Diamond Model Development of ICT Industry Clusters in a Developing Country

Wawan Dhewanto1, Rendra Chaerudin2, Donald Lantu3, Sri Herliana4, Evy Rachmawati5
1,2,3,4,5School of Business and Management, Bandung Institute of Technology, Bandung 40132, Indonesia
Emails : w_dhewanto@sbm-itb.ac.id; rendra.chaerudin@sbm-itb.ac.id; donald@sbm-itb.ac.id; sri.herliana@sbm-itb.ac.id;

Abstract:
The ICT industry clusters initiative development in Indonesia has been quite a lot and can be found in various areas, but has not yet to show the optimal result. In West Java, Indonesia, there are some institutions that develop the ICT industry clusters include Bandung Techno Park (BTP), Cimahi Creative Association (CCA), Region IT Center of Excellence (RICE) – PT. INTI, RICE-Bogor, Incubator Business Centre (IBC) Gunadharma, Bandung Digital Valey (BDV), Inkubator Industri Telematika Bandung (I2TB).

The industry clusters involve triple helix (academia, business and government). The triple helix as the main actors should always do a move to form a knowledge circulation spaces (spaces of knowledge in which the three actors already have an understanding and knowledge equivalent), which will direct the three actors to create a consensus space (space agreement where the three actors began making agreements and commitments over a matter) that ultimately will lead to the formation of innovation spaces (spaces of innovation that can be packed into the creative products of economic value).

Diamond model (Porter, 2000) approach is used to analyze the development of industrial clusters. While the research method used is the case study method. ICT clusters are formed to stimulate the growth of skilled labor and sophisticated, as well as the development of knowledge and technology in certain fields. Consequently, if a cluster develops, it will tend to produce not only product, but also intellectual capital and technology.

Keywords:
Diamond Model, ICT Industry Clusters, ICT Industry Clusters Development

I. INTRODUCTION

The ICT industry clusters initiative development in Indonesia has been quite a lot and can be found in various areas, but has not yet to show the optimal result. In West Java, Indonesia, there are some institutions that develop the ICT industry clusters include Bandung Techno Park (BTP), Cimahi Creative Assosiation (CCA), Region IT Center of Excellence (RICE) – PT. INTI, RICE-Bogor, Incubator Bussines Centre (IBC) Gunadharma, Bandung Digital Valey (BDV), Inkubator Industri Telematika Bandung (I2TB).

Infrastructure development that supports the ICT industry growth in West Java is still not adequate. The problem is there are plenty of activities or programs related to ICT are scattered in various government agencies, so that the lack of planning that is synergistic in supporting the realization of ICT society. However, what happens is the lack of effective coordination among government agencies in developing and directing the development of the field of ICT. It is therefore necessary to determine the direction of the national consolidation of ICT development as well as strategic steps necessary to realize a knowledge-based society. One of the strategic steps that can be done is through the development of the ICT industry clusters, which in many countries has been done to collaborate element of R & D institutions, educational institutions and the industry as a strategy to increase the capacity of increasing the role of ICT in enhancing its contribution to development.

Theory about the Triple Helix was originally popularized by Etzkowitz and Leydersdorff (2000), as a method of innovation-based policy development. This theory emphasizes the importance of creating synergies of the three elements of intellectual, business and government. The purpose of this theory is the development of a sustainable knowledge-based economy. The synergies are expected to occur circulation of knowledge leads to innovations that have economic potential or capitalization of knowledge capital.

Triple Helix (academia, business and government) as the main actors should always do a move to form a knowledge circulation spaces (spaces of knowledge where there are three actors who already have an understanding and knowledge equivalent), which will direct the three actors to create a consensus space (space agreements in which the three actors began making agreements and commitments over a matter) that ultimately will lead to the formation of innovation spaces (spaces of innovation that can be packaged into economic value of creative products). Circulation is always trying to create innovation or creative destruction (Joseph Schumpeter, 1934), which means, the emergence of new innovations in the industry will displace the old industries that are not creative and replaced with a more creative industry.

Business environments shape and influence ICT businesses nature, ranging from how companies determine which products, how the companies choose raw materials, processing, and thus how the companies address the market. Environmental and industrial clusters provide a combination of assets, institutions and knowledge which tends to produce a level of innovation that is more than usual. This occurs because of the opportunities and the development of ideas will be more easily seen if the businesses are in the group of business people and suppliers who conduct its activities in close proximity. Industrial clusters can fertilize conditions that allow for innovation. Industry clusters tend to stimulate the growth of skilled labor and sophisticated, as well as the development of knowledge and technology in certain fields. Consequently, if a cluster develops, then not only will result in new products, but also will generate intellectual capital and technology. The development of clusters containing four determinant factors known as the diamond model that leads to the competitiveness of the industry, namely: factor / input condition, demand condition, related and supporting industries, and context for the firm strategy (Porter,2000). This research objective is to analyze the development of ICT industrial clusters using diamond model approach.

II. LITERATURE REVIEW

Clusters are geographic concentrations of interconnected companies and associated institutions in a particular sector (Porter, 2000). Cluster can also be defined as a geographic concentration of related industries and institutions-institutions (JICA, 2004). They are related because of togetherness and complementary. Clusters encourage industry to compete with each other. In addition to industry, the cluster including government and industry who provide support services such as training, education, information, research and technology support (Porter, 2000).

An industry cluster is a group of companies, economic actors and institutions that are located adjacent t o each other and provides productive advantages of closeness and connection between them (Porter, 2000). Industrial clusters may be linked by the functional proximity of suppliers and buyers, producers and distributors or by competition in the same market. Most successful clusters specifically found in the multi-regional territories where members can easily interact and jointly exploit labor and training. Assets-companies are in the cluster and is in a position to compete in the global economy so that it can contribute on regional welfare (COC, 2006: 1).

Associated with the notion of industrial clusters, industrial grouping was originally known as sector or industry classification, which is a set company set up to produce similar goods and services. The nature of this kind can be observed from the similarity in sharing (sharing commonality) associated with products, inputs and labor skills. Clustering approach in the sector has been recognized to be an effective strategy in the construction workforce, particularly in creating employment opportunities. Industry cluster has a broader scope because it can cover multiple industry sectors.

Industry cluster focused on competitiveness in the sector. Industry cluster is formed b y a number of actors, resources, and activities that together to build, manufacture and market a variety of products and services. In a certain extent to form an energized value chain due to shared power markets work and other conditions of factors (natural resources, funding, infrastructure, etc.). Industrial clusters do not always use a territorial approach, can even include a country, for example in the Finnish forest cluster.

Form a cluster means preparing continuum units. The process of cluster formation increased cooperation, is still at a very early level. Many artisanal clusters are sleeping (dormant), with the understanding that for several years practically almost no market development, improvement of means of production and product development. Some authors refer to the sleep artisanal clusters as cluster survival (survival cluster) of small and micro enterprises. However, the other cluster has grown rapidly in terms of improvement of skills, technology, and successful penetration of the domestic market and export.

The region has not benefited from direct governmental support and also had minimal influence from Porter's diamond factors (Porter, 1990). Workshop staffs shared the same culture, speak the same language in technical terms and had developed trust relations between them. The social capital of the cluster had a major impact in the development of the clusters. Also, this type of capital is difficult to build using artificial techniques as in the case of the technological capital that can be acquired and is an important advantage in facilitating the communication and the collaboration specific cluster models (Boja, 2011). Porter's analyses (Porter, 2000) add to the economic relations and flows of goods the process of innovation that takes place inside the cluster through the transfer of information, know-how and experience.

In the Triple Helix model (Etzkowitz, 2002), the capitalization and transfer of knowledge is defined by the relationshipsbetween three important factors for a cluster development: education, government andbusiness. Among these components there is a relationship of academic-industry-governmenttype (Etzkowitz, 2002) in which each component is independent of the other butoverlap in terms of innovation and knowledge transfer. Also, each component has an equalrole and takes over the leading role as an innovation generator. This model differs frommodels in which each factor is independent of the other three without a

clear relationshipbetween them or from models in which education and research is part of a larger public system run by the state.

Cluster is built by a company related to each other in the flow of goods and services that are stronger than the flow to other sectors or regions. Anderson (1994) emphasized the importance of linkages in the cluster in the following three categories:

a.Linkage buyer and seller (buyer-seller) who concentrated on the interaction between the vertical inputs, primary production process, and goods and services distribution.

b.Linkage competitors and collaborators (competitor-collaborator) that occurs because the competitors are usually (although not intentionally) gave rise to mutual competition information on products and processes which are then divided (shared) which means to use that information to create a pattern of collaboration in innovation.

c.Linkages shared resources that can be identified in relation horizontally linkages in leavened technology, labor or information.

An industrial policy that is not associated with the cluster policy can lead to the emergence of a dependency path (path dependency) on various aspects of the industry such as the problem of raw material supply, distribution channels, availability of skilled labor, and so on. Then in the absence of cluster policies can lead to failure in coordination (coordination failure) and asymmetric information obtained from economic actors that have an impact on local externalities. To needed a target of public policy on the cluster and the creation of platforms for joint action (Sölvell, 2008).

Target public policy on cluster can be created in various forms among them to attract business, enhance the promotion of exports, expanding information and market opportunities, creating specialized physical infrastructure, protect natural resources, protecting the environment, creating standards, developing education, job training and develop knowledge and technology transfer infrastructure at research centers, universities, and government ministries. While creation of platforms for joint action can be done by improving operations and corporate strategy across the group or company, develop business clusters certain environmental conditions and strengthen the network to increase the economic benefits of cluster (Sölvell, 2008).

Cluster development, as defined by Michael Porter (2000), contains four determinant factor or known as diamond model that lead to the competitiveness of the industry, namely: (1) input factors (factor / input condition), (2) demand conditions, (3) related and supporting industries, and (4) corporate strategy and competitor (and context for firm strategy).

III. RESEARCH METHODOLOGY

Diamond model (Porter, 2000) approach is used to analyze the development of industrial clusters. The respondents are members of ICT cluster in West Java Bandung Techno Park (BTP), Cimahi Creative Assosiation (CCA), Region IT Center of Excellence (RICE) – PT. INTI, RICE-Bogor, Incubator Bussines Centre (IBC) Gunadharma, Bandung Digital Valey (BDV), Inkubator Industri Telematika Bandung (I2TB), The respondents were determined purposively and then using snowball sampling. Necessary data are qualitative and quantitative data in the form of primary data and secondary data. In accordance with the method of study in-depth case study, the primary data performed with the variety of ways: in-depth interviews, tracing (historical), and observation. Secondary data were obtained by collecting documents and literature.

IV. RESULT AND DISCUSSION The growth of the ICT cluster in West Java is described based on the Porter's model. Cluster growth diamond is determined by the business environment surrounding the cluster-forming candidate companies. Shaping the business environment and affect the nature of the company ranging from how companies determine the product, how do companies choose the raw materials, processing, how the company is responding to the market.

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The ICT industry clusters descrption in this study can be seen in the following table :

Table 1. ICT Industry Clusters

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NO	CRITERIA	ICT CLUSTER					
		BTP	CCA	RICE PT INTI	I2TB	IBC GUNADHA RMA	BDV
1	Founder	ITT Telkom assisted by Ministry of Industry	Cimahi City Governme nt and Local ICT Company	Ministry of Industry and PT Inti	Ministry of Communicat ion and Information	Gunadharma University	PT Telkom Indonesia
2	Cluster Manager	ITT Telkom employee (academics) and Bandung Tekno Park employee	ICT Communit y	PT Inti employee	ICT Company and Academics	Gunadharma University employee	PT Telkom Indonesia employee
3	Business Field	Electronics , Robotic, Software, Games, Animation, Website	Animation and content	Software House and IT Services	Software, Website	Software, Website	Animation and content, Games, Software
4	Cluster Member Product	Software, Games, Animation, Website	Games, Animation, Website, Mobile App	Games, Animation, Website, E learning Content, Software Training	Software, Website, Mobile App	Software, Website	Animation and content, Games, Software
5	Cluster Member Business Size	Micro and Small Company	Micro and Small Company	Micro and Small Company	Micro and Small Company	Micro and Small Company	Micro and Small Company
6	Financial core Business Support	ITT Telkom and Governme nt	Cluster Members and Governme nt	PT Inti and Governme nt	Ministry of Communicat ion and Information	Gunadharma University	PT Telkom Indonesia
7	Cluster infrastructur e	Building provided by ITT Telkom	Building provided by Cimahi City Governme nt	Building provided by PT Inti	Renting Office Suites financed by Ministry of Communicat ion and Information	Building provided by Gunadharma University	Building provided by PT Telkom Indonesia

Based on the survey (interviews and observations) and the source literature relating to ICT cluster (Bandung Techno Park (BTP), Cimahi Creative Assosiation (CCA), Region IT Center of Excellence (RICE) – PT. INTI, RICE-Bogor, Incubator Bussines Centre (IBC)

Gunadharma, Bandung Digital Valey (BDV), Inkubator Industri Telematika Bandung (I2TB)), it can be explained growth and competitiveness of the ICT cluster using Porter diamond model. For details can be seen in the following table.

a. Input Factors
Input factors consist of human resources, capital resources, physical infrastructure, information infrastructure, scientific and technological infrastructure, as well as administrative infrastructure.

Table 2. Input Factor

NO	CRITERIA	CONDITION
1	Human resource	ICT Industry Clusters in West Java was founded by the Government, ICT Company, University, and ICT community. ICT Industry Clusters in West Java is considered adequate number of stewards in accordance with the existing workload at this time. Capabilities and skills of managers in the currently considered sufficient according to the activities scope at this time.
2	Capital resource	The initial capital came from government, ICT Company or University establishment in West Java. To run its operations, the source of funding is derived from ICT Industry Clusters' members independently, university or government assistance. Fund support from other parties derived from the Ministry of Industry, Trade and Industry Department of West Java Province, Government, etc. ICT Industry Clusters for development activities, available funds were deemed to be insufficient.
3	Physical infrastructure	ICT Industry Clusters' Office Buildings to conduct business incubation activities, provided by the Government, ICT Company or University space facilitated public service or public service information display space and a place to introduce the world Information Technology (IT) to the public, trade, and research and development space telematics industry. Room Studio Research and Development field of informatics and telecommunications, computer room access to technological developments, the IT training space and members Activities ICT Industry Clusters, for indoor display and multimedia simulations (auditorium), where seminars, discussions and meeting space infrastructure and animation that facilitated movie. Existing building at this time was considered sufficient to perform the development activities of the ICT Industry Clusters.
4	Information infrastructure	Infrastructure supporting information available at this time includes Routers, Hubs, Network, InFocus, Multimedia Tools. The facility is considered sufficient to perform the development activities of the ICT Industry Clusters at this time.
5	Scientific and technological infrastructure	Infrastructure supporting science and technology are considered sufficient for the scope of the current activity (Servers, Routers, Hubs, Network, Multimedia Tools). The labor while having knowledge in related field with ICT Industry Clusters' activities are considered within the scope of the current work.
6	Administrative infrastructure	Furniture and office equipment for the scope of activities considered sufficient current (Server, Printer, Scanner, Infocus, Routers, Hubs, Network, Multimedia Tools).

b. Demand Conditions
Demand condition according to diamond model is associated with sophisticated and demanding local customers. The more advanced a society and increasingly demanding customers in the country, then the industry will always strive to increase product quality or conduct innovation to meet high domestic market need. But with globalization, demand condition not only sourced from local but also sourced from overseas.

Table 3. Demand Conditions

NO	CRITERIA	CONDITION
1	Domestic market needs	ICT Product such as content and animation, software, games, etc., can be produced by ICT Industry Clusters is significant, as the development of technology and content development and ICT industry is growing rapidly.
2	Purchasing Power Market	Industries and companies that utilize ICT products such as content and animation, software, games, etc., have started to choose to use domestically made ICT Product although foreign products are cheaper.
3	The market demands will be the quality of the product	ICT Industry Clusters' products are required to be able to compete in price and quality products made overseas ICT Product.
4	Domestic Demand Growth Rate	Underdeveloped domestic demand, especially broadcast industry who prefer to use the products because of cheap foreign products.
5	Effect of International Demand	International demand continues to increase, due to the international scale industry, the cost of production in Indonesia is relatively cheap.

Table 3. Demand Conditions

c. Supporting and Related Industries
The existence of supporting and related industries will increase efficiency and synergies in Clusters. Synergies and efficiencies can be created mainly in transaction costs, technology

sharing, specific information and skills that can be utilized by industry or other companies. Another benefit supporting and related industries are going to create competitiveness and increased productivity.

Table 4. Supporting and Related Industries

NO	CRITERIA	CONDITION
1	Availability Local Suppliers	The tools support the production activities of more than 90% of import.
2	The ability of Local Suppliers	The low availability of local suppliers and quality products.
3	Availability of complementary products	Not available complementary products made locally such as operating system software, animation/games development software, and others aplication system.(100% Import).
4	Achievement of efficiency	Production cost efficiency has not been achieved because of the cost of production is still dominated by imported content.
5	Linkages with the business community technology development activities	The perpetrators members of ICT Industry Clusters still has not made the connection and does not have any technological development cooperation.
6	Business community linkages with market development activities	The perpetrators members of ICT Industry Clusters still has not made the connection and does not have any market development cooperation, is still limited to the exchange of information on market.
7	Linkages with the business community development activities of manufacturing	The perpetrators members of ICT Industry Clusters still has not made the connection and does not have any manufacturing development cooperation.
8	Linkages with the business community development activity distribution	The perpetrators members of ICT Industry Clusters still do not hold a connection and distribution development cooperation.
9	Linkages with the business community services development activities	The perpetrators members of ICT Industry Clusters still has not made the connection and does not have any joint services development activities.

d. Corporate Strategy and Competitors

Corporate strategy and competitors in the diamond model are also important because these conditions will motivate the company or industry to constantly improve the quality of the products and are always looking for new innovations. With healthy competition, companies will always look for new strategies that fit and strive to always improve efficiency.

Table 5. Corporate Strategy and Competitors

NO	CRITERIA	CONDITION
1	Encouragement of Innovation	Competition similar industries in domestic and foreign demand must innovate.
2	The company's goal	The purpose of business actors in ICT Industry Clusters has led to the success and growth of ICT Industry Clusters.
3	The purpose of the individual employee	Individual goals of the employees in the company who are members of ICT Industry Clusters, has been concerned with the success and growth of ICT Industry Clusters.
4	The influence of national priorities	National policy and local governments do not support the development of clusters.
5	Commitment of human resources and capital to the industry	HR commitment to the industry is quite high because there is a career and business interests.
6	Competitor Product	Malaysia, Singapore, India, China, Korea, Jepang,USA, Eropa,. Jakarta, Batam Jateng, Yogyakarta, Surabaya

V. CONCLUSION

Based on the analysis of the diamond determinant factor models, it is known that the competitiveness of the ICT industry clusters is quite good because it is supported by the input factors and demand good condition. Competiti1ve conditions in the ICT industry clusters encourages innovation. It's just existence of supporting and related industries are still lacking support for the availability of local suppliers and the availability of complementary products and still rely on the supply from abroad. Essentially networks and creativity are mutually

beneficial, because the greater the number of nodes in a system, the greater capacity to innovate.

Cases of ICT industry cluster can also note that the power of collaborative arise if the presence of a fusion of thought through interactive and communicative processes in problem solving and planning. Collaborative strength will also appear if the same commitments from all parties, partnerships are not hyrarchy and all parties have the same role.

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