

Exploring Correlation of Industry Cluster Alternative with Cluster Formation and Correlation of Cluster Formation with Cluster Effect: A Case Study of Taiwan Precision Machinery Industry

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Abstract--This research purpose was to explore industry cluster alternative factors, cluster formatting factors, cluster effect factors, and correlation of cluster alternative dimensions with cluster formation dimensions, and correlation of industry cluster formatting dimensions and industry cluster effect dimensions. This research utilizes Taiwan precision machinery industry for a case study. The methodology is through experts method, factor examination, to explore the industry cluster alternative factors, cluster formation factors, and cluster effect factors; Utilizing canonical correlation analysis of the multiple-regression analysis explores correlation of industry cluster alternative dimensions with cluster formation dimensions, and correlation of cluster formation domain with cluster effect domain. The result was discovered: industry cluster alternative dimensions and industry cluster formatting dimensions have significant correlation. The higher the selectivity of industry cluster alternative will have the higher clusters formatting. Industry cluster formatting dimensions and industry cluster effect dimensions have significant correlation. The higher the selectivity of industry clusters formatting will have the higher clusters effect.

I. INTRODUCTION

In recent year mainland China, Southeast Asia, Taiwan, and other regions which development of industrial clusters flourishes, the overall economic development of Asia will have real impact. Porter [29] point out that "Industry clusters" is a group of geographical proximity, or a particular field of interactive associated with the relevant enterprises and corporate bodies, their commonality or complementary to each other links. Industry clusters from a single city, the whole state, a country, and even some neighboring countries or continents linked into networks of the Union. Union formatting type depends on its extent environment and depth depending on the complexity of the different. Most industry clusters members were not in direct competition, they have their own service industry to separate; But they still have many common needs and opportunities, facing of the company operating efficiency which they still have many the efforts to breakthrough. Industry clusters-groups of geographically proximate firms in the same industry—are a striking feature of the geography of economic activity [20] examined by industrial geographers at least since Marshall. The particular industry in the region is not a new industry or high-tech industry, general including the final product, professional components, parts, machinery and equipment, service providers, financial institutions and related industries. "Industrial clusters" for the industry operating strategy, the

up-stream and down-stream supply chain, technical research and development, marketing and other various commercial activities have a certain extent the impact [36, 30, 31, 20, 21]. At the same time industry cluster members include down-stream industries (e.g., channel and customers), the complementarities of manufacturers, specialized suppliers, the government and the other to provide specialized training, education, information, research and technical support organizations (e.g., the University of Chile libraries and vocational training bodies), and standard-setting organs; Finally, it includes the association, and other support industry cluster of civil society members. Therefore, the industry cluster can grasp cross-industry manufacturers and the importance of links to complementary, and the effectiveness of technology and exchange of information, marketing channels and customer needs [19, 40, 36, 31, 20, 21].

For the past scholars researched that "industrial clusters" mostly focused on the impact on innovation system [44, 17, 7]. Or the high-tech regional development strategy based on the science park industry cluster effect [17, 11]. But for the precision machinery of industry cluster alternative factors, cluster formatting factors, cluster effect factors, and correlation of cluster alternative dimensions with cluster formation dimensions, and correlation of industry cluster formatting dimensions and industry cluster effect d dimensions have a lacked of depth discussion. Therefore, this research purpose was to explore industry cluster alternative factors, cluster formatting factors, cluster effect factors, and correlation of cluster alternative dimensions with cluster formation dimensions, and correlation of industry cluster formatting dimensions and industry cluster effect dimensions. In the research methodology, past researches used directly enclosed questionnaire by researchers in accordance with the literature formed survey content and make a good answer questions please manufacturers to answer. This research methodology use the experts, Delphi method, and we collect open-views questionnaire to make contents first in many rounds and further conducted closed design of the questionnaire. After mailing closed questionnaires, we gathered the primary data of this research. Finally we used factor examination to explore the industry cluster alternative factors, cluster formation factors, and cluster effect factors; Utilizing canonical correlation analysis of the multiple-regression analysis explores correlation of industry cluster alternative dimensions with cluster formation dimensions, and correlation of cluster formation dimensions with cluster effect dimensions.

In this research, research framework are as follows: Section 2 are industry cluster alternative, industry cluster formatting, industry cluster effect and correlation of industry cluster alternative dimensions with cluster formation dimensions, and correlation of cluster formation dimensions with cluster effect dimensions related literature review and Hypothesis formed; Section 3 describes research process, framework and method, a questionnaire tools and methods, data collection and factor examination; Section 4 are discussion and results, explaining canonical correlation analysis, testing hypotheses, issues for discussion and testing correlation of industry cluster alternative dimensions with cluster formation dimensions, and correlation of cluster formation dimensions with cluster effect dimensions; Section 5 are conclusions, recommendations, restrictions and suggestions.

II. LITERATURE REVIEW

The main purpose of this research is to explore industry cluster alternative, industry cluster formatting and cluster effects theory, cluster alternative domain with cluster formation dimensions, and correlation of cluster formation dimensions with cluster effect dimensions. Therefore, this research uses the industry cluster alternative, industry cluster formatting and cluster effects, and the correlation of dimensions related literature review as the main explore direction.

A. Industry cluster alternative theory

General enterprises for industry cluster alternative will be different industries and demand differences together. Industry clusters—groups of geographically proximate firms in the same industry—are a striking feature of the geography of economic activity [20]. Some firms with groups develop better resource or competitive positions [24]. Generally industrial clusters alternative have many considerate factors, such as: industry cluster of level, transaction costs and public facilities and other factors. They will directly affect to set up the selection of the site for small and medium enterprises, particularly industry clusters of convenience for the supply chain, products transaction costs are directly related impact, and the surrounding public facilities is complete that will also affect the willingness of enterprises to set up factories; Clusters alternative considerate factors including efficient technological infrastructure, mature innovation production interaction, and competitive advantages with clusters network, all enterprises become one of the considerate industry clusters factors [17]. Learning mechanisms for enterprises adjusting to the new era information technology are needs as they constitute the dynamic element of technological capabilities

[32]. So Learning mechanisms is also one of industry clusters considerate factors; Location specific cluster formation should be promoted, including efficient technological infrastructure, mature innovation production interaction, and competitive advantages [17, 7]. So the industry cluster with regional characteristic is also one of industry clusters considerate factors. Industry clusters alternative will be different from other industries, industry characteristics, ethnic, customer base, and other factors in the industry clusters. The cluster formatting is composed with a group, and for the point of social networks view, groups with all activities are inseparable from the social network of relations. Social network will be divided into three domains: (1) the transaction, (2) link nature: its contents at: a. strength; b. reciprocity; c. expectations clear; d. multiple, and (3) structural characteristics [21]. Industry clusters are characterized by external economies, generalized reciprocity and flexible specialization [10]. It have many factors for example: a comprehensive public facilities and humanities education level, abundant labor market, low cost of land acquisition, and enjoy tax concessions and the future of the plant and sell the land easily. Five major elements of the national system of innovation (NSI) explain the extensive diffusion of new technology in the industry. Namely: industry clusters, educational systems, bridging institutions, government policy, and global business environment [44]. Therefore, the industry cluster alternative in the process will think about the best of their own businesses, the best of the convenience and efficiency of the network as a cluster alternative target.

The scholars will be more choice for the industry cluster theory of literature into the **Table 1**, including 12 variables it were from A1 to A12, its content is A1 convenience of traffic networks (ports, airports, mass transit); A2 cost of land acquirement (price and tax); A3 the degrees of salt and humidity; A4 easy to sell factory buildings and lands; A5 geographic factors (geomancy, magnetic fields, positions, geology); A6 supply of parts (convenience, low cost, and quality); A7 public facilities (water, electric power, postal and cable service, banking, leisure); A8 near to schools, research foundations, and job-training centers; A9 abundant labor forces and human resources; A10 climate (rainfalls, temperatures, humidity, typhoons, earthquakes); A11 cultural level (education, characteristics, customs, religions, diligence); A12 relative assistance infrastructure (kindergartens, shopping malls, medical systems, restaurant, hotels). Then the Section 3 will test factor examination to extract factors of the follow-up research framework dimensions in order to facilitate follow-up research data analysis.

TABLE 1 INDUSTRIES CLUSTER ALTERNATIVE THEORY

Relative literature	A6	A7	A9	A11	A4	A8	A12	A3	A5	A10	A1	A2
Chang et al., 2002		X				X						
Dayasindhu, 2002		X	X	X	X							X
Hu et al., 2005		X				X	X				X	
Krugman 1991, 1995	X	X					X				X	
McCann et al., 2002	X	X				X						
Mollering, 2003	X			X							X	
Pramongkit et al., 2000						X						
Yeh and Chang, 2003						X						
Our creating new (by expert)								X	X	X		

B. Industry cluster formatting theory

Human, biological, and the species needs to survive or convenience, and together referred to “cluster phenomenon”. “Cluster phenomenon” was from the view of ecology, “ecology” research formation of science naturally on the relationship between biological and environmental [34]. In ecology, “population” refers to a certain kind of biological composed groups; “Community” means all ethnic composed groups in a habitat environment; “Ecosystem” is a system composed of the natural environment and a cluster of the lives. Therefore, “Synecology” researches the complex interaction species between on the cluster and in ecology. Above “cluster phenomenon”, it was only general biology, species in the Synecological situation. When it takes place in the various industries, industrial and commercial activities, and the cluster phenomenon was called “industry clusters”. Industry clusters theory origin was in the 1950s, scholars Emerson [12] point out that industry development blocks research industrial growth and development. He believes that the successful industry cluster was mainly in industrial complexes, and up-stream and down-stream the production chain had the effective integration of internal and spontaneous mobile technology. To the late 1970s scholars focused on the company and inter-industry network relationship. Industry network is mainly based on geographic proximity and strategic cooperation on the basis. The companies of network cooperation are mutual benefit between the shared resources and complementary interested, thus producing the industry information, human resources sharing benefits [12, 13, 31, 36, 9]. By the 1980s, “industry cluster” is proposed by Porter [29] a book in the “competitive strategy”, and then it set off a high degree of attention in school official's efforts. It was accompanied by Silicon Valley high-tech industry and Hsin-Chu Science-based Industrial Park achievements. Industry clusters gradually become an important theory on the development of the industry. A cluster may be broadly defined as a geographically concentrated group of competing, collaborating and interdependent firms connected by a system of market and non-market links [9]. Clusters are diverse in terms of time and space, for example: embeddedness and knowledge transfer are key determinists of industry clusters that lead to global competitiveness, thus it attract other companies to join combine [26]. Industry clusters are characterized by external economies, joining the cluster enterprises become more

competitive [10]. When the industry cluster has learning mechanisms, they will increase the effectiveness of learning mechanisms. Learning mechanism is one of the industry clusters formatting factors [32]. Location specific cluster formation should be promoted, including efficient technological infrastructure, mature innovation-production interaction, and competitive advantages. They were direct or indirect impact on enterprises to join cluster considerations [17, 7]. Industry cluster is a regional economic activity of the show, enterprises cope with the economic activities directly or indirectly to seek alliance partners in cooperation network, and then set up alliance partners networking purposes. Alliances are access relationships, and therefore that the advantages which a focal firm derives from a portfolio of strategic coalitions depend upon the resource profiles of its alliance partners. In order to alleviate some factor with depended resource to bring uncertainty, limiting, and it improved the supply chain convenience [6].

The 21st century the enterprises competitiveness depends on cluster of industries with good innovation system could be given more encouragement and intensively emphasized relative to other clusters of industries with poor innovation system [32]. So the innovative system is one of industry cluster formatting factor. Others, enterprise can get highly supported of technology depended in industry cluster, forcing era techniques diffusion, and close communication, an essential aspect of the cluster is the development of close cooperative relationship [16, 39]. The goods, new products required by the market response quickly. In addition, industrial clusters formatting may be related to up-stream or down-stream of the industry, law, market, transport, culture, natural environment and other factors, and caused the industrial clusters effect phenomenon.

The scholars will be more choice for the industry cluster formatting theory of literature into the **Table 2** including 21 variables it were from F1 to F21. Its content is F1 restrictions of political laws; F2 tax-free or premium by government policy; F3 nature formatting industry cluster; F4 convenience by up-stream and down-stream companies as industry clusters; F5 support of related industries; F6 promoting the product quality by related industries competition; F7 convenience to customers by market goods supply; F8 growth of supply and demand of main industry and part processing industry numbers; F9 related industrial institutes to increase information and resources sharing; F10 setting the local

exhibition museums to attract foreign customers; F11 diversity of materials by industrial clusters; F12 center-Satellite factories system (marketing and sell channel); F13 attracting building factories by industrial inner/outer market demand; F14 effects of customer requests and needs; F15 effects of industrial clusters and reputation influences; F16 setting warehouse centers and easy for goods supply; F17 convenience by up-stream and down-stream companies

as industrial clusters; F18 the efficiency of getting inbound and outbound goods with traffic convenience; F19 timing and economy of satellite factories setting; F20 effects of local human-training institutions (job-training centers, schools); F21 influences of local human resources. Then the Section 3 will test factor examination to extract factors of the follow-up research framework dimensions in order to facilitate follow-up research data analysis.

TABLE 2 INDUSTRY CLUSTER FORMATTING THEORY

Relative literature	F 3	F 4	F 5	F 6	F 8	F 11	F 19	F 9	F 10	F 20	F 21	F 7	F 12	F 14	F 15	F 17	F 13	F 16	F 18	F 1	F 2
Ahuja and Katila, 2001			X					X													
Burt, 1983		X			X		X	X				X				X					
Cook et al., 2001		X		X					X			X		X			X	X			
Chang and Tsai, 2002							X	X											X		
Dayasindhu, 2002					X												X				
Emerson, 1962		X				X						X				X		X			
Enright, 2004								X		X	X										X
Gargiulo, 1993		X			X									X	X						
Hung and Yang, 2003			X				X					X									
Hu et al., 2005						X		X											X		
McNamara et al., 2003								X													
Pramongkit et al., 2002								X													
Starr and Taggart, 1989	X																				
Thomas, 2002			X				X					X									
Our create new																					X

C. Industry cluster effects theory

Compared with all scholars views, industry cluster phenomenon can explain one group and produces similar products or the relationship between up-stream and down-stream manufacturers, and the phenomena linked the each other. Cluster showed a concentrated situation in geographic location, geographic location concentrated will bring many benefits, such as: the exchange of information industry, geographic resource sharing, more frequent interaction, competitive-cooperative relationship with each other, and it help manufacturer create cooperation and trust [5, 2, 35]. Industry cluster formatting has four effects for manufacturer: (1) increase interaction between manufacturers; (2) major competitors and cooperation between the partners; (3) increase information and flow; (4) a mutual sense in the same groups [9, 17, 36, 10]. Industry clusters enterprises in the relationship between efficiency and competitiveness composed by the following three dimensions: (1) relation between buyer and supplier; (2) relation between competitor and cooperator; (3) relation of the shared resource. Three dimensions of the relationship improve the effectiveness of their operations. Industry cluster effect are on each industry for mutual visit, healthy competition, product development, and successfully guide the products to enter the market and the process of innovation in every economic obtains benefits [1, 14, 2, 35, 43, 22, 15].

In the era of information explosion, the extent of the information flowed to obtain related information is an important indicator for the enterprises. Company in the industry cluster is more than other companies in the non-cluster easily benefit from information flowed

convenience [31]. Therefore, the industry effect is helpful to obtain the industrial information for the company. In the clusters the enterprises exchange information to improve its resilience, the sharing of information resources, and the extent of the information flowing will have a direct or indirect impact on the competitive and cooperative level [36]. Rapid growth in East Asia, some regions have already produced the phenomenon of regional industry cluster, the cluster effect of the environment, promotion of the East Asian countries have endogenous growth [38]. The U.S.A. is most important source of technology for all countries. In terms of types of technology diffused, the information and communication technology (ICT) cluster of countries is main source of technology acquired in the most countries [28]. Therefore, by cluster effect effectiveness, it makes the information technology product sharing effect in cluster effect. So enterprises must first create good learning mechanisms in order to invoke the large number of new IT, organizations with scientific and technological capabilities to increase the enterprises competitiveness [32]. Clusters effect causes inter enterprises sharing of effectiveness in the cluster, regional cluster effect has significantly helpful industries completeness for the up-stream, middle-stream and down-stream of the supply chain, for example: the Hsinchu Science Park has formed a complete industrial supply value chain [17].

Scholars pointed out that the cluster effect and the R & D system is closely related. Network activities have resulted in setting priority in research and linking research fields that have high potential to coalesce into distinct technological cluster [23]. We argue that in terms of innovation policy the

regional level provided a grounded approach embedded in networks of actors acknowledging the importance of knowledge base of an industry [4]. A group of scholar pointed out that the different levels of cross-innovation system in clusters is more than efficient a single innovation system [18, 25]. That is when the cluster effect appears, enterprises in the cluster are easily influence on regional innovation system and they cause to the impact on the more innovative concept [2]. For Taiwan's machine tool industry cluster effect, it caused in central Taiwan machine tool industry innovation system special circumstances [43]. Therefore, it is worth to explore correlation of industry cluster alternative with cluster formation for Taiwan's machine tool industry.

This study focused on Taiwan's precision machinery cluster effect on the formation of clusters combine innovative elements correlation for in-depth study. The scholars will be more choice for the industry cluster effect theory of literature into the **Table 3**. It were from E1 to E21 including a total of 21 various. Its content is E1 malignant competitions by cluster effects; E2 benignant competitions by cluster effects; E3 promoting operation competitions; E4 exhibitions of the same

industry to influence the business; E5 promoting the related industries and foreign companies to gather in the exhibition; E6 lowering costs of materials and parts; E7 promoting to share information and resources; E8 decreasing delivery costs (transportation and human forces); E9 same trade union and market monopolization; E10 lowering stocks and shortening time of preparing materials; E11 promoting materials just-in-time and convenience; E12 it is better to satellite factories lower R&D cost than center companies; E13 enhancing reputations (credit); E14 promoting the quality of supply chain; E15 promoting product qualities and guarantees to customers; E16 promoting to gather the EDI, EC, e-business; E17 local industries influence customers' confidence; E18 decreasing the benefits of product sales; E19 related industries learning from each other; E20 attracting foreign customers to visit and give order; E21 Increasing in effects of company operations. Then the Section 3 will test factor examination to extract factors of the follow-up research framework dimensions in order to facilitate follow-up research data analysis.

TABLE 3 INDUSTRY CLUSTER EFFECT THEORY

Relative literature	E 4	E 15	E 19	E 20	E 3	E 5	E 6	E 7	E 8	E 9	E 10	E 11	E 12	E 14	E 16	E 13	E 17	E 21	E 1	E 2	E 18
Ahuja and Katila, 2001		X			X			X	X			X				X	X		X	X	
Asheim and Coenen, 2005				X	X																
Ackoff, 1982			X		X	X		X										X			
Bahrami and Evans, 1995		X			X			X				X				X	X		X	X	
Bianchi and Bellin, 1991			X					X													
Cook et al., 2001	X		X			X		X		X											
Dayasindhu, 2002			X			X		X				X									
Ermst, 2001				X				X	X					X							
Hu et al., 2005			X			X	X	X			X	X		X							
Lanjouw and Schankermen, 1999	X																	X	X		
Liyanage, 1995															X						
Papaconstantinou et al., 1998															X						
Poter, 1998					X			X								X		X			
Terutomo, 2003																X	X				X
Trajtenberg, 1990		X		X										X				X			
Swann and Prevezer, 1996	X		X		X	X		X		X					X						
Stuart, 2000		X			X				X			X				X		X			
Yeh and Chang, 2003																				X	
Our create new (by expert)													X								X

D. Correlation of industry cluster alternative with cluster formation

Since the end of the 1980s, the development of the knowledge-based economy, globalization, and international competitive pressure has increased the importance of innovation in local economics [31]. At the same time, Asheim and Coenen [4] researched that an innovation system of localization will provide enterprises for a base of innovation model.

Therefore, the innovation system comprises become an important elements in the industrial clusters. However, it will also affect other businesses choose to join whether the industrial clusters with the innovation system, the question is

worth exploring. The industrial clusters phenomenon can often show in local economic environment. For example: the United States Silicon Valley, the Hsin-chu Science-based Industrial Park are knowledge and technology-based best example in local economics. The industry cluster infrastructure, technical originality, will affect the follow-up enterprises to join one of the cluster the main considerate factors [17]. Therefore, the follow-up enterprises joining the industry cluster consideration and the atmosphere formatting clusters at that time have a significant correlation. So correlation of industry cluster alternative with cluster formation and correlation is an interesting topic and it worth exploring. Scholars study pointed out cities' roles as center of

knowledge flows and creativity are the key determinants of their competitiveness in the knowledge-intensive software industry [43]. New industry cluster in the city will form a new economic structure space in the future, including drawing, software design and multimedia industries. Newly metropolis spatial economy and regional communities, a new industrial economic center transform metropolis core [39]. Therefore, the metropolis has formed the industry cluster phenomenon of new economy, which has become the software industry clusters and infrastructure. Will it attract other opted for the software industry? So correlation of industry cluster alternative with cluster formation and it is worth to explore. General industry clusters in the selection process will be the best of their own businesses, the best of the convenience and efficiency of the network as a cluster alternative target. Because Central Taiwan machine tool industry has cluster effect, it formed phenomenon of the machine tool industry in innovation system [44]. Are subsequently enterprises joining the industry cluster influenced by the original infrastructure, innovative systems and the effect of other factors? It is an interesting and worth exploring the question. Therefore, Correlation of industry cluster alternative with cluster formation is worth exploring the question, a hypothesis of this research form the proposition:

H1: Industry cluster alternative dimensions and cluster formation dimensions have significant correlation

E. Correlation of cluster formation with cluster effect

Industry cluster effects sometimes are different from different types of cluster formation. General “industrial clusters” are many types, as summarized in the following major categories, electronic and biotechnology-based: (1) bio-industry cluster; (2) the computer industry cluster; (3) the biotechnology industry cluster; (4) the electronics industry clusters [36, 38]. The types of cluster effect will show the electronics, bio-technology as the spindle, and the cluster effect is with science and technology capability to play mutual assistance, equipment sharing, and personnel exchange. Knowledge services, infrastructure-based : (1) “Switzerland innovative models” the services cluster [5]; (2) By regional integration, national stability, transport costs and the surrounding public facilities and other factors, determine to site multinational companies behavioral assessment considerations that case are exploring “multinational enterprises clusters” in Singapore [24]; (3) By knowledge transfer, and talents gathered and the global competition, it will explore “software industry cluster” problem in India [10]. These have kept the industry cluster formatting factors and the relative cluster effect is worth exploring an interesting correlation with the question. Learning mechanism is helpful to use new information technology and it makes organizations more scientific and technological capabilities increase the enterprises competitiveness [32]. It is recommended that cluster of industries with good learning potential could be given more encouragement and intensively

emphasized relative to other clusters of industries with poor learning potential [32]. Therefore, learning mechanisms and the cluster effect are complementary and phase-benefit changed. Are learning mechanisms in the industry cluster formatting process also key factors? Less-developed countries always lack well-developed industrial cluster, and nurturing such cluster essential to their economic development, especially technology-base industries [17]. Therefore, enterprises in the industry cluster formatting that the existing infrastructure, surrounding facilities can speed up the technical capacity, and have become key factors in the industry cluster. Hsin-chu Science-based Industrial Park as an example, it explored the cluster formation of high-tech industries [7]. The research found in the high-tech industry clusters including efficient infrastructure, cutting innovation system, and more enterprises have a competitive advantage. Industry cluster effect in the science park has been important effectiveness. Correlation of cluster formation with cluster effect is worth exploring. Therefore, formation of this study was the second hypothesis proposition:

H2: Industry cluster formation dimensions and cluster effect dimensions have significant correlation

III. METHODOLOGY AND PROCESS

Taiwan's precision machinery industry nearly 70 percent of the factories are concentrated in the central region, and formed a very clear “industrial clusters” results [27]. The industry cluster effect for the impact of the enterprises is interesting and worth exploring the question. Through this research, we hope to explore Taiwan's precision machinery correlation of industry cluster formation dimensions with industry cluster alternative dimensions and correlation of industry cluster formation dimensions and cluster effect dimensions.

A. Factor Examination

In this research, the factor examination was conducted using principal component analysis, and with varimax of Orthogonal Rotation. For the number factors of decisions, this research used evaluation that the standard reservation eigenvalue or more than 1. Use SAS software running Rotated factor pattern analysis, the variable factor modules grouped at the factor loading are based on the size. The statistics are as follow, factor loading, cumulative, eigenvalue, and Alpha coefficient.

1. Industry cluster alternative factor

Through literature review, Expert, Delphi method, we can obtain **Table 1** cluster alternative variables from A1 to A12 which are the sum total twelve variables. Then factor examination later, we can get factors which are four eigenvalues bigger than 1. The research denominate four factors of cluster alternative that is “Infrastructure and convenience of support (fa1)” including four variables of A6, A7, A9, A11; “Peripheral facilities and factory transfer (fa2)”

including three variables of A4, A8, A12; “Relevant factors of geography and climate (fa3)” including three variables of A3, A5, A10; “Convenience and land cost (fa4)” including two variables of A1, A2. Four factor’s Cronbach Alpha coefficient are 0.726, 0.735, 0.671, and 0.610. The first three

factors are higher 0.6 standard value. So we can claim the first four factors with quite height reliability (see **Table 4**). Twelve variables for the correlation coefficients answer that P-values are less than 0.05. Therefore it conforms to convergence validity.

TABLE 4 FACTOR ANALYSIS OF INDUSTRIAL CLUSTERS ALTERNATIVE

Factor Code	Variables code and content	Factor loading	Cumulative%	Eigen value	Alpha coefficient
Infrastructure and convenience of support (fa1)	A6. Supply of parts consideration of the degree	0.761	0.362	4.347	0.726
	A7. Public facilities consideration of the degree	0.534			
	A9. Abundant labor forces and human resources	0.704			
	A11. Cultural level consideration of the degree	0.694			
Peripheral facilities and factory transfer (fa2)	A4. Easy to sell factory buildings and lands consideration of the degree	0.599	0.476	1.368	0.735
	A8. Near to schools, research foundations, and job-training centers consideration of the degree	0.771			
	A12. Relative assistance infrastructure consideration of the degree	0.835			
Relevant factors of geography and climate (fa3)	A3. The degrees of salt and humidity consideration of the degree	0.731	0.581	1.262	0.671
	A5. Geographic factors consideration of the degree	0.746			
	A10. Climate consideration of the degree	0.561			
Convenience and land cost (fa4)	A1. Convenience of traffic networks	0.822	0.666	1.011	0.610
	A2. Cost of land acquirement (price and tax) consideration of the degree	0.680			

2. Industry cluster formatting factor

Through literature review, Expert, Delphi method, we can obtain **Table 2** cluster formatting variables from F1 to F21 which are the sum total twenty-one variables. Then Factor examination later, we can get factors which are five eigenvalue bigger than 1. The research denominate five cluster formatting factors that are “Supporting convenience of industrial supply chain (ff1)” including seven variables of F3, F4, F5, F6, F8, F11, F19; “Industrial information and HR share (ff2)” including four variables of F9, F10, F20, F21; “cooperate with marketing and customer convenience (ff3)”

including five variables of F7, F12, F14, F15, F17; “considering factor of market supply convenience (ff4)” including three variables of F13, F16, F18; “factors of policy and law influence (ff5)” including two variables of F1, F2. Five factor’s cronbach alpha coefficients are 0.870, 0.822, 0.776, 0.687, 0.653. All factors are higher 0.6 standard value. So we can claim all factors with quite height reliability (**Table 5**). Twelve variables for the correlation coefficients answer that P-values are less than 0.05. So it conforms to convergence validity.

TABLE 5 INDUSTRY CLUSTER FORMATION FACTOR ANALYSIS

Factor Code name	Variable code name and content	Factor loading	Cumul ative%	Eigen value	Alpha coefficient
Supporting convenience of industrial supply chain (ff1)	F3. Nature formatting industry cluster, and policies, regulations are not affected	0.606	0.389	8.188	0.870
	F4. Convenience by up and down-stream companies as industry clusters	0.678			
	F5. Support of related industries, such as the manufacturing industry required processing industry	0.802			
	F6. Promoting the product quality by related industries competition	0.615			
	F8. Growth of supply and demand of main industry and part processing industry numbers	0.726			
	F11. Diversity of materials by industrial clusters	0.673			
	F19. Timing and economy of satellite factories setting	0.607			
Industrial information and HR share (ff2)	F9. Related industrial institutes to increase information and resources sharing	0.593	0.473	1.747	0.822
	F10. Setting the local exhibition museums to attract foreign customers	0.654			
	F20. Effects of local human-training institutions (job-training centers, schools)	0.770			
	F21. Influences of local human resources	0.812			
Cooperate with marketing and customer convenience (ff3)	F7. Convenience to customers by market goods supply	0.755	0.549	1.597	0.776
	F12. Center-Satellite factories system (marketing and sell channel)	0.431			
	F14. Effects of customer requests and needs	0.513			
	F15. Effects of industrial clusters and reputation influences	0.748			
	F17. Convenience by up and down-stream companies as industrial clusters	0.517			
Considering factor of market supply convenience (ff4)	F13. Attracting building factories by industrial inner/outer market demand	0.546	0.601	1.084	0.687
	F16. Setting warehouse centers and easy for goods supply	0.612			
	F18. The efficiency of getting in and out goods with traffic convenience	0.645			
Factors of policy and law influence (ff5)	F1. Restrictions of political laws such as Hsin-Chu Science Park, Center Taiwan Science Park, Sorthern Taiwan Science Park.	0.867	0.650	1.040	0.653
	F2. Tax-free or premium	0.679			

3. Cluster effect with innovative elements of the business impact factor

Through literature review, Expert, Delphi method, we can obtain **Table 3** Cluster effect with innovative elements of the business impact variables form E1 to E21 which are the sum total twenty-one variables. Then Factor examination later, we can get factors which are five eigenvalue bigger than 1. The research denominate factors that are “Mutual visit between enterprises and attracting foreign customers by cluster effect (fe1)” including four variables of E4, E15, E19, E20; “Reducing enterprise operation cost and improving competition ability by cluster effect (fe2)” including six variables of E3, E5, E6, E7, E8, E9; “Improving supply chain

efficiency and e-enterprise by cluster effect (fe3)” including five variables of E10, E11, E12, E14, E16; “Improving enterprise operation achievement and customer praise by cluster effect (fe4)” including three variables of E13, E17, E21; “Influence on positive/ negative competition of enterprise operation by the combination of cluster effect and innovative factors (fe5)” including three variables of E1, E2, E18. Five factors cronbanch alpha coefficient are 0.790, 0.828, 0.824, 0.735, 0.673. All factors are higher 0.6 standard value. We can claim all factors with quite height reliability (**Table 6**). Twelve variables for the correlation coefficients answer that P-values are less than 0.05. So it conforms to convergence validity.

TABLE 6 CLUSTERS WITH INNOVATIVE ELEMENTS OF THE BUSINESS IMPACT OF FACTOR ANALYSIS

Factor	Code name	Variables code name and content	Factor loading	Cumulative%	Eigen value	Alpha coefficient
Mutual visit between enterprises and attracting foreign customers by cluster effect (fe1)		E4. Exhibitions of the same industry to influence the business	0.700	0.403	8.458	0.790
		E15. Because the cluster effect improves the quality of the products, to the degree which the customer guarantee	0.691			
		E19. Because the cluster effect drives relevant industries to view and emulate, improve the degree of study each other	0.603			
		E20. Because the cluster effect attracts the foreign customer to come to visit, make the order degree	0.721			
Reducing enterprise operation cost and improving competition ability by cluster effect (fe2)		E3. Because the cluster effect improves the competitiveness of managing (such as resources, information sharing) degree	0.541	0.482	1.669	0.828
		E5. Because the joint degree that exhibit that gets both at home and abroad that industry cluster can promote relevant industries	0.612			
		E6. Because the clustering effect can reduce the degree of original supplies, part purchase cost	0.573			
		E7. Because the cluster effect can promote the degree that the information, resource interflow	0.761			
		E8. Because the cluster effect can be reduced and provided and delivered the cost (transporting, manpower) degree	0.648			
		E9. Because the clustering effect causes the degree of the alliance of the same trade or business, market monopolisation	0.502			
Improving supply chain efficiency and e-enterprise by cluster effect (fe3)		E10. Because the degree of time that the cluster effect can reduce the stock of the supplies, get the material ready	0.511	0.545	1.324	0.824
		E11. Because the cluster effect can promote the degree that the supplies melting in time, convenience	0.596			
		E12. Cluster effect than favorable to little factory (follow heavy factory reduce and research and develop the fee) degree	0.588			
		E14. Because cluster effect is it supply chain quality to raise (whether one replace, purchase another) degree	0.779			
		E16. Because the cluster effect improves the degree channeled into EDI, EC, electronic enterprise	0.505			
Improving enterprise operation achievement and customer praise by cluster effect (fe4)		E13. Because the cluster effect can promote the public praise (prestige, pays the bill, stability) degree interflowed	0.725	0.605	1.255	0.735
		E17. Because the regional industry public praise of cluster effect influences the degree of customer's confidence	0.606			
		E21. Because the cluster effect helps to improve the degree that enterprises manage benefit wholly	0.569			
Influence on positive/negative competition of enterprise operation by the combination of cluster effect and innovative factors (fe5)		E1. Because the cluster effect causes the malignant competition (as price war, secret outside) degree	0.814	0.654	1.022	0.673
		E2. Because the cluster effect causes the benign competition (such as quality, product development) degree	0.467			
		E18. Because the cluster effect causes the degree that the profit of sales reduces	0.805			

B. Research Framework

The framework chart of this research is based on introduction of the section1 and the industry cluster literature of the section 2 and experts discuss the results. It included industry cluster alternative, industry cluster formatting and the cluster effect of three dimensions as the framework chart on the spindle. Each dimension is impact on dimensions with

arrows indicating to another. The arrow is on behalf of the dimensions impact of inter-directional. Finally two hypotheses test that correlation of industry cluster alternative dimensions with cluster formation dimensions and correlation of cluster formation dimensions with cluster effect dimensions (See **Fig. 2**).

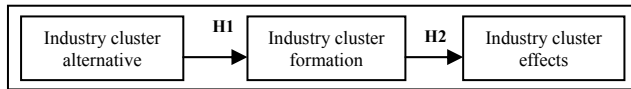


Figure 2 Research framework chart

C. Formation of questionnaire tools

Many past scholars' research all used closed questionnaire, which researchers literature become the content of the closed questionnaire. It will be different from other industries and it is hard to avoid bias of concern. In addition to the extensive collecting research literature, we find the experts of the industry to make Experts, Delphi method, the multi-round approach to the collect open-views content and further consolidate into enclosed questionnaire. Through the implementation of the survey, questionnaire investigation collects from information on the initial cost of the research.

D. Sampling design

Enterprises set up factories and companies that mostly business owners, senior managing director or general manager consider the overall interests of enterprises. The investigation of this research should be Taiwan's precision machinery industry with business owners, general manager, and senior managing director for the best object. It Survey manufacturers as the central Taiwan region based precision machinery industry, and reference the Commercial Times published central Taiwan precision machinery industry directory [37] in the machine tool 500 manufacturing. It included 500 industrial machinery industries, a trade or vendors 100 manufacturers, 100 manufacturers parts

industries, the manufacturing sector 100 stamping machines, components supply industry, such as total of the 1400 manufacturers as research population. The method is survey research. Through a questionnaire survey to collect information on industry clusters alternative dimensions, the correlation of cluster formation and clusters effect of dimensions. Sample is from a research of population to select. The principle of stratified random sampling method chosen part to replace the overall investigation and the results of the survey infer to the overall situation.

E. Data collection

1. The sample retrieving and examining

After expert's questionnaire, it will send out formal questionnaires on February 15, 2004. A total of 280 questionnaires were sent. So far we had recovered 48 questionnaires on March 5, and then followed by telephone for the first time with the reminder questionnaires. We had only received 25 questionnaires On March 12, 2004, and later take second telephone reminders to 93 questionnaires on May 5, and then we only 20 questionnaires were received. We total recovery 93 questionnaires, which there are three questionnaires were unable to use and the remaining 90 questionnaires were available "18 of questionnaires in the field survey". The recovery effective rate is 25%. Precision machinery industry in the chain both balanced distribution in the six industries.

2. Samples background

TABLE 7 INDIVIDUALS AND COMPANIES BASIC BACKGROUND INFORMATION

Background information project		Number of people	Percentage	Total
Sex	Man	68	75.6%	90
	Women	22	24.4%	
Education degree	High school grades	27	30%	90
	Training	35	38.9%	
	University	15	16.7%	
	Master	7	7.8%	
	Doctor	1	1.1%	
	Other (under high school)	5	6.7%	
Length of service	2 years (include) Following	8	8.9%	90
	3-5	16	17.8%	
	6-8	12	13.3%	
	9-10	4	4.4%	
	More than 10 years	52	57.8%	
Company Capital	5 million (include) Following	17	18.9%	90
	5,010,000-10 million	21	23.3%	
	10,010,000-50 million	12	13.3%	
	50,010,000-100 million	11	12.2%	
	More than 100 million	27	30%	
The total number of employees	Under 10 people	24	26.7%	90
	11-50 people	23	25.6%	
	51-100 people	12	13.3%	
	101-300 people	6	6.7%	
	More than 301 people	25	27.8%	
The industry	Manufacturing industry of the tool machine	23	25.6%	90
	Industry's machinery industry	13	14.4%	
	Manufacturing industry of the pressing machine	3	3.3%	
	Processing industry of the part	9	10%	
	Industry that supplies spare part	14	15.6%	
	Trade or merchandising business	19	21.1%	
	Other	9	10%	

3. No-response bias

In order to test samples characteristics of three questionnaires on whether differences, we carried out non-response bias test. Do the chi-square test on the three variables from sex, education, length of service in background information table. The significant level is 0.05. If p-value approved more than 0.05, there was no significant difference between three testers. Information can combine to analyze on next step. If p value approved less than 0.05, there was significant difference in the properties between three testers. Information will be discarded. Research inferences only apply to recall the samples on the first time. No-response bias test results are that there was no significant response bias. The three questionnaires are valid recovered merger analysis.

F. Reliability and validity

To ensure this research the quality, we do the test of reliability and validity. Reliability is the same or similar samples to duplicate the results of testing the extent consistent. This research set reliability that Cronbach coefficient is over 0.6. Data analysis results meet the reliability test. Validity can be divided into content validity and face validity. The surveys of the literature from the contents meet the face validity. The survey contents that the last survey completed by the experts using Delphi method, meet the content validity.

IV. RESULT ANALYSIS

This section is data analysis, hypothesis testing, and results showed for the recovery of the survey data. For the following hypothesis testing as follows:

A. Canonical Correlation

General linear regression analysis can analyze different variables of relevance. The research uses multiple linear regression analysis of canonical correlation to test the various dimensions correlation. It is mainly the correlation between the two variables in the research. Canonical Correlation is technology to combine the dependent variables and independent variables. The two variables can predict each other and equal status; it would not need to separate clearly who independence variable is and who dependent variable is.

The research canonical correlation equation is as follows:

$$Y_1+Y_2+Y_3+-----+Y_n = X_1+X_2+X_3+-----+X_n$$

B. Test of association: Industry clusters alternative dimensions and clusters formatting dimensions

From the literature on section 2, it obtain a hypothesis

H1: Industry cluster alternative dimensions and cluster formation dimensions have significant correlation

In the correlation of cluster alternative dimensions and industry cluster formation dimensions, this research uses the

canonical correlation analysis to test H1. After canonical correlation analysis, we obtain four groups of canonical function as shown in **Table 8**. Thorndike [41] pointed out that select correlation function in addition to the significant F-statistic value as assessment criteria, we must also use canonical R2 as a basis, if canonical R2 value less than 0.1 is not used. After analysis data, we obtained two canonical function canonical R2> 0.1, that are 0.7133, 0.2551, and P-values are 0.0001, 0.0044. Conform to above assessment criteria, we choose the only two functions as follow-up explanation of basis. Besides canonical R2 and the F-statistic value, Thorndike [41] pointed out that if prediction variable of cross-loading coefficients greater than 0.3, it may be that a variable has predicted ability on dependent variables. By **Figure 3** we found the various dimensions of the variables that the cross-loading coefficients are greater than 0.3. Five dependence variables on industry cluster alternative dimensions and five independence variable on cluster formation dimensions have the predicted capacity with each other. Therefore, it was verifiable that industry cluster alternative dimensions and cluster formation dimensions have significant correlation. From industry cluster alternative dimensions and industry cluster formation dimensions of canonical correlation the model, we can know cluster alternative dimensions that “infrastructure and convenience of support (fa1)” and “peripheral facilities and factory transfer (fa2)” two dependence variables most predict independence variable “clusters formatting dimensions”. On cluster formatting dimensions, “industrial information and HR share (ff2)” and “supporting convenience of industrial supply chain (ff1)” two dependence variables most predict dependence variable “clusters alternative dimensions”. Clusters alternative dimensions of two dependence variables fa1, fa2 and clusters formatting dimensions of two dependence variables ff1, ff2 have high significant correlation. SMC (square multiple correlation) is the dependent variable or independent variables, and explain the dependent dimensions of function and independent dimensions of function significant correlation capacity. “Infrastructure and convenience of support (fa1)” explaining “cluster formatting dimension” function for the SMC is 49.09%. “Peripheral facilities and factory transfer (fa2)” explaining “cluster formatting dimension” function for the SMC is 45.67%. Other variables explain “cluster formatting dimension” function for the SMC to see figure 3 show. Further examination, “industrial information and HR share (ff2)” explaining “cluster alternative dimension” function for the SMC is 56.09%. At the same time, “Supporting convenience of industrial supply chain (ff1)” explaining “cluster alternative dimension” function for the SMC is 46.77%. Other relevant information is shown in **Figure 3**. Therefore, the dependent variables fa1, fa2 and independent variables ff1, ff2 are highly explained the dependent dimensions of function and independent dimensions of function significant correlation capacity.

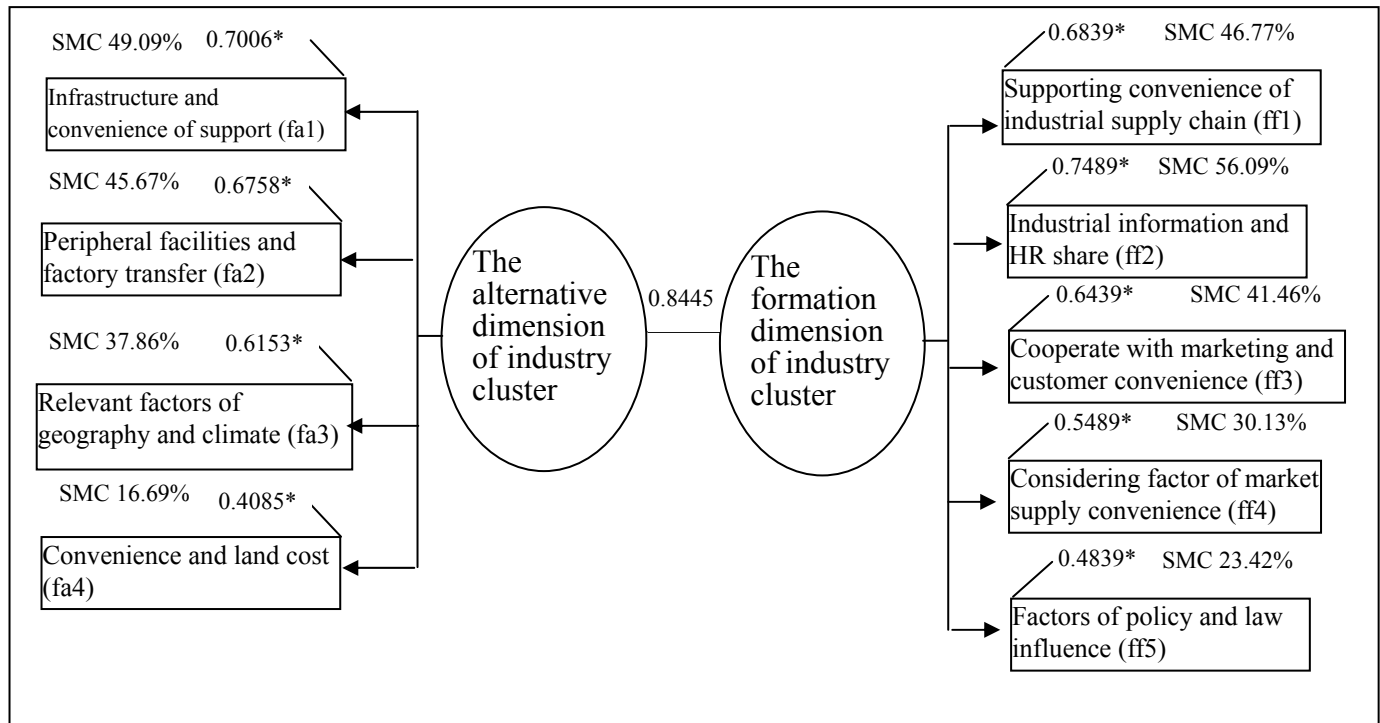
TABLE 8 CANONICAL CORRELATION ANALYSIS OF INDUSTRY CLUSTER ALTERNATIVE DIMENSIONS AND INDUSTRIAL CLUSTERS FORMATTING DIMENSIONS

Canonical Function model	Eigenvalue	Canonical Correlation	Canonical R ²	F-values	P-values
1	2.4881	0.8446	0.7133*	8.30	<.0001***
2	0.3424	0.5051	0.2551*	2.49	0.0044***
3	0.0373	0.1896	0.0359	0.66	0.6838
4	0.0105	0.1017	0.0103	0.44	0.6462

***: P<0.001; **: P<0.05; *: Canonical R² values >0.1

In short, above the cross-loading and SMC analysis, clusters alternative dimensions fa1, fa2, fa3, fa4 four dependent variables have predicted and explained cluster formation dimensions variance ability. At the same time ff1, ff2, ff3, ff4, ff5 five variables have predicted and explained

cluster alternative dimensions variance capacity. Thus, the good cluster alternative factors can have significant correlation on the formation of clusters quickly. It accepted the H1.



*: Cross Loading coefficient >0.3

Figure 3 Industry cluster alternative dimensions and industry cluster formation dimensions of canonical correlation the model

C. Test of association: Industry clusters formatting dimensions and clusters effect dimensions

From the literature on section 2, it obtain a hypothesis 2

H2: Industry cluster formatting dimensions and cluster effect dimensions have significant correlation

In the correlation of cluster formation dimensions and industry cluster effect dimensions, this research uses the canonical correlation analysis to test H2. After canonical correlation analysis, we obtain five groups of canonical function as shown in Table 9. After analysis data, we obtained three canonical functions canonical R²> 0.1, that are 0.5062, 0.2289, 0.2179 and P-values are 0.0001, 0.001, and 0.0017. Above three functions conform to assessment criteria,

we choose three functions as follow-up explanation of basis. By Figure 4, we found the various dimensions of the variables that the cross-loading coefficients are greater than 0.3. Five dependence variables on industry cluster formatting dimensions and five independence variables on cluster effect dimensions have the predicted capacity with each other. Therefore, it was verifiable that industry cluster formatting dimensions and cluster effect dimensions have significant correlation. From industry cluster formatting dimensions and industry cluster effect dimensions of canonical correlation the model, we can know cluster formatting dimensions that “Industrial information and HR share (ff2)”, “Supporting convenience of industrial supply chain (ff1)” and “cooperate with marketing and customer convenience (ff3)” three

dependence variables most predict independence variable “clusters effect dimensions”. On clusters effect dimensions, “Mutual visit between enterprises and attracting foreign customers by cluster effect (fe1)”, “reducing enterprise operation cost and improving competition ability by cluster effect (fe2)” and “improving supply chain efficiency and e-enterprise by cluster effect (fe3)” three dependence variables most predict dependence variable “clusters formatting dimensions”. Clusters formatting dimensions of three dependence variables ff1, ff2, ff3 and clusters effect dimensions of three dependence variables fe1, fe2, and fe3 have high significant correlation. “Industrial information and HR share (ff2)” explaining “cluster effect dimension” function for the SMC is 38.17%. “Cooperate with marketing and customer convenience (ff3)” explaining “cluster effect dimension” function for the SMC is 34.12%. “Supporting convenience of industrial supply chain (ff1)” explaining “cluster effect dimension” function for the SMC is 28.05%. Other variables explain “cluster effect dimension” function for the SMC to see **Figure 4**. Further examination, “reducing enterprise operation cost and improving competition ability

by cluster effect (fe2)” explaining “cluster formatting dimension” function for the SMC is 40.98%. At the same time, “mutual visit between enterprises and attracting foreign customers by cluster effect (fe1)” explaining “cluster formatting dimension” function for the SMC is 37.17%. “Improving supply chain efficiency and e-enterprise by cluster effect (fe3)” explaining “cluster formatting dimension” function for the SMC is 31.46%. Other relevant information is shown in **Figure 4**. Therefore, the dependent variables ff1, ff2, ff3 and independent variables fe1, fe2, fe3 are highly explain the dependent dimensions of function and independent dimensions of function significant correlation capacity.

In short, above cross-loading and SMC analysis, clusters formatting dimensions ff1, ff2, ff3, ff4, ff5 five dependent variables have predicted and explained cluster effect dimensions variance ability. At the same time fe1, fe2, fe3, fe4, fe5 five variables have predicted and explained cluster formatting dimensions variance capacity. Thus, the good cluster formatting factors can have significant correlation on the clusters effect quickly. It accepted the H2.

TABLE 9 CANONICAL CORRELATION ANALYSIS OF INDUSTRY CLUSTER FORMATTING DIMENSIONS AND INDUSTRIAL CLUSTERS EFFECT DIMENSIONS

Canonical function model	Eigenvalue	Canonical Correlation	Canonical R ²	F-values	P-values
1	1.0249	0.7114	0.5062*	4.93	<.0001***
2	0.2969	0.4785	0.2289*	3.23	<.0001***
3	0.2786	0.4668	0.2179*	3.10	0.0017***
4	0.0542	0.2267	0.0514	1.52	0.1975
5	0.0195	0.1384	0.0192	1.64	0.2037

*** P<0.001; ** P<0.05

● Canonical R² values >0.1

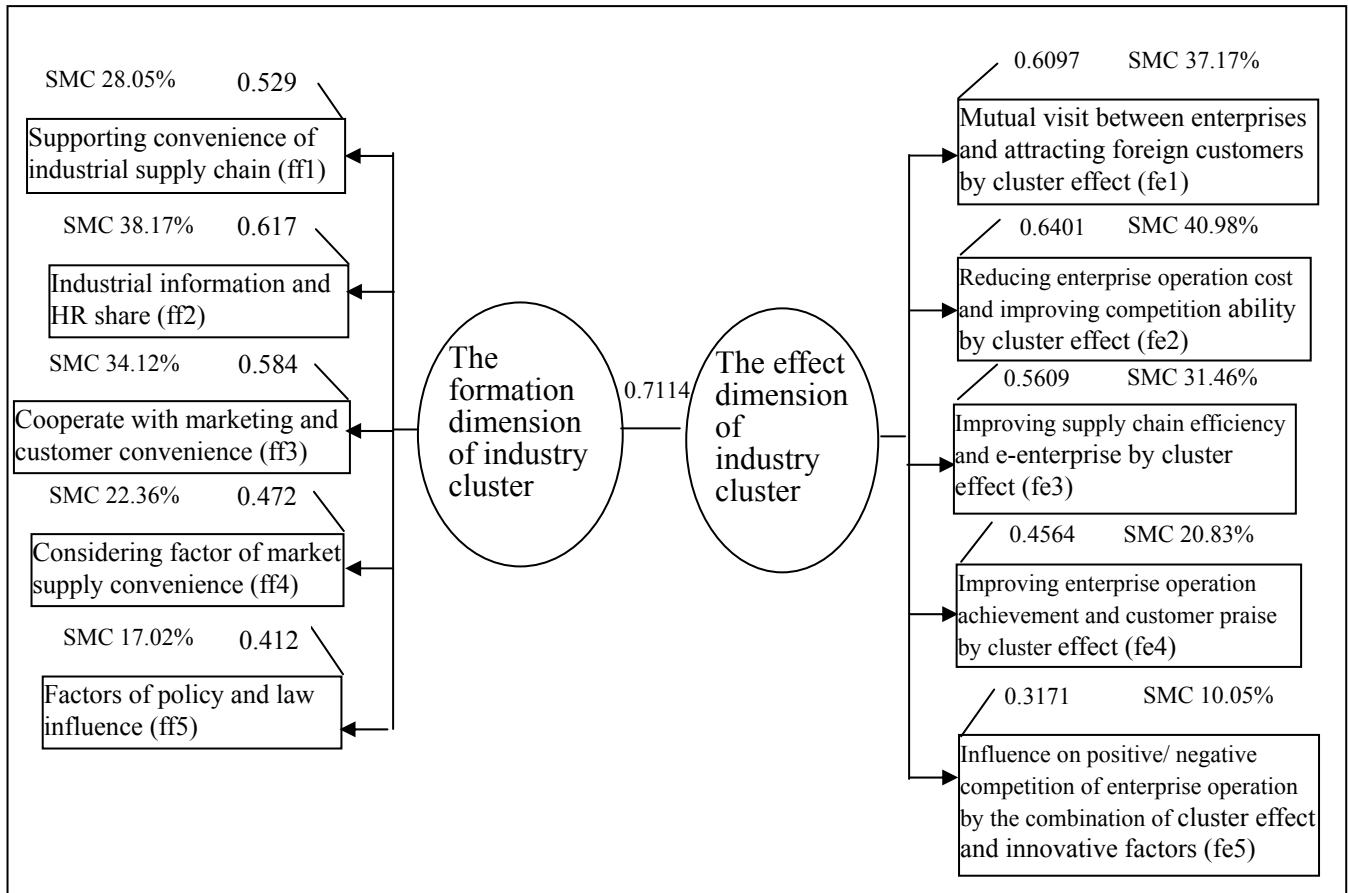
D. Discuss

This section related that correlation of cluster alternative, cluster formatting process and cluster effect .When cluster effect influence on enterprise, cluster formatting and cluster transfer three issues for further discussion, clusters transfer explore their time and effect.

1. Correlation of industry cluster alternative with cluster formation and correlation of cluster formation with cluster effect

Industry cluster effect process can divide into three stages that are clusters alternative, cluster formatting and cluster effect. In this cluster alternative stage, enterprises will direct itself industries, industry characteristics, customers, infrastructure, peripheral facilities, geography and climate, convenience of support. Enterprises make a careful assessment and choose to join. Industry clusters formatting can be different from time and space, and the cluster formatting types will be different, for example: learning mechanisms, innovative organizations and embeddedness.

Considerate factors are technology-related infrastructure, peripheral measures, sharing resources, facilitates market and innovation system factors. This research do multiple regression analysis to explore clusters alternative, clusters formatting, clusters effect three dimensions and make a figure (see **Figure 5**). From the information, industry cluster alternative dimensions “infrastructure and convenience of support (fa1)” factor and cluster formation dimensions have the maximum correlation. Secondly it is the “relevant factors of geography and climate (fa3)”, and the next is “peripheral facilities and factory transfer (fa2)”. Three factors on the cluster formatting have closely correlation. On the correlation of clusters formatting and cluster effect, the formatting dimension of industry cluster “Industrial information and HR share (ff2)” factor has the best significant correlation. Secondly it is the “cooperate with marketing and customer convenience (ff3)”, and the next is “supporting convenience of industrial supply chain (ff1)”, “factors of policy and law influence (ff5)”. Four factors on the formation of clusters have closely correlation.



*: Cross Loading coefficient >0.3

Figure 4 Industry cluster formatting dimensions and industry cluster effect dimensions of Canonical Correlation the model

2. Cluster effect

Is the cluster effect the positive impact? Where is its real benefit? With the business environment change quickly and face the competitive pressures the market, how to reduce production cost, improve supply chain efficiency and the competitiveness of enterprises? It will become enterprises to seek goals. The research found that improving supply chain efficiency and competition ability by cluster effect have significant impacts. It also found that industry clusters effects will be affected on mutual visit between enterprises and attracting foreign customers. Industry clusters effects will be affected on reducing enterprise operation cost and improving competition ability. Industry clusters effects will affect on improving enterprise operation achievement and customer praise. Above results of the analysis, we can understand industry cluster effect on enterprises performance that has a positive impact. In addition, the cluster effects have the negative impact from the industry research. It will carve up the resources in the area, and caused high staff turnover and

poor stability. If the clusters are all independent areas declined or the image of the poor, the cluster have a negative impact, such as Bangkok, Thailand, pornography and dirty, and Southeast Asia's Golden Triangle, such as drug trafficking and crime. Therefore, how to make the best cluster effect of positive results, and reduces the negative impact of cluster effect? It is that enterprises must be reflection of the breakthrough in the future.

3. Cluster migration

In the animal world and the human, we can find migration clusters in many circumstances, such as migratory birds caused climate change and migration, rhinoceros and sheep who seek new grassland and movement. Some examples are that ancient human avoid war, for food, open frontiers and the capital relocation. In the industry cluster formatting for some time, do certain factors cause the cluster migration? When is the best timing of migration? How is the effect of replication clusters? These are the issues worthy discussing in the future.

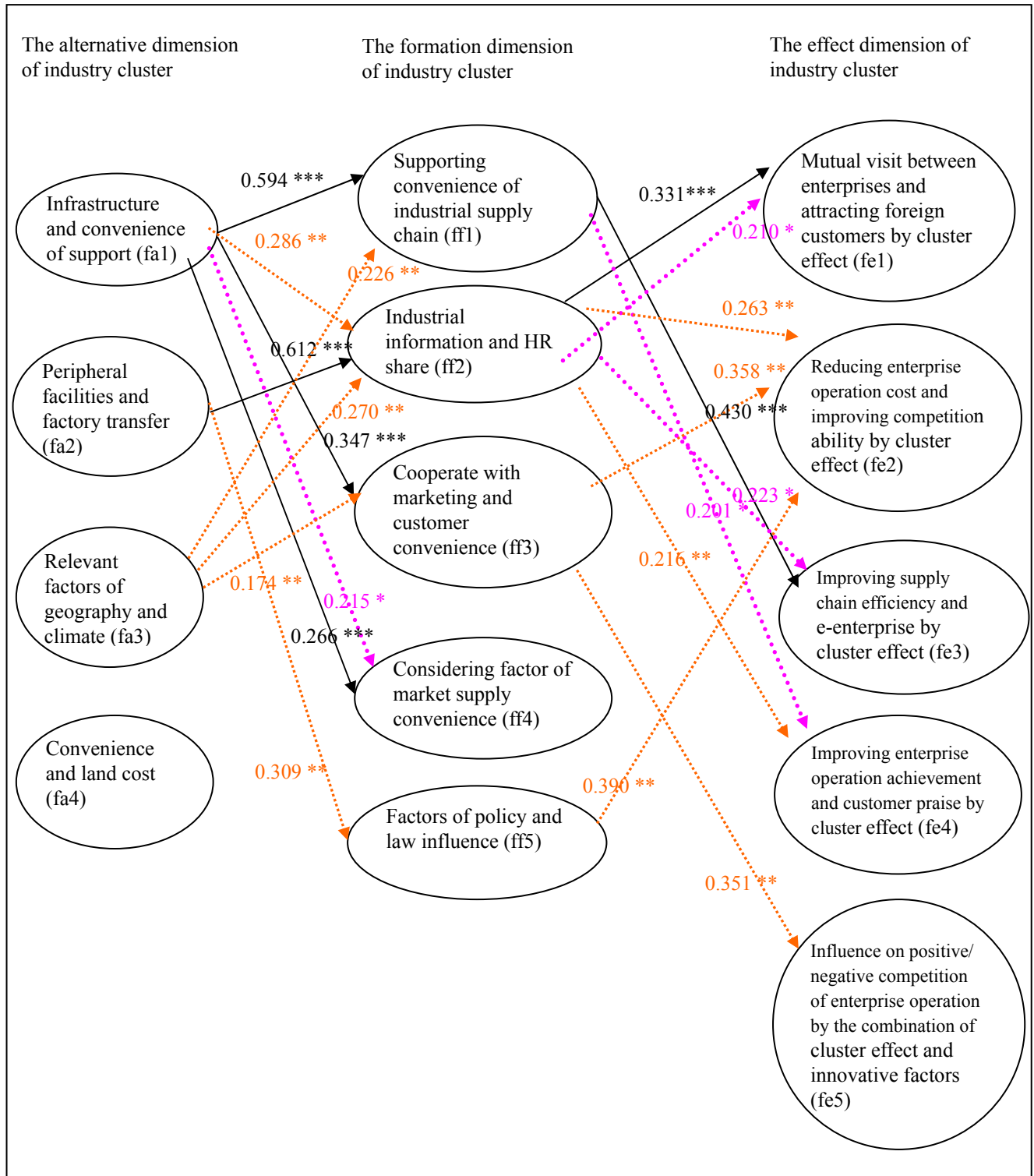


Figure 5 Correlation of industry cluster alternative, cluster formation, cluster effect

V. CONCLUSION AND SUGGESTION

The past scholar research, “The innovation system of the Taiwan tool machine industry: a case study” [43], and

“Technology-based regional development strategies and the emergence of technological communities: a case study of HSIP, Taiwan” have deeply discussed [17]. Correlation of cluster alternative with cluster formatting and correlation of

cluster formatting with cluster effect have less explored. This research select the issue “correlation of cluster alternative with cluster formatting and correlation of cluster formatting with cluster effect”, and Taiwan's precision machinery industry as an example to understand the three dimensions of correlation

A. Correlation of cluster alternative dimension, cluster formatting dimension, cluster effect dimension

In recent years, Southeast Asian region, mainland China have many industry cluster phenomenon and product the cluster effect of substantive results, the cluster effect also have a real effect on the business [9, 17, 36]. However, industry clusters formatting phenomenon may be hidden a number of factors behind. Therefore, understanding enterprises to join the cluster considerations and the reasons for the clusters formatting is worth exploring the question. Other industry cluster effect will be the development of management contribution. Therefore, this research issues focus on “correlation of cluster alternative dimension with cluster formatting dimension, and correlation of cluster formatting dimension with cluster effect dimension”, and Taiwan's precision machinery industry as an example.

We select four key factors by factor examination from the cluster alternative dimension information, including “infrastructure and convenience of support (fa1)”, “peripheral facilities and factory transfer (fa2)”, “relevant factors of geography and climate (fa3)” and “convenience and land cost (fa4)”. Especially “infrastructure and convenience of support (fa1)” and “peripheral facilities and factory transfer (fa2)” two factors most predict independence variable on “clusters formatting dimensions”. We select five important factors from the cluster formatting dimension information, including “supporting convenience of industrial supply chain (ff1)”, “industrial information and HR share (ff2)”, “cooperate with marketing and customer convenience (ff3)”, “considering factor of market supply convenience (ff4)”, and “factors of policy and law influence (ff5)”. Especially “industrial information and HR share (ff2)”, “supporting convenience of industrial supply chain (ff1)” and “cooperate with marketing and customer convenience (ff3)” three dependence variables most predict independence variable on “clusters alternative dimensions”. At the same time, the cluster dimensions of “infrastructure and convenience of support (fa1)”, “peripheral facilities and factory transfer (fa2)” and “relevant factors of geography and climate (fa3)” key factor, those will be reflected in the clusters formatting dimensions “industrial information and HR share (ff2)”, “supporting convenience of industrial supply chain (ff1)” and “cooperate with marketing and customer convenience (ff3)”. By analysis data, we obtained “correlation of cluster alternative dimension with cluster formatting dimension” canonical correlation coefficient is 0.8445, canonical R^2 is 0.7133, and F-value is 8.30. Therefore, we get the conclusion that industry cluster alternative dimensions and cluster formatting dimensions have significant correlation. Good cluster alternative factors

are helpful quickly clusters formatting of effectiveness and the higher the selectivity of industry cluster alternative will have the higher clusters formatting.

We select five key factors by factor examination from the cluster effect dimension, including “mutual visit between enterprises and attracting foreign customers by cluster effect (fe1)”, “reducing enterprise operation cost and improving competition ability by cluster effect (fe2)”, “improving supply chain efficiency and e-enterprise by cluster effect (fe3)”, “improving enterprise operation achievement and customer praise by cluster effect (fe4)”, and “influence on positive/ negative competition of enterprise operation by the combination of cluster effect and innovative factors (fe5)”. Especially “mutual visit between enterprises and attracting foreign customers by cluster effect (fe1)”, “reducing enterprise operation cost and improving competition ability by cluster effect (fe2)” and “improving supply chain efficiency and e-enterprise by cluster effect (fe3)” three factors most predict independence variable on “clusters formatting dimensions”. We select three key factors from the cluster formatting dimension information, including “industrial information and HR share (ff2)”, “supporting convenience of industrial supply chain (ff1)” and “cooperate with marketing and customer convenience (ff3)”. Three factors most predict independence variable on “clusters formatting dimensions”. At the same time, the three key factors of “reducing enterprise operation cost and improving competition ability by cluster effect (fe2)”, “mutual visit between enterprises and attracting foreign customers by cluster effect (fe1)” and “improving supply chain efficiency and e-enterprise by cluster effect (fe3)”, those will be reflected in the clusters formatting dimensions. By analysis data, we obtained “correlation of cluster formatting dimension with cluster effect dimension” canonical correlation coefficient is 0.7114, canonical R^2 is 0.5062, and F-value is 4.93. Therefore, we get the conclusion that the higher the selectivity of industry cluster formatting will have the higher clusters effect, and industry cluster alternative dimensions and cluster formatting dimensions have significant correlation. Two dimensions have high correlation. Good cluster formatting factors are helpful quickly clusters effect of effectiveness.

B. Managerial implication

Cluster effect on the business can help to bring some benefits such as: exchange information, sharing resources, competing relations and frequent interaction, manufacturers created cooperation and trust space [3, 8, 35]. From the research data showed that, “cluster effect can improve supply of materials in time and convenience”, this factor attaches importance to. Second is that “effects caused clusters healthy competition”, such as quality, product development. The next is that “effect caused mutual visit between enterprises and learning”. Thus, this research can find factors and in front of scholars have pointed out that factors are the same.

Scholars pointed out that cluster phenomenon products

similar production, or upstream-downstream relationship between enterprises, linking between the phenomena. The cluster effects bring the enterprise information sharing, human resource sharing, mutual visit between enterprises, competitive-cooperative effect [35, 3, 14]. From the research found that the dimensions of clusters formatting “industrial information and HR share” for business “mutual visit between enterprises and attracting foreign customers by cluster effect” have highly significant positive correlation. Industrial information share also affects customer praise, for company confidence and efficiency, and it have a significant positive correlation. Therefore, the research responds above scholars have pointed out the cluster effect caused mutual visit between enterprises and competitive-cooperative effect. Scholars pointed out that cluster effect for product development, and guide products to enter the market, the mutual visit between industries, the process of innovation and it will be better efficiency on economic [42, 35, 14, 3]. From the research found, cooperate with marketing and customer convenience will be influence on positive and negative competition of enterprise operation. In other words, when product development, and guide products to enter the market well, cooperates with marketing and customer convenience will be influence on positive competition of enterprise. They also accords with the above arguments by scholars. Cluster effect will reduce enterprise operation cost and improving competition ability. Industrial information and HR share will improve supply chain efficiency and e-enterprise. But the relationship are lower significantly correlation. Therefore, the above exploratory analysis can see that, industry cluster formation dimensions of industrial information and HR share will have significantly positive correlation on mutual visit between enterprises and attracting foreign customers. Industry cluster formatting dimensions of supporting convenience of industrial supply chain will have significantly positive correlation on improving supply chain efficiency and e-enterprise. Industry cluster formatting dimensions of cooperating with marketing and customer convenience will have significantly positive correlation on reducing enterprise operation cost and improving competition ability by cluster effect and it will have significantly correlation that cluster effect is influence on positive and negative competition of enterprise operation by the combination of cluster effect and innovative factors.

C. Research limitation

This research target focused on precision machinery industry, such as: optical, microelectronics, electronic devices and other precision machinery is not within the research scope. This result only indicated for precision machinery industry statutory. Although this research the questionnaire survey objects have made the plan, but in the mail survey, the researchers did not control, it will inevitably produce deviation. Machine tools are precision machinery industry value chain included a wide range of related industries. Because funding and time limited, we are unable to have

included in the study target. All the above three points are limitations of this research.

D. Suggestion and future research

Industry cluster are different from different industries. This research focused on Taiwan's precision machinery industry, and precision machinery industry is a group of technician or mechanic on his own early. The beginnings of these companies are the small size, which are technology-based. The cluster formatting is different from a number of capital-intensive high-tech industry clusters formed by the cluster effect. Therefore, we proposed follow-up researchers can move in different regions or industries other research. At the same time, industry cluster alternative, formatting reasons may also use different research methods, for example: AHP, grey theory, fuzzy theory and other methods. It will make up for changes in the environment quickly. In addition, information showed that it will have influence on positive, negative competition of enterprise operation by the combination of cluster effect and innovative factors. And it had significantly positive correlation. As it will be positive or negative influence and impact, it is a good follow-up study direction of the considerations.

REFERENCES

- [1] Ackoff, R. L. (1982), “Creating the Corporate Future”, New York: Wiley.
- [2] Ahuja, G. and Katila, R. (2001), “Technological acquisition and the innovative performance of acquiring firms: a longitudinal study”, *Strategic Management Journal*, Vol. 22(4), pp.197-220.
- [3] Ahuja, G. and Katila, R. (2004), “Where do resources come from? The role of idiosyncratic situations”, *Strategic Management Journal*, Vol. 25(8-9), pp.887-907.
- [4] Asheim, B. T. and Coenen, L. (2005), “Knowledge bases and regional innovation systems: Comparing Nordic clusters”, *Research Policy*, Vol. 34(8), pp. 1173-1190.
- [5] Bahrami, H. and Evans, S. (1995), “Flexible Recycling and High-Technology Entrepreneurship”, *California Management Review*, Vol. 37(1), pp.62-89.
- [6] Burt, Ronald S. (1983), *Corporate Profits and Cooptation: Networks of Market Constraints and Directorate Ties in the American Economy*, Academic Press, New York.
- [7] Chang, P. L. and Tsai, C. T. (2002), “Finding the niche position: competition strategy of Taiwan's IC design industry”, *Technovation*, Vol. 22(2), pp.101-111.
- [8] Chandler, A. D. Jr. and Bruce M. eds., (2005), “Leviathans: Multinational Corporations and the New Global History”, U.K.: Cambridge University Press.
- [9] Cook, G., Pandit, N. R., & Swann, P. (2001), “The dynamics of industrial clustering in British broadcasting”, *Information Economics and Policy*, Vol. 13(2), pp.351-375.
- [10] Dayasindhu, N. (2002), “Embeddedness, Knowledge Transfer, Industry Cluster and Global Competitiveness: A Case Study of the Indian Software Industry”, *Technovation*, Vol. 22(3), pp.551-560.
- [11] Echols, A. and Tsai, W. (2005), “Niche and performance: the moderating role of network embeddedness”, *Strategic Management Journal*, Vol. 26(3), pp. 219-238.
- [12] Emerson, R. M. (1962), “Power Dependence Relations”, *American Sociological Review*, Vol. 27(1), pp.31-41.
- [13] Enright, M. J. and Newton, J. (2004), “Tourism destination competitiveness: a quantitative approach”, *Tourism Management*, Vol.

- 25(6), pp. 777-788.
- [14] Ernst, H. (2001), "Patent applications and subsequent changes of performance: evidence from time-series cross-section analyses on the firm level", *Research Policy*, Vol. 30(3), pp.143-157.
- [15] Hollenstein, H. (2003), "Innovation modes in the Swiss service sector: a cluster analysis based on firm-level data", *Research Policy*, Vol. 32(2), pp.845-863.
- [16] Hung, S. W. and Yang, C. (2003), "The IC fables industry in Taiwan: current status and future challenges", *Technology in Society*, Vol. 25(4), pp.385-402.
- [17] Hu, T. S., Lin, C. Y., and Chang, S. L. (2005), "Technology-based regional development strategies and the emergence of technological communities: a case study of HSIP, Taiwan", *Technovation*, Vol. 25(2), pp.367-380.
- [18] Koka, B. R. and Prescott, J. E. (2002), "Strategic alliances as social capital: A multidimensional View", *Strategic Management Journal*, Vol. 23, pp. 795-816.
- [19] Krafft, J. (2004), "Entry, exit and knowledge: evidence from a cluster in the info-communications industry", *Research Policy*, Vol. 33(10), pp. 1687-1706.
- [20] Krugman, P. (1991), "Geography and Trade", The MIT Press, Cambridge, MA.
- [21] Krugman, P. (1995), "Development, Geography and Economic Theory", The MIT Press, Cambridge, MA.
- [22] Lanjouw, J. O. and Schankerman, M. (1999), "The Quality of Ideas: Measuring Innovation with Multiple Indicators", NBER working paper, p.7345.
- [23] Liyanage, S. (1995), "Breeding innovation clusters through collaborative research networks", *Technovation*, Vol. 15(9), pp. 553-567.
- [24] McCann, P., Arita, T. and Gordon, I. R. (2002), "Industrial clusters, transactions costs and the institutional determinants of MNE location behavior", *International Business review*, Vol. 11(6), pp.647-663.
- [25] McEvily, S. K. and Bala, C. (2002), "The persistence of knowledge-based advantage: an empirical test for product performance and technological knowledge", *Strategic Management Journal*, Vol.23, pp.285-305.
- [26] McNamara, G., Deephouse, D. L. and Luce, R. A. (2003), "Competitive positioning within and across a strategic group structure: the performance of core, secondary, and solitary firms", *Strategic Management Journal*, Vol. 24(2), pp. 161-181.
- [27] MIRL, (1998), "Taiwan Yearbook of Machine Tools Research Report, Industrial Technology Research Institute, Taiwan.
- [28] Papaconstantinou, G., Sakurai, N. and Wyckoff, A. (1998), "Domestic and international product-embodied R & D diffusion", *Research Policy*, Vol. 27(3), pp. 301-314.
- [29] Porter, M. E. (1985), "Competitive Advantage: Creating and Sustaining Superior Performance", The Free Press, New York.
- [30] Porter, M. E. (1993), "The Competitive Advantage of Nations," The Free Press.
- [31] Porter, M. E. (1998), "Cluster and the New Economics of Competition", *Harvard Business Review*, Nov.~ Dec., pp.77-90.
- [32] Pramongkit, P., Shawyun, T. and Sirinaovakul, B., (2002), "Productivity growth and learning potentials of Thai industry", *Technological Forecasting and Social Change*, Vol. 69(1), pp. 89-101.
- [33] Ritsila, J. J. (1999), "Regional differences in environments for enterprises", *Entrepreneurship &Regional Development*, Vol.11, pp.187-202.
- [34] Starr, A. and Taggart, S. (1989), "Organizational ecology", Cambridge Harvard Press, New York.
- [35] Stuart, T. E. (2000), "Inter-organizational alliances and the performance of firms: a study of growth and innovation rates in high-technology industry", *Strategic Management Journal*, Vol. 21(8), pp.791-811.
- [36] Swann, P. and Prevezer, M. (1996), "A comparison of the dynamics of industrial clustering in computing and biotechnology", *Research Policy*, Vol. 25(2), pp.1139-1157.
- [37] Taiwan's precision machinery industry directory (2004), the Commercial Times published.
- [38] Terutomo, O. (2003), "Pax American-led macro-clustering and flying-geese-style catch-up in East Asia: mechanisms of regionalized endogenous growth", *Journal of Asian Economics*, Vol. 13(3), pp.699-713.
- [39] Thomas, H. (2002), "A theory of strategic venture investing", *Journal of Financial Economics*, Vol. 64(3), pp.285-314.
- [40] Thomas III, L. G. (2004), "Are we all global now?: Local vs. foreign sources of corporate competence: the case of the Japanese pharmaceutical industry", *Strategic Management Journal*, Vol. 25(8-9), pp. 865-886.
- [41] Thorndike, R. M. (2000), "Canonical Correlation Analysis", *Handbook of Applied Multivariate Statistics and Mathematical Modeling*, New York in Press, pp. 237-263.
- [42] Trajtenberg, M. (1990), "A penny for your quotes: patent citations and value of innovations", *Rand Journal of Economics*, Vol. 21(3), pp.172-187.
- [43] Tsang, D. (2005), "Growth of indigenous entrepreneurial software firms in cities", *Technovation*, Vol. 25(11), pp. 1331-1336.
- [44] Yeh, C. C. and Chang, P. L. (2003), "The Taiwan system of innovation in the tool machine industry: a case study", *Journal of Engineering and Technology Management*, Vol. 20(3), pp.367-380.