

# ***Developing an Effective Industrial Cluster from Strawberry***

## ***Farms: A Case of Dahu Township in Taiwan***

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*Dahu, a small township in northern Taiwan, is famous for its produce of strawberries. Near Dahu, there are some attractions such as hot springs, native Taiwanese tribes, and a national park named Shei-pa. In this research, we investigated 200 strawberry farmers to examine forming factors of the cluster, and effects of cluster on organizational performance. The findings are firstly, capital resource is regarded as the most effective forming factor of the cluster. Secondly, institutionalization, interaction mechanism, and knowledge flow positively intermediate the clustering effects on organizational performance. These findings have important implications for the local government and the businesses as well.*

*Keywords: industrial cluster, organizational performance*

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### ***Introduction***

Dahu is a township of Miaoli County at northern Taiwan. Miaoli has a soft sand beach along the west coastline, hills in the center, and lush mountains of 3,000 meters to the east. Miaoli has various agricultural industries and products. As to the people, Miaoli has Hakka, Fukien, Atayal and Saisiat. With such diversified natural and cultural resources, the Miaoli County government has been inspecting local agricultural, fishing, manufacture, accommodation and catering industries, and tries to utilize their

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advantages to form a successful recreational tourism industry. Nowadays, Miaoli County Government proactively promotes “One Town One Product” to make the county distinguished by local specialties, and Dahu Township is famous of its strawberry. Strawberries were introduced into Taiwan by Japanese as early as 1934. At first, Japanese tried to plant strawberries at the high-altitude and cooler areas around Yangming Mountain. Afterwards, Dahu residents started to plant strawberries in the Dahu area since 1958, and until 1983 a common transportation and marketing system was developed. With the suitable climate and dryness of land, as well as the hard working of farmers, Dahu Township now has become so-called the “kingdom of strawberry” in Taiwan. Today, Many Dahu farmers run their strawberry farms as tourism orchards. The opening of strawberry farms for tourism fruit-picking not only brings higher sales margin to farmers, but also growth to related peripheral industries. For example, visitors to Dahu Township would like to go to nearby historical monuments and other neighboring areas like Jhuolan Township famous for its abundant and various fruits, Taian Township famous for its hot spring, Shei-pa National Park and Malaban Mountain. This research is aimed to help the local government promote an industrial cluster of agriculture and tourism based on the well-developed strawberry farms. A model of industrial cluster and organizational performance will be developed as a framework of this investigation and research.

### ***Conceptualizing the Model***

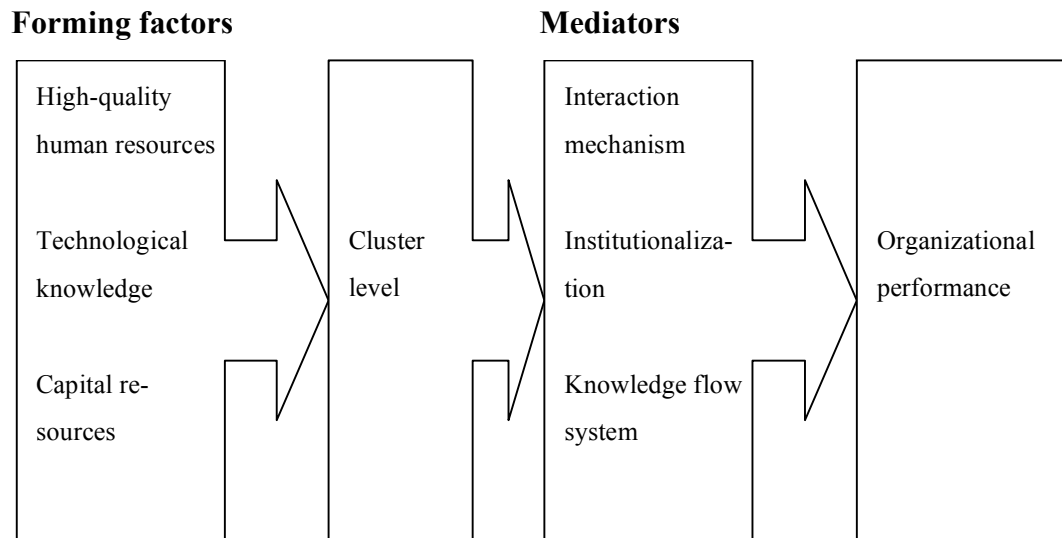
Industrial cluster is a phenomenon of the agglomerate economy. It is also defined as an industrial connection among economic developments of different industries that clusters a variety of companies in a specific place, aiming to generate benefits to each other. Weber (1929) explained the advantage of industrial cluster, based on perspectives of the clustered companies, from “internal economics” and “external economics”. The theory is regarded as the fountainhead of related theories of industrial cluster. Hoover (1948) extended and elaborated Weber’s theory by delineating the agglomerate economy into three categories: scale economies, localization economies, and urbanization economies. In recent years, the famous scholar Michael E. Porter viewed the industrial cluster as a foundational concept in industrial development. Other scholars like Czamanski and Ablas (1979) also indicated the industrial cluster can show geographical centralization in their studies, and regarded the phenomenon as the industrial complex. According to studies of Anderson (1994), Rosenfeld (1995) and Feser & Bergman (2000), the industrial complex means the industrial cluster in specific geographic locations. In conclusion, we define the industrial cluster to be the connection among those companies who make similar products or have supply chain relationship. The connection often contributes to geographical proximity of their company locations. Geographical proximity is proven to be advantageous for clustered companies, such as exchanges of industrial information and share of local resources that are beneficial to enhance their competitiveness.

After the industrial cluster is formed, clustered companies then naturally build up a co-existence relationship. Feser and Bergman (2000) supported this concept as well. They think clustered companies of related industries are composed of one or several

relationships. The relationship may come from connection of importers and exports or suppliers and buyers, geographical proximity, resource sharing with business-related local organizations, and informal cooperation and competition. Anderson (1994) also raised his viewpoints that individual efficiency and competitiveness are comprised of three aspects: buyers and suppliers, partners and competitors, and the status of resource sharing. In summary, the organizational relations among clustered industries are geographic proximity, vertical cooperation among companies, horizontal competition among companies, horizontal cooperation among companies, and resource sharing. We use these concepts to measure the cluster level.

In Porter's famous Diamond Model (1990, 1998) there are four determinants of national competitive advantage, including factor conditions, demand conditions, related and supporting industries, and firm strategy, structure and rivalry. The factor conditions can be regarded as forming factors of an industrial cluster, and the related and supporting industries means an industrial cluster.

In summary, we identify four forming factors of an industrial cluster, including high-quality human resources (Porter 1998; Olson 1998; Bahrami & Evans 1995; Porter 1990), technological knowledge (Porter 1998; Olson 1998), capital resources (Porter 1998) and basic infrastructure (Olson 1998; Porter 1990). In addition, we propose behaviors of clustered companies, including the interaction mechanism among clustered companies (Porter 1990; Feser & Bergan 2000; Anderson 1994), institutionalization (Uzzi 1997; Mohr 1994) and the knowledge flow system (Pouder and John 1996; DiMaggio and Powell 1983) mediate the cluster effect on organization performance. The conceptual framework is illustrated in Figure 1.



**Figure 1 Conceptual Framework of Industrial Cluster and Organizational Performance**

## ***Methods***

To measure each concept in the framework, we develop a questionnaire consisting of 68 questions of Likert Scale of 7 points. We distribute questionnaires to strawberry farmers in person to collect data. 200 farmers were surveyed, and excluding incomplete samples with unclear answers and incomplete data, we have 160 effective samples.

Then we conduct factor analysis to screen out those items with eigenvalue greater than 1. The absolute value of factor loading of the remaining item after Varimax rotation must be greater than 0.5. Each remaining item is regarded as a random variable and given a name.

Consequently, we conduct regression analysis to analyze the relationship among variables. There are three parts of analysis. Firstly, we analyze effects of forming

factors on industrial cluster. Secondly, we analyze effects of industrial cluster on interaction mechanism, institutionalization and the knowledge flow system. Lastly, we analyze effects of interaction mechanism, institutionalization and the knowledge flow system on organizational performance.

## ***Results***

After data reduction, we reduce our number of question items from 69 to 16. Each item is regarded as a variable and given a name. The variables and their belonging constructs are summarized in Table 1.

**Table 1 Variable List**

<b>Construct</b>	<b>Variable</b>	<b>Accumulative variance</b>	<b>Cronbach's <math>\alpha</math></b>	<b>Eigenvalue</b>
Forming factors of industrial cluster	Worker knowledge	66.628 %	0.80	3.415
	Basic infrastructure			3.081
	Capital resource			2.832
Cluster level	Vertical cooperation	86.712 %	0.75	2.601
	Resource sharing			2.267
	Horizontal cooperation			2.034
	Horizontal competition			2.953
Interaction mechanism	Geographical proximity	73.212 %	0.82	2.363
	Reliable communication			2.809
	Conflict resolution			3.780
Institutionalization	Mimetic isomorphism	69.994 %	0.80	2.802
	Coercive isomorphism			2.798
Knowledge flow system	Knowledge flow	65.439 %	0.92	5.350
Organizational performance	Operational performance	76.317 %	0.85	3.082
	Behavioral performance			2.495
	Innovation performance			3.581

As to the effects of forming factors on clustering level, we found capital resource is the most influential and significant factor. Its standardized regression coefficients for all aspects of clustering level are greater than those of worker knowledge and basic infrastructure, and more significant. The result is shown in Table 2.

**Table 2 Regression Analysis of Forming Factors and Cluster Level**

		<b>Cluster level</b>				
		Geographi- cal proxim- ity	Vertical cooperation	Horizontal competition	Horizontal cooperation	Resource sharing
<b>Form- ing factors</b>	Worker knowledge	0.254	0.127	0.568	0.731	0.812
	Capital re- source	0.693**	1.112***	1.370***	1.030***	1.109***
	Basic infra- structure	0.116	0.304	-0.582**	0.313	0.356
<b>R<sup>2</sup></b>		0.146	0.316	0.309	0.273	0.348
<b>F</b>		13.188	35.506	34.462	28.95	41.098
<b>P</b>		0.000	0.000	0.000	0.000	0.000

Note: \* significance level 0.1; \*\* significance level 0.05; \*\*\* significance level 0.01

Secondly, we analyzed the effects of cluster level on interaction mechanism, institutionalization, and knowledge flow system, the three mediators between cluster level and organizational performance. We found each mediator is significantly affected by at least two variables from cluster level; in other words, the three moderators are positively associated with clustering level. Among the variables of cluster level, vertical cooperation and resource sharing have most broad effects. They affect all of the three mediators. The regression result is shown in Table 3.

**Table 3 Regression Analysis of Clustering Level on Interaction Mechanism, Institutionalization, and Knowledge Flow System**

		Interaction mechanism		Institutionalization		Knowledge flow system
		Reliable communication	Conflict resolution	Mimetic isomorphism	Coercive isomorphism	Knowledge flow
<b>Cluster level</b>	Geographical proximity	-0.031	-0.097	-0.145*	-0.092	-0.067
	Vertical co-operation	0.2730***	0.238***	0.073	0.173**	0.263***
	Horizontal competition	0.146*	0.122*	-0.023	0.169	-0.029
	Horizontal cooperation	-0.128**	0.172**	0.078	0.045	-0.091
	Resource sharing	0.246**	0.212**	0.382***	0.184*	0.343***
<b>R<sup>2</sup></b>		0.419	0.545	0.249	0.365	0.334
<b>F</b>		21.751	36.149	10.007	17.394	15.121
<b>P</b>		0.000	0.000	0.000	0.000	0.000

Note: \* significance level 0.1; \*\* significance level 0.05; \*\*\* significance level 0.01

Lastly, we examine effects of interaction mechanism, institutionalization, and knowledge flow system on organizational performance. We found that organizational performance is affected by these mediators because each performance variable is significantly and positively associated with at least two variables from these mediators. Especially innovation performance is affected by interaction mechanism, institutionalization, and knowledge flow system, all of the three constructs. The regression model explained up to 64.6% of the variance of innovation performance score. The results are summarized in Table 4.

**Table 4 Regression Analysis of Interaction Mechanism, Institutionalization, and Knowledge Flow on Organizational Performance**

		<b>Organizational performance</b>		
		Operational performance	Behavioral performance	Innovation performance
<b>Interaction mechanism</b>	Reliable communication	-0.099	0.032	-0.011
	Conflict resolution	0.251**	0.324***	0.475***
<b>Institutionalization</b>	Coercive isomorphism	0.350***	0.044	0.241***
	Mimetic isomorphism	0.043	0.087	-0.045
<b>Knowledge flow system</b>	Knowledge flow	0.152	0.475***	0.324***
<b>R<sup>2</sup></b>		0.271	0.613	0.646
<b>F</b>		11.210	47.761	55.065
<b>P</b>		0.000	0.000	0.000

Note: \* significance level 0.1; \*\* significance level 0.05; \*\*\* significance level 0.01

## ***Conclusion***

Basing on results of regression analysis, capital resource is the most effective forming factor of the industrial cluster. Its influence on vertical and horizontal cooperation, resource sharing, horizontal competition, and geographical proximity is greater than those of basic infrastructure and worker knowledge. Therefore, in fostering the cluster, the local government may set its priority of efforts first in making capital resource more accessible to small businesses, and second to improve the infrastructure or worker knowledge of this area.

Secondly, we proved institutionalization, interaction mechanism among companies, and knowledge flow positively intermediate the cluster effects on organizational performance. In other words, businesses joining a cluster may enhance performance through interaction with other members, better sharing of industrial knowledge, and further institutionalization. For small businesses, since that the cluster helps to en-

hance organizational performance is evidenced here, participating in the Dahu industrial cluster is a smart decision.

## ***Reference***

- Anderson, G. (1994). "Industry Clustering for Economic Development," *Economic Development Review*, 12(Summer), 26-32.
- Bahrami, H. and S. Evans (1995). "Flexible Re-Cycling and High-Technology Entrepreneurship," *California Management Review*, 37(3), 62-87.
- Bahrami, H. and, M. Peter Swann (1999). "A Comparison of Clustering Dynamics in the US and UK Computer Industries," *Journal of Evolutionary Economics*, 9, 373-399.
- Baptista, R., and Peter Swann (1998). "Do Firms in Clusters Innovate Mores?," *Research Policy*, 27, 525-540.
- Czamanski, S. and Ablas L. A. (1979). "Identification of Industrial Clusters and Complexes: A Comparison of Methods and Findings," *Urban Studies*, 16, 61-80.
- DiMaggio, P. J. and W. W. Powell (1983). "The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organization Fields," *American Sociological Review*, 48, 147-160.
- Felker, Greg B. (2003). "Southeast Asian Industrialization and the Changing Global Production System," *Third World Quarterly*, 24(2), 255-282.
- Feser, E. J., and E. M. Bergman (2000). "National Industry Cluster Templates: A Framework for Applied Regional Cluster Analysis," *Regional Studies*, 34, 1-19.
- Hoover, E. M. (1948). *The Location of Economic Activity*, New York, NY: McGraw-Hilpress.

- Mohr, J. and R. Spekman (1994). "Characteristics of Partnership Success: Partnership Attributes, Communication Behavior, and Conflict Resolution Techniques", *Strategic Management Journal*, 15(2), 135-152.
- Olson, K. (1998). "Strategic Clustering," *Executive Excellence*, 15, 12.
- Porter, M. E. (1990). *The Competitive Advantage of Nations*, New York, NY: The Free Press.
- Porter, M. E. (1998). "Clusters and the New Economics of Competition," *Harvard Business Review*, November-December, 77-90.
- Pouder, R. and C. H. John (1996). "Hot Spots and Blind Spots: Geographical Clusters of Firms and Innovation," *Academy of Management Review*, 21(4), 1192-1225.
- Rosenfeld, S. (1995). *Industrial Strategies: Regional Business Cluster and Public*, Washington D.C.: Aspen Institute.
- Rosenfeld, S. (1996). *Business Clusters That Work: Prospects for Regional Development*, Carrboro, NC: Regional Technology Strategies Inc.
- Sabourin, V. and I. Pinsonneault (1997). "Strategic Formation of Competitive High Technology Cluster," *International Journal of Technology Management*, 13(2), 165-178.
- Uzzi, B. (1997). "Social Structure and Competition in Interfirm Networks: The Paradox of Embeddedness," *Administrative Science Quarterly*, 42(1), 35-67.
- Weber A. (1929). *A Theory of the Location of Industries*, Chicago, IL: University of Chicago Press.