26 Higher education research and education fostered with knowledge sharing

Kari LAINE
Satakunta University of Applied Sciences, Pori, Finland

Matti LÄHDENIEMI
Tampere University of Technology, Pori, Finland

Olli MERTANEN
Turku University of Applied Sciences, Turku, Finland

26.1 Abstract

Higher education meets new requirements. Higher education and industry interaction requires multi science, up to date knowledge. On the other hand, higher education is required to renew itself and have up to date learning contents. It is not always possible or meaningful to create the needed knowledge. Therefore, adequate and fast access to quality knowledge is needed. What higher education institutions can and should do to be more open and to make more knowledge publicly available from their research and collaborative innovation processes with industry. What universities should do to be able to access quality knowledge to develop up to date education contents and make high quality research.
Companies need new knowledge to develop their business. Companies and public authorities create a big amount of data, but sometimes it is not up to date enough and not even at the level of knowledge. There are delays in collecting the data, modifying it, making summaries and making data publicly available. Artificial intelligence is a future tool that can combine data and evaluate information to knowledge. In the present paper the following topics will be discussed and analyzed: Participatory R&D, BaltSe@nioR, and Robot Academy. The correlation of these also renews competences of Higher Education.

Keywords: knowledge sharing, research, higher education

26.2 Introduction

This paper concentrates on controlled and focused knowledge sharing in research, innovation and higher education. The authors have dealt with collaboration between higher education institutions (HEIs) and industry, knowledge intensive entrepreneurship and the role of HEIs in digitalization in context of big data. The current paper is also based on researchers' diverse experience on the field. [8 and 13-17]
Open data and big data are close to access to data, usability and enrichment towards knowledge. Enrichment of data to knowledge is a requirement of added value and benefits. All this is also related to access to knowledge and selection of the knowledge.
In this paper data turns into information when it is processed. This means grouping, selecting or in other ways enriching the content. Information turns into knowledge when we create understanding what the information means or how it can be used. Knowledge has a life cycle when it turns from unknown to known [1]. As an effect of digitalization, the knowledge cycle is fastened. The knowledge comes faster available for various actors.
Innovation processes can be closed or open. Closed innovation process means that an organization creates innovations with own resources. In Open innovation processes resources form outside the organization are used in creation of the innovations and in commercializing the results. Open innovation processes can share costs and risks of innovation. More resources also mean faster solving of wicked problems. There are different actors working in

networks. There are business actors, public actors like research organizations and their combinations. [13,14,15] In principle, the more actors there are the more views and knowledge there is. But business creates also limitations to knowledge sharing due to tight competitiveness thinking and immaterial rights.

There is already plenty of knowledge available from internet, research organizations and enterprises. Therefore, free and uncontrolled data sharing may lead into confusion. Small and medium sized enterprises (SMEs) can't use raw data. They need help in searching focused knowledge for their needs. They may also need help in interpreting the research knowledge. All this means that we need a focused and selected or controlled sharing of knowledge in means to benefit from it. The biggest challenge in research and R&D networks may be selection, enrichment and controlled sharing of the knowledge.

26.3 Accelerating scientific progress

EU has estimated that it could create 40 billion euros benefits annually with better sharing of knowledge. Research knowledge is one part of the knowledge that should be shared. Scientific activities are increasingly undertaken through global collaboration on the internet, using large data collections, computing resources and visualization. e-science (research enabled by e-infrastructure/ICT) is essential for meeting the challenges of the 21st century in scientific discovery and learning. The data used come from simulations, digital instruments, sensor nets, and observatories. [4, 5]

The data is important for science and its potential to change the very nature of scientific process. Wide access to scientific data will for example help researchers in different domains to collaborate on the same data set, to engage in entirely new forms of scientific research and to explore correlations between research results.
The change in the scientific process can increase amount of results published. It can also create new and perhaps also unexpected solutions to societal challenges. In addition to this, the cross-field interaction between publicly funded research and industry can increase the pace and impact of innovation.
However, there are barriers to promote research data management and open access to the research data in HEIs. According to European University Association the top six barriers are: different scientific cultures within the university, lack of polices or guidelines on national level, limited awareness of benefits, legal concerns, technical complexity and lack of incentives. [6, 7]
During last years, alternative metrics have been introduced to measure research efforts in addition to citation counting. These alternative metrics can be bookmarks, links, blog posts, tweets, likes, shares, press coverage and similar. This is because research is also published in various forms and various platforms like social media. It may be also popularized and shortened to be able to publish on these new platforms. It may be easier to understand for various readers, but it may contain only part of the knowledge. [3]

Higher education also tries to engage itself with its environment, offering collaboration for enterprises in research, innovation and education. Universities must combine and build their knowledge into the form of a service process or even service product to make successful collaboration with enterprise clusters. Real identification skills of universities are needed to satisfy enterprise needs. This is realistic only in the case of long time co-operation at the level of strategic partnership. [8] It also requires knowledge sharing between HEIs and industrial partners. In the following chapters we will introduce three cases to explain how knowledge is shared and what effects we have in those contexts.

26.4 Case Participatory R&D

This chapter describes the participatory R&D development in ship building. The ship building process is a large process. The design phase alone can involve 40 companies and 200 people in a global network. It is obvious that good sharing of knowledge is a necessity to complete the design process. However, the good sharing of knowledge can be limited to necessary knowledge that is needed in the process. There may be some essential knowledge that could improve the design or could be used in next design, but this kind of knowledge is not shared because the participants want to protect their future work. Therefore, there is no access to knowledge although it exists in the network. Challenge is, how to share knowledge that is protected.

The same phenomenon can happen in single large organization. Needed knowledge exists somewhere in the organization but the person or team who need it is not aware of it or does not have access to it. The one who has the knowledge can lead the process where it is used. Knowledge is power and creates options for future actions.

There are several needed types of knowledge to share during the ship building life cycle. For example, sub contractor's load is one of them. In life cycle business the knowledge is developing and enriched during the ships life cycle. The knowledge should be enriched together and shared during the process. Also, analysis of ended project gives valuable knowledge that can be used in other projects. Research indicates similarities between open source software and open knowledge. Similar types of rules could be used for knowledge sharing as there is used for code sharing.

26.5 Case BaltSe@nioR

Number of aging population is growing in developed countries. The challenges have not been properly recognized or they have not been taken into consideration early enough. The number of products that are focused for elderly people is low, and choices are fragmented. It is the last moment to react. On Baltic Sea region the problem has been noticed and collaboration and cross sectoral actions are created. The challenge of aging is turned into a promising opportunity for business life.

Baltic Sea region is a creative environment and it offers a unique platform for fostering new innovations and improve quality of life of safety of elderly people. BaltSe@nioR project creates furniture solutions for aging population and strengthens age friendliness and business opportunities on Baltic Sea region. The project shares knowledge of leading actors on the field, and it creates collaboration between existing significant knowledge on fields of furniture manufacturing and design, ICT, robotics and technology industry, business and social sciences.

BaltSe@nioR project offers innovative ICT solutions, databases and tools for SMEs. These tools are created with multifield scientific collaboration. Multi field scientific collaboration is basis also for creative working methods that are created in the project. These methods can be utilized in product design and development. The methods help in developing the safety and reliability of the furniture. They also help to recognize the needs of aging population and to remove less aging friendly elements from the furniture. The project particularly creates synergy between furniture and ICT sectors. It develops competitiveness, inspiring identity, improves innovation capability, creates knowhow, creates prerequisites to act in international environment and creates intelligent products for aging population.

Sharing of knowledge and modeling of the innovation process were essential parts of the project plan. Academic actors are familiar with knowledge haring and modeling. Therefore, the modeling was a quite easy part of the project. There is still some work left as the knowledge databases, platforms and possibilities of the project should still be marketed for SMEs. Project will last till 2019 so all results of the project will be seen then. [9, 10]

During the project the researchers noticed that there would be need for a systematic literature review as a service to support innovation processes. Also, all organizations need other

competencies related to innovation, like how to use research knowledge as a starting point for an innovation process and how to use research knowledge to make the "right" choices during the innovation process. Development competences are also needed to create a constant flow of development based on knowledge.

26.6 Case Robot academy

Satakunta University of Applied Sciences in Finland started the Robot academy to respond to future technology and knowledge challenges. In the robot academy different age groups like children, young people and adults can study and learn on level that fits their competence. They also run technology development projects. Interesting learning tasks and inspiring learning environments also add attraction of technology studies.
Students from comprehensive school and vocational school are familiarized with new technologies with concrete exercises in the laboratory of Satakunta University of Applied Sciences. At the same time the teachers of comprehensive schools learn how to program Lego robots. They can teach programming for their students later. All actors are familiarized with technologies, step by step. They get positive memories related to robotics and programming.
Visiting students spent a “technology action day” at the University of Applied Sciences by programming robots and testing virtual reality and 3D printing with the researchers. Virtual reality and corroborative robots have been most interesting according to the students. Two handed robots have been challenging to program so far.
Engineering students are also participants of the robot academy. They perform their studies and graduate by running technology development studies in teams. Project themes and goals come from the local industry. Also, research projects of the University offer possibilities to participate into large R&D projects. The industry benefits from competence of the students, and their enthusiasm as well. Challenges are seen from various views and there are opportunities for new types of solutions.

Students have several roles in projects. They can act for example as a project manager, 3D designer, developer responsible of the motion control. They can have experience about roles and learn different competences according to their roles. Teachers are coaches and give guidance in the learning processes. Students see that studies are more practice oriented in Robot Academy. Learning is wider, and processes are longer than single study units in traditional studies. Studies in Robot Academy require commitment. They see it reminds working life. It requires initiative from the students, but the learning is deeper at the same time. Robot academy is a developing model that is modified in time. New leaning tools and methods are developed to better fill the learning needs and technology development needs of the local industry. Small groups and taking into consideration the levels of the participants have more impact in learning. Interaction is based on discussions and analysis between students, teachers and researchers. All are encouraged to comment on other’s ideas and to bring their own idea into discussion. There are mixed methods in learning, like collaborative, project and problem based learning, and learning by developing. Students can act as a bridge towards industry. There is a knowledge flow from HEI to comprehensive and vocational schools. They create positive attitudes towards technologies and studies in higher education. SMEs open their challenges and may have solutions created for them and have competent employees in the future. [11]. So, the knowledge is shared for different actors and for reasons on purpose.

26.7 Discussion

Innovation is extremely dependent on the availability of knowledge. Therefore, the complexity created by the explosion of richness and reach of knowledge have to be recognized and managed to ensure successful innovation. [20]. Innovation in build on need knowledge and technological solutions knowledge [19]. Even neighboring disciplines fail to learn from each other [2]. This research implies, that access to knowledge is shared in many ways and for

many reasons. Knowledge is also protected for commercial reasons. Better solutions could be created to knowledge sharing by evaluating the knowledge sharing processes during and after project execution. In addition to knowledge organizations need new competences to benefit from the knowledge. These are innovation and development competences [12]. Some organizations need help in knowledge management for innovation. On individual level motivation to change institutionalized practices, interest in change, experience in the field, multi embeddedness, authority to act, and the strategic use of social networks are needed [18]. Not only amount of knowledge, but also accuracy and validity of the knowledge matters in the innovation processes. This requires critical thinking of research and education when using the knowledge.

26.8 Conclusions

In addition to knowledge sharing, many organizations also need to enhance their culture and create new competences to utilize the new knowledge. The research suggests the following. There is need for more intelligent use and multifield combination of knowledge in research, innovation and educations processes. SMEs also need help in interpreting research knowledge and enriching it to their needs in the context of their development. Knowledge sharing in ended projects should be evaluated systematically and best practices, methods and results should be fully utilized in next projects and actions. Open science requires new culture, but so does this kind of controlled and focused knowledge sharing, presented in this paper. Organizations, SMEs and public organizations but also HEIs, need innovation and development competences in addition to new knowledge to utilize the knowledge for their innovation processes. Critical thinking and change of culture is needed. Future research should focus also on new multi science methods to change research and education cultures towards openness.

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