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THE NETWORK CONNECTIONS AMONG ENTERPRISES

Katarzyna Koziół-Nadolna¹

Abstract

The aim of this paper is to present the network connections between enterprises, i.e. all connections (formal and informal) between enterprises and other organizations. The connections are to increase their innovativeness and competitiveness. Remaining in an innovation network has a lot of potential advantages regarding an innovation process: access to a bigger database of ideas, sharing risk, sharing innovation costs, access to new markets and technologies, synergy effect. Such networks are very flexible and, if necessary, make it possible to move the whole production between countries quickly, which reduces the risk connected with a political or economic situation in a given country. This article focuses on a few issues: definitions of networks, types of networks, creating networks and network functioning, an example of a successful and unsuccessful cooperation within a network. In the last part of this article the main participants - transnational corporations - were presented briefly.

JEL classification: O3

Key words: innovations, innovation network, transnational corporations

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Introduction

The currently changing innovation models (from closed innovation to open innovation), that is the increasing openness of innovation processes, the network connections between enterprises, cooperation within the network, corporate entrepreneurship, intellectual property management or R&D management, they all influence the innovativeness of enterprises, which also depends on the quality and quantity of ties with other subjects generating knowledge and innovation in economy (innovation network). The aim of this article is to present theoretical aspects of the network connections between enterprises.

Networking essence and types of networks

Networking comprises all types of formal and informal relations between business units and organizations. The network structure provides enterprises with quick access to knowledge, allowing them to save time and money. Defining the network we can assume that it covers clients, competitors, suppliers, research organizations, schools, non-profit institutions, which are connected and create innovations (De Jong, Vanhaverbeke, Kalvet, Chsbrough, 2008, p.17). The network is a set of actors connected by a set of relations. The actors may be people, teams, organizations or concepts.

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Another definition of network points at the specificity of relations between people, objects or phenomena in a particular set (Plawgo, Klimczuk, 2009, pp. 305-307).

The innovation network is composed of the following elements (Markowski, 1997, p.22):

- 1) the science pole (universities, science centers),
- 2) the technology and industry pole (technology centers, implementation centers),
- 3) the market pole (distribution centers).

The network type of relations in the innovation process means the creation of new technical and organizational solutions and their transfer and application in economy. It is possible due to the knowledge generated in the network which is the result of the interaction and cooperation process among network participants. According to A. Koźmiński (250, p.40), the primary function of the network is sharing knowledge among participants, which influences the changeability of network shapes, which are unpredictable and generate uncertainty.

The relations between subjects determine the type of the network. We can differentiate the following networks:

- 1) social networks,
- 2) networks inside the organization,
- 3) networks among various organizations.

Social networks are based on informal, personal contacts, and they provide information in the early stages of enterprise development. In further stages of development, the networks inside the organization and among organizations (with suppliers, customers, scientists or authorities) become more important. These networks facilitate our access to specific resources and information.

We agree with Mesjasz (2008, p.37) that transnational corporations are mainly interested in internal networks. It is not rare, however, that corporations with internal network relations participate in external corporate networks.

By external corporate network we understand such relation among enterprises in which information, material or energy exchange is taking place, and the exchange partners show mutual involvement (Czakoń, <http://shg.waw.pl/katedry/ktz/mf2020/referaty/>).

Brilman (2002, p.427) offers a traditional classification of corporate networks. He differentiates the following relations between organizations:

- 1) integrated networks, consisting of dispersed units: branches, agencies (banks, post offices),
- 2) federated networks, created to provide for common needs (associations, cooperatives),
- 3) contract networks, between independent partners, based on contracts, franchising agreements,
- 4) direct relations networks (direct sale networks).

Networks may be built on various levels: between organizations, or on social, global, national, sector, or organizational level.

The network influences its participants in two different ways: the first one consists in information flow in the network and defines the rules of information sharing; the second one is based on differences which are determined by the market positions of particular participants – these positions have a determined power of influence and control the imbalance level (Gulati, 1998, quoted after: Surówka-Marszałek, 2008, p.52). The organization's position in the network is the most important aspect, as it expresses its power, which influences the network. The sources of power may lie in the economic or technological power or in the trust the organization enjoys.

As Rybiński (2007, pp.67-72) rightly pointed out, one of the biggest advantages of being in the network is a possibility of cooperation with many enterprises or organizations on one project. The participants may come from various economic sectors, different countries with

different social systems (religious or cultural), therefore foundations of their knowledge will be different, and the research may lead to innovations which would probably not be made if a homogenous team from one company worked on it.

How do networks work? How do they achieve their common goal when they are composed of hundreds or even thousands of independent units or firms? The leader, called ODM (Original Design Manufacturer), initiates the creation of the network. ODM may be a group of people, a small firm or a large corporation. ODM decides who participates in the network, evaluates technical potential of possible participants and their corporate culture in view of their ability to cooperate with other units. ODM determines the rules of cooperation, but he lets participants create their own methods of achieving the goals and criteria set by them, which encourages innovativeness.

The organization of the network, its structure, is of vital importance. In module organization, when a given participant is assigned to a particular module, innovations may appear parallel in various modules at the same time. The speed and effectiveness of the innovation process are influenced by the quality and quantity of connections between modules and the evaluation of performed tasks.

Network functioning process

Globalization is the main factor accounting for greater openness of innovation processes in enterprises, not only due to intense and global competition, but also because of global innovation space has been created. More and more countries, not only belonging to the traditional triad, but also developing ones, participate in these processes. Hence it is justifiable to use the global innovation network term.

Thanks to globalization and scientific and technological progress, including the popularization of information and communication technologies, the geographic as well as economic, social and political distance has been shortened, as it was rightly noticed by Pakulska and Poniatowska-Jaksch (2009, pp.23-25). New technologies influenced the phenomenon of transforming domestic companies into corporations, while small and medium-sized firms were given the opportunity to enter into alliances or sign cooperation agreements with other enterprises all over the world.

Globalization of innovation activity, R&D sphere, or science and technology is a progressive process. In 2006 the OECD countries investment in research and development increased to USD 818 billion from USD 468 billion in 1996. The global distribution of R&D expenses has changed, however. In China, the GERD indicator reached the value of USD 86.8, growing 19% annually in 2001-2006. In South Africa, investment in research and development increased from USD 1.6 billion in 1997 to USD 3.7 billion in 2005. In 2005 the global share in total expense on research and development in three main regions of OECD was around 35% in the USA, 24% in 27 EU countries, and 14% in Japan. Japan has maintained its global share since 2000, while in the USA – due to very slow increase of expenses on research and development (BERD) – it fell by over 3 percentage points. The EU share decreased by 2 percentage points (OECD, 2008). The crucial year was 2007, when the Asian countries' R&D expenses exceeded the US expenses (respectively USD 436.2 and USD 353) and China became the world's second investor in R&D (data in table 1).

Table 1: Share of chosen countries in global R&D expenditure (%)

	2006	2007	2008 (forecast)
USA	32.7	31.4	30.1
Asia	36.9	38.8	40.8
China	13.5	15.6	17.9
Japan	13.0	12.8	12.4
India	3.7	3.7	3.7
European Union	25.2	24.6	23.9

Source: D. Ernst: *The New Geography of Innovation – Asia’s role in global innovation networks*. Obtained from

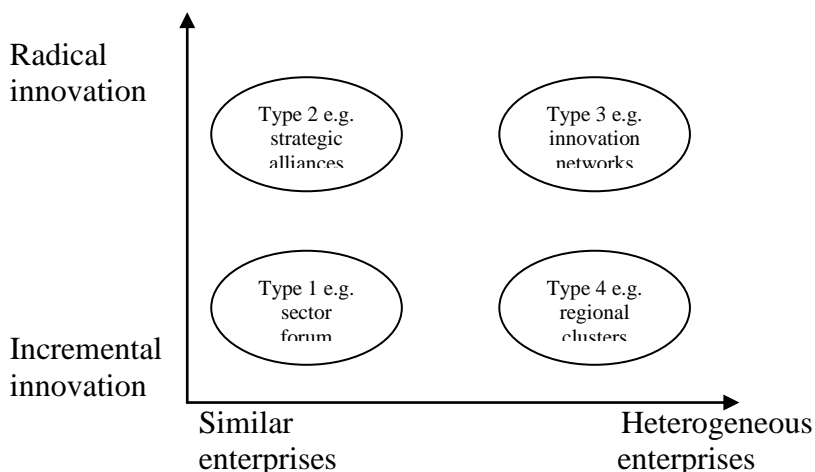
http://www.apru.org/awi/workshops/economic_integration/slides/Nov%209/5-4%20Dieter%20Ernst.pdf.

The off-shoring process also leads to the creation of global innovation network. By transferring certain areas of its activity abroad, the enterprise assumes that many functions may be quicker, cheaper and more effective if performed by partners, which contributes to the development of network. According to Nowak (2010, p.83), the network is created by knots, that is firms between which there relations contributing to the creation of much more organized structures than those appearing in the network itself. The network effect is generated when every new member joins the network, which increases its value for all its existing participants.

Global innovation network is created by companies with their own R&D back-up outside their home countries and cooperating with external subjects, not only in research activity, but also in production, marketing or sales. Global innovation network is not homogenous (various participants, varying number of them, types of information, forms of cooperation).

Tidd (2006) classified four types of global innovation networks, depending on the similarity of enterprises and radical nature of innovation (figure 1).

Figure 1: Different types of innovation networks



Source: J. Tidd (2006). *A Review of Innovation Models. Discussion Paper 1*, Tanaka Business School, London: Imperial College London

In the first case, global innovation network consists of enterprises using evolutionary innovations. These innovations usually consist in improvements of small elements of products and processes, using a ‘small steps’ approach (e.g. Japanese kaizen philosophy of evolutionary changes). The sum of all these small improvements may even have a greater importance for the position of the company than a one-off spectacular innovation. The network success depends on the ability to share experience or build trust among enterprises. The aim of the second type of networks is to create new products or processes (radical innovations) among the enterprises operating in similar sectors (for example biotechnology or pharmaceutical industry). Cooperation in the network is usually achieved by strategic alliances or joint ventures.

The third and fourth types of innovation networks comprise enterprises from different sectors, which bring their various knowledge and technologies into the network. It is essential to protect intellectual property here and to share risk and obtained profits.

A different division of innovation networks was proposed by Conway and Steward (1998) – we present it in table 2.

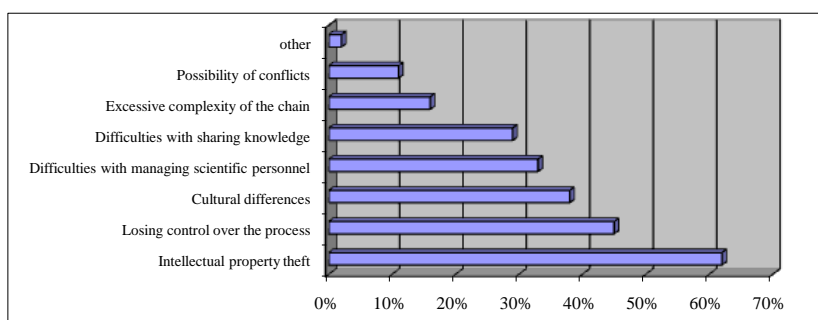
Table 2: Various perceptions of the network

Social context of the network	Regional and business groups, circles of scientists and engineers	Diffusion and commercialization of innovation
Concentration of actors creating the network	Portfolio of strategic alliances	Networks created on the basis of specific innovation
	Focus on innovativeness	Focus on discrete innovation

Source: S. Conway, F. Steward (1998). *Mapping Innovation Networks*. “*International Journal of Innovation Management*”, No 2, pp. 223-254.

The research carried out by the Economist Intelligence Unit (2007) points at the biggest risks connected with innovative activity in the network (figure 2).

Figure 2: Risk of global innovation network development



Source: *The Economist Intelligence Unit (2007). Sharing the Idea: the Emergence of Global Innovation Networks. London*

We can notice that global innovation network changes the geography of R&D expenses and generally – innovations. The whole Asian continent (especially China) is beginning to play a leading role here, which was reserved for Japan before. The countries which do not belong to OECD are quickly catching up. Chinese expenditure on research and development of technologies have grown at an amazing 18% rate for the past several years. If China maintains this speed, in ten years it will have become the world leader in expenditure on science.

Table 3: Expenditure on R&D in selected countries in 2007

Country	Expenditure on R&D (in USD billion)
USA	353
China	175
Japan	143.5

Source: D. Ernst: The New Geography of Innovation – Asia's role in global innovation networks. Obtained from

http://www.apru.org/awi/workshops/economic_integration/slides/Nov%2009/5-4%20Dieter%20Ernst.pdf

The intellectual property protection refers especially to developing countries, due to the risk of knowledge and know-how leaks to local enterprises.

Remaining in the innovation network, apart from the disadvantages presented in the figure, offers many advantages referring to the innovation process:

- 1) access to a larger base of ideas,
- 2) sharing risk,
- 3) spreading the innovation activity costs,
- 4) access to new markets and technologies,
- 5) taking advantage of the synergy effect,
- 6) the network is very flexible, if necessary, it lets you transfer the whole production between the countries in a very short period of time, which limits the risk connected with political and economic situation in the country.

Examples of the Silicon Valley and Route 128 as successful and unsuccessful cooperation within the network

In the 1970s in the USA, there were two global innovation centers: Silicon Valley in California and Route 128 near Boston. Both were renowned for their creativity, entrepreneurship and innovativeness, stimulated by university research and military expenditure. In spite of similar origins and technology, only Silicon Valley successfully overcame the early 1980s crisis. Why did Route 128 fail? We can concentrate on one fault – lack of cooperation within the network.

As Galar (2001) remarks, cluster Route 128 was dominated by a certain number of independent corporations, the management was centralized and the information flow – hierarchical. The boundaries between firms and local institutions and within the firms

themselves, were clearly defined and respected. In relations with clients, suppliers and competitors, company secrets were kept.

The Silicon Valley, on the other hand, functioned as a network system, consisting of thousands of quite small firms, learning from one another through informal contacts and cooperation. Internal and external boundaries of the firms were blurred, the main role was played by horizontal flow of information and exchange of employees between different departments of the companies, different companies, or between firms and local institutions. Was this and is this still a key to success? One thing is certain – this mode, this model of innovation processes is effective – no framework programs, no ordered issues or monitoring institutions. What counted most was spontaneous interactions based on trust, cooperation relying on social relations, respect for creativity and inventiveness.

The Silicon Valley in the 1970s started to generate its own dynamics, attracting knowledge, investment and talents from the whole world. In the 1990 it took advantage of a great number of Japanese, Taiwanese and Korean companies and the inflow of thousands of engineers and computer experts, for whom active presence in the Valley was the most effective way to access the sources of new technologies and valuable information knowledge (Castells, 2008). As Kelly rightly points out (2009), the value of the network increases together with the growing number of its participants, and this growth attracts even more participants, increasing the value of the network. This law worked in the Silicon Valley.

Transnational corporations as main network participants

It is undoubtedly true that transnational corporations play a significant role in global innovation network, due to their size and contribution to network, through coordinating research, production, sales or distribution in many countries all over the world in various continents. On the other hand, it is assumed that the development of global networks offers opportunities to small and medium-sized companies. Hence the participants of global innovation network mostly come from corporations and their branches.

Since they appeared and developed, the number of transnational corporations has increased eleven-fold until the present times. The data is presented in table 4.

Table 4: Number of corporations in the world

Number of corporations	Time period
7 000 corporations defined as multinational and cross-national, operating only in 14 most developed countries in the world (the triad)	1970s
10 000 corporations	1980s
Dynamic leap in the number of transnational corporations, assessed at 37 000 and at least 170 000 foreign daughter companies belonging to them, 33 500 of them were parent companies with headquarters in developed countries	Early 1990s

Over 77 000 corporations and 773 000 foreign daughter companies, at least half of them located in developing countries	2005
Over 82 000 transnational corporations and 810 000 foreign branches and subsidiaries	2009

Source: own work, on the basis of: M. A. Kolka: *Korporacje transnarodowe - ich znaczenie w erze globalizacji*. Obtained from <http://globaleconomy.pl/content/view/1774/24/>; A. Gwiazda (2000). *Globalizacja i regionalizacja gospodarki światowej*. Toruń: Wydawnictwo Adam Marszałek; M. Czerny (2005). *Globalizacja a rozwój. Wybrane zagadnienia geografii społeczno-gospodarczej świata*. Warszawa: PWN; UNCTAD (2005). *World Investment Report 2005: Transnational Corporations and the Internationalization of R&D*. New York and Geneva; UNCTAD (2009). *World Investment Report 2009: Transnational Corporations, Agricultural Production and Development*. New York and Geneva

Assuming that the main participants of global innovation network come from corporation and its foreign branches, it is worth presenting the number of transnational corporations active in 2009.

Table 5: Number of transnational corporations and their foreign daughter companies in 2009 broken down into countries

Region/country	Parent corporations	Foreign daughter companies	Year
Developed economies	58 783	366 881	2009
Europe	47 765	347 771	2009
European Union including:	43 492	335 577	2009
Austria	1 048	2 721	2005
Belgium	991	2 341	2003
Bulgaria	26	7 153	2000
Cyprus	1 650	4 800	2005
Czech Republic	660	71 385	1999
Denmark	9 356	2 305	1998
Estonia	1 168	2 858	2007
Finland	2 807	4 124	2007
France	1 267	10 713	2002
Germany	6 115	11 750	2007
Greece	245	777	2006
Hungary	-	26 019	2005
Ireland	39	1 225	2001
Italy	5 750	7 1811	2005
Luxemburg	38	717	2005
Latvia	26	5 683	2008
Lithuania	285	3 240	2007
Malta	95	291	2008
Netherlands	4 788	17 521	2008

Poland	58	14 469	2001
Portugal	1 300	3 000	2005
Romania	20	89 911	2002
Slovakia	534	3 398	2008
Slovenia	-	1 617	2000
Spain	1 598	14 767	2008
Sweden	1 268	11 944c	2007
United Kingdom	2 360	13 667	2005
North America	3 857	9 389	2009
Canada	1 439	3 725c	1999
USA	2 418	5 664	2002
Other developed countries	7 161	9 721	2009
Japan	4 663	4 500	2006
Developing countries	21 425	425 258	2009
Africa	746	6 084	2009
Asia	17 124	378 996	2009
China	3 429	286 232	2007
Hong Kong	1 167	9 712	2007
South Korea	7 460	16 953	2008
India	815	2 242	2008
World	82 053	807 363	2009

Source: UNCTAD (2009). World Investment Report 2009: Transnational Corporations, Agricultural Production and Development. New York and Geneva

In 2009, there were over 82,000 transnational corporations with 807,000 foreign branches all over the world. Their role in the world economy is undisputable, e.g. exports from foreign branches of transnational corporations accounts for a third of the total global exports of goods and services. The number of people employed in corporations and their branches exceeded 77 million in 2008 (twice as many as all employees of the German economy). They generated 11% of the world gross domestic product.

Analyzing table 5 we can see that 72% of transnational corporations are in developed countries, and 58% in Europe. The biggest number of transnational corporations are located in Denmark, Germany, Italy, the Netherlands, Great Britain, and outside Europe, in Japan, USA and Canada.

Over 52% of daughter companies are located in developing countries, mostly in Asian countries, China being the leading location (286,232 branches in 2007). 45% of branches are located in developed countries, most of them in Romania, Czech Republic, the Netherlands, Spain and Poland.

Conclusions

Networking greatly influences the functioning and growth of firms, their innovativeness, contacts with the surroundings, inclination to taking risk. Networking covers all kinds of formal and informal connections between units and organizations.

Globalization is the main factor accounting for greater openness of innovation process models in enterprises and creation of global innovation space (network). Innovation network is created by enterprises with their own R&D back-up outside their home country and

cooperating with external subjects, not only in research activity, but also in production, marketing and sales. Global innovation network is not homogenous (various participants, their number, types of innovations, forms of cooperation).

This new paradigm is one of the elements of Schumpeter's creative destruction, which is the destruction of the old ways of doing business and choosing the new approach. In the 21st century this phenomenon occurs much faster than in the past, but its essence has not changed: innovativeness, cooperation of enterprises within the network, are responsible for the development of the enterprises as well as for the failure of those which found it too difficult to adapt to new conditions.

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