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KNOWLEDGE CREATION IN INTERNATIONAL SCIENTIFIC NETWORKS IN UE. CASE STUDY OF IP NETAWARE KATOWICE

Introduction

Knowledge and innovation have always played a crucial role in the economic and social development. Earlier versions of human capital theory have been invigorated by new growth theorists who argue that it is not just education that is of greater importance, but the kind of education experience that fosters active learning¹ and innovative aptitudes. The theorists have promoted the concept of a “creative class” as a basis for producing competitive economies². In the article, the authors want to introduce collaborative projects as one of organizational forms of creating and transferring knowledge in education. Consequently, the main purpose of the article was to identify the processes of knowledge creation and transfer.

1. Scientific networks as a basis for collaborative projects

Institutions of higher education act as main figures in successful transition of knowledge into economy and society. Collaborative activities undertaken by these institutions with neighboring countries and with countries within their wider vi-

¹ K.J. Arrow: *The Economic Implications of Learning by Doing*. “Review of Economic Studies” 1962/29, pp. 155-173.

² S. Robertson: *Education, Knowledge and Innovation in the Global Economy: Challenges and Future Directions*. Keynote Address to Launch Research Centres, VIA University College, Aarhus, Denmark, 6th March, 2009, pp. 1-10.

cinity appear as a priority in order to prevent isolation of the university from the civil society, as well as to overcome other structural problems concerning outdated curricula and teachers' competence and skills.

Collaboration between universities and/or industry takes many different forms, including joint research programs, corporate funding of academic research and consulting provided by academic staff³. These types of networking are partly based upon an established relationship of key academic actors with enterprises. In order to stimulate the use of new knowledge across enterprises, universities and local governments make use of particular planning tools, such as scientific networks, transfer centers, science parks, and incubation schemes⁴. This learning organization has democratic culture and embedded systems to capture and share learning that is based on a problem solving cycle⁵.

In the article, special attention is given to scientific networks as one of the forms of knowledge creation and knowledge transfer. Unlike other factors affecting academic knowledge transfers, the specific role of scientific networking has not been broadly discussed in the subject literature. Scientific networking, which may take different forms from collaborative projects and co-publications to less formal meetings in conferences, workshops or seminars, is a common way of advancing science, mutual learning, information sharing as well as gaining and maintaining attention among fellow scientists. Thanks to increased specialization and competition in research as well as rapid development of technologies facilitating maintenance and expansion of linkages among scientists over large geographical areas, collaboration between researchers working in different institutions has become a key to high level research productivity⁶.

2. Knowledge creation and transfer through collaborative projects

Everybody believes that knowledge is broader, deeper and richer than data and information. Knowledge is a dynamic expert attitudes, and as such is used as

³ D. Charles, J. Howells: *Technology Transfer in Europe. Public and Private Networks*. Belhaven Press, London 1992.

⁴ M. van Geenhuizen, P. Nijkamp, H. Rijckenberg: *Universities and Knowledge-based Economic Growth: the Case of Delft (NL)*. "GeoJournal" 1997, 41.4. Kluwer Academic Publishers, pp. 369-377.

⁵ F. Alipour, K. Idris, R. Karimi: *Knowledge: Creation and Transfer: Role of Learning Organization*. "International Journal of Business Administration" August 2011, Vol. 2, No. 3, pp. 61-67.

⁶ A. Varga, A. Parag: *Academic Knowledge Transfers and Structure of International Research Networks*. Working Papers from University of Pécs, No. 2008/2, Department of Economics and Regional Studies.

a framework for evaluating and using new experiences and combination of experiences, values, existing information and systematized information. Knowledge, which arises from dynamic minds of scientists, flows through documents of science and technology, methods and procedures. Knowledge comes from information, whereas information comes from data. The man, in turn, is responsible for turning information into knowledge. To achieve this, it is necessary to compare new information with the old one, to find relations between the information, to draw conclusions based on the information and conversation. All these activities are undertaken and performed by informed groups who follow systematic procedures⁷. Knowledge creation is a collective phenomenon⁸ so that knowledgeable people can reproduce and create knowledge by using their own experience and that of other individuals. The knowledge created in the academic sphere takes various paths before finally reaching a competitive recipient, from patent and licenses to research publication or consulting⁹. In fact, knowledge is created through three main functions of universities: education of future workers, development and dissemination of research work, and active participation in social and economic development. This leads to the concept of entrepreneurial universities. A group is the foundation for knowledge creation processes. The knowledge created in groups is on the increase because the capability of a group to innovate and perform in complex tasks exceeds that of lone inventors¹⁰. A group is an organized set of people, working together towards a common objective¹¹. It constitutes a unit in which similarities and differences of the unit members become visible and reflect their work¹².

Another important question is how the knowledge is transferred. The subject literature contains numerous definitions of knowledge transfer. At one point, it is defined as an attempt by an entity to copy a specific type of knowledge from an-

⁷ S.A. Siadat, R. Hoveida: *Knowledge Creation in Universities and Some Related Factors*. "Journal of Management Development" 2012, Vol. 31, No. 8, pp. 845-872.

⁸ L.S. Coromina: *Social Networks and Performance in Knowledge Creation. An Application and Methodological Proposal*. Doctoral dissertation, Department of Economics, University of Girona, Girona 2006.

⁹ J. Hermans, A. Castiaux: *Knowledge Creation through University-Industry Collaborative Research Projects*. "The Electronic Journal of Knowledge Management" 2007, Vol. 5, Iss. 1, pp. 43-54, available online at <http://www.ejkm.com>.

¹⁰ A. Amin, J. Roberts: *Knowing in Action: Beyond Communities of Practice*. "Research Policy" 2008, 37(2), pp. 353-369.

¹¹ K. Rolin: *Science as Collective Knowledge*. "Cognitive Systems Research" 2008, 9(1-2), pp. 115-124.

¹² J. Hautala: *Academic Knowledge Creation as a Spatio-Temporal Process, the Case of International Research Groups in Finland*. Acta Universitatis Ouluensis, "A Scientiae Rerum Naturalium" 2011/584.

other entity¹³. At some other place, it is described with respect to such elements as speed, extent, effectiveness, and institutionalization. Effective knowledge transfer is more than the movement of knowledge from one location to another. It is proposed that organizations can gain significant learning benefits through transferring knowledge between units and people.

The well-known SECI model, first proposed by Nonaka, describes how explicit and tacit knowledge is generated, transferred, and recreated in organizations. While it was first proposed within the context of business organizations, the model can easily be applied to education. More specifically, the SECI model consists of four modes of knowledge conversion: socialization (tacit to tacit), externalization (tacit to explicit), combination (explicit to explicit), and internalization (explicit to tacit) – Figure 1¹⁴. Accordingly, the SECI emphasizes the dynamics of transforming the tacit/explicit interplay into novel products. These processes are complex and important for learning. In academic education, KM should focus on how to help identify, create, represent, distribute, and enable the adoption of good teaching practices in collaborative settings. The SECI should be a good model for teacher training¹⁵. The interplay between tacit and explicit knowledge is illustrated below.

The literature review has pointed out successful applications of SECI model within different business contexts. In this sense, Rodringues et al. (2006) approved the use of the SECI model across the IT sector. Besides, Martin-de-Castro et al. (2008) investigated the use of the SECI model in some knowledge intensive firms in the USA and Spain. Also, SECI has been used within higher education system and as a road-mapping technique for technology-enhanced professional training¹⁶.

¹³ E. Rogers: *The Diffusion of Innovation*. The Free Press, New York 1983.

¹⁴ I. Nonaka: *The Knowledge Creating Company*. “Harvard Business Review 69” 6 Nov-Dec 1991, pp. 96-104.

¹⁵ Yu-chu Yeh: *Knowledge Management and Professional Development in Creativity Instruction*. 2010, The website: http://www.ccis.nccu.edu.tw/sites/default/files/CCIS-EJ0011_0.pdf.

¹⁶ L. Cabera: *Knowledge Creation and Knowledge Creator within the Cuban Higher Education System*. “The International Journal of Cuban Studies” 2008, Vol. 1, No. 1.

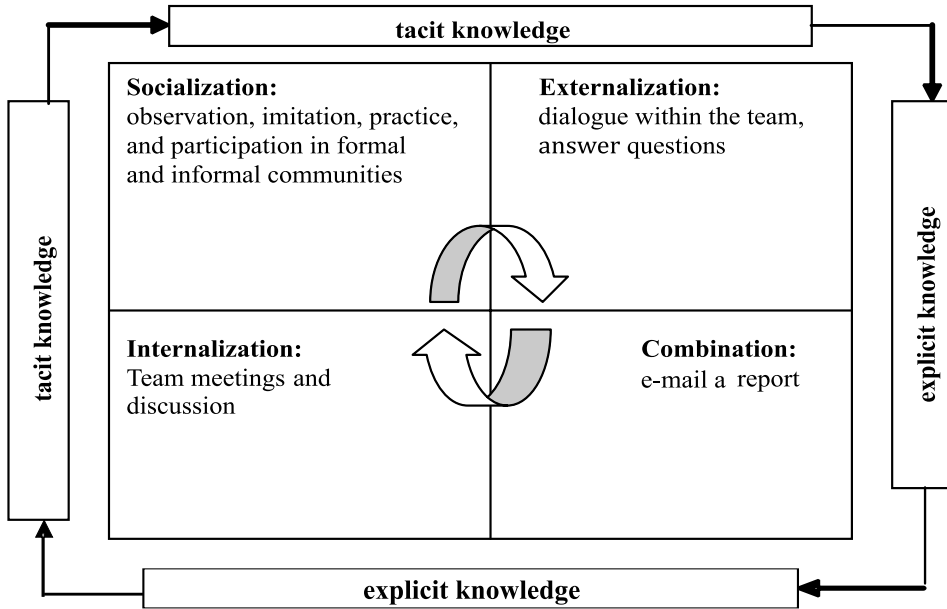


Figure 1. The four processes of knowledge creation/transfer

Source: Based on: I. Nonaka, H. Takeuchi: *The Knowledge Creating Company*. Oxford University Press 1995.

The collaborative project is a good framework for identification of all SECI models and has several strong theoretical advantages¹⁷. First, the formalization of interactions through a shared covenant precisely defines the objectives and responsibilities of each partner to ensure the success of the collaboration¹⁸. Secondly, it is a strong form of partnership¹⁹ inducing a propitious ground for trust building. Thirdly, frequent personal contacts result in an efficient collaboration and the transfer of tacit knowledge between partners²⁰. Based on those assumptions and the general belief that collaborations are “good things and should be encouraged”²¹, the collaborative project has received growing attention in recent years, both from the public concern²² and the academic world²³.

¹⁷ J. Hermans, A. Castiaux: Op. cit., p. 54.

¹⁸ T. Barnes, I. Pashby, A. Gibbons: *Effective University-Industry Interaction: A Multi-Case Evaluation of Collaborative RandD Projects*. “European Management Journal” 2002, 20 (3), pp. 272-285.

¹⁹ R. Landry, N. Amara: *The Impact of Transaction Costs on the Institutional Structuration of Collaborative Academic Research*. “Research Policy”, 27/1098, pp. 901-913.

²⁰ D. Schartinger, C. Rammer, M.M. Fischer, J. Frohlich: *Knowledge Interactions between Universities and Industry in Austria: Sectoral Pattern and Determinants*. “Research Policy” 2002, 31, pp. 303-328.

²¹ J.S. Katz, B.R. Martin: *What is Research Collaboration*. “Research Policy” 1997, 26, pp. 1-18.

²² European Commission: *Trends in European Innovation Policy and the Climate for Innovation in the Union*. EC Working Paper SEC 1564, 2000.

²³ S. Davenport, J. Davies, C. Grimes: *Collaborative Research Programmes: Building Trust from Difference*. “Technovation” 1999/19, pp. 1-40.

3. Methodology

In order to analyze the process of knowledge creation and knowledge transfer, the qualitative approach was chosen as it was theoretically relevant given the epistemological approach chosen to explore knowledge flows. The significant tacit component of knowledge flows as well as people-related concerns, which are proper to universities collaboration, bear out this direction. The performance of semi-structured interviews (and discussions) was a good method to gather rich data about grounds of knowledge creation and transfer processes in ISC and to learn how the processes influence ISC participants based on the case study of IP NetAware. The study has been conducted towards actors involved in the process, particularly in international groups where multi-national members communicate mainly in a non-native language, aim to create internationally renowned knowledge in their fields, and participate in the international collaboration project IP NetAware.

4. Research results and discussion

In the next sections, we present findings focusing on knowledge creation evidence through the SECI process of Nonaka and Takeuchi. The examination of each knowledge transfer mode is followed by a synthesis of knowledge creation. Dukenet is an international union of Universities in the field of Commerce and Business established in 1995 in the Netherlands. The main goal of the network is to create a platform of knowledge for both students and academics. The members of the network can participate voluntarily in all activities, organized within the network and co-ordinated by the co-ordinator or one of the other members. Current activities are followed in the field of: student exchange, staff exchange, intensive programs, European modules, curriculum development (European Bachelor / Master). At present, the network comprises 13 universities from 11 countries.

One of the largest and the most intensive collaboration projects of Dukenet network is NetAware Intensive Programme which was created by students and Dukenet academics concerned with social exclusions problems. It provides participants with awareness of social exclusion problems and, at the same time, supports non-profit anti-social exclusion organizations in fulfilling their mission by means of innovative ICT tools. What is more, this Intensive Programme is going to exploit and extend knowledge from existing teaching programs of IT, marketing, business ethics, sociology and social responsibility by enabling students' partici-

pation in professional training and application of the acquired knowledge in real market environment (for more information: www.netaware.ue.katowice.pl).

4.1. The SECI based on the case study of IP NetAware

1. Socialization: it is the process of sharing tacit knowledge through observation, imitation, practice, and participation in formal and informal communities²⁴. The socialization process is usually preempted by the creation of a physical or virtual space where a given community can interact on a social level. Evidence highlights the key role of the socialization process at the early beginning of the project in building credibility between potential partners. Representatives of each university involved in IP shared the tacit knowledge so the new knowledge was created by using the process of interacting, observing²⁵, discussing, analyzing, spending time together or living in the same environment.

The tacit knowledge about the IP topic and culture issues was shared. As students said: *it was interesting to see so many students coming from different countries to work together; I did not realize that we were so similar to each other, and although from different universities, we shared similar skills*. The socialization model was mainly based on the structure of informal networks which involved daily student-to-student or student-to-teacher interactions within their working environments. Special events like treasure hunting, bowling or sightseeing were organized so students and teachers could be engaged in unstructured, unmonitored discussions. Alongside these informal networks, there were also some formal ones in the form of international working groups. They were mainly focused on sharing and raising culture awareness among group participants. Most respondents perceived IP as interesting and very successful. However, it must be said that sharing tacit knowledge requires culture conducive background for this type of activity. Furthermore, IP managers must be employed to locate and translate knowledge elements, thus facilitating their integration into communities.

2. Externalization: it tries to convert tacit knowledge to the explicit one by developing concepts and models. At this stage, tacit knowledge is converted to a comprehensible and interpretable form so that it can be also used by others. Externalized and theoretical knowledge is a basis for creating new knowledge. This stage strongly depends on the socialization process as the created tacit knowledge about respective responsibilities and deliverables is converted to the explicit

²⁴ Yu-chu Yeh: Op. cit., p. 23.

²⁵ J.M. Myszewski: *On Nonaka's Dynamics Of Knowledge Management, Research in Logistics & Production*. Publishing House of Poznan University of Technology, 2013, Vol. 3, No. 1, pp. 59-70.

knowledge: first through dialogues, and eventually in the form of project reports. Results of the externalization process enabled students with different backgrounds to share their former tacit knowledge.

This idea also accompanied development of the concept of Google Adwords strategy. Students had to prepare a strategy concept according to IP rules and to present it in public. Some students found it very difficult: *working under time pressure in the international environment can be a challenge; presenting publicly in English was a big stress for me. We found a lot of positive answers as well: I learned a lot, especially about myself, it was a new experience for me, I could see the real work within companies; preparing the strategy was difficult, we had to use all the information and make our own decisions.* The explicit knowledge allowed for development of an unambiguous and clear definition of the collaborative work throughout the project.

3. Combination: it is compiling the externalized explicit knowledge into broader entities and concept systems. When knowledge is in an explicit form, it can be combined with the previously filed knowledge. At this stage, the knowledge was also analyzed and organized.

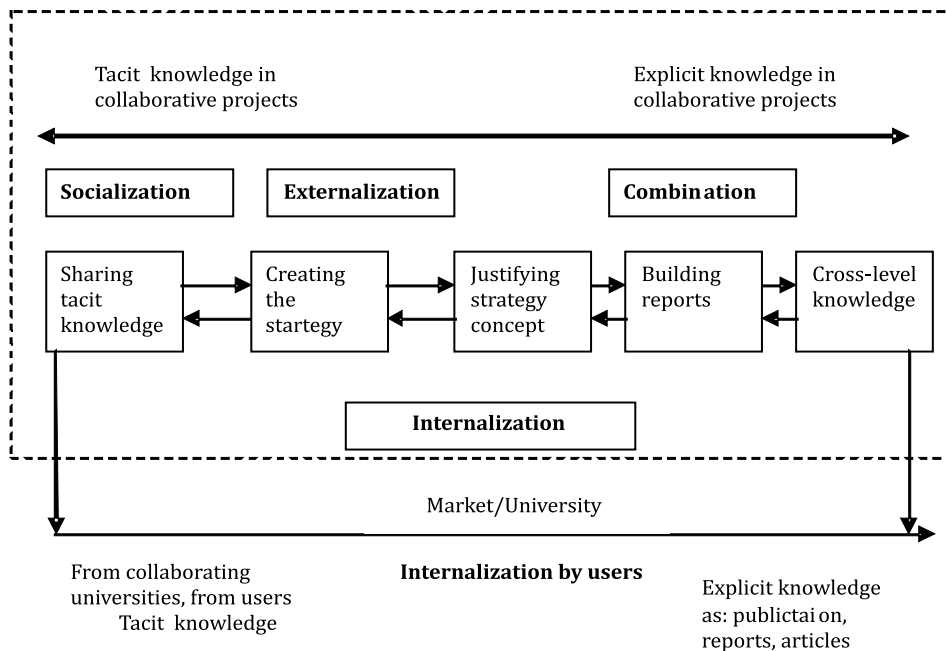


Figure 2. Stages of organizational knowledge creation in IP collaborative projects

Source: Based on: S. Ceptureanu, E. Ceptureanu: *Knowledge Creation / Conversion Process*. "Review of International Comparative Management" March 2010, Vol. 11, Iss. 1.

Through interview analyzes, the authors identified two main tangible supports for knowledge transfer in collaborative projects. First of all, project reports have been identified as central support for knowledge transfer between partners. Students in international groups had to prepare Google Adwords reports. The report was a final document of their work. Beside its channel function, the role of this articulated piece of knowledge is to create meeting opportunities, eventually leading to face-to-face knowledge exchanges and tacit sharing. Students and teacher have admitted that thanks to the face-to-face communication during working on the reports, they could understand and learn more. The report only helped them to structure their thoughts.

4. Internalization: internalization means understanding the explicit knowledge. It occurs when the explicit knowledge is transformed into the tacit one and becomes a part of individual's basic information. The cycle continues now in the spiral of knowledge back to socialization when an individual shares his or her tacit knowledge silently. This shows how the amount of knowledge grows and previous concepts might change. IP internalization knowledge refers to lessons of students and teachers learned from collaboration activities, from research work and from exploitation of created knowledge. Teacher respondents have acknowledged that collaborative research and projects created opportunities for building relationships with other scientific partners. It provides a new chance for cooperation and for transfer and creation of the knowledge. They have also admitted that after being together for two weeks, they may find consecutive projects more effective because of better mutual understanding, and even friendship.

The result of the whole process is (or can be) a *knowledge spiral* (Figure 2). It is sustained by using a dialogue to move from socialization to externalization; by linking explicit knowledge to move from externalization to combination; by learning to move from combination to internalization; and by field building to move from internalization to socialization. It is important to notice how it moves back and forth between explicit and tacit, and how it can increase its level (individual to group and beyond).

Conclusions and limitations

The following paper has examined empirical data on which the SECI model, central to Nonaka's theory of organizational knowledge creation, is based. The paper presents introduction of IP NetAware as an example of collaborative projects. The IP concept is developed and supported by EU funding as an effective frame-

work for academic knowledge creation and transfer. Empirical findings support existence of the knowledge spiral as a dynamic force for the collaborative project and present three main attributes influencing the knowledge process: strong involvement of the participants, existence of a long-term partnership and publication and research opportunities. The SECI model is certainly useful for explaining the process of new organizational knowledge creation, yet, it is not without limitations. First, the model is over-standardized and overgeneralized. Second, it assumes that there are no contradicting opinions and disturbances among interacting agents in the process, and that situations are predictable. Third, the assumption that knowledge is created out of the rational functioning of the mind is questionable, because our personal knowledge is influenced by habits, which are built on beliefs and are more or less firmly held, and thus not consciously performed. Fourth, the model assumes that the processes of acting and behaving, including learning, are conscious and intentional. Fifth, the model does not explain the motivations for individuals to become involved in the SECI cycle²⁶.

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²⁶ L. Sunaryo: *Pragmatic Account of the Process of Knowledge Creation In a Chinese Context – How Socially-Produced Identity Is Transformed into Economic Production*. Otago Business PhD Colloquium, October 18-19 2006 (working paper).

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Summary

The knowledge-based economy analysis economic organization and development when the creation, distribution and use of knowledge become decisive factors. To become a successful knowledge economies, countries must act simultaneously on their education base, their innovation systems and their information and communication technology infrastructure. This paper focuses on international scientific networks as an example of tool created in order to stimulate the use of new knowledge. The main objective of the paper is to identify the knowledge creation and transfer processes in ISC. The methodology utilized in this study is qualitative and exploratory. Results of research shows the process of knowledge creation and transfer on example of NetAware Intensive Programme and the project evaluation results.

Keywords: scientific networks, SECI models, IP NetAware