Modelling of Knowledge Sharing Processes for the Provision of Trilateral Cooperation

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Abstract. Information technologies in today's world function as support net for sharing knowledge and information coming more important as well as promoter of mutual cooperation when it comes to development of further education of adults. Because of a passive cooperation between educational institutions and enterprises, society is still in search of approaches and methods, new information systems and technology to improve service of knowledge, skills, abilities and attitudes. The research aims to justify and develop the knowledge sharing imitation model and prototype for trilateral cooperation. The goal involves innovative methods and web-based automated cooperation system. The main study question is what kind of modelling tools and technological solutions can be applied to improve and automate knowledge sharing efficiency and cooperation indicators? The results of this research are intended to be used in practice as promotional technology of cooperation development between potential interns/working individuals, adult educational institutions and enterprises.

Key words: Information and communication technologies, Information systems, Knowledge sharing models, Sustainable cooperation.

1 Introduction

Access to education and the opportunity to gain practical experience is important for every individual for their personal growth, as well as for companies to create and develop new, advanced products and services through high-quality work. Knowledge sharing is an endless process, where all parties involved need to be motivated constantly ensuring it remains sufficiently intense. Because of a passive cooperation between educational institutions and enterprises, society is still in search of approaches and methods, new information systems and technology to improve service of knowledge, skills, abilities and attitudes. In order to ensure sustainable success, emphasis should be put on building and strengthening cooperation between educational institutions and

enterprises, and potential trainees and working individuals should be involved. The research aims to justify and develop the knowledge sharing imitation model and prototype for trilateral cooperation. The goal involves innovative methods and web-based automated cooperation system. The results of this research are intended to be used in practice as promotional technology of cooperation development between potential interns/working individuals, adult educational institutions and enterprises. Changes and developments in available methods and technologies increasingly affect development of sustainable information society and determine educational tendencies thus affecting specificity of adult education as well.

2 Knowledge Sharing Model Development

First of all, knowledge transfer that is based on knowledge demand is linked with the cooperation, which depends on having the knowledge necessary and, secondly, knowledge can be formed when knowledge "suppliers" and "beneficiaries" meet. When providing and developing the prototype of cooperation system, functionality knowledge sharing is promoted which leads to educational institutions gaining experience in communicating directly with enterprises and creating personalized training courses on the particular case and actual topics. In turn, companies, showing initiative and cooperating with educational institutions, will gain the knowledge required for more effective work in industry and first-hand information on how to acquire young professionals and their knowledge. This trilateral knowledge sharing model is unthinkable without the young professionals as its main users, since they would be the ones getting actively and creatively involved in promoting electronic cooperation, while ensuring sustainable competitiveness of the system with their enthusiasm.

For imitation modelling of knowledge sharing processes, the process management tool [1] QPR ProcessDesigner was selected, which is a solution for rationalising different operations. Knowledge sharing and cooperation process is revaluated and modelled using business process [2] management tool QPR ProcessDesigner on purpose, since by modifying the flow of knowledge model it would be possible to analyze and predict user behaviour and knowledge sharing activities and business purposes in the long term. Modelling of the knowledge sharing allows to plan, develop and monitor the cooperation process as a whole, as well as the separate steps of each activity, the actors involved and to describe in a detailed manner the knowledge streams in the system. It is also possible to analyse how the changing factors change the shared environment of the system. Modelling and simulation has generally proved to be useful when addressing issues in complicated information systems' analysis, project drafting [3] and optimisation [4, 5, and 6]. Analysing results of the imitation model allows arriving at well grounded conclusions about ensuring sustainable cooperation and the necessary support mechanisms so as to achieve more precise and higher quality results for knowledge sharing between stakeholders.

3 Criteria for Evaluating Changes in Knowledge Sharing Activity and Cooperation Level

It is important to assess the factors affecting knowledge sharing activity and choose the criteria of changes regarding the level of cooperation. Public opinion states that the main reason slowing down cooperation between educational institutions and enterprises is by general lack of trust or an existence of large proportion of small and medium entrepreneurs with limited resources.

In order to identify all the possible options, factors affecting involvement in knowledge sharing and cooperation are characterized. Knowledge sharing activity is measured by how often stakeholders share actual needs and desires. The level of cooperation is measured by request and offer units complying with the requirements of the side interested in cooperation. People's willingness to cooperate and share their knowledge could be affected by a wide range of factors that have been identified within the study [7, 8] are further developed by the author and are then summarized in 4 categories: usefulness, efficiency, accessibility and sustainability (see table 1).

Table 1. Categorized influencing factors.

Usefulness	**Accessibility (electronic system)**

• Skill evaluation level (on scale 1-5)
• Offer evaluation level (on scale 1-5)
• Improved offers (complemented % of all)
• Recognisability level (view factor)
	• Technically
	  ○ Electronically for different Oss
	  ○ Mobile, tablet
	• Content related
	  ○ Offer precision and content
	  ○ Request precision and content
	• Eligibility of intern/internship

Efficiency	**Sustainability**

• Cost
  ○ Self advertising (savings from average market price)
• Time
  ○ Storing of contacts in the database (saved time when searching repeatedly)
  Data security (no access to third party)
	• Motivation (repeated use of the system)
	• Increase of offers and requests (number)
	• Reliability level (on scale 1-5)
	• New knowledge and experience (on scale 1-5)
	• Long term profit (increase of trainees, efficiency of qualified employees)

Identifying influencing factors and criteria allows analysing the current situation and forecasting possible future developments.

4 Development of the Prototype and Technological Functionality

Today automation of technological processes is an objective necessity and it contributes to increased productivity, improved service quality, reduced consumption of materials and energy and improved working conditions.

The prototype mimics the structure of the actual program and is pivotal for the process, since during the development of the information system it is changed and adapted several times, to achieve the desired outcome. The users of the system are the main driving force behind the development of the system's functionality. This is precisely why direct interaction is so important for the prototype - it has to be easy to grasp, shouldn't be challenging for the users and should allow processing the functionality of the system easily.

Information base consists of two main categories: educational opportunities and internships. These categories are then split in requests and offers which consist of needs and desires of users and are transformed, categorised and stored in a single location which is easy to access for all those involved. Simulation data of the imitation model indicates that, in order for active knowledge sharing to take place and for the cooperation to be sustainable, the critical mass for such a system is at least 200 motivated registered users.

Each individual user of the system can determine his or her needs independently from other users. Everyone has a chance to offer educational opportunities or topics they are interested in studying, as well as express their wish to become an intern of offer an internship to someone. While being involved in mutual knowledge sharing and cooperation processes, it is also pivotal to receive feedback [9]. During the process of knowledge sharing information users are stating their offers, adding reviews and suggestions for improvements for other offers. This way, effective cooperation-oriented communication is established.

The usefulness and convenience are two distinct criteria [10, 11]. In 1986, Davis developed a technology acceptance model, basing it on the motivated action theory, with the purpose to predict acceptance of information systems (see figure 1.) [12].

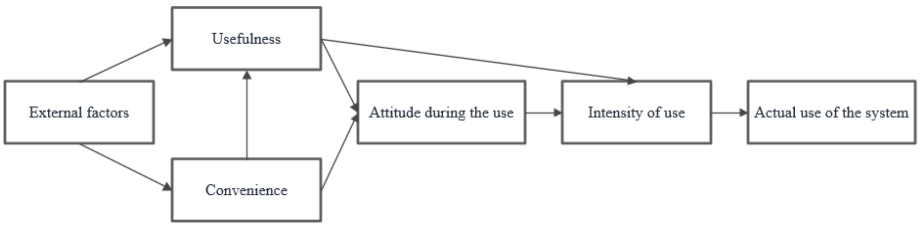

Fig. 1. Technology acceptance model [12].

Changing external factors influence both usefulness and convenience, which in turn affects system users' attitude, intensity of their activity and the actual application. The level of usefulness is assessed by how the user evaluates the level up to which his or her performance is enhanced by using the available opportunities. Convenience, in turn, relates to how easy it is to perceive the system.

After providing the functionality of the basic processes of the information system the next step could be to develop agents' technologies in the way they are able to ensure system's self-development and, when analysing the data of all users, the search of hidden connections and discovering of unknown relations between them can be performed [13, 14]. The goal of agents is to simplify the identification of possible solving of cooperation system users needs and desires, to filter useless information and to display offers in order to make the data of interest in the first place [15].

5 Analysis of the Pilot Project Data

In order to evaluate the pilot project, users of the cooperation system were interviewed. In addition, experts of the field were invited to review the theoretical and practical findings of the research. The analysed data demonstrates that successful categorisation and easily accessible functionality ensures faster and more precise locating of the necessary information. On average, the usefulness of the cooperation system was most highly evaluated by potential interns/working individuals. The usefulness of determining levels of the required skill in scale from 1 to 5 where 5 being 'very useful', and 166 respondents answered with either 4 or 5, which constitutes 82% of all responses. This target-audience group also evaluates the possibility to receive cooperation recommendations as prepared by the system most highly (see figure 2).

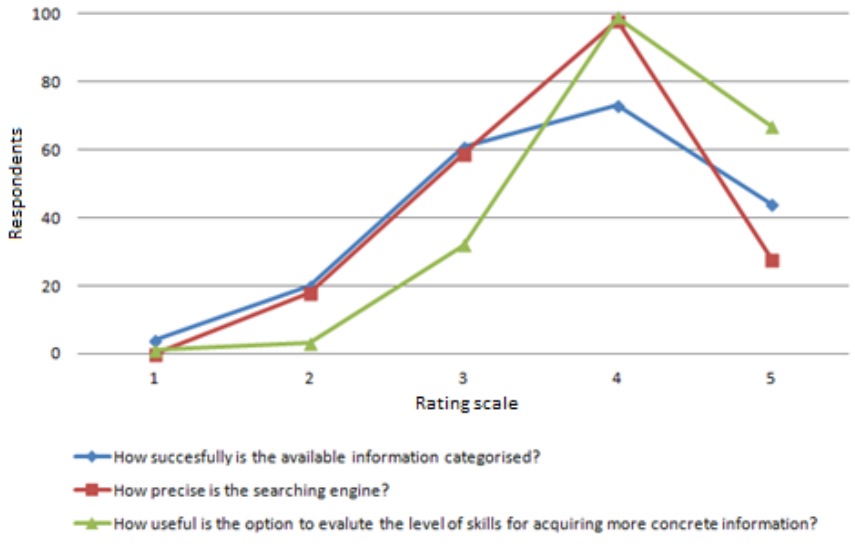

Fig. 2. Evaluation of information categorisation and search result precision.

This shows that potential interns/working individuals and entrepreneurs are least interested in spending a lot of time on searching for opportunities that correspond to their needs. Respondents were also asked to evaluate their motivation to use this type of cooperation systems. One or several answers were allowed. The total number of responses was 414. Most respondents (41%) indicated that they would like to follow the updates of new opportunities and requests, 19% stated they would like to add new course requests, 16% - to add internship opportunities, 12% - to add internship requests and 12% - to add training opportunities (see figure 3).

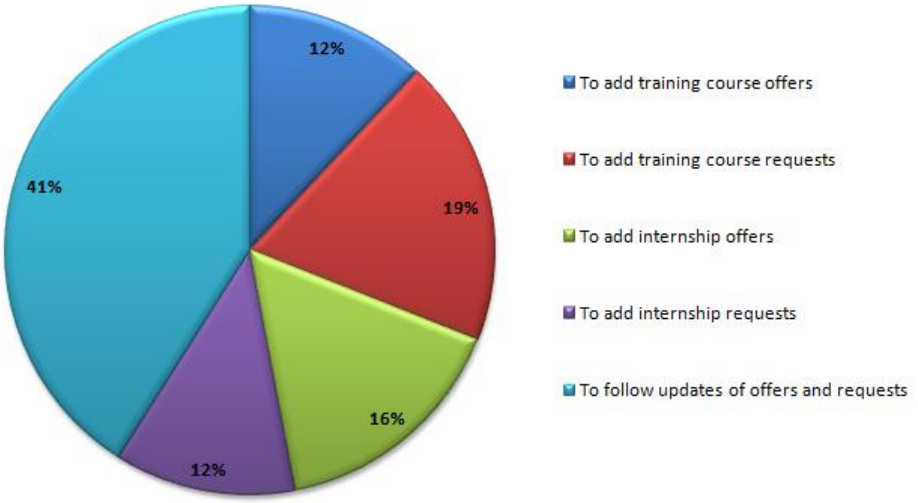

Fig. 3. Percentage distribution of the user-motivating activities.

It is possible that the acquired data is distributed in this way, since more enterprises were interviewed than educational institutions. Potential interns and working individuals have also expressed their wish to add their requests. The number of those users, who indicated that they would only wish to follow news updates, is very small and thus leads to a conclusion that most users are willing to get involved. The potential knowledge sharing activity in the information system is evaluated as high by most respondents, predicting that the educational institutions would be the most active ones.

In the trilateral knowledge sharing model both motivation of all those involved as well as mutual trust are key. It seems to be the case, that the level of trust for the enterprises regarding their potential partners is slightly lower than the level of trust of educational institutions and potential interns/working individuals. Considering the opinions of the current prototype users allows evaluating important factors that may affect the system in the future. After processing statistical results, recommendations have been developed for the use of a more individually oriented, automatic cooperation system for the potential interns/working individuals, educational institutions and enterprises.

6 Conclusion and Further Work

The research aim was to justify and develop the knowledge sharing imitation model and prototype for trilateral cooperation. With carrying out the task of the research, following theoretical results were achieved:

- Research and analysis carried out for the purposes of the thesis justifies the claim that process imitation modelling and the designed information system prototype is topical for the general public and useful for knowledge sharing and promotion of trilateral cooperation.
- Imitation model of knowledge sharing describes relation between potential interns/working individuals, educational institutions and enterprises, data and processes.
- Conclusions and suggestions of the research are important for promoting sustainable trilateral cooperation in further education.

With carrying out the task of the research, following practical results were achieved:

- Imitation model of knowledge sharing allows analysing and predicting potential knowledge sharing activities of all involved parties. The model can be adapted and modified also for analysis of business process.
- All three actors involved benefit directly from being involved, since they receive additional information for initiating cooperation and as a result, gain useful knowledge for developing a successful career, obtain new, field-specific studying modules or attract competitive employees for developing innovative business product.
- Cooperation information system prototype can be used in practice as promotional tool of knowledge sharing and cooperation between all involved actors.

Novelty of the research:

- Factors and criteria affecting the intensity of knowledge sharing and levels of cooperation have been identified, which allows to assess the existing situation and to predict potential future developments.
- Imitation model for knowledge sharing was designed, which allows to analyse motivation of the general public as well as the activity between interns/working individuals, educational institutions and enterprises.
- Cooperation information system prototype for trilateral cooperation has been designed, which affects and leaves a positive impact on development of knowledge-society, with an emphasis with immediate and easy-to-achieve benefits (saving time, financial resources, access information, improve communication skills, participate in social life and to increase one's competitiveness in the labour market).

The results of the research show that the applied information technologies play an important role in knowledge sharing and cooperation-promoting activities. Results of research provides basis for further inquiries about knowledge sharing, promotion of

cooperation and design of support technologies. Sometimes society is unable to follow the rapid technological development that is why it is important to balance the use of technology in the cooperation process and to create a user friendly and motivating information systems and electronic data base where possibilities of information exchange between adult education institutions, students and branch experts can be found. When developing functionality of a cooperation system it is necessary to work actively with agents for ensuring information exchange between all involved sides, so that self-development of the information system is ensured.

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