

PRODUCTION STRATEGIES IN KNOWLEDGE-BASED ECONOMY

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Özet

Dünyada bilgiye-dayalı ekonomilere yönelik bir dönüşüm yaşanmaktadır. Bu trend bilgiye dayalı ekonomilerde en önemli üretim faktörü olan bilginin üretilmesi, depolanması, işlenmesi ve dağıtılması süreçlerinin önemini artırmaktadır. Buna göre, yeni inovasyon süreci, başta firmaların dış ilişki ve işbirlikleri olmak üzere bir çok alanda değişikliğe yol açmaktadır. Bu makalede doğrusal olmayan yeni inovasyon modelindeki firma davranışlarını inceleyeceğiz. Özellikle, teknolojilerine ve network ilişkilerine göre sınıflanan belirli sektörler arasındaki karşılıklı etkileşim üzerine yoğunlaşan Kümelenme Modelini kullanarak, firmaların tüketiciler ve diğer birimler ile oluşturabilecekleri işbirliği stratejilerini belirlemeye çalışacağız. Ayrıca, Avrupa'daki uygulamalardan hareketle, bilgiye dayalı ekonomilerde uygulanabilecek politikalara ilişkin bazı çıkarımlarda bulunulacaktır.

Anahtar Kelimeler: Doğrusal olmayan inovasyon modelleri, endüstriyel kümelenme, işbirliği stratejileri, bilgiye dayalı ekonomi, rekabet.

Abstract

The global economic changes have moved towards a knowledge-based economy. This trend reflects the increasing importance of producing, accessing, storing and disseminating knowledge, the key production factor under knowledge-based economy. Accordingly, the new innovation process has lead to many changes in the behaviour of firms, especially with respect to their external networks of relationships and their collaborations with other firms. We shall try to explain the behaviour of firms in this new non-linear model of innovation. We will especially, focus on the firm strategies of alliance with consumer and partners using Cluster Analysis focusing on the interactions between particular types of firms and sectors, which can be grouped according to their technological and networking characteristics. Looking at the European experiences, we will also interpret some implications concerning economic policies in knowledge-based economy.

Keywords: Non-linear model of innovation, industry cluster, strategies of alliance, knowledge-based economy, competitiveness.

Production Strategies in Knowledge-Based Economy

INTRODUCTION

With the emergence of the knowledge-based economy, knowledge has gained great importance in the economic structure and the nature of firms. Especially, production activities have been changed dramatically. In this paper, we seek to shed light on this transformation, suggest a framework for understanding this process.

To understand why knowledge has gained increased urgency in economic structure and company strategies, we firstly need to understand the rapid changes in the nature of competition. Accordingly, the theoretical starting point adopted will be the national innovation system. This way, we will show that the innovation is the core of competitiveness in knowledge-based economy.

In this new economic environment, we will focus on cluster method to determine the basic features of production strategies. Thus, in order to achieve a proper understanding of production strategies in knowledge-based economy, we will deal with the industrial cluster closely linked to the nature and dynamics of knowledge generation and utilisation.

As for the plan of the study, section one will attempt to provide insights appropriate to the understanding of the dynamics of knowledge-based economy focusing on innovation process. Section two will try to analyse when production can serve to generate and maintain advantage in this new economic environment using cluster approach. Finally, the policy implications will be briefly introduced from the cluster perspective, redefining the character of government interference.

1 - KNOWLEDGE-BASED ECONOMY AND NATIONAL INNOVATION SYSTEM

In knowledge-based economy, as the name implies, knowledge gains great importance in the behaviour of economic actors, like firms and consumers, and the overall path of economic development. In other words, both the behaviour of micro economic actors and macroeconomic development depend on knowledge. The knowledge-based economy is defined as an economy in which creating value is directly based on the production, distribution and use of knowledge.

In this new economic environment, the process of creating value and governing production process has also changed dramatically. Intangible assets, such as human capital and know-how gain huge importance as a source of profitability for companies. The importance of intangibles in new economic structure can be seen from the value of market capitalisation for global industries in 1912 and 1999 shown in Table – 1 and Table 2. When comparing the top five global industrials by market capitalisation from 1912 to 1999, we can see that industries like General Electric, Coca Cola and Intel based on intangible assets gain huge importance while industries like US Steel, J&P Coates and Pullman based on raw material production have lost their importance. Thus, accompanying the shift to a knowledge-based economy has been a fundamental change in the way production is organized in the economy's most successful industries.

It is clear from this transformation of industry structure that company's intangible asset has increased in relative importance, compared to the other asset's components. Therefore, a firm's competition factors cannot be based on the tangible components of the company assets. In other words, the quality of knowledge, which is present at various levels in the company, is the key to success. Thus, we can argue that the raw material content of a product and its physical characteristics have become much less significant in terms of their contribution to overall value, which is in essence of the new economy. This is the primary reason for labelling the new economic structure as a knowledge-based economy or weightless economy.

Table-1: Top 5 Global Industrials by Market Capitalisations in 1912

Rank	Company	Industry	Capitalisation (US Dollar Million)
1	US Steel	Steel	741
2	Exxon	Oil	390
3	J&P Coates	Textiles	287
4	Pullman	Railcars	200
5	Royal Dutch Shell	Oil	187

Source: Kay: 1999: 33

Table-2: Top 5 Global Industrials by Market Capitalisations in 1999

Rank	Company	Industry	Capitalisation (US Dollar Billion)
1	General Electric	Electricals	223
2	Royal Dutch Shell	Oil	191
3	Exxon	Oil	158
4	Coca Cola	Soft Drinks	151
5	Intel	Chips	151

Source: Kay: 1999: 34

After determining the knowledge intensive transformation in the production process, we now need to consider how this knowledge-based revolution develops to understand the nature of knowledge-based economy in a deeper way. In traditional economy, differences in the availability of resources between places shape the competitive advantage of these different locations. Because of this, firms and countries located near these resources had great advantages. However, this fact has dramatically changed in new economic environment. Firstly, it can be said that more open trade and financial environments provide equal access to economic sources, like material and production equipments for competing companies and countries. Thus, in integrating world economy, resources that are equally available everywhere have no effect on the location's competitiveness or on the distribution of

economic activity (CORTRIGHT, 2002: 11). Secondly, the advent of increasingly sophisticated high capacity information and communications technologies, particularly the Internet, reinforces the perception that information can be moved with no costs from place to place.

To sum up, the reduction in barriers to trade and falling communication and transportation price make cost-based advantage less important. Geography, borders, and time zones are all rapidly becoming irrelevant to the way we conduct our business and personal lives (CAIRNCROSS, 1997: 37). “Death of distance” has dramatically changed all of the way to compete among firms in whole economy.

Economic growth in new economic environment assures that access to a new and different set of resources – particularly those resources relating to creating new production knowledge – are now more important. The overall growth of the economy is driven by the production of economically valuable new ideas. Accordingly, production process changes towards new form of advantage rules. While classical factors of production are more and more accessible because of globalization, competitive advantage in advanced industries is increasingly determined by differential knowledge, skills and rates of innovation that are embodied in skilled people and organizational routines. A firm’s competitiveness becomes more dependent upon its ability to apply new knowledge and technology in products and production processes. Therefore, business increasingly emphasizes access to new production knowledge – that is innovation while logistical needs of production can now be met almost everywhere (PORTER, 1998: 78). In other words, innovations are the main drivers of the knowledge-based economy. Comparative advantage rests on making productive use of inputs, which requires continual innovation against to rapidly changing market needs and competition.

Accordingly, economists examine more systematically the features of new economy focusing on innovation process and they use the expression “national system of innovation” to describe this analysis (NELSON, 1993, LUNDWALL, 1992 and OECD, 1997). National innovation system approach reflects the increasing attention given to the economic role of knowledge considered one determinant of competitiveness and growth. This system indicates that economic activities are becoming more and more knowledge-intensive. Apart from the recognition of the economic importance of knowledge, this approach assumes that the growing number of institutions involved in knowledge generation (OECD, 1997: 11). Innovation process in knowledge-based economy is not the activity of a single company like the “heroic Schumpeterian entrepreneur”, but rather, it requires an active scientific search process to tap new sources of knowledge and technology and apply them

to products and production process connected with consumers (ROELANDT / HERTOĞ, 1999: 10). The firm in the Schumpeter analysis is an agent of change within the economy, whilst the entrepreneur is the source of ideas that bring change about. In contrast, new knowledge economy based on national innovation system implies that not only some actors, but also institutions play a major role in innovation. In this view, the probability of innovation strongly depends on the number and variety of supplier and user linkages.

The national innovation systems approach also reflects the rise of systemic approaches to the study of technology development as opposed to the "traditional-linear model of innovation". As can be seen from Figure-1 and Figure-2, there are five sections in both innovation systems: science, technology, production, marketing, and consumption. Traditional innovation model, shown in Figure-1, is seen as a process of discovery in which new knowledge is transformed into new products via a set of fixed sequences or phases, which has reflected a linear model of technological change and stress on much more the stage of science. On the other hand, innovation process in national innovation system, shown Figure-2, is perceived as a complex interaction and non-linear path. Thus national innovation system criticises the traditional model both in terms of the description of the way of innovation process and the overemphasis placed on science because it is unable to provide a sound description or explanation of the actual innovation processes in knowledge-based economy.

Indeed, ideas for innovation in new economy can come from many sources and any stage of research, development, marketing and diffusion. Empirically found that the interaction between the actual production process and the accumulation of tacit knowledge are essential to increase the productivity science-based research activities. Thus, innovation can take many forms, including adaptations of products and incremental improvements to processes. Economically valuable knowledge or research do not happen just inside universities or dedicated research laboratories any more. Innovation is, thus, the result of a complex interaction between various actors and institutions. Here, the innovative firm is seen as operating within a complex network of co-operating and competing firms and other institutions, building on a range of joint ventures and close linkages with suppliers and customers.

In conclusion, from the analysis of national innovation system, we can underpin two essential dimensions of innovation process that is the basic dynamic of knowledge-based economy (ROELANDT, 1999: 10). Firstly, innovation is seen as a network including suppliers and buyers of products, knowledge and technology. Interaction and knowledge exchange among firms and different economic actors are at the heart of the innovation process because

innovation process is institutionally embedded in the setting of system. Secondly, national innovation system defines innovation as an interactive learning process requiring knowledge exchange and co-operation among various actors in a production network. Innovation and the upgrading of productive capacity is a dynamic social process that evolves most successfully in a network in which intensive interaction takes place between those “producing” and those “purchasing and using” knowledge.

Figure -1: Traditional – Linear Innovation Process

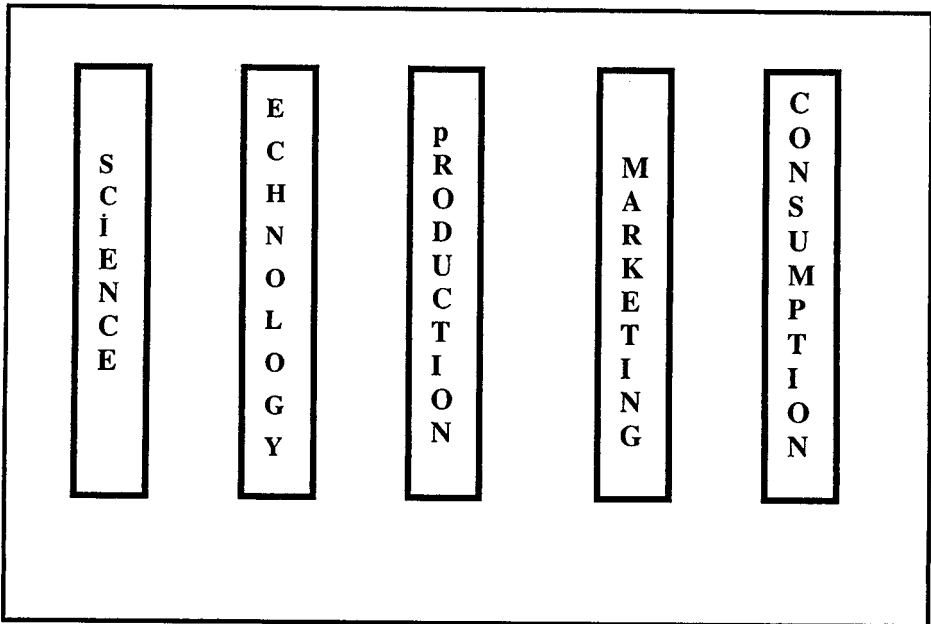
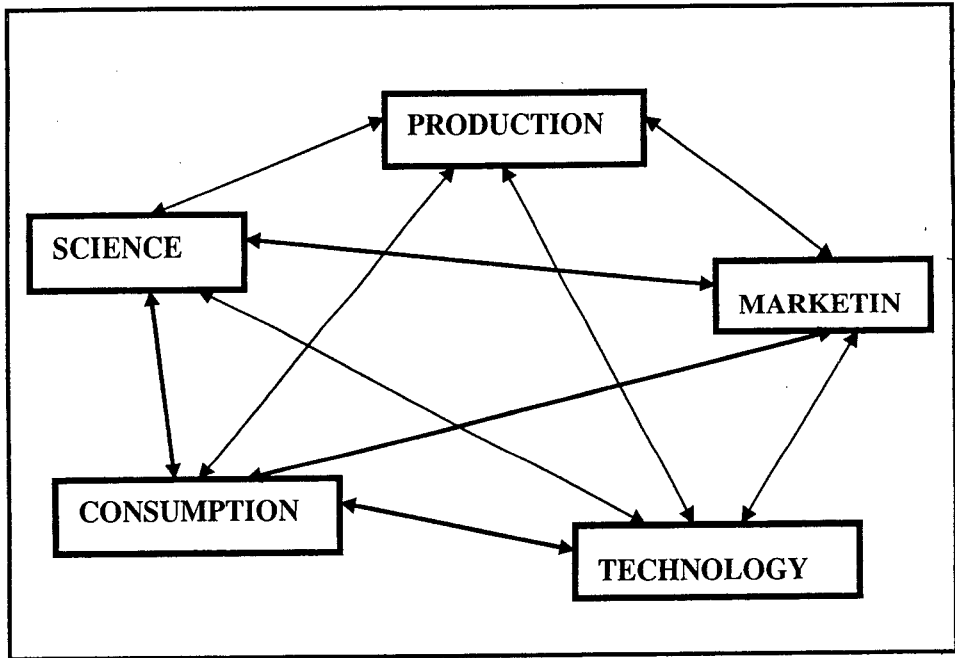


Figure-2: New – Non-linear Innovation Process



2 - PRODUCTION STRATEGIES IN INDUSTRIAL CLUSTER SYSTEM

The first part of this study has shown that the basic dynamics of knowledge economy depend on the national innovation system. Thus, the growth of the new economy is driven by the production of economically valuable new ideas while traditional sources of economic advantage, like access to raw materials, dwindles in importance. In recent years, strategy research has focused on the role of knowledge sources in the firm's innovation process. The ability to acquire, create and protect new knowledge has become fundamental aspects of firm strategy (NONAKA / TAKEUCHI, 1995: 6). Thus a, firm's competitiveness is also becoming more dependent upon its ability to apply new knowledge and technology in products and production processes.

Accordingly, it is required that firms get in national innovation system and regulate relations in this system well in order to gain competitiveness in new economy. As economic activities become more knowledge-intensive, a large and growing number of institutions specialised in the expertise of very different kinds of knowledge. Therefore, the determinants of enterprises'

success are ever more dependent on their effectiveness in gathering and utilising knowledge from these institutions (OECD, 1996: 12). Thus, to get ability to constantly participating in knowledge exchange networks becomes more important than the hoarding and protection of knowledge stocks. On the other hand, the challenge of more imbedded knowledge in each product and process generation in institutes requires relations of knowledge sharing with a continuity, bandwidth and symmetry way a conventional market transaction. The amount of knowledge imbedded in each function is large, complex, and predominantly tacit and only be mastered by intensive relations instead of simply networking relation. This cannot be mitigated by hierarchical intervention, but requires a direct sharing of knowledge in national innovation system (NIELSEN AND NIELSEN, 2004: 6).

Thus, firms have gone from an era in which production strategy was determined by static efficiency to dynamic efficiency. Static approach can be defined largely as the ability to achieve the largest scale of production and the lowest cost. On the other hand, the key characteristic of dynamic efficiency strategy is that it continuously innovates and adapts to changes in markets and improves techniques and technology (CORTRIGHT, 2002: 10). In dynamic efficiency strategy, companies also develop methods to cope with their increasing dependency on their environment such as more flexible organisation structures and the integration of various links in the production chain through strategic alliances. Accordingly, the concept of "alliance capitalism" may be used to indicate this new stage in the development of modern economic system. The main goal of most strategic alliances has been to gain access to new and complementary knowledge and to speed up the learning process (DUNNING, 1997: 34). Knowledge advancement and commercial success will primarily occur in conjunction with the development of strategic alliance, dense networks of closely related producers, consumers and research institutes who push and feed on their collective knowledge-creating skills.

Whereas the traditional framework leads to a view of industries in isolation, what we now see is all functions of product systems are combined in the national innovation system. There are many ways to approach this network based, integrated production system in new economy, like clusters, sectoral innovation systems, complex product systems, service-enhanced or new manufacturing systems (HOUGHTON et. al., 1999: 56). In this study, we will use the "cluster approach" in order to determine the production strategies for firms in knowledge-based economy that depends on national innovation system. Cluster can be defined as networks of closely inter-acting enterprises in the value chain. Clusters, therefore, include customers, suppliers and specialised institutions. In other words, clustering is about the intertwining of

knowledge relations and knowledge sourcing among formally autonomous organisations. Cluster approach defines innovation as an interactive learning process requiring knowledge exchange interaction and co-operation among various actors in a production network or value chain. Especially, the cluster models are used to describe networks of organisations, in which the competitive advantage grows from the dynamic interaction among the actors within same cluster (CASTELLS, 1996: 47).

Cluster can be identified at various levels of analysis. Micro-level analysis focuses on inter-firm linkages and industry linkages in the production chain, while macro-level analysis examines how industry groups constitute the broader economic structure. Cluster analysis can also be applied at the regional level. We will focus on industrial clustering, the concentration of firms and other firms and institutions that are active in the same value chain. In other words, cluster model used in this study can be characterised as networks of production of interdependent firms linked to each other in a value-adding production chain. The dynamics, system characteristics and interdependencies of individual industrial clusters are similar to those of national innovation system. Indeed, industrial clusters are considered to be reduced scale innovation systems' where one can observe the interlink ages and interdependence between different actors – firms, research institutes, and government – that jointly are responsible for the innovation performance. "Industry cluster reveals the mutual dependence and collective responsibility of all actors in industry to create the conditions for productive competition" (PORTER, 1998: 90). Empirical data support the notion that knowledge creation tends to be quite localized in cluster. Studies of the patterns of patent activity in Europe, for example, find that innovative activity measured by new patent issued, is located in certain clusters (CANIELS, 1997).

Instead of focusing on factors inside the company, the industry cluster approach emphasizes that competitive advantage lies outside companies. To make a cluster function, they must consist of interconnected firms in the same fields, specialized suppliers, service providers, firms in related industries, and associated institutions. This leads to fundamental changes in the nature of the relations in conventional concept of a company's production strategies. In principle, these transformations are redefining our concepts of a company and of the market. To successfully innovate, companies are becoming more dependent on complementary knowledge and know-how in companies and institutions other than their own. Thus, the emergence of the knowledge-based economy implies a shift from a firm-based structure to a network based economic structure so that the simulation of innovation cannot be directed at

the single firm, but should be directed at the stimulation of the knowledge diffusion capacity of the national innovation system (LAROSSE, 2001: 10).

The global network of interacting business networks also stresses the importance of relational capital or social capital for knowledge creation and innovation processes. The so-called intellectual capital of a firm refers to the combination of its human and relational capital (STOLPER, 1997: 35). We consider the relational capital part of intellectual assets at this stage. It can be argued that interacting business networks in industrial cluster model are required a "relation management organisation" for knowledge creation and innovation processes. Such a relation's management strategy allows firms to generate and coordinate acquired knowledge more efficiently. The ability of good management of relations with different actors within industry and providing a optimum knowledge creation from this process is called as a "relational capital". In this networking relation and connection, the boundaries between codified and tacit knowledge may change. There is an appropriate interaction between tacit learning process and codified knowledge in industrial cluster. This way, firm gets the experiment with different procedures of codification of experience, know how and localised tacit knowledge. In conclusion, firms should have a organizational integration relations in order to achieve and transfer of valuable economic knowledge within industrial cluster consist of factor suppliers firms, universities and customers as well.

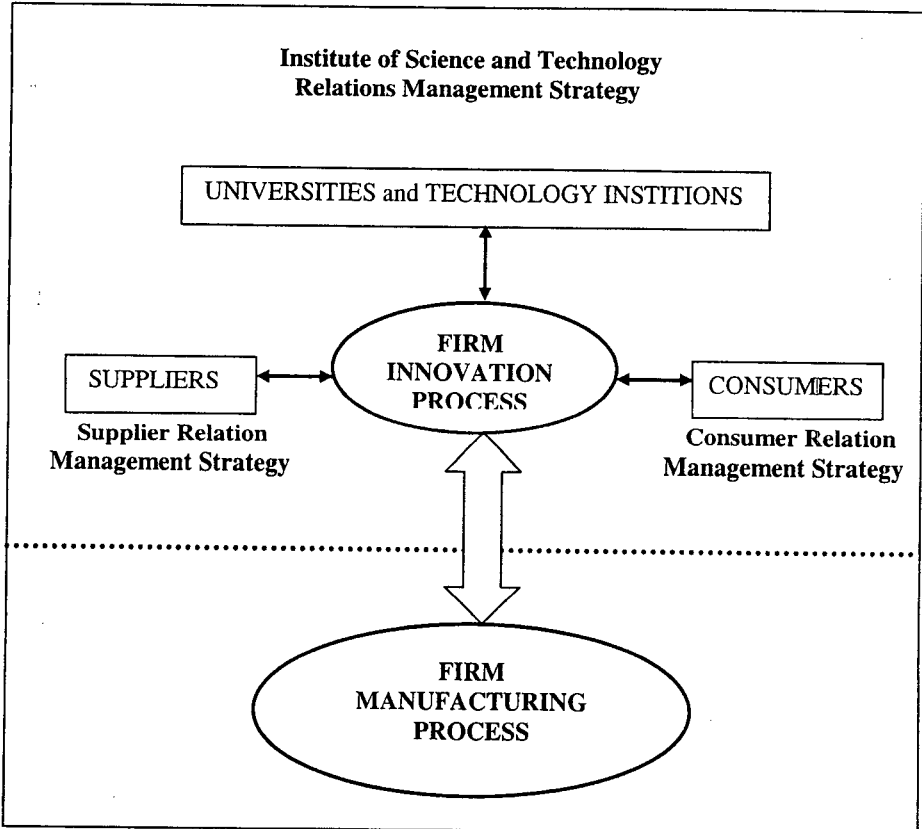
As can be seen from Figure-3, a firm's production system in industrial cluster can be divided two basic processes: Innovation Process and Manufacturing Process. In other words, production process consists of "creating goods", and "making goods". In new economic environment, innovation process increases its importance fast while manufacturing function decreases (ZYSMAN, 2002: 39). In this context, the industrial organisation of knowledge production becomes central in assessing the performance of firm activities. Thus, traditional manufacturing is to become less and less important and its contribution to employment decreases, while innovation section of production system is to become more and more important.

For example, Ericson, one of the most successful European firms in telecommunication industry, now employs fewer than 10 per-cent of its employees in manufacturing. This proliferation of "non-manufacturing" occupation is not, of course, treated as a form of conspicuous waste. Most of its personnel are engaged in software, design of systems, R&D, worldwide consultancy and marketing, technical services, management and networking. Basic reason of this fact is that new form of competition is highly required to management the relations with the other parts of cluster indicated above. Therefore, firms need much more worker in order to manage the relations with

other actors of industry. An extreme example is that of Benetton, which most people would think of as a firm belonging to the clothing industry. Benetton actually has hardly any employees in the manufacturing process. Almost all manufacturing is subcontracted to a network of small firms in North-Eastern Italy, whereas Benetton itself concentrates on design and worldwide marketing through hundreds of franchised retail outlets all over the world. (FREEMAN / SOETE, 2000: 283). Thus, we can conclude that the main element of our knowledge-based economic development is to add greater knowledge content to production system.

On the other hand, as indicated in Figure-3, the effectiveness of knowledge content enabled firm's production system is closely related to the extent of a commonly shared knowledge base provided by efficient management of the relations with supplier, university and technology centre, and consumer. Because of this reason, it is vital for firm to improve its technological and organisational skills in connecting with these actors in same cluster. Accordingly, the relations that a firm in industrial cluster should manage may be divided three basic parts: Institute of Science and Technology Relation Management, Supplier Relations Management, and Consumer Relations Management. There are three generic steps in managing knowledge flows from every relation management process. These steps concern absorbing ideas, integrating them into existing knowledge base (memorising) and further distribution into other relations (dissemination) (ANDRSEN, 2000: 6). This addresses the fact that firm gains knowledge and will create and share new knowledge in industry cluster.

Figure-3: Process and Strategies of Production in Industrial Cluster System



We can then argue that improving the organization of knowledge production can strengthen a firm's intangible assets, enabling to be more productive in knowledge-based economy. In other words, belonging to a network by these ways provides a strong "knowledge infrastructure" that constitutes a key factor of the competitive advantage. The separation of functions in the firm and industry are being mediated towards reintegration through these channels existing in industrial cluster model. Firms should use these connections in order to get knowledge for competitiveness. Because of this reason, management of every relation well constitute a part of production strategies for firm in knowledge-based economy.

For instance, in a new economy, product life cycles have grown shorter and shorter, and customers have come to expect products that are more closely tailored to their specific needs and demands. Thus, invention-giving importance to market signals using by the strategy of consumer relation management can only be successful in knowledge-based economy. In this circumstance, Schumpeter's theory, which puts the emphasis on autonomous activity by entrepreneurs as the mainspring of invention rather than market demand, cannot explain modern innovation process (CORTRIGHT, 2002: 9). On the other hand, linear innovation theory, which stresses on scientific research much more, is also not enough to explain modern innovation process because of ignoring the importance of consumer needs. A firm that has a good Consumer Relation Management may only recognize potential markets and design of new or improved products or process, identifying sources of consumer satisfaction and dissatisfactions. In other words, if a firm has a good Consumer Relation Management strategy, it has also a better window on the market and a better match with customers' requirements. New product carrying out and implementing without assessing the market potential and the costs of penetrating market cannot be successful.

In conclusion, production strategies for a firm in knowledge-based economy should focus on its internal growth of knowledge within it. However, knowledge acquisition and organisation do not occur only within the boundaries of the firm. External factors in industrial cluster may also become part of firm's stock of knowledge and consequently they may change the significance of the resources of the firm (PENROSE, 1995: 79). It can be argued that Knowledge Management Strategy consists of Institute of Science and Technology Relation Management, Supplier Relations Management and Consumer Relations Management. All aspects of knowledge management are the central focus of the company's top management. Companies can optimize their knowledge process by managing these relations well. We can argue that over time, relatively more knowledge will be codified in these interactive cluster relations. It is hard to share the tacit knowledge but not impossible. Thus the boundaries between codified and tacit knowledge may change (COHEDENT, 1999: 237). The relations included by industry cluster enable companies to remove constraints from the sharing of tacit knowledge. "Clusters are among the organisational mechanism having a strong leverage on the circulation of so-called tacit knowledge" (LAROSSE, 2001: 10).

In this framework, knowledge management including only codified knowledge is too narrow a strategy because codified knowledge is only one aspect of knowledge. In the new economy, companies should also optimize the process of tacit knowledge. Knowledge management tradition accepting

codified knowledge as all of knowledge is not enough to provide optimum knowledge management in knowledge-based economy. We know that much of value adding comes from tacit dimension. Several studies show that less than 3 percent of the value of innovation derived from relatively new codified knowledge. In other words, accelerated innovation and knowledge-based economy basically depend on developments of tacit knowledge (NIELSEN / NIELSEN, 2004: 9). On the other hand, the overemphasis on codified knowledge makes it logical to give priority to database and communication systems that encourage codification, documentation and storage of organizational knowledge. That is, traditional approach focuses on insider firm activities much more. However, our picture of the knowledge system and its dynamics, indicated Figure-3, stresses on the interactive relations among all units in industrial cluster.

3 – SOME IMPLICATIONS FOR POLICIES IN AN INDUSTRY CLUSTER

Industry Cluster Model not only provides an analytic tool to analyse systems of innovation, realised in section 2 in this study but can also be used as a working method for policy making in this area and as an economic development tool for strategic business development. Public policies will play important roles in creating the circumstances for innovation and the diffusion of knowledge in the framework of industry cluster. Many economic theories give the impression that governments are needed only when markets do not work. Nevertheless, in knowledge-based economy, governments should do much more than this conventional approach. In other words, cluster policy has a great potential for public policy additionally. Indeed, cluster studies have been the corner stone of industrial policy making in many countries.

Governments should work as institution builders creating appropriate incentive structures, as facilitators of efficient markets and as catalysts of dynamic comparative advantage. Thus, the role of the state in industrial policy making coincides with a shift from direct intervention to indirect inducement. From that perspective, the state should not try to take the lead or ownership in cluster initiatives, but primarily should work as a catalyst and broker that brings actors together and supplies supporting structures (ROEELANDT / HERTOOG, 1998: 36).

The most important job for economic policy in cluster context is to create an institutional environment that supports technological change. There is a role for government to ascertain institutional conditions for cluster development as a general policy to encourage knowledge diffusion (LAROSSE, 2001: 10). The

diffusion of new information and communication technologies plays a crucial role in cluster context. In order to stimulate cluster and knowledge based growth, the most important job for economic policy is to create an institutional environment. Innovation policy also needs new institutional setting to engage into dialogue with all actors and to organize policy coordination to support an integrative innovation system.

Review of cluster-based industrial policy making experiences in Europe clearly has pointed at some pitfalls in cluster-based industrial policy making. These pitfalls indicate starting points and leading policy principles when design a comprehensive cluster-based policy (ROEELANT / HERTOOG, 1998: 38).

- The creation of clusters should not be a government-driven effort, but should be the result of market-induced and market-led initiatives.

- Government policy should not have a strong orientation towards directly subsidizing industries and firms or to limiting the rivalry in the market.

- Government policy should shift from direct intervention to indirect inducement. Public market interference only can be justified if there is a clear market or systemic failure.

- Governments should not try to take the direct lead or ownership in cluster initiatives, but should work as a catalyst and broker that brings actors together and suppliers supporting structures and incentives to facilitate the clustering and innovation process.

- An effective cluster policy means interaction between researchers, captains of industry, policy-makers and scientists and creating a forum for constructive dialogue.

In conclusion, leaders of business, government, and institutions all have a stake in the new economics of competition. The lines between public and private investment blur. Companies, no less than governments and universities, have a stake in education. Universities have a stake in the competitiveness of local business. By revealing the process by which wealth is actually created in an economy, clusters open new public-private avenues for constructive action (PORTER, 1998: 90). On the other hand, economic development policy based on the industry cluster approach has the advantage of developing a public policy approach that is based on the provision of services and improvements to the business climate to a group of firms rather than to individual firms.

CONCLUSION

From the viewpoint of knowledge-based economy, a firm's competitiveness is becoming more dependent upon its ability to apply new

knowledge in products and production processes, which is also called intangible assets. In the new economic environment, a firm's production system can be divided into two basic processes: Innovation Process and Manufacturing Process. It can be argued that innovation process increases its importance fast while manufacturing function decreases. In this context, the industrial organisation of knowledge production becomes central in assessing the performance of firm activities. Because of this reason, the networking relationships may be an essential part of the firm's intangible assets or competitiveness in knowledge-based economy. In this framework, national innovation system and cluster model show the way for firms in knowledge-based economy, how to integrate and benefit from the network economy.

Thus, the emergence of the knowledge economy implies that production strategies should be determined in a network-based economic structure, instead of a firm-based structure. In order to determine the production strategies in networked-based economic structure, industrial cluster provides a strong analytical tool because the separation of functions in firm and industry are being mediated towards reintegration through some channels existing in this model. Accordingly, we indicated that three basic relations should be managed in the framework of efficient production strategies. These are Institute of Science and Technology Relation Management, Supplier Relations Management and Consumer Relations Management. In a cluster, using this relation management, firms can get tacit knowledge tightly linked to practical experience of other parts of cluster.

Industry cluster is a market-induced and market-led process. On the other hand, governments have a crucial role to play in setting up the right structures for economies to evolve over time in a cluster system. We can define the roles of government in this framework as a facilitator of networking, as a catalyst of dynamic comparative advantage, and as a institution builder, as opposed to a participant of the system.

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