 2011. To promote industrial clusters for this new period, the Japanese Government decided to provide a budget of 20.8 billion yen for 2007[12] divided as follows:

- 6.5 billion for the formation and management of University-Industry-Government

11) The 19 initial clusters were reviewed after a first-term final evaluation of the METI (through RBETIs), five were eliminated, nine were modified, five others continued and three new ones were created.

12) In 2006 the national budget for industrial clusters was 30 billion yen for 19 projects, and only the fund for international development has increased between 2006 and 2007: 14.1 billion yen to 15.5 billion yen (Sakai K., 2007).

Figure 2: Map of industrial clusters



Source: METI, http://www.meti.go.jp, viewed on December 2007

networks

- 13.3 billion yen for the promotion of technology development incorporating the special characteristics of a region (including financial support for SMEs and Venture Business)
- 1 billion yen to strengthen the functioning of incubation centers.

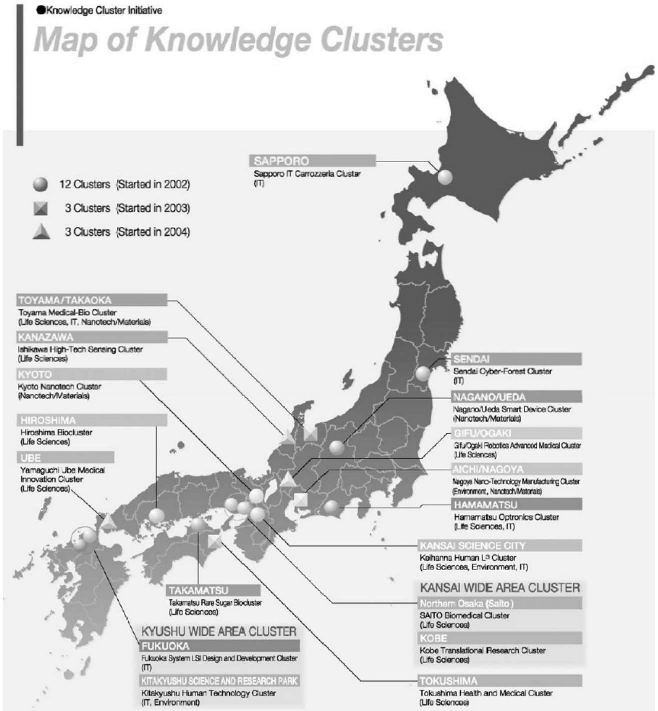
On the other side, the Second Science and Technology Basic Plan, established by a Cabinet Decision in March 2001, called for the creation of Clusters in the different regions of Japan and since 2002 MEXT has been implementing two types of actions to promote regional R and D activities by supporting regional clusters:

- The Knowledge Cluster Initiative that aims at "developing into world-class innovative clusters attracting humans, goods, and money from around the world";

And the City Area Program that aims at "developing small to medium-size clusters across Japan" with strengths that utilize unique regional resources to support the creation of new business and R and D business through industry-academia-government collaborations (Kakizawa Yuji, 2007)[13].

13) Although MEXT is supporting 48 City Area Programs, the paper will mostly focus on Knowledge

Figure 3: Map of knowledge clusters



Source: MEXT Knowledge Cluster Initiative Web Site
http://www.mext.go.jp/a_menu/kagaku/chiiki/cluster/index.htm, viewed on December 2007

A knowledge cluster is a system for technological innovation, organized by local initiative around universities and other public research institutions whose R&D focus is original and has potential. This system drives technological innovation and creates new industries by stimulating interaction between the technological seeds from research institutions and the practical needs of business world. In this process universities and public research institutions are considered as "concentrations of knowledge and talent" and intend to create world-class technological innovation. In order to stimulate the centers of knowledge creation the Japanese Government decided to put 500 million yen per year into each cluster, over five years, and also some grants for the core organizations (foundations or other organizations) designated by local governments[14]. In 2002 the Knowledge Cluster Initiative started with 12 knowledge clusters but a year later 3 new ones were implemented and 3 more in 2004 (see figure 3); but in 2007 the first term of this policy ended and the final evaluation showed that only 11 clusters out of 18 have the potential to survive in open innovation competition. The objective of the second term will be to focus

clusters which are the most representative of MEXT cluster plan.

14) The government budget for 2004 was about 9 billion yen and 10 billion yen for 2005

on upgrading to world-class level clusters and to create competitive businesses by patenting research results and conducting R&D related to incubation.

Both cluster initiatives represent together the core of industrial innovation and became a guideline for new businesses. Since their creation most of new policies implemented were adapted to them as we have seen before.

A majority of industrial clusters and knowledge clusters are located in the same areas. They are independent from each other and differ according to the objectives of their ministries of affiliation (METI or MEXT) and also in their governance.

Taking into account the fact that regional characteristics are quite numerous, and that it would therefore be difficult to national government to support all of them, METI has devolved part of its competence to Regional Bureaus (RBETI). Those have the ability to adapt national objectives to local needs according to their appreciation of public policy measures. The governance structure, while regionalized to some extent thanks to a strong collaboration between national and local level, remains however rather centralized. MEXT for its part doesn't have Regional Bureaus to delegate power as the METI has done. This difference finally gave a larger autonomy to local governments to create and manage clusters. Core Organizations are designated by the local government concerned to set up a Knowledge Cluster Headquarters[15], which acts in each region as a control body for project implementation. Despite their differences, the two cluster types also present common characteristics as following empirical case studies will show.

2. METI and MEXT clusters, a complementary interdependence: evidence from empirical studies

In spite of their respective objectives, both cluster types are linked in a kind of complementary interdependence. METI industrial clusters focus on the market side and intend to define the new needs. Those are translated in terms of new technology or research needs while intellectual clusters focus on research seeds to be nurtured. These have to serve as a basis for new technologies or product developments. To favor the needs-seeds interrelations, METI, MEXT, local government and other relevant organization tend to establish Committees for Regional Cluster Promotion in each region, which act as a forum[16] for close cooperation and coordination between both ministries' projects.

15) Staffed by a President, a Project Director, a Chief Scientist and other members, and including S&T coordinators or advisers like patent attorneys.

16) At the national level joint conferences are organized once a year to announce project results, but at the regional level 3 or 4 forums per year are usually organized in order to exchange point of views about specific coordination policies and other related matter.

2.1. The case of Kyushu Silicon Island: Kyushu Silicon Cluster and Fukuoka LSI Design Development Cluster

Kyushu, the southernmost of Japan's four main islands, has a long tradition in the coal industry but the oil shock in 1973 announced the progressive decline of this industry. The semiconductor industry which started in the late 1960s with a few plants grew during this period, leading the island to be known as Silicon Island in the late 1980s. But, the Kyushu region which became home to a number of companies operating in this sector has been for a long time referred to as a "brainless silicon island" because of its relative scarcity of semiconductor design and development institutes. In the 1990s the island experimented a Hollowing Out phenomenon that strongly hurt the region. The heavy industry concentration around Kita Kyushu having led to high pollution levels, started to turn to ecology industry promotion while the semiconductor industry had to completely switch to LSI[17)] semiconductor development (Fukuoka). The region now produces about ten percent of the world's semiconductor devices. In 2001 and 2002 the Kyushu Silicon Cluster, in Fukuoka, and the Kita-Kyushu K-RIP Cluster were set up.

The Kyushu Silicon Cluster[18)] establishment process started in the late 90's, to address the scarcity of design and development institutes mentioned above. Based on a regional revitalization plan the motivation was to create an innovative semiconductor industry. Some high performance industrial districts were created in several Kyushu locations for that purpose. This prefigures the foundation of the future cluster and was characterized by a solid network lead by Aso Wataru, the charismatic governor of Fukuoka Prefecture. The implementation of the Industrial Cluster Plan by the METI in 2001 helped to upgrade the existing network. The aim of the cluster is to support business expansion, growth and progress for the semiconductor-related industries in the Kyushu region so that regional companies can acquire technologies, human resources, management etc. that are competitive and viable throughout the world and can independently develop active businesses.

The Kyushu Silicon Cluster is considered nowadays as one of the most competitive Japanese world-class industrial clusters because of its large potential and also its worldwide reputation[19)]. This cluster has established its head office in the city of Fukuoka but in reality the network is a coordination of several regional semiconductor promotion

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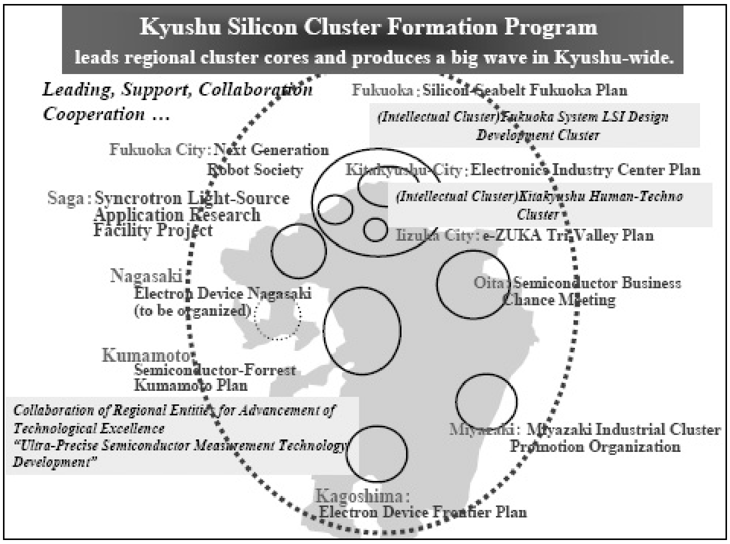
17) Large Scale Integration, a new type of high integration chips used in computer main memories or second generation microprocessors and replacing standard DRAM system.

18) Information based on interviews in February 2007, complemented by documentation provided (Kyushu Regional Bureau of Economy, Trade and Industry, 2007).

19) In 2005 Kyushu Silicon Cluster produced 1.6 Billion semiconductors, which represent 30% of the Japanese production and 10% the world production.

Figure 4: Kyushu initiatives and their linkages



Sources: Asano Tanemasa, 2004

projects[20] in various regions of Kyushu Island, such as for example the "Semiconductor-Forrest Kumamoto Plan" or the "Miyazaki Industrial Cluster Promotion Organization" (see figure 4). Fukuoka is the regional core of this Kyushu-wide Cluster because the Regional Bureau of METI is located there. But, the city's geographical proximity with other Asian countries (China, South Korea, Taiwan and Singapore) finally constitutes an advantage. It makes it easier for the cluster to have linkages with the "Silicon Sea Belt Project" whose goal is to create a real cross-border Asian semiconductor hub fostering a higher technological and human resource co-operation between the countries involved.

The Kyushu Regional Bureau is the nexus of the system and has a role as an intermediate institution between the Central Government and the local level: on a Top-Down basis the appropriate funds are distributed to the RBETI in order to promote the cluster's projects. However management/coordination of the entire network is delegated to the Semiconductor Industries Technology Innovation Association which acts as a regional hub. This Association[21] which is a civilian agency was created in 2002, in order to promote the University-Industry-Government networks[22] within the cluster. Being the leading organization of the Kyushu Silicon Cluster, the Association works in close co-

20) Eleven projects in total, including two co ordinations with intellectual clusters (regional clusters)
21) 1020 members in 2006 mainly from companies and academic institutions
22) The network consists of about 150 companies, 42 universities, college of technology and public research institutes, 17 local governments and 5 financial institutions.

operation with the Regional Bureau of the METI to maximize the networks' potential. To realize the objective she has to follow established guidelines referring to some essential activities:

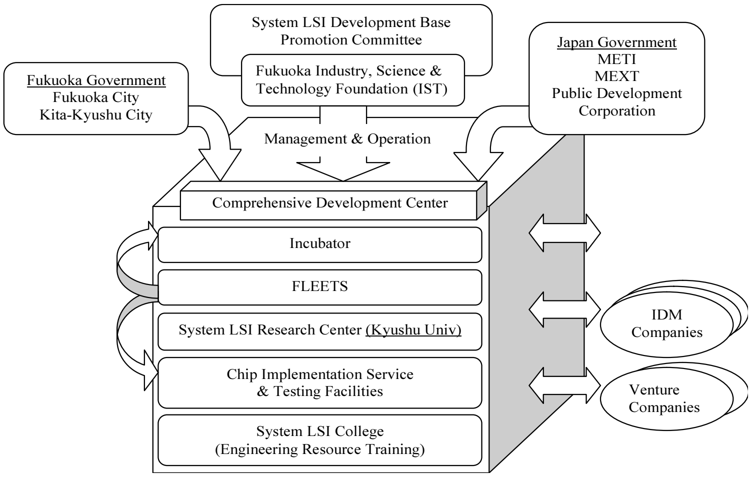
- Network formation: development of a collaborative aptitude between actors, using internet tools (newsletters, homepage,...), organizing common events (research forum) or education program, and formation of a wide-area network between industry and academia;
- R&D support: organization of seminars for the presentation of results, common technology workshops or the elaboration of new research projects;
- New markets opening: support for the finding of markets for new products created by the exploitation of project results, the creation of venture business for new marketable products manufacturing;
- Encourage local talent: support for the theoretical and practical study of the production device to improve management strategy;
- Business support: reinforcement of the management support through intellectual property seminars, strategic attraction of companies and construction of innovative regional models.

The Kyushu Silicon Cluster is collaborating with the "Fukuoka LSI Design Development Cluster" which is a knowledge cluster under the MEXT cluster plan[23]. As figure 4 shows, the whole is to some extent integrated in a broader cluster including the whole of Kyushu Island. The idea behind such an interdependence is to reinforce the seeds-needs relation between the two kinds of clusters, using their complementarities to enhance new businesses creation. In the case of Fukuoka this inter-ministerial cooperation is mostly used for incubation on a transversal basis (the housed research institutes and incubation centers are members of both, METI Kyushu Silicon Cluster and MEXT Fukuoka System LSI Design and Development Center.

Indeed, Fukuoka has created a very unique infrastructure, gathering actors from research, administration and industry in the same building: the Fukuoka System LSI Design and Development Center created in November 2004. This organization's originality lies in the ability to support the whole process of the LSI System industry development, from the encouragement of local talents to the commercialization of the R&D results. The other characteristic is that the interaction and the gathering of researchers, engineers, users, entrepreneurs, businessmen etc. in the same location allows accelerated innovation in LSI design and the launch of venture businesses; thus the infrastructure of the Center can be considered as a "vertical cluster" (see figure 5).

23) Information based on interviews February 2007 and documentation provided (Fukuoka IST, 2007).

Figure 5: System LSI Design and Development Center



Source: System LSI Design and Development Center, http://www.ist.or.jp/lsi/pg01_03.html, viewed on December 2007

The Fukuoka System LSI Design and Development Center is managed by the Fukuoka Industry, Science and Technology Foundation (Fukuoka IST[24)]) and funded by public institutions including the Fukuoka prefecture[25)] and the MEXT[26)]. The organization structure inside the building allows essential actors of the cluster to agglomerate in a very close spatial proximity:

- 1[st] floor, administrative part and System LSI information center
- 2[nd] and 3[rd] floor, academic and research section. This section benefit from the cooperation of Kyushu University, of the Fukuoka System LSI College and of the Fukuoka Laboratory for Emerging and Enabling Technologies (FLEETS), an independent research laboratory supporting linkages between universities and industry by setting up core projects and by assigning expert researchers and staff to appropriate projects teams.
- 4[th] floor, common design laboratory for ventures
- 5[th] to 7[th] floor, 39 incubation rooms from 20 to 160 square meters-wide[27)].

Thanks to the creation of the Fukuoka System LSI Design and Development Center, the number of incubated firms has increased to reach in 2006, 38 out of the 84 LSI-related SMES companies in Fukuoka Prefecture (table 3).

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24) Representative from semi-conductor industries, alumnus (OB) of big firms like NEC or SONY and persons from administrative institution are the core members of this Foundation
25) 6 million yen, 3 million from Fukuoka city and 3 other million yen from Kitakyushu city
26) 50 million yen for 5 years
27) Location fees are very low and regulated according to the firm's size: from 1260 yens per month for a firm just starting activity, to 4305 yens per month for bigger companies.

Table 3: Number of LSI-related Company in Fukuoka Prefecture

	2000	2001	2002	2003	2004	2005	2006
Small and Medium Companies, Start-ups	9	19	33	35	55	76	84
Big companies	12	16	18	19	19	20	21
Total	21	35	51	54	74	96	105

Source: Fukuoka IST, 2007

2.2. From a science park project to a knowledge cluster: The Saito Life Science Park and bio cluster

Saito is located 20 km north of Osaka in a hilly area, close to several cities (Ibaraki, Doshomachi, Suita, Senri).

The project started in 2000, but the park opened in April 2004. The Saito project associated to a new town project, including housing, schooling, amusement and transportation means (Saito international culture corporation), required considerable new infrastructure.

In 1998, the Osaka prefecture established its guidelines on Industry, Science and Technology Promotion. Following the recommendation of the Basic Law for the Promotion of Science and Technology of the national government, which put emphasis on the need, in an aging society, to develop life sciences, new drugs etc..., Osaka prefecture decided to create an international centre of life science in the region. In the 2000 Osaka Industry Revitalization Program, bio related industries were positioned as a priority industrial field and a bio promotion project team was formed from all relevant government agencies. In 2000 too, a Bio Business Competition started as preliminary activity of the Saito Liaison Office. The aim of this annual competition was to verify the existence of research seeds by soliciting business plans based on results with potential for industrialization at universities etc. in the bio medical, bioscience and bio agriculture fields. The winners received prize money. Some plans proposed to the competition resulted in business start-ups.

Finally, in 2001, in a second decision of the revitalization plan, Saito was selected for the location of a research park in the life sciences, thanks to the existence of University campuses (Osaka University) in the vicinity and research laboratories specialised in health, bio technologies etc. as well as hospital facilities, the Senri Life Science Centre and the Foundation which were created in 1988 and 1990 respectively to promote life science by implementing research programs etc. Also, close to Saito, Doshomachi is an historical trade centre for pharmaceuticals in Japan with some leading drugs companies such as Takeda chemicals or Tanabe Seiyaku. The Senri Life Science Foundation (and the Senri Life Science centre which is the facility where the Foundation bases its activities) served as core institutions to support the project of knowledge cluster creation which aims at producing innovative drugs. In 2002 the Saito project was selected by the National Government under the MEXT cluster plan. It includes the Saito Life Science Park which is the core element of the Saito bio-cluster, and all other institutions in the vicinity including of course the Senri Life Science Foundation.

The facilities of the Saito Life Science Park were constructed with an association of public and private funds. In 2005, one year after partial opening (other research centre were still under construction), more than 2000 experts in the life sciences were agglomerated in the bio-cluster while 22 companies had located business there. A year later the number increased to around 60 companies, half of them being start-ups based on research seeds (ME Osaka September 2006). Fiscal incentives are given to businesses locating in the park, from the Osaka prefecture but also from the city of Ibaraki.

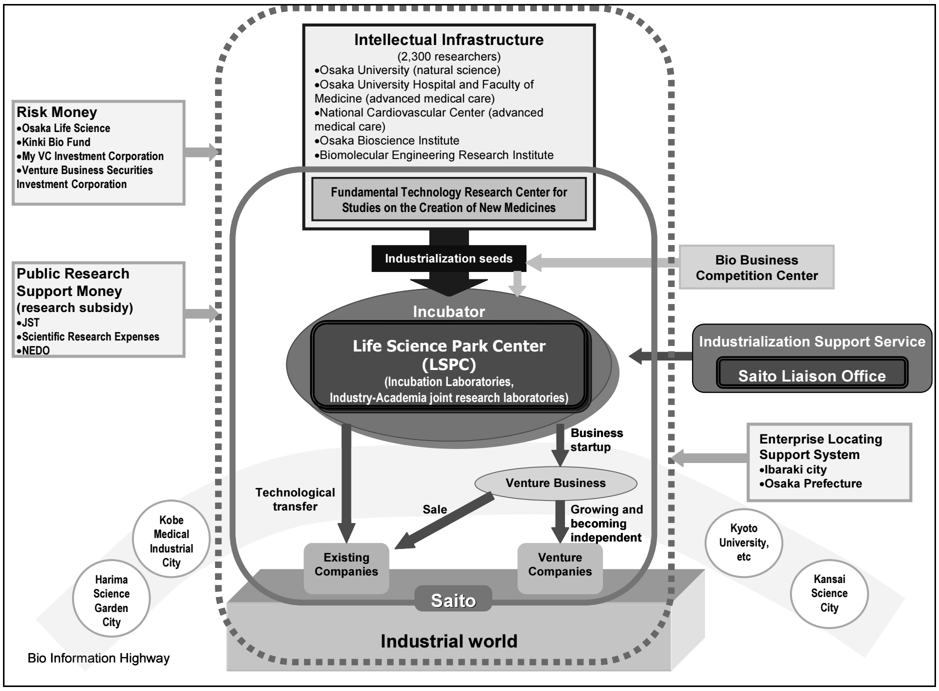
The Saito Liaison Office has as its mission to liaison between academia and industry and to support the industrialization of research seeds by holding several functions:

- Project management: development of research results into industrial seeds, evaluation of industrialization measures to be taken, support to attract research subsidies, joint research project stimulation etc.
- Technology licensing: support to intellectual property rights, technology transfer etc.
- Commercialization support: establishment of business plans and providing the necessary resources for implementation
- Supply of venture capital and human resources: supporting industrialization from the financial and human resource perspectives.
- Information: promotion of information exchanges and of mutual collaborations between industry and academia.

The main instrument to reach the goal is the Saito bio incubator opened in July 2004. It is funded by the government but is managed privately. It houses 19 firms but is already short of space and new applications had to be stopped. New facilities were projected to open at the time of study (spring 2006).

An organization to promote the commercialization of bio-related research results generated by Saito researchers: the Kita Osaka Bio Seeds Incubate Conference (KIC) was established in January 2005 with as an objective to nurture pharmaceutical and other related businesses. The KIC is jointly managed by the Senri Life Science Promotion Foundation and funded by public institution including the Osaka prefecture and the International Culture Park Corporation. Representative from pharmaceutical companies, venture businesses and patent offices are appointed as advisors to conduct technical evaluation of the research results. KIC introduces promising results to investors to favour the transfer of know-how and the start of new business.

Figure 6: Saito Life Science Park: organizational structure



Source: Document issued by the International Culture Park Corporation, Saito Life Science Park (May 2006)

Saito bioscience seminars, centred on the researches carried out at the Saito bio-incubator, are also held twice a month with eventually guest lecturers specialized in science but also in business management. The seminars are open to neighbouring research facilities and Universities like Osaka University. It aims at favouring information exchanges but also at creating a research community spirit (see organization of the park on figure 6)

The Saito bio-cluster is cooperating with (or to some extent included in) a broader cluster: the Kansai Bio Cluster which is an industrial cluster under the METI cluster plan. The idea is to enlarge the network and create new bio ventures and businesses through strengthening collaboration on a cross-industry basis including pharmaceutical and drug, but also food and environment or medical equipment and diagnosis devices etc... leading to the creation of a complete bio industry in the Kansai Region. According to the cluster key person, the creation of such a biotechnology environment would make it possible for technologically advanced SMEs, for example from Higashi-Osaka to enter into the bio-industry[28]. The final goal of the project is the revitalization of the regions potential but

28) Higashi Osaka is an old industrial district where a lot of SMEs are agglomerated. Those used to work as subcontractors for automotive and electronic industries. To revitalize the districts that lost

also to foster broader cooperation with other bio-clusters in Japan to make the country a worldwide leader in the industry.

Kansai bio cluster announced these results (2006): 40 venture enterprises created (it includes the Saito incubated companies), 85 collaborations promoted, 2 public stock offerings while the targets for the first 5 years are: 1000 new business, and 25% growth in sales from the cluster's core companies.

Despite the existence of two different cluster programs, the two cases studied above show how the regional organization of innovation tend to use simultaneously all policies implemented (revitalization laws, METI and MEXT cluster plans[29]) and mix all initiatives in a multi-layered network. The partial overlapping of these layers confirms the complementary interdependence between industrial and knowledge clusters. It also gives flexibility to the whole structure which can remain strongly embedded in the local area, while co-operating regionally and nationally, or even internationally as for example the above mentioned Kyushu project to create an Asian semiconductor hub shows.

3. Conclusion: clusters evaluation and further perspectives for innovation

In the context of Globalization, the role of Science and Technology as the engine for economic growth and international competitiveness has been increasingly recognized. International competition in the field of Science and Technology has greatly intensified in recent years and innovation has become the most important factor of production. Many countries all over the world are now considering "innovation" as the most important issue to be addressed and have set up various initiatives to strengthen their National Innovation Systems (NIS). Clusters appear to be the main instrument used to coordinate these and preexisting initiatives.

Japan is of course no exception even though its innovative strengths were clear from its strong competitiveness of 80s. But, after the bubble burst, with the high yen and increasing competition from emerging economies, as well as the aging and now declining population, weaknesses also appeared and led to restructuring.

A lot of regional areas, where SMEs were agglomerated faced difficulties due to an

part of its activity due to global competition, an industrial cluster was formed there. Different industrial domains related to Higashi-Osaka specializations seem as being needed by bio-industries.

29) Region specific measures might also be implemented to complement national framework. For details and case studies on the regional initiatives, see: Lecler Yveline, (2006); Yamaguchi (2006).

increasing firms' closure rate which was not compensated by new firms' creation as before[30]. The reasons are multiple, but the difficulties encountered by SMEs in developing new products, and finding new markets outside of their big clients, is one of the most important. SMEs, who used to work as subcontractors, don't have the needed capabilities to innovate themselves. Therefore already in the 90s, the government started addressing the issue of innovation more extensively, (revitalization law, law for facilitating the creation of new firms etc.). The aim was twofold, promote the creation of start-ups from research seeds and help existing SMEs to develop new activities based on research. To achieve these objectives, it was necessary to ease the process of firm creation by researchers and to favor the linkages between research institutions and firms (University reform, TLO etc.).

In order to develop the industries of the future, that are given priority in the Science and Technology basic plans, and gain competitive international positions in these new domains, companies need to cooperate closely with universities and basic research institutions. Indeed, the triple helix (San-Gaku-Kan) promotion became the keyword and led to the cluster plans implementation, with as a final goal enhancing the competitiveness of Japan and revitalizing the local economy through the development of Science and Technology based innovation, or in other terms through the development of Regional Systems of Innovation.

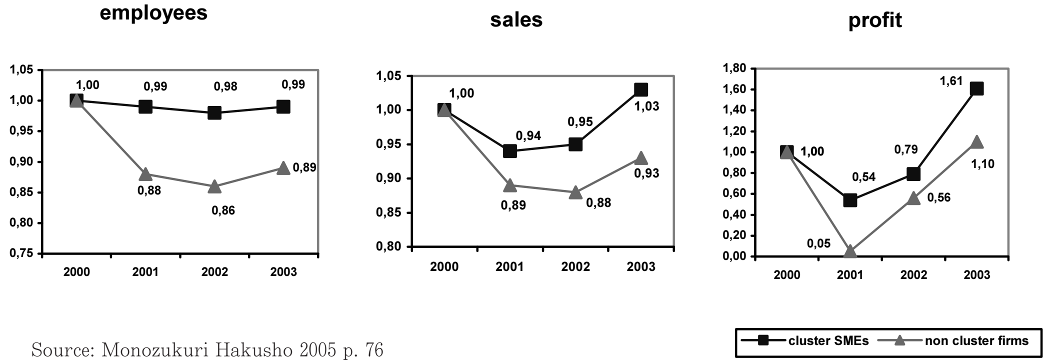
Both cluster plans started in the early 2000s. Evaluation after a first phase of activity shows some positive results.

According to the Industrial Cluster Study report (May 2005), the number of firms participating in industrial clusters increased from 3000 in 2001 to 5800 in April 2004, while the number of universities increased from 150 to 220 respectively. Questioned about the main advantages of participating in a cluster, firms answered that they had an easier access to information on policies and measures (72.7% of firms), an easier understanding of industry trends (58.6%), greater opportunities for interactions with universities and research institutes (51.2%) and easier access to information that would lead to new business (50.8%). Greater opportunities for interaction with trading companies or with financial institutions remains low with only around 18% of firms mentioning such a merit showing that coordination with such actors is still difficult. 133 ventures from universities were created thanks to the start of new collaborations (38.5%), the launching of new business (58.7%) or the second establishment of business (18.9%). As far as performances are concerned, clustering seems to be successful in addressing part of the problems faced by industrial districts, SMEs located in clusters do better than the average firm outside, whether in terms of employment, evolution of sales or current net profits

30) See Lecler (2006), and for number Chusho kigyo cho (2007).

(see chart 4).

Chart 4: Comparative evolution of SMEs in clusters and outside



Source: Monozukuri Hakusho 2005 p. 76

According to the intermediary evaluation of Knowledge Cluster and City Area Program of the MEXT, concerning the period from 2002 to 2005 (Kakizawa Yuji, 2007), 3764 researchers participated in Industry-University-Government collaborations and 1316 of them were from industry. During this period a large number of technology seeds were produced with 1928 domestic patents and 272 overseas patent applications. 800 seeds led to commercialization, trial products or venture start-ups. The 2007 questionnaire survey studying the impact of the knowledge cluster initiative on the regions shows that collaboration and networking increased thanks to the clusters' implementation (69% of respondents), access to information became easier (52%), research (49%) as well as practical application (48%) capabilities, were enhanced while commercialization was promoted (39%). Compared to the industrial cluster case mentioned above, access to information on policies and subsidies seem to be more difficult (22%) while weaknesses seem to appear in the fostering of human resource (19%) and the synergy with other projects (8%); the second phase of the knowledge cluster plan will put emphasis on reinforcing these aspects (Kakizawa Yuji, 2007).

The second part of this questionnaire studied the benefits of knowledge clusters for individual participants. It appears that the implementation of an expanded network led to the emergence of unexpected learning about technology (74%), of new ideas for research project and commercialization (67%). It also permitted an easier access to information in specialized fields (67%) as well as to researchers from other participants in the project (61%). But the survey also shows that the cluster's organization and coordinators should be more involved in business partner's information sharing and in the promotion of new contracts and joint researches with other participants, as respectively only 39% and 38% of respondents considered those elements as positive. MEXT plans in the coming years to reduce the number of knowledge clusters from the present 18 to 11. This should lead to only keeping world-class clusters which have the capacity to enhance regional potential.

These results prove the efficiency of the policy packages, not only the cluster initiatives, but the whole legal framework including the revitalization law, the science and technology basic plan, the law for facilitating the creation of new business etc... All these are jointly used by actors and combine to improve the cluster performance, even though further efforts are required.

Presently, the 'mega competition of knowledge' experienced worldwide seems to lead to a new stage. Following the USA who enacted the US Competitiveness Initiatives in 2006 and America Competes Bill in 2007, or the European Union who used 53.2 Billion Euros for the 7th Research and Development Framework Project in 2006 to increase European technological competitiveness during the next 7 years[31], Japan too decided in autumn 2006, under the Abe government, to launch a new long term innovation policy: the Innovation 25 Project. The objective is to develop by 2025 some essential innovation domains and push Japan which already has a world-class level in technology to an even higher level. A new organism will be set up to support projects and evaluate basic research. Also, local scientific talents, whose number is limited in Japan due to a decreasing interest of students for scientific fields, will be encouraged[32]. The priority is the development and implementation of an innovation strategy, based on objective assessment of the entity's strengths and weaknesses. In the short term, the Japanese Government would first implement some policies focusing on the resolution of global environment issues as a driver for Japanese and global economic growth (needs for upgrading technologies in nanotechnology, biotechnology, green technology, etc.), on the fostering of human resources and unique talents that universities are providers of, on investment increase for basic science and technology research or on the regulation framework (social system, norms, rules etc.) that can sustain innovation over the next 20 years and promote Japanese international competitiveness.

This new project aims at making Japan an innovation-driven nation able to bring solutions for the needs of individuals and collectives in a long term perspective. The project was submitted to the Cabinet Council in June 2007 for definitive approbation. It is still too early to know what will concretely result from their deliberations.

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31) As examples for EU regional level, France set up the Pole of Competitiveness policy in 2004 and UK since 2006 has a program to foster scientific researchers

32) USA and EU also aim at increasing the number of scientific professors, 70000 for the USA in the next 5 years, principally in mathematics and biology, and 30000 professors until 2014 in UK.

References

Asano, Tanemasa. 2004. "Kyushu Silicon Cluster Formation Program, An Overview", paper presented at *RIETI Regional Cluster Seminar*, June 25. RIETI: http://www.rieti.go.jp/users/cluster-seminar/pdf/011_a_e.pdf, viewed on January 2008

Chusho Kigyo Cho ed. 2006. *Chusho kigyo hakusho* 2005 nenpan (White Paper on Small and Medium Enterprises 2005).

Chusho Kigyo Cho ed. 2007. *Chusho Kigyo Hakusho* 2006 nenpan (White Paper on Small and Medium Enterprises 2006).

Fukuoka IST. 2007. *"Silicon Sea Belt Fukuoka project and the Fukuoka System LSI Design and Research Center"*, January, 42p. (non published document provided by Fukuoka IST Executive, interview January 2007)

Hattori, Akira. 2006. "Public Policies in Japan: Revitalization, Technology Creation and Clustering", paper presented at the International Workshop: *Industrial Clusters in Asia: Old and New Forms,* Lyon, November 29th-30th and December 1st

Industrial Cluster Study Group. 2005. *Industrial Cluster Study Report*, on line www.cluster.gr.jp/relation/d.ata/pdf/cluster kenkyu houkoku english.pdf, viewed on June 2006.

Innovation 25 Strategy Council. 2007. *Innovation 25, Creating the Future, Challenging Unlimited Possibilities*, interim report, February 26, Prime Minister's Official Residence Homepage: http://www.kantei.go.jp/foreign/innovation/interim_e.html, viewed on December 2007

JANBO. 2006. *Bijinesu Inkyubeshyon Shisetsu no Genjo* (situation of business incubation facilities), October, JANBO home page: http://www.janbo.gr.jp/bidb/BIabstract.pdf, viewed on January 15, 2008.

Kakizawa, Yuji. 2007. *Knowledge Cluster Initiative and City Area Program -Present State and Issues*, MEXT: www.iar.ubc.ca/centres/cjr/seminars/locecondev/slides/kakizawa.pdf, viewed on January 2008.

Kyushu Regional Bureau of Economy, Trade and Industry. 2007. *Kyushu Silicon Cluster Formation Program*, Kyushu RBETI Policy Information Section, 25p. (non published document provided by Kyushu RBETI executive, interview February 2007)

Lecler, Yveline. 2006. "The Revitalization of Regional Areas in Japan: Incubation and Clustering", paper presented at the International Workshop: *Industrial Clusters in Asia: old and new forms*, Lyon, November 29-30th and December 1st

METI, Ministry of Health, MEXT. 2005. *Monozukiri Hakusho* (White Paper on Manufacturing).

OECD. 1999. *Business Incubation, International Case Studies*, on line www.oecd.org/searchResult/0,2665,fr_2649_201185_1_1_1_1_1,00.html, viewed on September 2006.

Sakai, K. 2007. *Sangyo Kurasuta Keikaku no Genjou to Kadai* (Industrial Cluster Policy's Situation and Issues), METI Industrial Cluster Project Promotion Section, Project leader, Feb.23, 53p

Sakamura, Ken. 2007. *Kawareru Kuni Nihon e Inobeeto Nihon* (To a Flexible Country, Innovate Japan), Kabushiki Gaisha Ascii, March, 192p.

Whittaker, D. Hugh. 1997. *Small Firms in the Japanese Economy*, Cambridge University Press.

Yamaguchi, Takayuki. 2006. "From Jibasangyo to Industrial Cluster: Strategy of Local SMEs in Hyogo", paper presented at the International Workshop: *Industrial clusters in Asia: old and new forms*, Lyon, November 29-30th and December 1st.

Yamawaki, Hideki. 2001. *The Evolution and Structure of Industrial Clusters in Japan. World Bank Institute n° 37183*; on line pdf: //siteresources.worldbank.org/wbi/resources/ wbi37183.pdf, consultation April 2005.

Yasuura, Hiroto. 2007. *Silicon Sea Belt and CLUSS Project for SoC Design*, System LSI Research Centre, Kyushu University: http://www.slrc.kyushu-u.ac.jp, viewed on November 2007