Modelling Knowledge Sharing According to Personal Characteristic

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Abstract: - The rapidly growing accessibility of information and knowledge in the World Wide Web and in various media and literature is increasingly raising the question, how to improve and evolve knowledge sharing processes in both education and other fields for society sustainable development. Knowledge sharing problems originate from the inadequacy of the given information with the recipient's personality characteristics, which determine the type of information perception. Major role in knowledge sharing goes to group work, but the group work efficiency depends not only on the mutual compatibility of the personality types, but also on the suitability of the type to the given task. Combining certain personality types it is possible to both improve and reduce the group work efficiency, that's why the aim of the paper is to develop an imitation model of knowledge sharing, according to the division of group member personality characteristic. To achieve the aim requires to perform a study of the personality characteristics and small groups, their effect on knowledge gaining and group work efficiency, as well as to perform the potential group work efficiency imitation modelling. To improve the knowledge sharing process a recommendation base is created according to the division of type characteristics. The results of the paper can be used to improve the knowledge gaining process, when assembling groups and when forming of different work groups is needed.

Key-Words: - knowledge sharing**,** modeling, personal characteristics, simulation, education, sustainable development

1 Introduction

Independent learning and teaching of students and teachers and also nowadays forces researches to be without boundaries unaffected by rules of institutions and political influence and oriented towards harmonious personal development. According the European Council's decision in Lisbon, 23 and 24th March 2000, a new strategic goal for the European Union itself had been set: to become the most competitive and dynamic knowledge based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion [1]. In order this goal to be achieved, an overall strategy have been developed. Main purpose of this strategy is the investment in people through education and lifelong learning. The educational system should change its focus from trying to create readymade specialists to possibly training specialists for changing life situations and supporting flexible lifelong learning. The increased value and usage of knowledge in everyday life and in business develops a necessity for well educated individuals. With the latest advances in information and communication technologies, learners can now engage in continuous and learning-sessions that characterize today's digital learning ecosystem. There is wide range of options for continuing education as face to face courses as well as online.. Wide range of accessible information technology (IT) as well as potential of new technologies allows people to learn throughout the life-course. Necessity for lifelong learning defines turbulent life change and rapidly changing demand for new knowledge and skills. Educational framework moved from knowledge acquisition, as objective, to knowledge sharing and seeking methods. This is the main reason UNESCO started early to publish books and develop educational programs for teachers around the world. Their main objective was not to integrate ICT in this professional but to assist educators to understand what transformations have been occurred and what methods have to be adopted in their day to day performance of their profession [2].

Due to incomplete knowledge transfer there is an information loss during the process of knowledge sharing and exchange. Parts of knowledge gets lost or corrupted in the process thus giving a result of

different information received than sent. There is necessity of similar information coding and decoding system between people for successful communication. Information coding system between people contains words and signs. There are different coding systems depending of personal characteristics. The problem is that often in knowledge sharing takes no notice team partner conformity and type of information accordingly recipient personal characteristics. The result is prevent perception. The goal of the paper is to develop an imitation model of knowledge sharing, according to the division of group member personality characteristic. The following sentences briefly outlines the main points of the paper proposed to reach the defined goal. Section 2 describes related work. Section 3 reflects a methodology. Section 4 analyses the specifics of knowledge sharing simulation model. Section 5 describes the conclusions.

2 Related Work

The literature identifies five primary contexts that can affect successful knowledge sharing implementations, including the relationship between the source and the recipient, the form and location of the knowledge, the recipient's learning predisposition, the source's knowledge-sharing capability, and the broader environment in which the sharing occurs. This paper focuses on first two aspects: relationship between the source and the recipient depending of their personal characteristic and form and location of the knowledge.

2.1 Knowledge Sharing in Groups

Knowledge is rather intangible and thus it can not be fully realizable in common with all our human being [3]. Here comes in person's characteristics such as psychological traits, motivation, volition and intelligence as they play eminent role in that how knowledge is handled in a personal level. Also knowledge perceiving plays important role in this part. Knowledge as such is well defined by a long time and well known researcher in this field Thomas Davenport. As per him knowledge is a mix of ones experience, contextual information, values, and an expertise that serves as a base for evaluation and absorption of new information and experiences. Knowledge has only become knowledge after information has been interpreted, context has been added, and knowledge has been anchored in the beliefs and commitments of individuals [4]. One approach to defining knowledge-sharing success focuses on the degree to which the knowledge is re-created in the recipient. From this perspective, knowledge transfer involves the re-creation of a source's knowledge-related elements – its knowledge package – in the recipient [5,6]. There is also evidence that sharing mechanisms what involve people interactions can be superior to those involving only document exchanges, since knowledge often needs to be adapted to the new context in order for it to be effectively utilized Successful knowledge transfer involves neither computers nor documents but rather interactions between people. Knowledge internalization refers to the degree to which a recipient obtains ownership of, commitment to, and satisfaction with the transferred knowledge. With respect to ownership, when knowledge is fully internalized by a recipient, it becomes theirs. Knowledge sharing includes the dissemination of existing knowledge into the team from the external environment, which points to the necessity to understand the complexity of knowledge sharing between knowing team members within global organisations [7,8,9]. It means that also team members plays important role in knowledge sharing process.

2.2. Personal Characteristics and Perception of Information

One of the first scientists who focused on personal characteristics differences was Jung. Among all of Jung's concepts, introversion and extraversion have probably gained the widest general use [10]. The psychological type model originally developed by Jung as adapted and embodied in the Myers-Briggs Type Indicator (MBTI), what defines four categories of psychological type differences - Extraversion / Introversion; Sensing / Intuition; Thinking / Feeling; Judging / Perceiving (see fig.1) [11]. The identification and description of the 16 distinctive personality types that result from the interactions among the preferences. Extraversion (E) or Introversion (I) — where focus human attention and gets energy,
Sensing (S) or Intuition (N)—how human takes in information, Thinking (T) or Feeling (F)—how human makes decisions, Judging (J) or Perceiving (P)—how human deals with the outer world.

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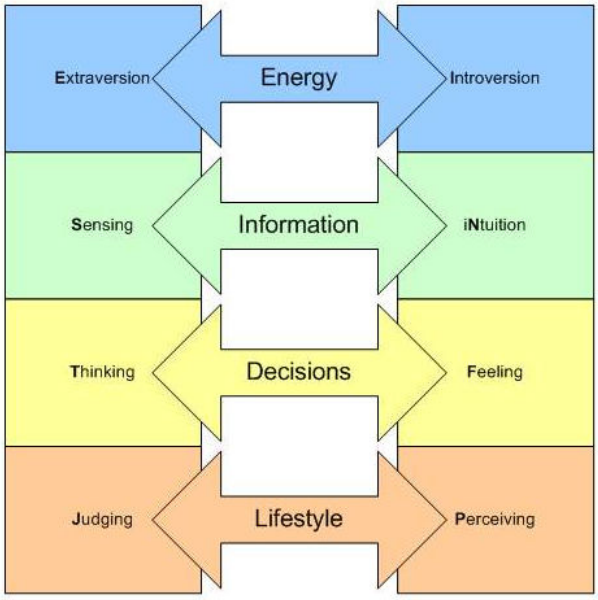

Fig.1. The four Personal Type Dichotomies [11].

Schaubhut**,** Herk and Thompson made research about reliability of the MBTI assessment and validate this theory in several ways[12]. Based on this theory there are different types of small groups developed. Apparently, the obtained class of small groups breaks up into two subclasses, which essentially differ one from another: groups with all their elements in identical relationship between the types: a set of three symmetrical relationships. This subclass consists of fifteen splittings. These groups will be labeled as homogeneous. There are also three kinds of relationships splittings into heterogeneous groups. However, one pair of types having symmetrical relationships is in more favorable intertype situation in relation to the other pair. There are 20 different heterogeneous groups [13,14].

3 Methodology

Social process modelling enables the common understanding of all the pertinent aspects, the clear description of problems in continuing education and requirements, the definition of various design alternatives and a mechanism to analyze these options for design implementation at the strategic, tactical and operational and technological levels [15].

Following methodologies are chosen for benchmarking: EKD (Enterprise Knowledge Development) – enterprise modeling method [16]; Keith A.Butler method – for business process modeling and software requirements definition [17]; DRM (Decision Relationship Model) – reflecting actors, processes, input flows und decisions [18]; Imitation models – the real actions imitated in the time. The imitation models depending on their application are divided into dynamics models (for description of variable processes), microanalytical simulation models (for describing the typical elements), queuing models (or discrete event models for describing the queues), multilevel simulation models (for describing the groups of typical elements), cellular automatic (describe the regularities of fixed number of elements and relations with their adjacents), multi – agent models (for describing the agents and their behaviour, mutual interaction and interaction with the milieu) and learning and evolutionary models (for describing the neuron network, genetic networks) [19].

For solving the described problem the system dynamics modelling is used where models can be described with differential equations. Every from the imitation models has its own tools for implementation elaborated. In this case DYNAMO, IThink/Stella, PowerSim, Vensim etc. Dynamo was the first specially developed language for establishing dynamic system models [19], but Stella, Vensim and Powersim are the most used tools for developing dynamic system models [20].

For developing the model the Isee Stella 9.0.3 computer simulation application software that ensures the development of dynamic models [21] by using the graphic description language or graphical symbols was chosen [19]. The modelling milieu is characterized by intuitive use of user interface, storage and flow diagrams for depicting the systematic actions, as well as possibility to create both discreet and uninterrupted event models by using elements like [22]:

- **stock** – figures the stocks, for example, population, biomass, various substances, water, knowledge;
- **flow** – labels actions that change the volume of the stock;
- **converter** – includes formulas that convert the input data into the output data;
- **connector** – transmits input data or output data; since it performs data transmission, it can not contain numeral values, as well as it can not transmit data to the stock [21].

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4 Knowledge Sharing Simulation Model

The efficiency of the implementation of the task assigned to the team depends on the correspondence of the personality types of the team member to the type of the task to be done and on mutual cooperation ability amidst the team or the level of synergy. Both watching the student team work and employees' mutual cooperation ability it has to be noted that in several cases the cooperation is successful and the result is achieved noticeably earlier then if the task would be done by individual person, despite that in some cases performing simple task creates lots of difficulties. This depicts the basic principles of small groups – harmonic attitudes within the team improve the work efficiency. The principles mentioned before are implemented into the developed knowledge sharing model.

The developed imitation model that provides opportunity to estimate the potential efficiency of four-person team consists of two sequential basic components that form the common imitation process – for calculation the team synergy or potential cooperation ability that verifies the correspondence of the group, based on four small teams and the simulation of the time of performing the assigned task based on the percentage division by the types of the members of the team corresponding the task to be done (see fig.3). As the model's input data serve as the characteristics necessary for the team work task (study determines two work tasks – solving the problem task and writing the essay, determining that those are characterized by thinking and intuition, and feeling and intuition features) and percentage division of characteristics of the team members.

Initially in order to do the time modelling of the team work task it is necessary to determine whether any of groups corresponds the defined small group. The synergy or coefficient of the potential cooperation ability is calculated after having proved four small groups – the club, the mobilizing group, bouquet, blocking group, since the interactions of these groups significantly influence the time for performing the task. If the group is formed it is allocated a following coefficient of efficiency:

- **club** – able to solve complicated problems, make specific decisions on theoretical level, but the club will not implement them on practical level [14], therefore the group is allocated the coefficient 1,5. The group is considered established, if all it's members have similar feature S or N, and at the same time also T and F, by forming the couples SF, ST, NF and NT.
- **mobilizing group** – able to implement the problem solutions into the practice, because the aim of the work is discussed and achieved in short time [14] – coefficient 0,5, which indicates that the work efficiency would be higher then input of every individual. This group is characterized by the fact that all its member have similar E and I feature and within this group a set of features is formed consisting of two S and two I types, that form feature pairs SF and NT or ST and NF after combining itself with feature T and F.
- **bouquet** – the atmosphere is tense but it is effective in doing some urgent task [14] – coefficient 0,25. Within the group its members have similar E or I feature and at the same time also J or P, and it forms pairs EP, EJ, IP, IJ.
- **blocking** – the personality types in this group can discuss for a long time, but are unable to perform assigned task [14], therefore the group is allocated coefficient 2. The group is characterized by similar feature J or P, and within the group forms the same set of features as for group "club" by forming the pairs SF and NT, or ST and NF.

If the team which is tested for the efficiency does not correspond any of the types of the small group, it is allocated a neutral coefficient of efficiency – 1. See the algorithm for determining of the efficiency coefficient in the fig. 2.

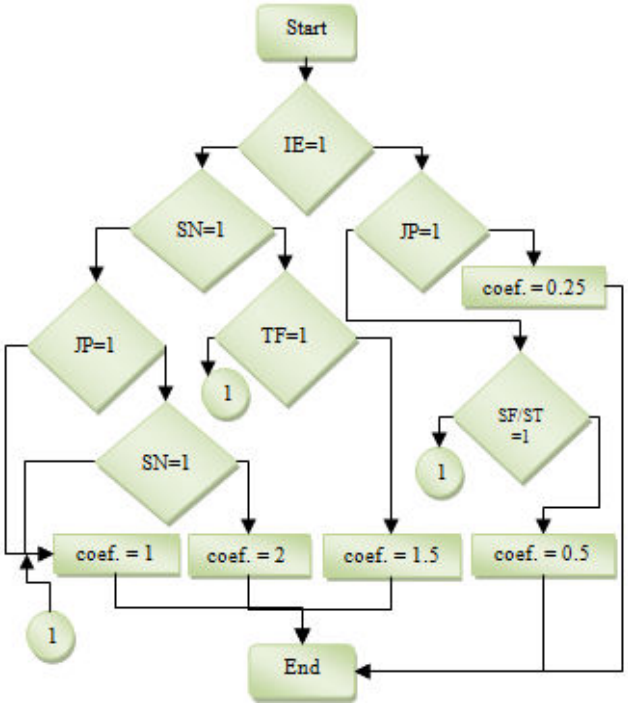

Fig. 2. The coefficient of efficiency allocation algorithm for cooperation ability in the imitation model.

When the calculation of potential team cooperation coefficient if done, it is supplied to the basic part of the model which performs the simulation process of task solution. Parallel to the calculation of the efficiency coefficient the team average indicator of every feature is calculated; which in the simulation process in compared to the features for defined to the task by increasing the time for solving the team task by one unit until it reaches the task feature (see. fig. 3) In the third picture the converter „Compare extraversion" implements the above described mechanism, but identical process is repeated for every of the eight features.

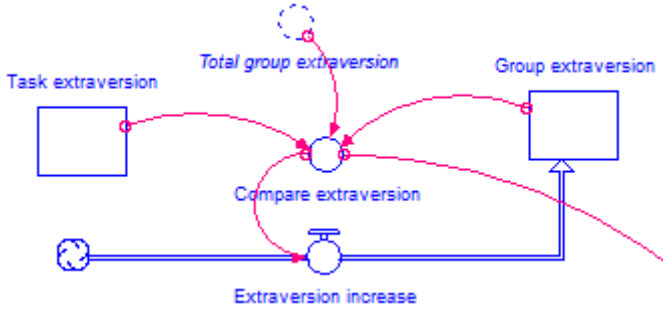

Fig. 3. The imitation process of completing task within the frames of one feature.

The total work efficiency of the team is calculated based on the value obtained during the simulation by multiplying it with the efficiency coefficient calculated before (see fig.4 converter "Coefficient of efficiency"). The obtained value characterizes the team work efficiency in performing the task with regard to other teams.

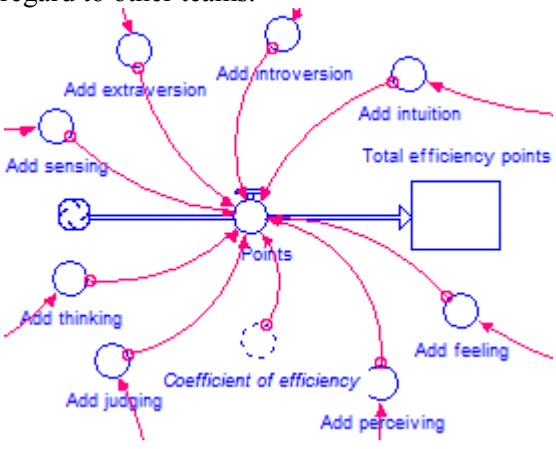

Fig. 4. Calculation of total efficiency of the team.

In order to perform the model validation by using the quantitative data output and its statistical analysis, it is necessary to repeat the modelled situation in the real life, which would demand very time consummating studies, therefore for evaluation of the model functioning an opinion of experts is requested. The polled experts recognize the correspondence of the developed model to the principles of the type theory and its expedience for modelling the efficiency of team work.

5 Conclusion

The performance of the developed model was tested on December 2011 at Vidzeme University of Applied Sciences by using the data obtained from student poll where the personality types and percentage division of the features were determined. Students were grouped by four from every study year following two principles – random and arranged, where arranged group is formed according to the principles of small groups, but random groups – according to the sequence of receiving filled poll questionnaires. Performing the model test for completing two different tasks it was concluded that mature team completion would improve the efficiency (the arranges groups delivered higher results), but at the same time it is not possible to create all groups equally efficient since the whole 16 type spectrum is not represented.

Since the developed knowledge transmission model demonstrates the close interlink with the study results with the division of team's features, the adjustable recommendation basis was developed for four of eight personality features, influencing the knowledge acquirement – introversion, extraversion, sensory and intuition. The adherence to the prepared recommendations would improve knowledge sharing and learning processes, because of improvement of the knowledge perception.

For further development of the project it is necessary to complete serious additional studies in the field of application of small group theory in the process of improvement of education and knowledge sharing processes. For the application of current study to wider audience it is necessary to develop application software that would suggest more convenient user interface by implementing the developed algorithm, and where it would be possible to calculate the possible efficiency for the teams when performing specific tasks based on individual division of the features of every student of every study year – which would be more expedient both for lecturers when assigning the team works, and for enterprises and organisations when planning team work.

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