A Study on Building the Regional Cluster:
The Case of Fire and Emergency Industrial Cluster in Samcheok-si

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ABSTRACT

Korea has relied on top down development method, in which companies, research and education institutions move into the industrial complexes established by the government. However, to improve local competitiveness, the paradigm is shifting from the government initiated industrial complex to the clusters based on the cooperative network of the region. Representative case is 'Samcheok-si Fire & Emergency industry cluster construction project' that begun in 2007. AHP technique analysis results on first-stage showed that priority was on policy and network elements, and the results of second-stage analysis show that priority was on Policy incentives to internationalize the cluster and strengthen link,. Cluster branding, Sharing of organizational culture to cope with changes in environment, Creation of group learning culture. The subject of this research is limited to Samcheok-si's the Fire and Emergency Industry cluster formation project. Therefore, the research area and standard should be expanded to increase generality in further researches.

Keywords: Cluster, Fire & Emergency industry cluster, Analytical Hierarchy Process(AHP)

1. INTRODUCTION

The idea that unique local economy could improve a country's competitiveness in the global era is gaining recognition in recent years[1]. In other words, in the global economy, it is important to strengthen the competitiveness of a region rather than that of central government. A lot of research is underway about the benefits of spatial concentration of industrial activities and clustering of industries to strengthen competitiveness[3], [4]. As if to reflect such logic, OECD members have tried to establish systems, organizations, and rules to facilitate cooperative networks between local bodies and technology development by adopting cluster establishment policy to strengthen local competitiveness since 1990[9]-[10],[13]-[18]. But Korea has relied on top down development method, in which companies, and research and education institutions move into the industrial complexes established by the government[25]. However, to improve local competitiveness, the paradigm is shifting from the government initiated industrial complex to the clusters based on the cooperative network of the region. Representative case is Samcheok-si's the Fire & Emergency industry cluster

construction project' that is begun in 2007. In coal industry city had stagnated past, is self-regulating relatively for area development and cluster is evaluated by thing which is formed to the Fire and Emergency city of international standard that have individual capacity.

This study tries to find indices for strategic methods for the direction of Fire and Emergency industry and find policy implications through priorities. Previous studies focused on the economy of scale through geographical concentration, analysis of clusters from social composition perspective, and local innovation systems and competitiveness seen from industrial environment problem aspect or business plan aspect[22]-[24].

Therefore, this study was set to empirically look for developing strategies on *Fire and Emergency's Industry of region for cluster,* specially we looked for the best strategy. This study tries to examine the theoretical base of cluster concept, find the indices for strategic methods for the establishment of desirable clusters, and present policy implications through priorities AHP techniques. It is expected that this study will contribute to the exploration and development of policy support tools and development direction to reinforce Korea's competitiveness in the future.

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2. THEORETICAL EXAMINATION AND RESEARCH DESIGN

2.1 Theory and practice of industrial cluster

As Cluster was used as an analytical concept for the competitive advantage of a country or region in the past. In the 1990s, it was used as a key policy tool by OECD and other countries. A cluster is a geographical and relational aggregate that represents the relationship between buyer and supplier vertically and the relationship between customer, technology and channel horizontally[12]. Internally, these components are connected and the formal and informal interactions between these are important. In this context, the growth of competitive local economy is the result of concentration of geographically closely located companies through networks[2],[18]. The key for the establishment of cluster is to strengthen cooperation in a certain industry already concentrated in a region and related universities, companies and research institutions and improve its competitiveness. To improve local competitiveness through industrial clusters, it is necessary to specialize in one or several industries by using the research and business startup support of the related agencies, attracting excellent companies at home and abroad, and strengthening cooperation between companies, universities, and research centers. In this sense, an industrial cluster is a total industrial system, in which industrial production system, science and technology system and corporate support system function inter-connectedly, as companies in certain industry are geographically concentrated.

Commonalities and complementarities in a region are emphasized for an industrial cluster as a system. However, analyses of industrial clusters in Korea showed that they are in their early development stage, network formation is limited and access to support system is difficult, therefore commonalities and complementarities are urgently needed[11].

2. 2 Components of Fire &Emergency industry cluster

In his book, "The Competitive Advantage of Nations," Professor Michael Porter pointed out the cluster phenomenon as a common characteristics of competitive countries and emphasized the importance of spatial proximity and the anchoring of firms in their home base as key factors for economic development. He defined a cluster as "A geographically proximate group of companies and associated institutions in a particular field linked by commonalities and complementarities."

The key of a cluster is the establishment of cooperative network of independent production companies, part and raw material suppliers, final consumers, and user companies that are linked in a production chain that creates added value. Base on this, he explains external elements and internal elements of the cluster model. External elements include the chance in domestic and international markets and government capabilities. The internal elements consist of four; first is factor conditions that include human, material, and knowledge resources and social infrastructure; second is the conditions by which a firm is formed, organized, and operated and competition conditions that include firm strategy, structure, and rivalry; third is related and supporting industries, which means the existence of any internationally competitive industries among the related or supported industries; and fourth is demand conditions that include demand market, structure, growth pattern, globalized demands, and requirements of consumers.

The elements for cluster described above are important elements for the establishment of the Fire & Emergency industry cluster. Because Fire & Emergency industry is influenced by the role of National Fire & Emergency Management Agency(government capabilities), creation of competitive infrastructure(factor conditions), consumption environment(demand conditions), and production environment(corporate condition, and information and communication technology (related industry environment).
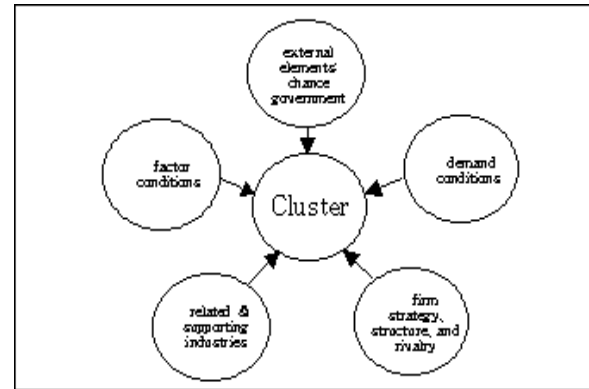

Fig.1. M. Poter's Cluster Model(1990)

2.3 Analysis model

To give weight to evaluation indices using Analytical Hierarchy Process(AHP), it is necessary to develop an evaluation index system and set a hierarchy deductively. This study examines the policy indices for the establishment of Fire and Emergency industry cluster by Samcheok-si based on the indices presented by Michael Porter's model and present policy implications through priorities.

Based on the Porter model and refer to a references in Bok, Deuk Kyu(2003), Castells (1994) Brown(2002), P. Cooke(2007) Stefano Breschi(2007)[5]-[8], therefore this study examines the policy to create Fire and Emergency industry cluster by Samcheok-si and classify it into policy, supply, demands, and network elements.

First, Policy elements is that Cluster map is Preparation of overall index of the existence of specialized industry and core industry, existence and level of support organizations, and existence of part companies, and competition relationship, Cluster branding is Preparation of PR and communication strategies for Fire and Emergency industry cluster(Brand for local cluster), and, Policy incentives to internationalize the cluster and strengthen link is Development of policy, implementation capabilities, budget size, strategies to secure local competitiveness, and policy incentives such as reduced rent and tax benefits to integrate, combine, and localize domestic and foreign technology to establish Fire and Emergency industry cluster.

Second, Supply elements is that Market potential of cluster is Customer development with foreign countries and domestic superior enterprise, support institution, school, research institute for Fire and Emergency industry cluster, Core

infrastructure is Concentration of core infrastructure(roads, railroads, communication, and ports) necessary for the project, and, Establishment of hinterland is Preparation of sufficient hinterland(city center and shopping area) for the establishment of Fire and Emergency industry cluster.

Third, Demand elements is Development of market concentration is Focusing on attracting excellent companies, support organizations, universities, and research centers to meet customer requirements, Support of venture startup companies is Preparation to support venture startup companies(Provide offices and help with starting business) for the establishment of Fire and Emergency industrial cluster, and, Establishment of specialized labor pool is Creation of labor pool for special education and actual work for Fire and Emergency industry.

Finally, Network elements is that Link between components is Establishment of link between financial and information support, technology and labor provision, part and element technology, Formation of distributed network of related local industries is Establishment of interrelationship between companies and institutions by inducing the cluster components to focus on their core capabilities and procure other things through network, and, Sharing of organizational culture to cope with changes in environment is Establishment of systematic information collection network to check industry trend and changes in environment anytime, Supply of convenient administrative and support service, Supply of convenient administrative and other support services (finance, insurance, law, and consulting), Creation of group learning culture is Companies, universities, and research centers provide learning opportunities and create group learning culture to create and transfer vision and knowledge.

Table 1. Analytical Model of This Study

poter model		this area of study	the details index	contents
external elements	chance	Policy elements	Cluster map Bok, Deuk Kyu etc (2003)	Preparation of overall index of the existence of specialized industry and core industry, existence and level of support organizations, and existence of part companies, and competition relationship
	governmental competence		Cluster Branding Bok, Deuk Kyu etc (2003)	Preparation of PR and communication strategies for Fire and Emergency industry cluster (Brand for local cluster)
			Policy incentives to internationalize the cluster and strengthen link Brown(2002)	Development of policy, implementation capabilities, budget size, strategies to secure local competitiveness, and policy incentives such as reduced rent and tax benefits to integrate, combine, and localize domestic and foreign technology to establish Fire and Emergency industry cluster
internal elements	factor conditions	Supply elements	Market potential of cluster Brown(2002)	Customer development with foreign countries and domestic superior enterprise, support institution, school, research institute for Fire and Emergency industry cluster
			Core infrastructure P. Cooke(2007) Brown(2002)	Concentration of core infrastructure(roads, railroads, communication, and ports) necessary for the project
			Establishment of hinterland Brown(2002)	Preparation of sufficient hinterland(city center and shopping area) for the establishment of Fire and Emergency industry cluster
	firm strategy, structure, and rivalry	Network elements	Link between components Bok, Deuk Kyu etc (2003)	Establishment of link between financial and information support, technology and labor provision, part and element technology
			Formation of distributed network of related local industries Bok, Deuk Kyu etc (2003), Brown(2002) Stefano Breschi(2007)	Establishment of interrelationship between companies and institutions by inducing the cluster components to focus on their core capabilities and procure other things through network
			Sharing of organizational culture to cope with changes in environment Bok, Deuk Kyu etc (2003), Castells (1994)	Establishment of systematic information collection network to check industry trend and changes in environment anytime
			Supply of convenient	Supply of convenient administrative and other

		administrative and support service Brown(2002)	support services (finance, insurance, law, and consulting)
		Creation of group learning culture Stefano Breschi(2007)	Companies, universities, and research centers provide learning opportunities and create group learning culture to create and transfer vision and knowledge
related and supporting industries	Demand elements	Development of market concentration Bok, Deuk Kyu etc (2003)	Focusing on attracting excellent companies, support organizations, universities, and research centers to meet customer requirements
demand conditions		Support of venture startup companies Bok, Deuk Kyu etc (2003)	Preparation to support venture startup companies(Provide offices and help with starting business) for the establishment of Fire and Emergency industrial cluster
		Establishment of specialized labor pool Bok, Deuk Kyu etc (2003), Brown(2002) Castells (1994), P. Cooke(2007)	Creation of labor pool for special education and actual work for Fire and Emergency industry

3. ESTABLISH THE DIRECTION FOR LOCAL FIRE AND EMERGENCY INDUSTRY CLUSTER POLICY

3.1 Survey design and hierarchy

The purpose of this study is to establish the direction for local Fire & Emergency industry cluster policy. For this purpose, this study carries out an empirical analysis through a survey of experts and the data collection and analysis method are as follows. First, to set a priority and weight using AHP, a survey of experts on the establishment methods of local Fire and Emergency industry strategies is carried out. Second, a questionnaire for the survey is organized so that comparison of elements according to the hierarchy is easy, and the pair wise comparison uses 9 point scale. Third, the analysis is done according to AHP and Excel 2007 is used for statistics.

To collect data, a questionnaire is designed with items appropriate for AHP analysis and a survey of experts using the questionnaire is conducted. It is because the survey for AHP analysis is very complicated and it requires accurate answers. And interviews with 11 experts in the Fire & Emergency field including central and local government officers, industry experts, field workers, policy experts, and business owners are conducted. Hierarchical indices discussed above are as follows.
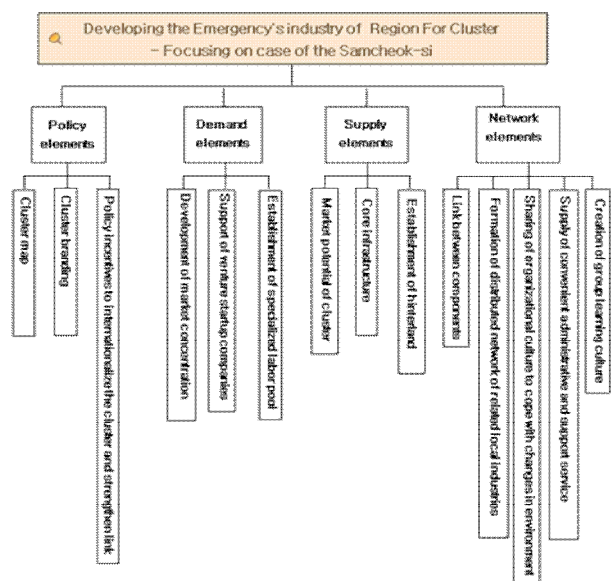

Fig.2. Hierarchical Structure of This Study

The questions can be difficult for the interviewees to understand and similar questions could bore them. So the questions are made as easy as possible to understand. The scale needs to be made to reflect the difference a person feels as much as possible in the pair wise comparison. According to Miller's psychological experiment done in 1956, "Humans can compare to things simultaneously without getting confused."[19] Based on this, the scale consists of 1 to 9 or 9 to 1. These numbers are closely related to daily language expression as follows.

Table 2. Compare Dual Measure of Importance

Judgment	Importance
Extreme importance	□⑨
Intermediate value	□⑧
Very strong importance	□⑦
Intermediate value	□⑥
Strong importance	□⑤
Intermediate value	□④
Moderate importance	□③
Intermediate value	□②
equal importance	□①

When compare dual measure method of importance as follows. So, the 9 point scale is used for the AHP analysis.

Table 3. Measure Composition of Questioner AHP Analysis

Assessment Division (A)	Extreme	Very Strong Importance	Strong Importance	Moderate Importance	Equal Importance	Moderate Importance	Strong Importance	Very Strong Importance	Extreme	Assessment Division (B)
	⑨	⑧	⑦	⑥	⑤	④	③	②	□①	②□	③	④	⑤	⑥	⑦	⑧	⑨	

Currently the considerations for the establishment of local Fire & Emergency industry cluster have not been established theoretically and they are affected by various complicated factors. Thus, AHP can be very useful for the integrated strategic decision making for the policy.

3.2 Analysis method

3.2.1 Measurement of importance and scale

We used the AHP to analyze this study. The weight for each sub index is calculated by pair wise comparison. Relative point of the comparing item against the base item is coded for the collected survey data. To the range better than the standard item, a point between 1-9 is given and the reverse number is given to a item in the opposite range. When there are n number of elements, and they are called A_1, A_2, ···, An and their importance is W_1, W_2, ···, Wn, Matrix A obtained from pair wise comparison can be expressed as follows[19]-[21],[23].

$$A = \begin{array}{c} \\ A_1 \\ A_2 \\ \vdots \\ A_n \end{array} \begin{array}{cccc} A_1 & A_2 & \cdots & A_n \\ \hline W_1/W_1 & W_2/W_2 & \cdots & W_1/Wn \\ W_2/W_1 & W_2/W_2 & \cdots & W_2/Wn \\ \vdots & \vdots & & \vdots \\ Wn/W_1 & Wn/W_2 & \cdots & Wn/Wn \end{array}$$

Fig.3. Formation of Matrix A

The importance is called priority, which can be obtained from pair wise comparison. Priority is calculated by using eigen vector and eigen value of matrix that consists of pairwise comparison. When a group participates in the importance evaluation, importance can be decided by the agreement of the group. However, if individuals decide the importance, geometric mean can be used. It is symmetrical reverse performance. The reciprocal of geometric mean of multiple numbers is the same as the metric mean of the reciprocals of the numbers. In making the matrix, cardinal consistency as well as ordinal performance are not assumed. Therefore, it is necessary to examine the cardinal consistency to verify the level of logical inconsistency of matrix.

3.2.2 Consistency test

To incorporate their judgments about the various elements in the hierarchy, decision makers compare the elements two by two. When a study will begin with the n Criteria, the Criteria will be compared as to how important they are to the decision makers, with respect to the Goal. Each pair of items in this row will be compared; there are a total of () pairs.

In this study, we used geometric mean in order to make 11 experts' sheets into one sheet. Because interval scale is made by logic 'how important A is B' in order to compare pairwise. Then we conducted the AHP Excel Tool.

AHP provides standard index for possible reliability error through Consistency Ratio(CR). Where C.I.(consistency index) is

$$C_1 = \frac{(\lambda max - n)}{(n - 1)}$$

, λmax=pair wise comparison is the largest eigenvalue of the Matrix. n=number of variables compaired. In pair wise comparison in the Matrix, relationship between λmax≥n is stablished, where perfect consistency is λmax=n, λmax gets closer to n if consistency gets bigger.

In general, up to 10% error range is considered excellent data and up to 20% error range is allowed. However, when the CR is over 20%, it should be excluded from the analysis because it has a lot of logical problems. Therefore, this study also calculated CR for each stage and criteria and excluded the values over 0.2. Based on this, relative weight of item is calculated by stage[26].

4. AHP TECHNIQUE ANALYSIS RESULT

4.1 Results of the first stage stratification structure in this study

The first stage stratification structure in this research have four elements including policy, supply, demand, and network element. In the analysis on the first stage stratification structure, consistency ratio (C.R) was verified as 0.06 and the order of preference was policy, network, demand, and supply. In terms of importance rate policy element had 39%, network element had 37%, demand element   had 11%, and supply element had 11%. The results of the first stage stratification structure result are as follows.

Table 4. First Stage Hierarchical Structure Analysis Result

First stage hierarchical structure analysis result				
Area	**Policy elements**	Demand elements	Supply elements	**Network elements**
Weight	**0.393**	0.119	0.118	**0.370**
Priority	**1**	3	4	**2**
C. R: consistency ratio			**0.0641**	

Such results show that policy and network elements are reflected as important factor of success in order to establish cluster of emergency management industry. The reasons that experts gave much weight on policy and network elements can be interpreted as follows. First, will of policy and implementation ability of Samcheok-si to suggest a vision and lead the emergency industry cluster are important. Second, the network between relevant entities including planning, distribution, cultural sharing, consumption, and learning sectors in Samcheok-si emergency is considered as important core factors of policy index. On the other hand, supply and demand elements are relatively low because the industry establishment of the Fire and Emergency's Industry cluster is still in the initial formation stage, thus, to develop network and concretize it in policies are recognized more importantly. Moreover, supply and demand elements in all cluster model towns in the country are very low and differences may not be noticeable.

4.2 Results of the second stage (sub-criteria of each elements) stratification structure analysis in this study

The second stage stratification structure has sub-criteria for the elements of the first stage such as policy, supply, demand, and network elements that is the first stage. Weight by each index of second-stage hierarchical structure is as follows.

First, the results of sub-criteria analysis on policy elements are as follows.

Table 5. Second-stage Hierarchical Structure Analysis Result
- Policy elements

Policy element hierarchical structure analysis result			
Area	Cluster map	Cluster branding	**Policy incentives to internationalize the cluster and strengthen link**
Weight	0.187	0.346	**0.467**
Priority	3	2	**1**
C. R: consistency ratio			0.0001

Policy incentives to internationalize the cluster and strengthen link was the highest with   47%, cluster branding had 35%, and cluster mapping was 19%. Such results are due to nature of cluster that tends to expand externally as it is

developed. Therefore, in order to establish successful cluster for Samcheok-si's the Fire and Emergency Industry, it needs to develop cluster linked with globalization and converge and compound technology. With such recognition, not only concern from internal but external sectors are important for the excellent operation performance. That is the reason that cluster branding index got more weight. The use of cluster map should be processed for objective research and development about competition and to induce the vision through the path agreed by residents in the region although the index had low weight.

Second, the results of analysis on sub-criteria of supply elements are as follows.

Table 6. Second-stage Hierarchical Structure Analysis Result
- Supply elements

Second-stage hierarchical structure analysis result -supply elements			
Area	Market potential of cluster	**Core infrastructure**	Establishment of hinterland
Weight	0.286	**0.477**	0.237
Priority	2	**1**	3
C. R: consistency ratio			0.0224

Supply element can develop the basis of project and contribute to revitalization of local industry structure and promote to attract external investment in establishment of regional cluster. The core infrastructure had 48%, market potential of cluster had 29%, and establishment of hinterland had 23% points. Experts gave much weight on core infrastructure and market potential of cluster because and these show that they are important elements to promote regional development that fit to the setting of the region. It shows that infrastructure should be expanded around the core industry and market concentration should be development based on research and support functions.

Third, the results of analysis on sub-criteria of demand element are as follows.

Table 7. Second-stage Hierarchical Structure Analysis Result
- Demand elements

Second-stage hierarchical structure analysis result -demand elements			
Area	Development of market concentration	Support of venture startup companies	**Establishment of specialized labor pool**
Weight	0.330	0.268	**0.402**
Priority	2	3	**1**
C. R: consistency ratio			0.0006

Demand element in regional cluster establishment make possible with technological development and nurturing of professionals for technology convergence. Experts gave much weight on establishment of specialized labor pool and development of market concentration that had 40% and 33% points respectively. It shows the importance of creating education and training systems to nurture excellent human resources in the region and fostering the potential of regional

market that attracts talented scientists and revitalizes researches.

Fourth, the results of analysis on sub-criteria of network element are as follows.

Table 8. Second-stage Hierarchical Structure Analysis result
- Network elements

Second-stage hierarchical structure analysis result -network elements			
Area	Link between components	Supply of convenient administrative and support service	**Sharing of organizational culture to cope with changes in environment**
Weight	0.122	0.112	**0.282**
Priority	4	5	**1**
C. R: consistency ratio			**0.0428**

Experts gave importance on networking between the entities in the region for regional cluster project. This is reflected on the analysis and sharing of organizational culture to cope with changes in environment, creation of group learning culture, formation of distributed network of related local industries had 28%,.25%, and 23% points respectively. In the situation that uncertainty about main operator of the cluster, sharing of organizational culture to cope with changes in environment, creation of group learning culture, and formation of distributed network of related local industries are recognized as important. Such formation of network are important factors to lower the possibility of error and policy failure in regional cluster project.

As the AHP developer Saaty (1994a) said if AHP analysis consistency ratio is less than 0.1, it is considered to have rational consistency[19]. Most category got less than 0.1 points of AHP in the results of this research, thus, survey respondents are considered to have consistency. Final analysis considering the total weight on developing of Samcheok-si's the Fire and Emergency Industry cluster showed that priority was . 1)Policy incentives to internationalize the cluster and strengthen link 2)Cluster branding 3)Sharing of organizational culture to cope with changes in environment 4)Creation of group learning culture 5)Supply of convenient administrative and support service 6)Cluster map 7)Core infrastructure 8)Establishment of specialized labor pool 9)Link between components 10)Formation of distributed network of related local industries 11)Development of market concentration 12)Market potential of cluster 13)Support of venture startup companies 14) Establishment of hinterland.

Table 9. Hierarchical Structure Analysis Total Result of this study

First stage hierarchical structure analysis result		Second-stage hierarchical structure analysis result			
Area	Weight	Area	Weight	Total Weight	Total Rank
Policy elements	0.393	Policy incentives to internationalize the cluster and strengthen link	0.467	0.184	1
		Cluster branding	0.346	0.136	2
		Cluster map	0.187	0.073	6
Demand elements	0.119	Development of market concentration	0.330	0.039	11
		Support of venture startup companies	0.268	0.032	13
		Establishment of specialized labor pool	0.402	0.048	8
Supply elements	0.118	Core infrastructure	0.477	0.056	7
		Market potential of cluster	0.286	0.034	12
		Establishment of hinterland	0.237	0.028	14
Network elements	0.370	Sharing of organizational culture to cope with changes in environment	0.282	0.104	3
		Creation of group learning culture	0.254	0.094	4
		Supply of convenient administrative and support service	0.230	0.085	5
		Link between components	0.122	0.045	9
		Formation of distributed network of related local industries	0.112	0.041	10

5. POLICY IMPLICATIONS AND CONCLUSION OF STUDY FINDING

In this research, policy index that can be applied to Samcheok-si's the Fire and Emergency Industry cluster was developed and AHP analysis on experts was implement to setup weights on each index. First stage hierarchy analysis showed that priority was on Policy elements and Network elements. Second stage hierarchy analysis showed that in Policy elements, Policy incentives to internationalize the cluster and strengthen link, Cluster branding, had priority and in Network elements, Sharing of organizational culture to cope with changes in environment, Creation of group learning culture had priority. As the results of analysis, policy and network elements are considered importantly for establishment project of Samcheok-si's the Fire and Emergency Industry cluster. However, supply and demand elements are considered relatively less important. Moreover, in sub-criteria of each category, policy element for cluster globalization and linkage reinforcement had high priority, establishment of core infrastructure and professionals, and sharing of organization culture to change environment were followed.

The summary of policy agreement for Samcheok-si's the Fire and Emergency Industry cluster is as follows.

First, it needs the policy with authority and responsibility about establishment of regional cluster that manages nurturing of cluster and formation of network. Types of cluster and policy that fits to regional competitiveness should take priorities in order to consider long-term development vision of the region which relevant entities could be agreed upon. Moreover, the emergency industry cluster is a cutting-edge industry which formation of relationship in new industry network (parts, materials, etc.) is important.

Second, it needs policy incentives to make entities of regional cluster concentrate on core abilities of the regional industry and promote network formation for exchange of

knowledge and information for technology based research. A complex emergency industry cluster can be operated smoothly if frequent exchange is supplied based on geographic closeness of regional cluster and reliable relationship is formed. Moreover, the cluster may not be operated if the network is not formed even thought the entities are attracted with developed site and benefits for them.

Third, it needs to put efforts on forming infrastructure to establish world class cluster. Most clusters in other countries such as Kista Park in Sweden and Oulu Technopark in Finland have world class companies reside in to take the key role of cluster creation and they also contribute to attract multinational companies.[   ] It needs to be processed in aspect to reinforce geographic approach rather than simple development of the site.

Fourth, professionals are essential to establish regional cluster. The strong human resource pool of professionals is the basic element of active networking between cluster organizations.

Fifth, it needs the organizational culture that frequently reviews regional industry trend and environmental changes and respond flexibly to them. Moreover, it needs to form labor division network and collective learning culture. The reason is that flexible organizational culture should be created to develop world class the Fire and Emergency Industry cluster in the uncertain and rapidly changing environment. Based on such culture, labor division network system that allows concentration on each sector should be established for diversification of the Fire and Emergency Industry cluster.

Moreover, it needs to form collective learning culture of emergency industry that creates and transfer knowledge to establish professionalized cluster. Such results of index analysis can be used as standard to establish basic principles to develop and support regional cluster establishment project. Based on the results of this analysis we can see the importance in the method of approach to develop regional cluster and create incentives for policy elements and network elements to make trust between subjects, and demand elements between regional research centers and universities should be understood to make a collaborative structure thus we found that strategies to supply elements needed by companies were necessary in Fire and Emergency Industry cluster.

The subject of this research is limited to Samcheok-si's the Fire and Emergency Industry cluster formation project. Therefore, the research area and standard should be expanded to increase generality in further researches. In particular, it is also important to establish standards for index of each cluster development stage. Furthermore, more accurate research model can be induced if the sample size is expanded in the research range. In order to accomplish such goals, the sample must be expanded through expansion of the research subject. The data based on recognition of cluster entities in Samcheok-si are used, therefore, it may be insufficient with objectivity in establishing the standard. Therefore, more meaningful results can be induced if the variable data from plural group or objective data are used.

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