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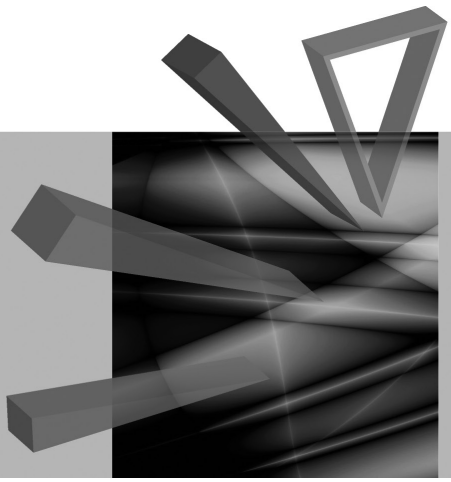
Innovation Sources of Economies in Eastern Asia



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Innovation Sources of Economies in Eastern Asia ISSN 1899-3192

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NETWORK-CENTRIC INNOVATIONS. THE CASE OF CHINA

Summary: The purpose of this paper is to determine importance of knowledge exchange and creating knowledge-based relationships between the innovative company and its partners, and/or competitors in innovation processes which are executed within the framework of networks. This paper characterises the role of clusters, technology-scientific parks and other innovation networks in economic development of regions and countries. It presents examples of their activity in China, which also shows international cooperation and exchange of knowledge amongst collaborators of the analysed innovation networks.

Keywords: innovation networks, knowledge-based relationships, innovation process.

1. Introduction

Today's companies are faced with dynamic and turbulent environment that requires flexible and fast responses to growing competition on markets, and changing consumers' needs and expectations. Many of them have responded by taking part in innovation process execution in decentralised, team-based and distributed, constantly changing structures as innovation networks (also clusters, technology and science parks). Companies have increasingly shifted from innovation initiatives that are centred on internal resources of knowledge to those centred on external networks, in other words, they shifted from firm-centric innovation to network-centric innovation.[1]

Innovation is the effect of the development and application of knowledge within the innovation network, which now determines economic success of the innovative company and its market value in the knowledge-based economy. The value of such a company depends on its ever-growing inside and outside resources of knowledge, exchange and creation of knowledge with partners (suppliers, consumers) and competitors during innovation processes execution within the framework of the network.

[1] S. Nambisan, M. Sawhney, Orchestron processes in network-centric innovation: Evidence from the field, *Academy of Management Perspectives* 2011, August, p. 40.

In this paper innovation networks can be understood as an organisation in which two or more independent firms aim at joint researching, developing or dispersing innovations. In such a relatively stable and cooperative collaboration, partner firms find support during one or more activities of the innovation process, which may increase their innovation performance[2] and make possible access to competitive resources of knowledge on innovation markets.

The network can have a positive impact on innovation in all organisational contexts (i.e., within established large organisations, small businesses and new entrepreneurial start-ups). Those companies which do not co-operate and which do not formally or informally exchange knowledge base on a long-term basis ultimately reduce their ability to enter into exchange relationships.[3]

This paper focuses on building knowledge-based relationships by the innovative company with partners (consumers, suppliers), and/or competitors during innovation processes execution within networks. These relationships integrate knowledge resources of the innovative company and its collaborators within the framework of the innovation network and allow their mutual learning and effective knowledge development during accomplishment of innovation processes.

Networks provide efficient access to diverse information, capabilities, current knowledge, technologies, new markets and more opportunity for learning, and less risk of inter-network rivalry. In this paper, the role of clusters, technology-science parks and other innovation networks in the region is characterised, and examples of their development in China are also presented.

2. Knowledge-based relationships of innovative companies with partners of innovation networks

Knowledge can be understood in terms of internal and external sources. Organisations also assimilate and integrate knowledge by facilitating its communication, sharing and transfer among individuals, and by encouraging interactions, relationships in groups and networks.[4] The use of external knowledge has been proven to be one of the key factors in ensuring innovation, learning, business competitiveness and long-term growth.[5]

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[2] Ch. Dilk, R. Gleich, A. Wald, J. Motwani, State and development of innovation networks, *Management Decision* 2008, Vol. 46, No. 5, p. 693.

[3] L. Pittaway, M. Robertson, K. Munir, D. Denyer, A. Neely, Networking and innovation: A systematic review of the evidence, *International Journal of Management Reviews* 2004, Vol. 5/6, No. 3&4, pp. 137, 145.

[4] P. Kess, K. Phusavat, J. Takala, Managing external knowledge: Framework for organizational life-cycle, *International Journal of Innovation and Learning* 2008, Vol. 5, No. 3, pp. 255–265.

[5] P. Anussornnitisarn, S. Sanpanich, K. Phusavat, P. Kess, M. Muhos, Sustaining organizational innovation and learning through external knowledge, *International Journal of Innovation and Learning* 2010, Vol. 7, No. 1, p. 86.

Small- and medium-sized enterprises need to sustain innovation, learning and development, because it is essential for their long-term business successes and growth. Due to their limited size and resources, they often have to seek relevant and emerging knowledge from the outside[6] and begin to collaborate with partners during innovation process execution within the network.

The issues concerning the balance between suitable knowledge, and when and with whom to seek such knowledge are important for sustainability of companies' innovative development. Therefore, identifying external knowledge sources is perceived to be critical for companies' learning and innovative development. External knowledge of the innovative company derives from its partners and competitors within the innovation network and is generated in the area of micro- and macroenvironment.

The innovation process consists of the following activities: development of a new solution concept, innovation elaboration, its application, promotion and selling on the innovation market, and also its continuous improvement. During the course of this process knowledge-based relationships are created among its contractors connected with the flow, application and development of shared knowledge. With accomplishment of innovation processes within the innovation network, knowledge resources of its participants are multiplied.[7] Networks are critical not only for accessing knowledge to create in-house innovations, or for the diffusion of technological innovation, but they are also equally important for learning about innovative work practices that other organisations have developed or adopted.[8] Networks are means by which companies can pool or exchange knowledge resources and jointly develop new ideas, innovative skills, innovative culture and innovations.

Innovation arises from complex interactions and relationships between individuals, business partners of the network organisation and their markets during the implementation of innovation processes. Firms and their employees cooperate with one another during the execution of innovation process activities and then use and develop their complementary knowledge resources. The role of knowledge-based relationships between partners of innovation network is central to knowledge creation, transfer and effective using in innovation processes.

Knowledge-based relationships of the innovative company with collaborators of the innovation network are formed during knowledge flow, development and using innovation processes which are executed within the framework of the network. These relationships are created among (see Figure 1):

– partner entities of national and regional systems of innovation;

[6] P. Garengo, G. Bernardi, Organizational capacity in SMEs: performance measurement as a key system in supporting company development, *International Journal of Productivity and Performance Management* 2007, Vol. 56, Nos. 5–6, pp. 518–532.

[7] M. Dolińska, *Innowacje w gospodarce opartej na wiedzy*, PWE, Warszawa 2010, pp. 8, 14, 15.

[8] L. Pittway, M. Robertson, K. Munir, D. Denyer, A. Neely, *op. cit*., p. 145.

– companies and their customers and/or suppliers/distributors of knowledge, information, innovative solutions (also patents, licences);
– employees and project or process teams which cooperate with one another in the company and with partner entities of innovation networks (also national, regional innovation systems): firms in the same and/or different lines of business, R&D institutions, laboratories, high schools, universities, polytechnics, technology and science parks, clusters, regional and/or local authorities, innovation transfer institutions, clubs of innovators, associations of innovators, suppliers of funds for innovations (also VC firms), consulting firms, innovation sale and promotion services.

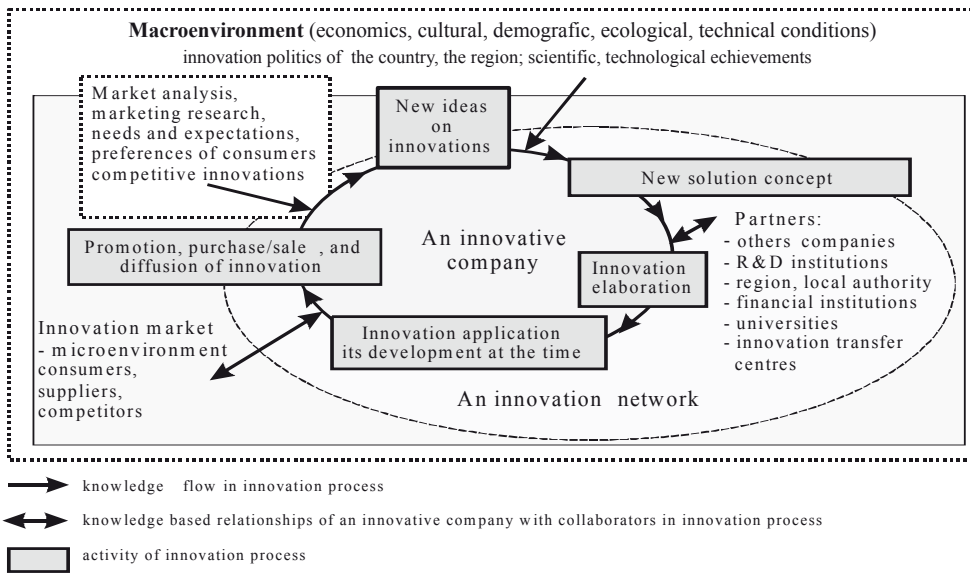

Figure 1. Knowledge flow and creating knowledge-based relationships between the innovative company and its partners within the innovation network

Source: author's own concept.

Advantages that accrue from diverse sources of information, knowledge and other resources in innovation processes are considerable for their partners. Successful companies realise that investing in knowledge is essential to their ability to create high value products and services[9] and build strong position on innovative markets. Market demand and consumer expectations also influence innovation process execution and innovative development of companies.

[9] W.S. Chang, J.J. Hsieh, Intellectual capital and value creation – Is innovation capital a missing link?, *International Journal of Business and Management* 2011, Vol. 6, No. 2, p. 3.

Contemporary companies must constantly upgrade their innovative capabilities by investing in their competencies, skills and knowledge bases, and also knowledge--based relationships with collaborators in the framework of innovation networks. These relationships lead to various benefits with respect to knowledge diffusion and its creating, resource sharing, access to complementary knowledge, specialised intellectual assets, skills, interorganisational learning and innovative capabilities improvement.

Innovations are results of innovation processes and must be commercialised to contribute to the regional/local economy. The role of regional innovation networks is to create innovation processes that accelerate application and commercialisation of innovations and shepherd the early stages of innovation's diffusion. Regional innovation networks are characterised by collaboration among regional/local authorities, universities, R&D, financial institutions, industry and service companies. The aim of these networks is to drive economic development in the region through increased commercialised innovations, derived from internal or external knowledge, financial resources, and other support skills and programmes for innovative companies and their collaborators within the framework of networks.

3. Innovation networks in the region

Regions and their companies depend on innovation as a source of economic sustainability and growth. The regional innovation system can be thought of as the institutional infrastructure supporting innovation within the production structure of a region. The concept of the region highlights an important level of governance of economic processes between the national level and the level of the individual cluster or firm.[10]

At the institutional level, national systems of innovation play an important role in diffusion of knowledge and innovations in terms of the way in which relationships with suppliers, customers and intermediaries, such as professional and trade associations, are important factors affecting innovation performance and productivity.[11] The national system of innovation is defined as the network of institutions in the public and private sectors whose activities and interactions initiate, import and diffuse innovations.

The firms and organisations of regionally networked innovation systems are embedded in a specific region and characterised by local, interactive learning. The objective of the regional innovation system is to increase innovation capacity and

[10] B.T. Asheim, M.S. Grether, The geography of innovation: Regional innovation system, [in:] J. Fagerberg, D.C. Mowery, R.R. Nelson (Eds.), *The Oxford Handbook of Innovation*, Oxford University Press, Oxford 2006, p. 299.

[11] L. Pittaway, M. Robertson, K. Munir, D. Denyer, A. Neely, *op. cit.*, p. 137.

collaboration in the region.[12] The regional innovation system is increasingly the level at which innovations are produced through regional networks of innovators, technology-scientific parks, local clusters and effects of R&D institutions work.

"Regional network is an agglomeration of companies, suppliers, service providers, and associated institutions in a particular field … linked by externalities and complementarities […] usually located near each other".[13] The role of third parties, such as professional associations, trade associations and publicity funded bodies specifically aimed at promoting innovation (such as technology transfer centers), have a positive impact on the development of innovation networks. They ideally act as neutral knowledge brokers but also as important conduits for the development of informal relationships (personal relations between individuals), which are the basis for the development of network relationships, particularly between small and medium firms. Third parties are one of many network mechanisms that improve regional innovation system infrastructures.[14]

The technology-scientific park is a group of firms that generate, develop and utilise new technology to apply it in the economy (also in new products on markets). These parks positively affect universities' contributions to innovative development of firms.

The science park is characterised by the International Association of Science Parks as an organisation managed by specialised professionals, whose main aim is to increase the wealth of its community by promoting the culture of innovation and the competitiveness of its associated businesses and knowledge-based institutions. To achieve these goals, the science park stimulates and manages the flow of knowledge and technology amongst universities, R&D institutions, companies and markets. It facilitates creation and growth of innovation-based companies through incubators and spin-off processes, and provides other value-added services together with high quality space and facilities.[15]

Porter defines clusters as geographic concentrations of interconnected companies, specialised suppliers, service providers, firms in related industries and associated institutions (e.g., universities, standards agencies, trade associations) in a particular field that compete but also cooperate.[16] The cluster in the regional innovative system includes the following components: companies, universities, research and

[12] M.G. Schoonmaker, E.G. Carayannis, Assessing the value of regional innovation networks, *Journal of Knowledge Economy* 2010, Vol. 1, February, p. 50.

[13] M. Porter, C. Ketels, M. Delago, *The Microeconomic Foundations of Prosperity: Findings from the Business Competitive Index*, World Economic Forum – the Global Competitiveness Report, 2007––2008, p. 1.

[14] L. Pittaway, M. Robertson, K. Munir, D. Denyer, A. Neely, *op. cit*., p. 154.

[15] www.iaspworld.org/information/definitions.php (accessed: 26.03.2012).

[16] M. Porter, Location, competition, and economic development: Local clusters in a global economy, *Economic Development Quarterly* 2000, No. 14, pp. 15–34.

development entities, laboratories, innovation transfer organisation and innovation financing institutions.

The mechanism cluster manifests itself in lots of aspects. In economic geography theories, rich inter-firm relationships, primarily driven by geographic proximity to competitors, supply chain members and firms in related industries, are addressed as the key factor of firms' performance. Motives for partnership are minimizing the sum of internal and external transaction costs and increasing efficiency. The objective of partnership is to economise on transaction costs through choosing an appropriate governance structure. Also, knowledge management theory points out the importance of knowledge spillovers and creativity within the innovation process, which primarily stems from the traditional economic idea of knowledge externalities and the more modern concept of localised learning systems. Proximity facilitates an increased number of interactions between related firms, largely as a function of high spatial concentration, which in turn enhances coordination and control of firm activities within the supply chain and facilities frequent and repeated inter-firm knowledge and information sharing as well as collaboration.[17]

In many OECD countries, efforts to increase the national economic returns from public investments in university research have been made to stimulate the creation of regional clusters of innovative firms around universities. These undertakings seek to stimulate regional economic development and agglomeration via facilitating creation of spin-off firms to commercialise university technologies. These policy initiatives are motivated by high-technology regional clusters in the United States, notably Silicon Valley in California and Route 128 in the Boston area. Both of these high-technology clusters have spawned a large number of new firms and have major research universities in their midst (for example, in Silicon Valley in California, the University of California in Berkeley, Stanford University, and the University of California in San Francisco). At least some of the successful new firms in these regions have been involved in commercializing technologies at regional universities.[18]

"If the local social and cultural environment is conducive to network building and companies' development, which is flexible, attractive, and looks to individual accomplishment and business achievement, the firms and therefore the cluster, will obtain more resources for development. […] Most of the science or technology related clusters of great eminence, e.g., Silicon Valley, Toulouse aerospace cluster, Zhongda textile district, are found located in developed countries or comparatively advanced areas".[19]

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[17] Y. Zhao, W. Zhou, S. Huesig, Innovation as clusters in knowledge intensive business services: taking ICT services in Shanghai and Bavaria as an example, *International Journal of Innovation Management* 2010, Vol. 14, No. 1, p. 8.

[18] D.C. Mowery, B.N. Sampat, Universities in innovation systems, [in:] J. Fagerberg, D.C. Mowery, R.R. Nelson (Eds.), *The Oxford Handbook of Innovation*, Oxford University Press, Oxford 2006, p. 225.

[19] Y. Zhao, W. Zhou, S. Huesig, *op. cit*., p. 7.

4. Examples of clusters and science parks in China

China has a long history of cluster development – some clusters have emerged relatively recently, while the origins of others date back to hundreds of years ago. Industry clusters in China can represent several thousand enterprises, from small to large, in a limited geographic area and all engaged in the same sector. Each cluster has an industry association and works closely with local university and government.[20]

The integration of China into the global economy in the course of transition was substantially driven by the textile sector, in which the country now holds the leading position worldwide. Globalisation has made China's textile industry one of the most important economic engines.[21]

One remarkable example of an economic cluster that was established in the more distant past is the Zhongda textile district south of the campus of Sun Yat-Sen-University in Guangzhou's Haizhu district. This area accommodates about 300 000 inhabitants, many of whom are migrants employed in one of the manifold business related to the textile sector. Since late 1980s, the area has grown from four villages into a vibrant centre for textile and other related industries. The district aims to serve as a one-stop fabric and accessories centre that provides integrated functions of international purchasing and trading, logistics, exhibition, consultation, knowledge and technology exchange, innovation application and staff training. The surrounding areas have also profited from the boom in textile trading and have seen the development of hotels, catering, banking, and mobile technology, information industries. The Zhongda textile district currently constitutes the second largest textile trading area in China and includes over 40 textile industry related centres with the agglomeration of over 10 000 shops. On completing the Guanzhou Textile Expo centre, currently the largest construction project in the area in terms of investment and space, the Zhongda textile district will become the largest textile commercial area in China. Some of the successful new firms in this cluster have been involved in commercialising knowledge and technologies developed at the regional university. In the development of the analysed cluster, the Haizbu District Government has apparently played the leading role. Regional government helped companies to improve their ability to compete on domestic and international markets and move to B2C business model.[22]

The Shanghai Zhangjiang High-Tech Park was established in 1992 as a national park designed for the development of new and high technology. The park's three leading

[20] J.P. Jeannet, *Cluster Companies in China's Zhejiang Province – Part I*, www.imd.ch, June 2009, p. 2.

[21] F. Schröder, M. Waibel, U. Altrock, Global change and China's clusters: The restructuring of Guangzhou's textile district, *Pacific News* 2010, No. 33, p. 7.

[22] F. Schröder, M. Waibel, U. Altrock, *op. cit.*, p. 5.

industries are information technology, modern biotechnology, pharmaceuticals, and its principal focus is to develop innovation and entrepreneurship. This park is one of the nation's hi-tech parks with an innovative and educational atmosphere and state-of-the-art technology. It is also striving to become a world-renowned centre for hi-tech industries and scholars. The Shenzhen High-Tech Industrial park was set up in 1996. In this park, a group of national grade scientific research institutions and a large number of domestically well-known enterprises of high-tech industries have built their agencies or bases, as well as many internationally famous enterprises, such as IBM, EPSON and OLYMPUS. These companies play an important role and offer leading products in the sectors of electronic information, bio-engineering, new materials and optical electromechanical integration.[23]

Zhongguancum China Science Park is located in Beijing and was the first state-level high-tech development zone approved by the State Council in 1988. More than 10 000 new and hi-tech international and China enterprises are residents of this park. There are more than 1500 R&D centres and hi-tech companies set up by, or invested in, by overseas transnational companies like IBM, Microsoft, Mitsubishi, as well as 40 overseas-listed companies. The Jianxiang Sector of the Park provides a range of capabilities and services including business and exhibition/convention facilities and support, science-technology brokerage, investment and financing intermediary services and technical talent exchanges.[24]

5. Conclusions

Contemporary companies cannot learn and build their innovative capabilities relying solely on their own knowledge resources. They ought to draw on the outside and also on foreign sources of knowledge as well as learn from partners (suppliers, consumers) and competitors during innovation processes execution within the area of innovation networks. Assimilation of external knowledge depends on company's capacities of cooperation with participants of networks and creating knowledge-based relationships with them. Innovation networks, such as clusters and science parks, enable companies to react dynamically to changeable conditions of innovation process execution, learn how to create and use knowledge in innovations and apply them in economy in an efficient way.

[23] www.ciste.gov.cn/englishversion/China_ST (accessed: 25.03.2012).

[24] www.agrifoodaisa.com/English/partners/zhongguancun_sp.htm.

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Streszczenie: Celem opracowania jest określenie znaczenia wymiany wiedzy oraz budowania relacji opartych na wiedzy pomiędzy innowacyjnymi przedsiębiorstwami oraz ich partnerami i/lub konkurentami w trakcie realizacji procesów innowacji w sieci. Opracowanie charakteryzuje rolę, jaką odgrywają klastry, parki naukowo-technologiczne oraz inne sieci innowacji w gospodarczym rozwoju regionów i krajów. W tekście przedstawiono przykłady ich działalności na terenie Chin, które także pokazują międzynarodową współpracę i wymianę wiedzy pomiędzy współpracownikami analizowanych sieci innowacji.

Słowa kluczowe: sieci innowacji, relacje oparte na wiedzy, proces innowacji.