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Knowledge Creation in International Scientific Networks on Example of NetAware Intensive Programme

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Keywords: *knowledge creation, knowledge transfer, collaborative project, education*

Abstract: *The knowledge-based economy analyzes 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, while also building a high-quality economic and institutional regime. The institutions for higher education are the main figures for the successful transition to a knowledge based economy and society. Their cooperation activities with the neighboring countries and the countries within their wider vicinity are an important priority for breaking the university isolation from what happens in the civil society, as well as the other structural problems, like the outdated curricula and skills of teachers. 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: 1) the knowledge creation and transfer processes in ISC 2) influence of that processes on the participants of the ISC. The methodology utilized in this study is qualitative and exploratory. Re-*

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sults of research shows the process of knowledge creation and transfer on the example of NetAware Intensive Programme and the project evaluation results.

Introduction

At the beginning of the twenty-first century, most economies can either be described as knowledge-based economies (KBEs) or as aspiring to develop into such economies. While KBEs can be defined in many different ways, they have to do with information, knowledge, learning, innovation, entrepreneurship, networks, information and communication technologies (ICTs). It is not uncommon to find various combinations of these terms to denote a particular version of a knowledge-based economy (KBE) popular at a particular time and place (Engelbrecht 2009).

A commonly used definition of KBEs is that provided by the OECD in the mid-1990s, i.e. KBEs, are ‘economies which are directly based on the production, distribution and use of knowledge and information’ (OECD 1996). The OECD observes that the emergence of such economies is reflected in trends towards high-tech investment, high-tech industries, highly-skilled labour, and associated productivity gains. It sees its task in promoting science, technology and industry policies that support these developments (OECD 1996). Intimately related to the development of KBEs is the emergence of ICTs as ‘general purpose technologies’ that spread throughout the economy, facilitating productivity gains and further innovations (Elhanan Helpman 1998). The history of the development of the mainstream concept of KBEs as used by the OECD, and that of the related concept of ‘information economies’, makes the topic complex. However, the mainstream definition of KBEs does point to some common features, like the emphasis on science and technology, innovation, and ICTs (Engelbrecht 2009).

In the Lisbon European Council (2000), the European Union (EU) adopted the ambition to transform itself into the most competitive and dynamic economy in the world, based on knowledge and sustainability, with higher employment rates and increased social cohesion (EC 2000a). In order to achieve this, the Council decided to launch a strategy focused on reaching a leading economic position in dynamic and competitive terms (Karagiannis 2007), based on reaching a knowledge-based economy (EC 2001).¹ Elabo-

¹ The Lisbon Strategy was coming to an end in 2010. A vision document had been published by the Commission on a new strategy: the EU2020 Strategy. Three thematic key drivers are mentioned in the vision document; creating value by basing growth on knowledge, empowering people in inclusive societies, and creating a competitive, connected and greener economy. Key in growth by knowledge is giving way to and stimulating innovation. Fostering innovation and creativity is however just as important in empowering people, as the development of entrepreneurship and smooth transition between jobs.

rating and implementing the strategies of creation of the knowledge based economy it is necessary to logically forecast various vehicles designed for expansion and development of the integral economic, social and culture space of the European Union.

To become a successful knowledge economies, countries must act simultaneously on their education base, their innovation systems and their information and communication technology infrastructure, while also building a high-quality economic and institutional regime. Strategies must be adapted to a country's level of development, and progress is usually gradual, but some countries have been able to achieve spectacular progress in a decade. Knowledge and innovation have always played a crucial role in economic and social development. Earlier versions of human capital theory have been invigorated by new growth theorists, who argue that it is not just more education that matters, but the kinds of education experiences that foster active learning (Arrow 1962) and innovative aptitudes (Romer 2007), have promoted concepts like the 'creative class' as the basis for producing competitive economies (Robertson 2009). In the article, the authors want to introduce collaborative projects such as the one of organizational forms of creation and transfer of knowledge in education. Taking the above into consideration, the main goals of the article were identification of the knowledge creation and transfer processes in ISC, as well as the influence of that processes on the participants of the ISC.

Scientific Networks as a Basis for Collaborative Projects

The institutions for higher education are the main figures for the successful transition to a knowledge based economy and society. Their cooperation activities with the neighboring countries and the countries within their wider vicinity are an important priority for over passing the university isolation from the happenings in the civil society, as well as the other structural problems like the outdated curricula and skills of teachers.

In recent years, universities have come under increasing pressure to expand their traditionally dominant role in the conduct of basic research and supplement it with more applied research activities. Three major trends characterize the changes that have affected the university system: the linking of government funding for academic research with economic policy; the development of more long-term relationships between firms and academic researchers; and the direct participation of universities in (Etkowitz, Webster 1998). As a result, while universities continue to fulfill their traditional roles of performing primary research and training highly qualified people, they

have come under increasing pressure in recent years to expand their basic research activities to include more applied research of greater relevance to industry, and to diffuse technical knowledge and provide technical support to industry (Wolfe 2005; Wolfe, Bramwell 2005).

The collaboration between universities and/or industry takes many forms, such as joint research programmes, corporate funding of academic research and consulting by academic staff (Charles, Howells 1992). These types of networking are partly resting on established relationships of key academic actors with enterprises. In order to stimulate the use of new knowledge among enterprises, universities and local governments make use of particular planning tools, such as scientific networks, transfer centers, science parks, and incubation schemes (van Geenhuizen et al. 1996), see Table 1.

Table 1. Planning tools and their characteristics

Examples	Actors	Goals of university
Scientific collaboration networks	University	- coordinate scientific research - knowledge Exchange
Transfer Centre	University	- consultancy - contract research - to sell facility use
Technology Licensing Office (USA).	University	- to bring inventions - to market (licensing)
Science parks	University Local government Investment banks Real-estate agencies Development agencies	- firm formation and fostering - knowledge Exchange - to sell facility use - revenues from real-estate
Incubation scheme	University Venture banks Local government	- firm formation and fostering
Supportive networks	University SME organisation	- firm formation and fostering

Source: own elaboration.

In the article, special attention is given to scientific networks as a one form of knowledge creation and transfer. Among the factors influencing academic knowledge transfers the specific role of scientific networking has not been touched upon very extensively in the literature. Scientific networking that may take different forms, such as collaborative projects, co-publications or less formal meetings in conferences, workshops or seminars is a common means of advancing science, mutual learning, information shar-

ing and gaining and maintaining attention among fellow scientists. Increasing specialization and competition in research, as well as the rapid development of technologies that ease sustaining and expanding linkages among scientists over large geographical distances have made it both possible and inevitable that collaboration among researchers working in different institutions has become a key to high level research productivity (Varga, Parag 2008).

Knowledge Creation and Transfer Through Collaborative Projects

Everybody believes that knowledge is broader, deeper and richer than data and information. Knowledge is a dynamic combination of experiences, values, existing information and systemized expert attitudes that is employed as a framework for evaluating and using new experiences and information. Knowledge, which arises from the dynamic minds of scientists, flows in the documents of science and technology, methods and procedures. Knowledge arises from information and information arises from data. Turning information to knowledge is the task of man. For turning information into knowledge, such activities as comparing new information with old information, finding the relations between information, concluding based on information and conversation are necessary, and these activities are accomplished by informed groups who follow systematic procedures (Siadat et al. 2012). Knowledge creation is a collective phenomenon (Coromina, Soler 2006) so that knowledgeable people can reproduce and create knowledge by using their own and others' experiences. The knowledge created in the academic sphere takes various paths before finally reaching a competitive recipient, from patent and licences to research publication or consulting (Hermans, Castiaux 2007). Actually, knowledge is created throughout the three main functions of universities: the education of workers-to-be, the development and dissemination of research work, and their active participation to social and economic development, which has led to the concept of entrepreneurial universities (Etzkowitz, Leydesdorff 2000; Van Looy et al. 2006).

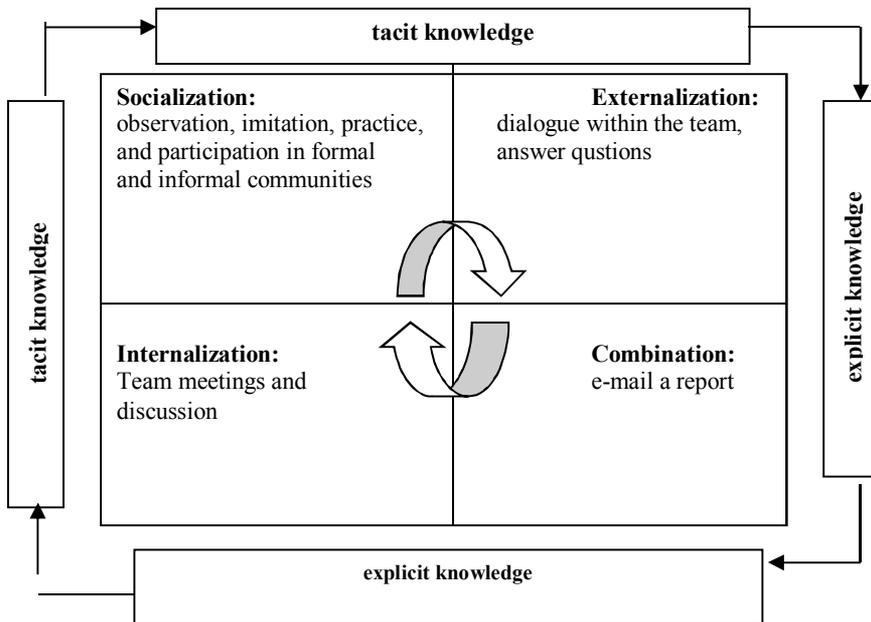
A group is the foundation for knowledge creation processes. Knowledge is increasingly created in groups, since their capability to innovate and perform in complex tasks exceeds that of lone inventors (Amin, Roberts 2008; Hoegl, Parboteeah 2007; Nonaka, Takeuchi 1995; Salas et al. 2008; Singh, Fleming 2010). A group is an organized set of people, working together towards a common objective (Rolin 2008). A group is the unit in which the similarities and differences of the members become visible and reflect their work (Hautala 2011).

Another important question is how the knowledge is transfer. There are numerous definitions of knowledge transfer within the literature. Knowledge transfer has been defined as an attempt by an entity to copy a specific type of knowledge from another entity (Rogers 1983). Others have defined knowledge transfer by focusing on 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 (Riege 2007). It tends to improve competence of both sides that transfer and share knowledge. This is because knowledge does not leave the owner when it has been transferred. As a result, the value of knowledge grows each time a transfer takes place and the key to value creation lies in how effective knowledge has been transferred throughout the organization (Sveiby 2001).

The well-known SECI model, first proposed by Nonaka (1991), 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) (Nonaka 1991). Accordingly, the SECI emphasizes the dynamic 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 training (Yu-chu Yeh 2010). The interplay between tacit and explicit knowledge is illustrated below.

The Collaborative project is good framework to identify all SECI model and has several strong theoretical advantages (Hermans, Castiaux 2007). First, the formalisation of interactions through a shared covenant precisely defines the objectives and responsibilities of each partner to ensure the success of the collaboration (Barnes et al. 2002). Secondly, it is a strong form of partnership (Landry, Amara 1998) inducing a propitious ground for trust building. Thirdly, frequent personal contacts result in an efficient collaboration and the transfer of tacit knowledge between partners (Schartinger et al. 2002). Based on those assumptions and the general belief that collaborations are “good things and should be encouraged” (Katz, Martin 1997), the collaborative project has received a growing attention in recent years, both from public concern (European Commission 2000; OCDE 2003), academic world (Davenport et al. 1999).

Figure 1. The four processes of knowledge creation/transfer



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

Methodology

A qualitative approach was appropriately given a twofold reason. First of all, 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 proper to universities collaboration bear out this direction. Secondly, this explorative study is the authors' first empirical contact with the field they are studying.

Performing semistructured face-to-face interviews (and discussions) was a good method to gather rich data about the ground of knowledge, creation and transfer processes in ISC and how the processes influence on the participants of the ISC on example of IP NetAware. The interviews went through three major components of the qualitative research: collecting data about the activities accomplished by the ISC in terms of SECI, using an interpretative procedure to conceptualize and analyse the data to get the findings, and finally, reporting the findings in the article.

The study has been conducted towards all actors involved in the process, particularly international groups, whose members have different nationalities, which mainly communicate in a non-native language, aim to create internationally renowned knowledge in their fields, and participate in international collaboration project IP NetAware.

Table 2. Presents the actual respondents' distribution

Respondent category	Academic	Student
	22	66

Source: own research

Results of Research 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 presenting the knowledge creation. In the last section, the participants opinions of the knowledge processes are presented.

Dukenet – Network of European Universities and IP Collaborative Projects

Dukenet is an international union of Universities in the field of Commerce and Business established in 1995 in the Netherlands. The main goal of network is to create a platform of knowledge for both students and academics. The members of the network can participate voluntarily in all activities, organised within the network and co-ordinated by the co-ordinator or one of the other members. Current activities are in the field of: student exchange, staff exchange, intensive programs, European modules, curriculum development (European Bachelor / Master). Nowadays in the network are 13 universities form 11 countries. The main Dukenet collaborative projects are:

- LLP Erasmus Intensive Programme – NetAware “InterNET advanced promotional tools application for increasing AWAREness of social exclusions movement”
- Intensive Programme MARKSTART Strategic Marketing Simulation,
- EMBS European Master in Business Studies (for more information: www.dukenet.info)

One of the largest and intensive collaboration project of Dukenet network is NetAware Intensive Programme, which was created by students and Dukenet academics concerned with social exclusions problems. It provides its participants with the awareness of social exclusion problems and at the same time supports non-profit anti-social exclusion organizations in fulfilling their mission with the usage of innovative ICT tools. What is more, this Intensive Programme is going to exploit and extend knowledge from existing teaching programmes of IT, marketing, business ethics, sociology and social responsibility by enabling students' participation in professional training and application of the acquired knowledge in real market environment. The other reason of working with real organizations is also to actively help them with realizing their mission more effectively. It is the first project of that scale in Poland that encompasses simultaneous practical exercises conducted on the real market with real Internet promotional tools and, what is more, that is connected with difficult subjects of non-profit organizations' promotion and social exclusion problems awareness (for more information: www.netaware.ue.katowice.pl)

The SECI Process on Example of IP NetAware

Socialization: is the process of sharing tacit knowledge through observation, imitation, practice, and participation in formal and informal communities (Yeh et al. 2011). 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 socialisation process at the early beginning of the project in building credibility between potential partners. The representative of each university involved in IP shared the tacit knowledge, so the new knowledge was created by using the process of interactions, observing, discussing, analyzing, spending time together, or living in same environment.

Tacit knowledge about the IP topic and culture issue was shared. As students said : *It was interesting to see so many students coming from differen countris to work together, I did not know that we are so similar to each other or even we are from different universities we have similar skills*. The structure which was mainly used in socializaltion mode was informal networks, which involved the day to day interaction between students and students and teachers within work environments. Special events like treasure hunting, bowling or sightseeing were organized, so students and teachers could be engaged in unstructured, unmonitored discussions. But also formal networks were created, international working groups. The main aim for that was to

share culture awareness. Most of the respondents perceived IP as interesting and very successful. But it must be said that sharing tacit knowledge requires a culture conducive to this type of sharing. Furthermore, IP managers must be used to locate and translate knowledge elements, thus facilitating their integration into communities.

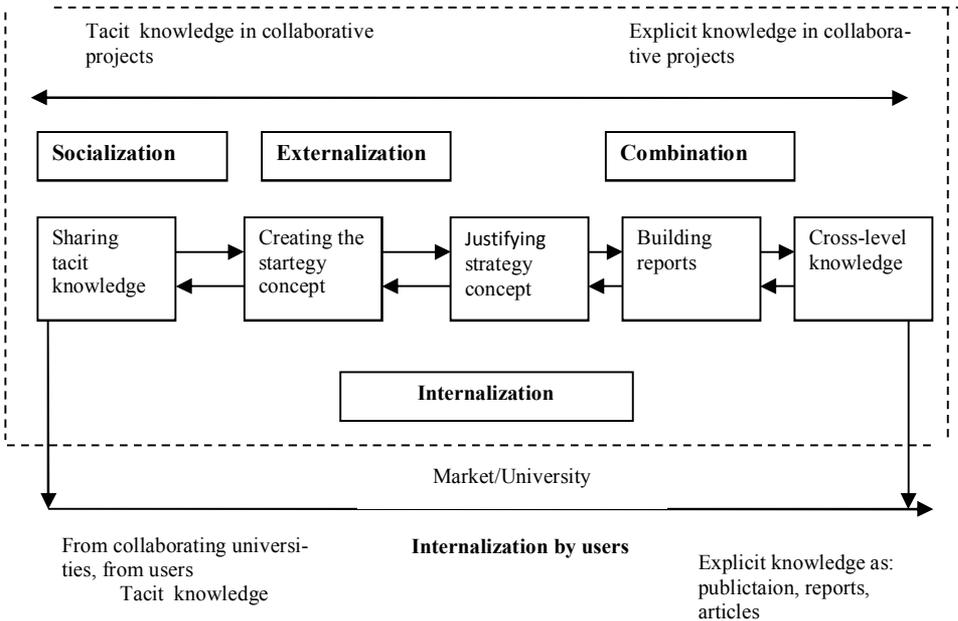
Externalization: is trying to convert tacit knowledge to explicit knowledge by developing concepts and models. In this phase, tacit knowledge is converted to understandable and interpretable form, so it can be also used by others. Externalized and theoretical knowledge is a base for creating new knowledge. This phase strongly depends on the socialisation process, as the created tacit knowledge about respective responsibilities and deliverables is converted into explicit knowledge firstly through dialogue and eventually under the form of project reports. The results of the externalization process enabled students with different backgrounds to share the former tacit knowledge.

In that mode, the Google Adwords strategy concept was developed. Students had to prepare a concept of strategy according to IP rules and present it in public. Some students found it very difficult: *working under the time pressure in international environment can be a challenge, Presenting in English in public, it was a big stress for me.* We found a lot of positive answers also: *I learnt a lot, especially about myself, it was new experience for me, I could see how companies really work, preparing the strategy was difficult, we had to use all information and make our own decisions* The explicit knowledge allowed for an unambiguous and visible definition of the collaborative work throughout the project.

Combination: is compiling externalized explicit knowledge to broader entities and concept systems. When knowledge is in an explicit form, it can be combined with the knowledge that has been filed earlier. In this phase knowledge was also analyzed and organized.

Through interview analysis, the authors identified two main tangible supports for knowledge transfer in collaborative projects. First of all, project reports have been identified as central supports 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 comments that thanks to the face-to-face communication during working on reports, they could understand and learn more. The report only help them to structure the thoughts.

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



Source: on the basis of: Ceptureanu, Ceptureanu (2010).

Internalization: internalization means understanding explicit knowledge. It happens when explicit knowledge transforms to tacit 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 their tacit knowledge silently. This is how the amount of knowledge grows and the previous concepts might change. IP internalisation knowledge refers to the lessons of students and teachres learned from the collaboration activities, the research work and the exploitation of created knowledge. Teachers respondents admitted that collaborative research and projects created the opportunities to build relationships with other scientific partners. It gives new opportunities to cooperate and to transfer and create the knowledge. They also admit that after being together for two weeks, next projects will be more effective because of better understanding and even friendship.

The result of all this 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; learning by doing to move from combination to internalization; and 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).

IP NetAware Evaluation Results

The process of internalization cannot be measured directly, or needs to be corroborated by the knowledge of the resources that it produces and consumes. To understand the process better, evaluation survey was conducted. The main tool of evaluation was a questionnaire evaluating the whole IP. A survey was carried out at the end of IP among all students by the Organizing Committee. Results of the questionnaire suggest that the participants were generally satisfied or even very satisfied with the project. There were no complaints about the duration of a project, however some participants indicated that the dates could be different. A majority of participants values personal outcomes of the project higher than learning outcomes and is more satisfied with the cultural activities and the time spent in international environment than teaching quality, although the difference is not really significant, oscillating from average 3,7 to 4,3 on the 5 – points scale (one meaning “not satisfied” and 5 “very satisfied”). Major dissatisfaction was shown by student when it came to the number of hours of learning, which they claim to be too long and overwhelming. Fortunately, no one encountered any serious problems during the IP and the satisfaction from the support received from both home and host institutions are rated very high (average 4,3 and 4,6 on the 5-point scale). A majority of students heard about the project at home institution, very small fraction also got information from other students or read about it in the Internet. The most common reason for participating is the possibility of gaining European and cultural experience, as well as improving language skills.

The recognition of IP depends on the university. All IP participants can obtain additional ECTS. Some students are going to get higher grades from certain subjects or additional points while applying for scholarship. Many participants (more than 60%) believe that the experience gained in the project is definitely going to help them in the next years of studies. The same percentage think that it may help them in future career and improves the chances for getting a better job. Some suggestions given by the participants are extremely valuable e.g. what to improve in accommodation, teaching, division of hours etc.

Every morning there was a teachers’ meeting, during which the teachers assessed the level of goals’ achievement, the level of students involvement and the quality of courses. There were also chosen teachers who assessed the final reports, final presentations of students, and the progress they made on the blog and social media.

There were also a few discussion questions:

a. *To what extent did the IP present a strong multidisciplinary approach, fostering the interaction of students from different academic disciplines?*

IP combines highly innovative knowledge from different disciplines, like IT, marketing, business ethics, sociology and social responsibility. All of these are combined with the social exclusion issue and the working mechanisms, market conditions of nonprofit organizations. Preparation of the internet advanced promotional tools demands multidisciplinary approach and crosscultural cooperation. During IP students gained advanced knowledge and skills about the advanced internet promotional tools. Deep understanding of the Google AdWords mechanism, blogs and social media usage as a promotional tool in the Internet are very important issue nowadays and IP gave an opportunity to learn about it also from a practical perspective. The students working in multinational groups had an opportunity to learn from each other and increase each others innovative thinking and creativity.

b. *To what extent did the IP train students' entrepreneurial competencies in any subject area?*

The globalization and the Internet made the market more competitive and, as a result, IP enabled the students to get familiar with new technologies in order to use innovative tools to increase the effectiveness of non-profit organization communication. New technologies enables to use relatively cheap, quick and effective communication channels. Creating a Facebook profile, blogs and Google AdWords campaign required a high level of creativity. The IP also encouraged open-minded thinking. It prepared students to own advertising agency in the future, so it encouraged entrepreneurial approach towards the knowledge gained. Students had to be flexible and organize their time effectively, very often it was demanded from them to show own initiative. They gained autopresentation skills, as well as interpersonal skills. It can be concluded that throughout all IP tasks students got entrepreneurial skills.

c. *What impact did the IP have on the people involved (students, teachers)?*

The students who took part in the project had a unique opportunity to use gained knowledge in the real market. Moreover, they became aware and sensitive to social problems, they got familiar with the non-profit organizations activities and, as a result, have a genuine opportunities to become specialists on the market in this sector. The students developed their creativity, copywriting skills, as well as the entrepreneurship and the ability to own small advertising agency. They got the opportunity to synthesize IT, marketing, business, economy, ethics, social responsibility and other disciplines in order to create real campaigns based on innovative technologies, in order to support non-profit organizations. IP influence on increasing students:

- ability to design promotional campaigns, particularly for non-profit organizations,
- skills to use new technology in promotional activities
- openness to a multicultural environment.

d. What impact did the IP have on the institutions involved?

Partner institutions had an opportunity to take part in really international project, which enabled deeper integration between Eastern and Western Europe and developing international acquaintance and partnerships. Every day, a teacher from a different university had a lecture, as a result teachers had unique opportunity to learn from each other, the teaching patterns from different countries, presentation skills. Moreover, non-profit organizations enjoyed real benefits during and after the campaigns prepared during the IP.

e. How and to what extent has the IP improved academic teaching/learning in the subject/s concerned?

IP improved the teaching programmes by synthesis of the knowledge and multidisciplinary character. What is more, it engaged innovative, new technologies and concerned current social problems. The IP was based on Google AdWords possibilities. As a result, students and teachers had an unique opportunity to gain updated and innovative knowledge and skills which is not taught during regular courses.

Conclusions

This paper has examined the empirical data on which the SECI model, central to Nonaka's theory of organizational knowledge creation, is based. IP NetAware as an example of collaborative projects was introduced. IP concept are created and supported by EU funding as an effective framework for academic knowledge creation and transfer.

Empirical findings support the existence of a knowledge spiral as a dynamic for the collaborative project and present three main attributes influencing the knowledge process: the strong involvement of the participants, the existence of long term partnership and publication and research opportunities.

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