

DISSCUSSION PAPER No.29

A Study on Successful Factors of Regional Innovation and Promotional Policy

- **Through the comparison of examples of advanced clusters
in the USA and Europe and regional clusters in Japan** -

(Interim Report)

[Summarized Version]

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1. Why regional innovations?

The present state of the Japanese economy seems to stay in the long-term doldrums due to complex structural factors such as industries becoming hollow and unemployment rates rising, and various kinds of anxieties and difficulties which have spread across social life, amid social and economic upheavals on a global scale. One of the effective countermeasures to solve such circumstances is the promotion of science and technology that will lead to the strengthening of industrial technologies (a creative country based on science and technology) as an important target. Here, key aspects are innovation and the creation of clusters which promote such activities.

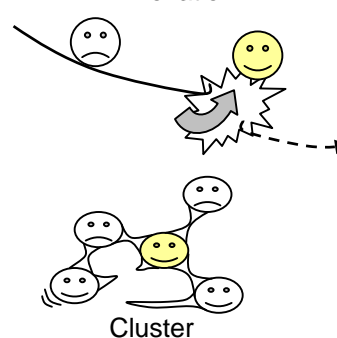
Innovation means activities (original ideas and contrivance) which produce a new value by creating knowledge, which is a product of the ability of human beings.

The result is original and can produce a breakthrough in the chain of the doldrums.

Furthermore, creation and accumulation of knowledge can become a main base of competition, but continual efforts and energetic activities by “innovators (intellectual activists)”, who are the key figures of innovation, are essential.

For its realization, not only individual inherent energy, but also synergistic effects using mutual cooperation and collaboration and stimulation due to competition are always required. Clusters are attracting attention as places to promote such innovation activities.

Fig. 1 Innovation & Cluster



A cluster indicates a state where research institutes including universities, etc., industries related to specific fields, suppliers with high specialty, service providers, corporations belonging to relevant industries and relevant organizations (standard associations, trade associations, etc.) are geographically concentrated, and compete but cooperate with one another. It is said that these organizations and corporations are linked by commonality or mutual supplementation, and that the whole cluster increases the functional values of these individual organizations and corporations, which contributes to effective function for innovation. In particular, what has drawn attention as agglomeration, which maintains the organic connected conditions that can bring about and promote innovation and sustains its activity, is regional innovation rooted in regions abundant in diversity and autonomy, and regional cluster which comprises its systems.

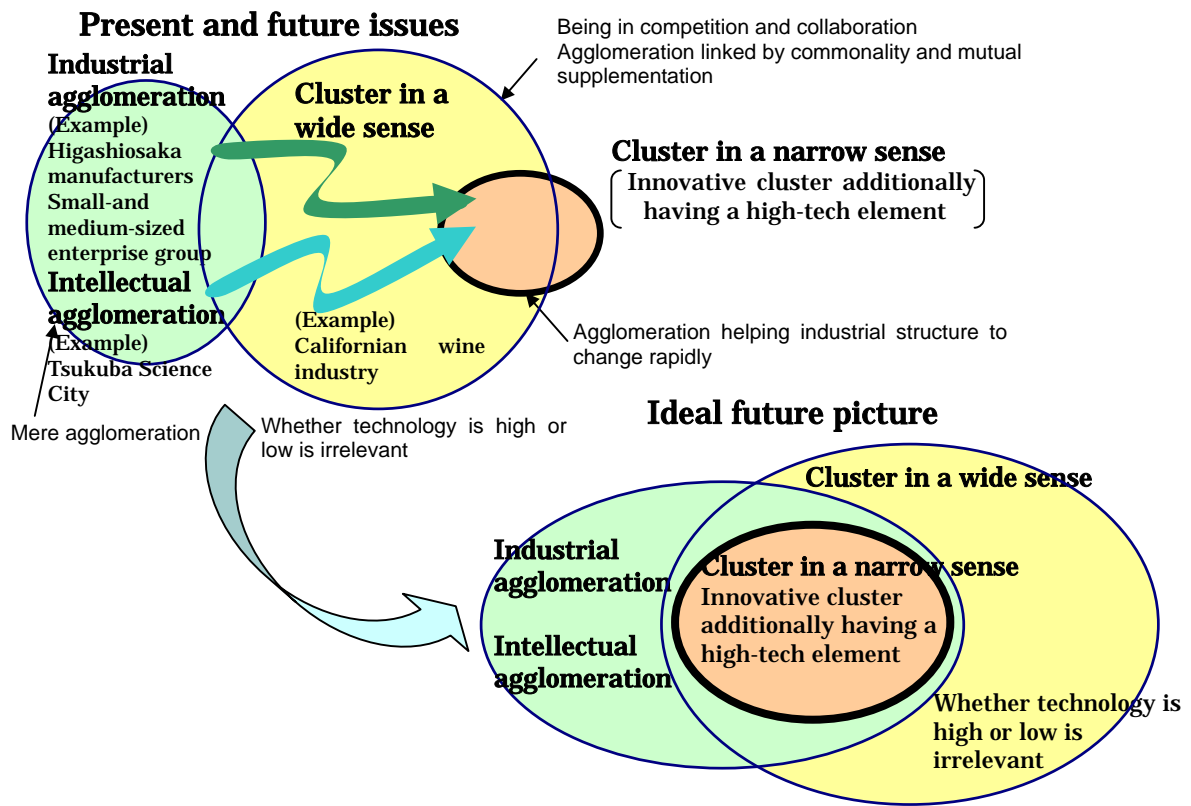
2. Definition of Regional Cluster

Research and study of clusters have been carried out worldwide in recent years. Fostering clusters has been very popular in various regions of Japan

as well. The definition of a cluster varies, and in many cases the difference from conventional activation of regions, industrial agglomeration, techno-park plans, etc. is not clear.

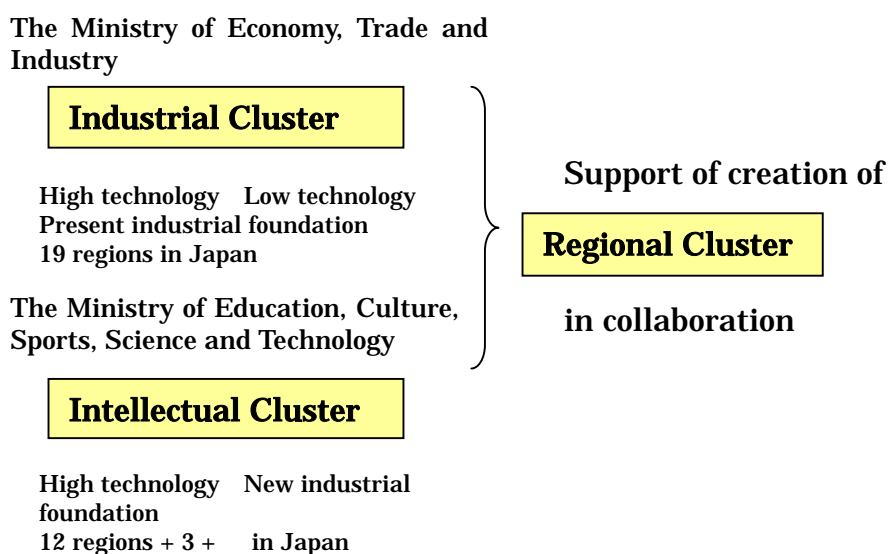
Here, we call an “innovative cluster” which will be of a help for industrial structures in Japan to show rapid changes a “cluster” in a narrow sense, by adding an innovative element to the definition of the “cluster” which Professor Michael Porter indicates in his “On Competition” (Harvard Business School Press, 1998).

Fig. 2 “Cluster” in its wide and narrow senses



The “Industrial Cluster” of the Ministry of Economy, Trade and Industry (METI) and the “Intellectual Cluster” of the Ministry of Education, Culture, Sports, Science and Technology (MEXT) both have the purpose of supporting the creation and fostering of this cluster in a narrow sense and are currently in the process of starting activities in collaboration under the name of the “Regional Cluster”.

Fig. 3 Concept of Japanese Regional Clusters



The definitions of industrial agglomeration, network and cluster (in a narrow sense) will be compared in the table below. Clusters in Japan tend to forget Start-ups, competition and spin-off compared to clusters in the USA and Europe.

Fig. 4 Comparison between Industrial agglomeration, Network and Cluster

Name	Member	Behavior	Effect
Industrial agglomeration	Corporations and cities/prefectures	Collaboration	Efficiency
Network	Corporations Research institutes and cities/prefectures	Collaboration	Efficiency Innovation (small)
Cluster	Corporations Research institutes and cities/prefectures Connecting function Ventures	Collaboration Competition	Efficiency Innovation (large) Ecosystem

Ecosystem:

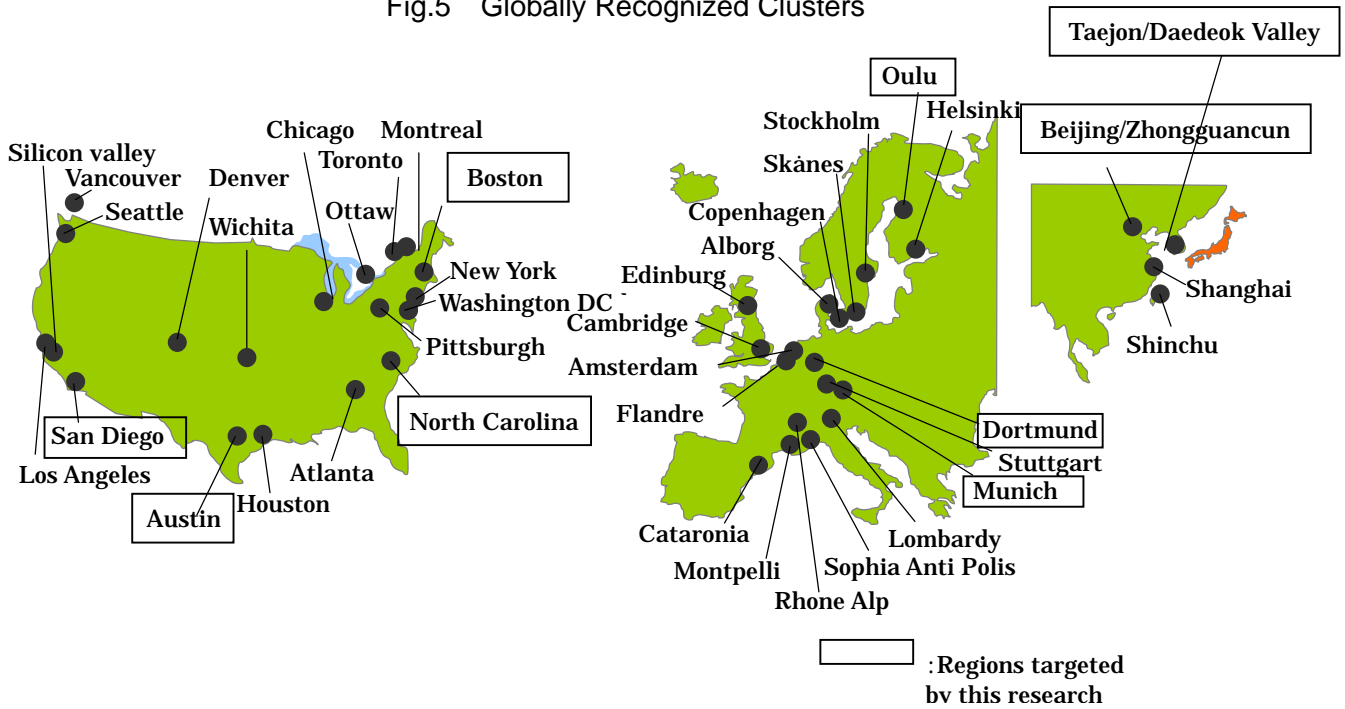
A locally rooted ecosystem will be easily created by major corporations' spin-off start-ups, etc. returning to regions, coordinated by various local organizations, and creating activities with major corporations or collaboration of local enterprises whose situations are well known to them.

3. Globally Recognized Clusters

Following are maps indicating clusters in regions which often come up in Cluster of Innovation Report, 2001, of the COC (the Council of Competitiveness) in the US, various kinds of reports including Innovative

Clusters, 2001, of the OECD, collections of academic reports relating to various kinds of innovations of academic societies such as those of the Japan Society for Science Policy and Research Management (JSSPRM), and publications whose themes are clusters, etc.

Fig.5 Globally Recognized Clusters



4. Case Studies and Elements for Promoting Success of Advanced Clusters in the USA and Europe

Out of the advanced cases of clusters, we carried out local research for the fiscal year 2002 in respect of Austin and San Diego in the USA, and Oulu in Finland. In addition, we also made reference to past research materials for Munich and Dortmund in Germany, and extracted their successful factors (by Prof. Noboru Maeda, Affiliated Fellow)

- *Austin (IT)*

The state of Texas gives one an immediate image of cities having flourished by oil drilling such as Dallas and Houston. Austin, which is the capital of the state, appears to have been a university city (Austin College of the University of Texas) enjoying a favorable climate and environment and the presence of the state government without any particularly noticeable industry until the mid 1960s. After that, major corporations, etc. (such as IBM, SEMATEC and MCC) engaged in the development of computers and semiconductors transferred their R&D divisions there one after another, and Michael Dell, who is a symbol of a successful person of a venture business, founded Dell Computer. Although Austin experienced a severe economic

slump in the latter half of the 1980s, business starter fostering programs were organized such as Austin Technology Incubator (ATI), the Capital Network (TCN) and Austin Software Council (ASC), which performed a “catalytic” role in promoting technology transfer by employing the strength of the University of Texas such as IT and software development. In the latter half of the 1990s, many Start-ups were born, and it is now growing into a mega intelligence-intensive city.

- *San Diego* (Biotechnology, medicine)

Details on how regional economies have developed are introduced in innovation cluster analysis carried out by Professor Michael Porter of Harvard University. The source of knowledge, beginning with San Diego College of the University of California (UCSD), and the UCSD Connect Program which activates business start-up by promoting collaboration, are two main factors to increase regional competitiveness in San Diego. High level basic research is carried out especially in high technology and life science fields, and relevant diversified talents are agglomerated. Connect Program facilitates mutual understanding between researchers and business leaders (lawyers, accountants, management consultants, banks, real estate industry....), and supports the formation of teams and grouping necessary for business start-ups.

- *Oulu* (IT, Information communication)

The cluster in the Oulu City called as ‘the Arctic Silicon Valley’ is totally different from a huge, spontaneously generated Silicon Valley, but a small hand-made cluster. Oulu, which had been a declining town of factories of paper manufacturing and chemicals, has been regenerated in collaboration by university-industry-government cooperation deciding allocation of their functional works systematically, and developed new industries. It is an exemplary cluster of an advanced cooperation of univ.-ind.-gov. as a model of a small provincial city, but has no power to drive the Finnish economy with a population of 5.2 million. However, Finland was plunged into a crisis at the beginning of the 1990s, accompanying the fall of the USSR, and a movement of following the example of Oulu which had succeeded in creating a cluster ten years before spread across the nation at that time. Helsinki, the capital of Finland, also succeeded in creating a cluster, and Finland showed a rapid progress as ranked in the second (2001 survey) in IMD Global Competition Research in line with the growth of Nokia.

Sapporo Valley, which is said to be the only cluster that has had a contemporary cluster form in Japan, has consciously interchanged with Oulu City over the past 9 years, and has studied the “Oulu model”. A book titled “People who have achieved a miracle of Oulu” was published in Finland, and the Oulu model has been reevaluated.

Fig.6 Elements for Promoting Success of Clusters extracted from Advanced Cases in the USA and Europe

	Item	Contents
1. Specified region	1-1 Access within 30 minutes in a specified region	Distance where you can just think of having lunch together without prior appointment Distance where you can see anyone, anytime
	1-2 Crisis awareness as being in the same region	Awareness that collaboration for reform is necessary Climate and traits of the region (Example: "Let's do" spirit in Hamamatsu)
2. Specified industry	2-1 Selection and concentration of industries which utilize regional assets	Enterprises flee to metropolitan areas, if their characters are not rooted in the region Low technology assets are utilized in many cases
	2-2 Several Anchor Companies (enterprises that can be cores in an initial period) exist	These include local enterprises, business divisions of major corporations, rapidly growing venture companies, etc. These will initiate collaboration of univ.-ind. or spin-off start-ups. These will become the first customers, and foster next generation Start-ups.
3. R & D	3-1 There are world class abilities of R&D.	Global human resources attract young people. Invitation by winning over global human resources. Fund for R&D from the government, etc. is relatively easy to obtain. Existence and invitation of R&D divisions of laboratories of the government, universities and corporations No clusters will be born without any organizations for R&D.
	3-2 Collaboration and connection of University-Industry-Government	Collaboration with local enterprises, Start-ups, universities and government-run laboratories. There expected a great effect by combining univ.-ind.-gov. in the same site and building
4. Start-ups	4.1 Vitality of Start-ups	High mobility of human resources of spin-off, lay-off, M&A, etc. Technology transfer is the most effective, as transfer of human resources has an immediate effect. The most appropriate means to increase relevant enterprises as a cluster. An area having a "Spin-off tree" in mind is growing.
	4-2 Collaboration of Start-ups, major corporations, universities, etc.	Regional industrial promotion by collaboration of major corporations and Start-ups in the region. Rapid growth of Start-ups will start from collaboration with major corporations.

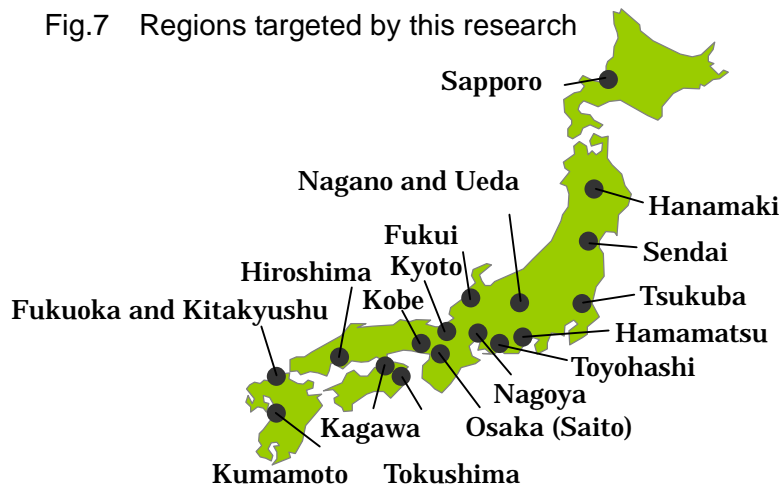
5. Support/ Collaboration	5-1 Support infrastructural organizations such as finance, management, technology, manufacturing, etc. locally exist.	Venture capitals, angels, incubation centers, licensed tax accountants, lawyers, certified accountants, certified social insurance and labor consultants, manufacture of trial products, design, overseas business support, etc.
	5-2 Existence of collaborative coordinating organizations for corporations, universities, supports, etc.	Not just individuals but specialized organizations must deal with them energetically. Core producers and trigger makers are necessary. Comprehensive involvement of regional administrative organizations such as the city, prefecture, etc. Decision and direct participation of mayors or Prefectural governors. Even the satisfaction level of the region by families is considered for attracting human resources of world class researchers.
6. Visionary	6-1 A person who depicts and realizes a future regional vision to attract researchers	Existence of a missionary having global results, enthusiasm and high reputation. Existence of a specific person who is said to exist for that cluster.
7. Fusion with other industries	7-1 Fusion with other clusters in that region	Creation of a new industry from fusion of an IT cluster and a bio cluster. Differentiation from other clusters by pursuing multi-clusters.
8. Global evolution	Market expansion by global measures, and promoting innovation	Invitation of human resources, corporations, institutes, and universities from all over the world. To become global standard by world-wide evolution at the initial stage.
9. Result of IPO	9-1 Increase trustworthiness and high growth by IPO (Initial Public Offer)	Securing superior human resources will become easy. Stimulation towards all time low growth small- and medium-sized enterprises in the surrounding areas. Business effect by social recognition.
10. Nation-wide recognition	Enhancing public profile of the cluster	Easy attraction of major corporations, universities, government-run laboratories. Change from escape to gathering of superior human resources.
11. Level of lifestyle and culture	11-1 Invitation of global human resources	A cultural and climatic environment where engineers and managers themselves feel like moving to live in. Attraction of shopping, theatergoing, education, etc. is necessary for their families as well.

5. Clusters in Japan

Measures towards forming regional clusters in Japan have just started. It can be said that only the “Sapporo Valley” in Hokkaido has grown to a stage of “the existence of the cluster itself being recognized” by corporations and universities.

If you have a look at regions in Japan in the light of the definition of a cluster, there exist many industrial agglomerations and institutes of higher education such as universities, but two elements, which are “mutually related” and “linked by commonalty and complementarily”, appear to be lacking between corporations and each institute. The following issues can be pointed out, when this situation is considered from the personnel, financial and other aspects.

Fig.7 Regions targeted by this research



Personnel	<ul style="list-style-type: none"> - Shortage of people having strong entrepreneurship , and lack of mobility of personnel - Low awareness of IPO (Initial Public Offer) - Fragile supporting function for business formation. - Attitude of each institute and organization which deal with business formation.
Finance	<ul style="list-style-type: none"> - Main bank system (management mainly by indirect finance by way of a bank) - Shortage of risk money - University system (R&D expenditures for research institutes such as domestic universities from industrial sectors)
Others	<ul style="list-style-type: none"> - Delay of supporting measures for Start-ups - Vigilance and consideration to potential issues in the collaboration of Industry and universities - Collaboration with local enterprises and small- and medium-sized enterprises

Furthermore, elements peculiar to Japan that have to be allowed for cluster formation are as follows:-

Elements peculiar to Japan	<ul style="list-style-type: none"> - Centralization in one place, Tokyo (Concentration of science and technology resources, centralized placement of public research institutes) - Characteristics of technological development (commercialization and good operational efficiency) - Roles of municipalities (reform from dependence on the central government to decentralization of power, and promotion of merger of cities, towns and villages) - Technological development capability (high-tech development capability of information infrastructure, sensors, robots, etc.) - Financing capability (Increase in surplus funds due to retained earnings of corporations) - Countermeasures for an imminent society with a larger population of elderly people
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We considered the results of this analysis and examination in comparison with the “elements for promoting success of clusters in the USA and Europe”. The elements that Japan should pay special attention to and elements which can be yardsticks of growth among them are as follows:-

Elements Japan should pay special attention to	<ul style="list-style-type: none"> - Vitality of Start-ups (high mobility of personnel, and its assumption, i.e. the fostering and establishment of personnel) - Local existence of support infrastructural organizations such as finance, management, technology, manufacturing, etc. (the fostering and establishment of personnel and VCs) - Existence of collaborative coordinating organizations for corporations, universities, support groups, etc. - Existence of Anchor Companies (core corporations at the initial stage) - Existence of trigger makers
Yardstick of growth	<ul style="list-style-type: none"> - Collaboration between Start-ups and major corporations, universities, etc.

Extraction and analysis of those elements creating and promoting Japanese clusters is one of the issues that must be examined towards the final report, but we set out below what we think are the other elements needing attention.

Other elements that should be paid attention	<ul style="list-style-type: none"> - Measures having a regional identity to compete with centralization in one place, Tokyo - Success example as a trigger maker ... global Start-ups - Awareness of collaboration for reform - Diversity and openness in the region
Clusters in small cities	<ul style="list-style-type: none"> - Seedbeds for research divisions of major corporations, etc. - Utilization of seeds that universities have - Evaluation of “mini-clusters”
Others (supplementary points)	<ul style="list-style-type: none"> - An idea of the “Kansai Business Starter Special District” (concentrated investment which can compete with centralization in one place, Tokyo) - Having foreigners as managers - Collaboration of regional Start-ups

6. Classification based on Initial Formation Factors of Clusters

We tried to classify clusters as follows, on the basis of initial formation factors from the viewpoint of who (organizations) started taking the very first initiative in order to analyze factors which attract cluster formation.

Fig.8 Initial formation factors

Type	Initial formation factors	Examples
Government policy	These are under special policy for creation of a specified industrial cluster carried out by nation, state, prefecture, etc.	Munich, and Kobe
Invitation	These are by invitation of universities, corporations, research institutes, etc. being aware of the creation of clusters with prefecture, state, etc. at the central figure.	Austin, Research Triangle, Sophia Anti Polis, and Kitakyushu
Regional collaboration	These are by collaboration of existing local enterprises, universities, research institutes and regional government.	Pittsburgh, Oulu, Dortmund, Kumamoto, Kyoto and Fukuoka
Start-ups	These are created from active spin-off Start-ups from local enterprises, research institutes, etc.	Silicon Valley, San Diego and Sapporo

7. Growth Phases of Clusters

We classified processes of growth and development of clusters into a germinal period, start-up, exploratory formation period, growth and stability period, and attempted to prepare a model by examining local research and documents concerning at what phase the respective “elements for promoting success of clusters” mentioned above have effects.

Fig.9 Graph showing time series development of clusters

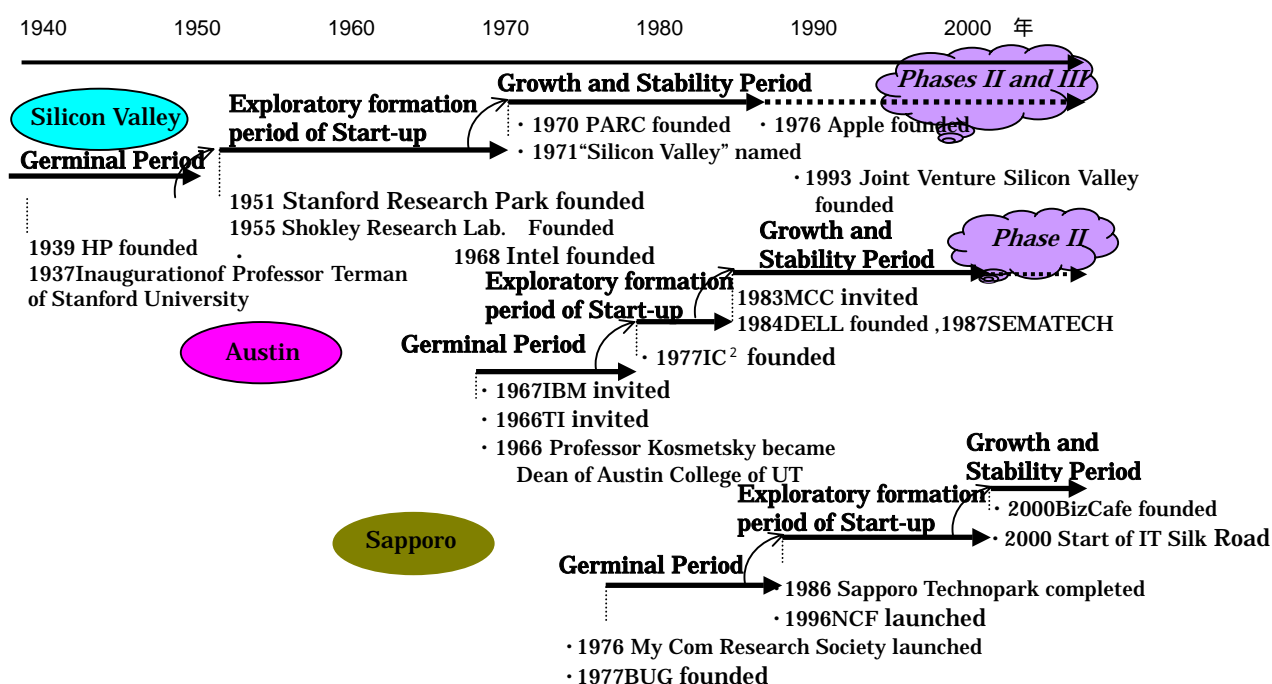
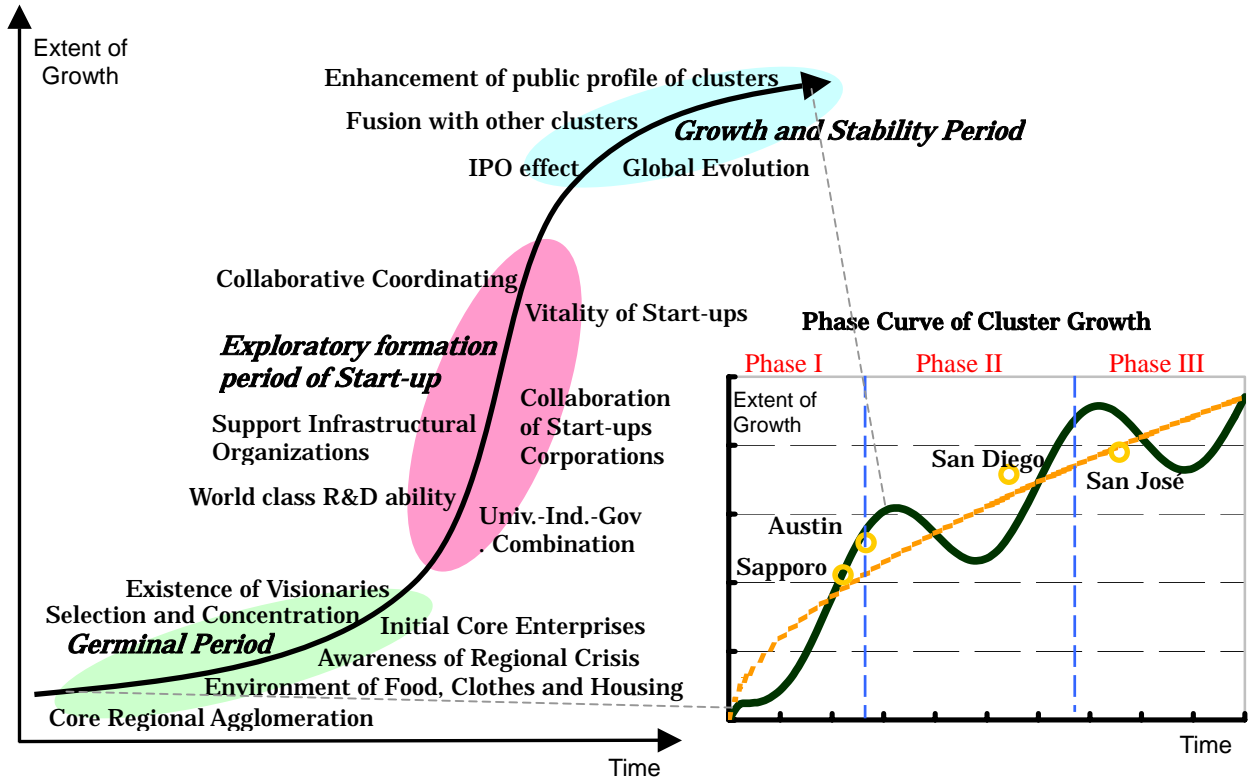


Fig.10 Elements for Promoting Regional Innovation at Various Growth Phases



8. Categories of Clusters and their Effects

In the process where clusters repeat the cycle of prosperity and decline, they may show various situations to grow in the following phases. Here, we will attempt to carry out classification of their form.

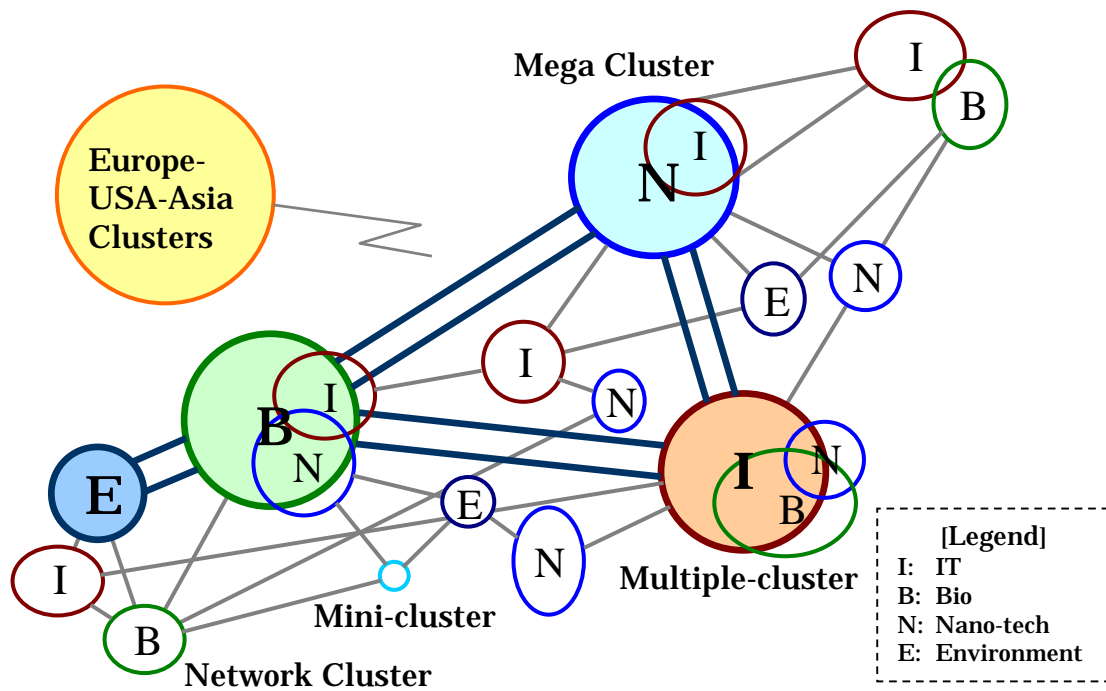
Fig.11 Types of Clusters

Type	Characteristics and Effects	Examples
Multiple-clusters	Multiple clusters specialized in different industrial fields exist in the same area. These will become stimulation for the birth of new business as skills and technologies in different fields mix with one another.	US Silicon Valley (Microelectronics + communications), US Research Triangle (Medicines + Biotechnology), Sapporo (IT + Biotechnology)
Mega clusters	These are clusters that will function as the nucleus of national strategy, and some clusters having high technology which is the highest level in the world have collaboration within the same region. They can strongly lead the national reform of industrial structure by having collaboration with other cluster groups in the world.	Future potential is in the Metropolitan area (with Tokyo in the center) and the Kansai area (Osaka, Kyoto and Kobe), etc.

Network (wide area) clusters	The situation where the effect of forming clusters increases by a number of clusters having collaboration with one another by network. They have a network with other clusters, and mutually supplement the technologies and knowledge that they are lacking.	Collaborative networking of Fukuoka and Kitakyushu.
Mini-clusters	Although they do not fit the basic definition of clusters, they are regions where they carry out activities towards promoting innovation by fusion of local authorities and industrial sectors in small cities. Creation of new businesses including Start-ups is expected.	Kumamoto, Kochi, etc.

We will need a plan for the creation of cluster groups as a national innovation system in the future.

Fig. 12 Cluster groups as a National Innovation System



9. Conclusion

The points of the interim report are summarized as follows:-

Contents of Research	Results
Analysis of cluster success examples in the USA and Europe and extraction, classification and evaluation of their common success elements.	It has become clear that it is necessary to analyze and study growth stages and phases.

Defining clusters, which are focused in this report.	Research should be focused on innovative clusters incorporating high-tech elements.
<p>Selection of sites proposed for clusters in Japan that should be researched.</p> <p>Local research is carried out in consideration of success factors in the USA and Europe. Finding out the points of success factors in the USA and Europe that are not applicable to Japanese cases, and success factors peculiar to Japan.</p>	<p>It was found out that in the USA and Europe deep involvement of intellectual organizations such as universities and public research institutes became important elements for the fostering and development of clusters.</p> <p>Issues concerning the weakness of Japanese universities in tackling problems as a single entity and centralization of one place, Tokyo, of public research institutes have begun to emerge.</p> <p>It was found that the elements of creation and development of clusters by Start-ups by means of spin-offs, etc. from major corporations, public research institutes and universities in the USA and Europe are greater than had been thought.</p> <p>It has begun to be seen from examples in the USA and Europe that it is necessary to start thinking of dealing with cluster policy as a part of the national innovation system in Japan, amid processing the creation and fostering of clusters in Japan.</p>

Awareness of issues which have become clear at this time and the subjects to clear before the submission of the final report are as follows:-

Awareness of issues having become clear	Subjects to clear towards the final report
<p>- How Japanese weakness should be overcome. Looking into causes of lack of competition within a region, centralization of research institutes in the Metropolitan area, universities' weakness in dealing with organizational cluster activities, shortage of high-tech Start-ups, low mobility of personnel from spin-offs, etc. and examination of measures to overcome these.</p> <p>- How to make the best use of Japanese unique strengths Measures to make the best use of energetic medium standing enterprises, local industries, and technology of regional universities</p> <p>- How to link regional competitive superiority with national competitive superiority Relating the national innovation system to regional clusters organically</p>	<p>- Extraction and analysis of elements of creating and promoting Japanese unique clusters</p> <p>- Generalization of models for promoting collaboration from intellectual clusters to industries</p> <p>- Making regional innovation systems to general models</p> <p>And others</p>