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Texts discussing envisioned predictions for the present millennium reveal that the basic types of knowledge needed in the future are those of mathematics, computing and informatics. What do these, to some people rather daring, statements refer to? Most of all they point out that knowledge is, for example, key not only for discoveries in the fields of bio-sciences and astrophysics but also for solving current burning social and ecological issues. Essentially, it is about making the qualitative shift from technology-based to science-based innovation. In this, the computer surpasses the boundaries of a technological tool, the use of which is commonly limited to desktop applications and the Internet. Here, e-literacy signifies significantly new methods of work that enable this leap.

Informatics and computing have reached a threshold of a new knowledge revolution. Besides being merely a tool for operating knowledge, computers, together with new methods such as data mining, also enable the creation of new knowledge that leads to new discoveries that would otherwise be impossible. An example of this is the decoding of a genome.

Revolutionary shifts in knowledge have been infrequent throughout the history of mankind. They have occurred as the result of basic conceptual discoveries, among them algebra, or technological discoveries, an example being the telescope. When in 1202, Fibonacci published Liber Abaci and introduced algebra as a new branch of mathematics, algebra enabled a shift from written to symbolic mathematics. Similarly, the invention of the telescope in 1604 by Galileo and later technological inventions such as the microscope and X-rays significantly influenced the development of science. Thanks to these shifts, humans have changed their understanding of humankind, the world and the universe. It goes without saying that the mode and content of education played an important role in this process.

It is difficult to estimate the depth of the change that computing and informatics are bringing into the 21st century. We can say that it is having an important effect on how we live, on how long we live, on what we know about ourselves and the world around us and on how to protect the entire life-support systems of the earth. What are its effects on the processes of education? It appears that its influence is essentially greater than ever before. What is the reason for this difference? Most of all, the knowledge of informatics and computing is closely methodologically aligned with the processes of education. Important difference arise also from the fact that new challenges cannot be tackled if knowledge is something that is intended only for the elites. Technology, however, enables knowledge to be available to everyone at all times. Furthermore, this means a big shift in learning.

Efforts for suitable education are numerous and varied, from small suggestions and examples of good practices to conceptual shifts in thinking. It is becoming clear that the way to motivate the youth of today, for example to obtain a university degree, cannot be achieved only by emphasising the expectations regarding the knowledge they will attain or the degree they will receive on paper that will be recognised outside our borders. Universities in the United Kingdom have therefore edited a publication on the 100 greatest discoveries made at their institutions, intended primarily for high-school students and politicians. For politicians, it aims to demonstrate that investments in knowledge and research pay off eventually despite their long-term nature. To the target group of students, on the other hand, the universities wanted to show that university is not only an intermediate for delivering codified knowledge but that it can also offer access to newly generated knowledge by participation in concrete projects leading to new discoveries and solutions.

And what lies in store for us at the 10th conference "Education in the information society" held in the frame of the multiconference "Information society"? The contributions present some of the results of research and development from the pre-school to the university level and lifelong learning. Our goal is to enable the flow of knowledge and ideas and, more importantly, to encourage future work in this field.

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Structuring Domain Knowledge by Semi-automatic Ontology Construction

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In this paper, we present a case in semi-automatic ontology construction from literature. For this, we concentrate on the articles about autism obtained from the PubMed Central database. Our motivation was to investigate how separate parts of articles, such as titles, abstracts and full texts, influence the constructed ontology. Our results confirm the intuitive expectation that constructing ontologies from abstracts is a rational choice when uncovering the structure of a given scientific field. In addition, when compared to general knowledge of autism, ontology concepts from abstracts show the highest similarity.

Key words: Knowledge management, education, concept learning, ontologies, autism

Strukturiranje domenskega znanja s pomočjo polavtomatske gradnje ontologij

V članku opisujemo primer polavtomatske gradnje ontologij iz literature. Članke, ki smo jih uporabili v opisanem primeru, smo pridobili iz baze Pubmed Central. Cilj naše raziskave je bil ugotoviti, kako uporaba posameznih delov člankov – naslovi, povzetki, cela besedila – vplivajo na zgrajeno ontologijo. Dobljeni rezultati potrjujejo intuitivno domnevo, da gradnja ontologije iz povzetkov daje najboljše rezultate pri odkrivanju zakonitosti na izbranem problemskem področju. Koncepti, ki smo jih evidentirali pri gradnji ontologij iz povzetkov člankov s področja avtizma, se najbolj ujemajo s splošnim znanjem o avtizmu.

Ključne besede: Upravljanje z znanjem, izobraževanje, učenje konceptov, ontologije, avtizem

1 Introduction

Throughout each period of science, ontologies have been used as a means to organise scientific information and, more importantly, to provide a common vocabulary of concepts for educational processes. Until recently, the practice of ontology construction has relied mostly on the manual extraction of interesting concepts from scientific literature and their organisation in a suitable hierarchy. Nowadays, the largely increased amount of scientific publications requires automated support for such a task. With new knowledge technologies, selected scientific articles can be processed semi-automatically, and therefore, the process of ontology construction can be made more effective and feasible in practice.

Ontologies play a substantial role in the process of education (e.g. Breuker et al., 1999). Although content has always been considered a crucial factor in education, the emphasis in educational research has also been on form. From this perspective, ontologies in education are part of the common-sense understanding of the world that define the concepts and structures in a domain. Thus, ontologies are particularly important when the process of education embraces not only skill acquisition but also insight and understanding.

In information science, ontology is a data model that represents a domain and is used to reason about the objects in that domain and the relations between them. Thus, ontologies are capable of sharing a common understanding of domains and therefore of supporting research with the ability to reason over and to analyse the information at issue (Joshi and Undercoffer, 2004). In recent years, many tools that help to construct ontologies from texts in a given problem domain have been developed and successfully used in practice (Brank et al., 2005). Among them, OntoGen (Fortuna et al., 2006) has received notable attention in the text-mining community.

Nowadays, researchers and students are faced with vast amounts of data when extracting knowledge from the rapidly growing volumes of databases. The situation becomes even more striking when a person wants to obtain an insight into a field that does not fall directly into his or her

area of expertise. A special field of knowledge discovery in databases aims at supporting researchers and students for such tasks. Knowledge discovery is the process of discovering useful knowledge from data, which includes data mining as the application of specific algorithms for extracting patterns from data (Fayyad et al., 1996). In fact, important information hidden in huge databases could be revealed by data mining and knowledge discovery techniques. When databases contain bibliographic semi-structured data, text mining as a specific type of data mining can be used.

When constructing ontologies from scientific articles in a semi-automatic manner, there is a decision to be made: which parts of the articles to include in the process. While some experts suggest that the more text one can obtain, the better the constructed ontology, others advocate a more systematic approach that relies on comparably balanced parts of explored texts (Cohen et al., 2005). With the experiments described in this article, we aim to clarify this dilemma. Thus, our main motivation was to analyse how separate parts of scientific articles influence the constructed ontologies. Initial results presented in the study by Petrič et al. (2006) encouraged further investigation that enabled us to present our findings in a more systematic fashion. When evaluating which parts of articles would be more appropriate for the ontology construction, we assessed two criteria: first, the pair-wise similarity of the constructed ontology concepts, and second, their resemblance to the commonly accepted concepts in a given domain.

The set of articles for our study was selected from the autism domain. Autism belongs to a group of pervasive developmental disorders that are portrayed by the early delay and abnormal development of cognitive, communication and social-interaction skills of a person. Owing to its rather complex nature, the domain still lacks a thorough understanding of the underlying phenomena, and therefore, further investigations are needed (Persico & Bourgeron, 2006). Our team is active in investigations towards finding new methods for early diagnosis in autism. We are particularly focused on extracting knowledge from vast amounts of textual data and presenting it in a human readable form that will help us to gain a better insight into and understanding of the domain (Urbančič et al., 2007).

This paper is organised as follows. First, we provide a short overview of ontology construction approaches. In Section 3, we present our studies on documents about autism. Section 4 contains the evaluation of the obtained ontologies. The most important findings are summarised in the conclusion.

2 Semi-automatic ontology construction

Ontologies are used in information science as a form of knowledge representation of the world or some part of it. In general, ontologies include descriptions of objects, concepts, attributes and relations between objects. Traditionally, ontologies for a given domain are constructed manually using some sort of language or representation and rely on the manual extraction of common-sense knowledge from various sources. Recently, several programs that support manual ontology construction have been developed, such as Protégé (Gennari, 2002).

Since manual ontology construction is a complex and demanding process, there is a strong tendency to provide a computerised support for the task. Based on text-mining techniques that have already proven successful for the task, OntoGen (Fortuna et al., 2006) is a tool that enables the interactive construction of ontologies from text documents in a selected domain. A user can create concepts, organise them into topics and also assign documents to concepts. With the use of machine learning techniques, OntoGen supports individual phases of ontology construction by suggesting concepts and their names, by defining relations between them and by the automatic assignment of documents to the concepts (Fortuna, 2006).

Our main motivation for using OntoGen was to gain a quick insight into a given domain by semi-automatically generating the main ontology concepts from the domain's documents. The semi-automatic ontology construction method implemented in OntoGen incorporates basic text-mining principles. The input for the tool is a collection of text documents. Documents are represented as vectors, which together are often referred to as a vector space model. Using this representation, similarities between two documents can be defined as the cosine of the angles between the two corresponding vector representations. When suggesting new concepts, OntoGen uses a *K*-means clustering technique (Jain et al., 1999) and a keyword extraction method (Brank et al., 2002).

3 Experiments on documents about autism

For the purpose of this analysis, we decided to use professional literature that is publicly accessible on the Internet in the PubMed database of biomedical publications. In this database, we found 10,821 documents (up until August 21, 2006) that contain words in the form of *autis**, which we used as the search criterion for articles about autism. Documents were prevailingly described with the titles, authors and abstracts. However, 354 articles were presented in the database with the entire text. Other relevant publications were either restricted to abstracts of documents or their entire texts were published in sources outside PubMed. From the listed 354 articles, we further restricted the target set of articles to those that have been published in the last ten years. As a result, we ended up with 214 articles from 1997 onward. To use these in our experiments, we partitioned them into titles, abstracts and texts.

3.1 Design of experiments

When designing the experiments, we had two goals in mind. First, we wanted to become acquainted with the domain in the sense that we understand better the underlying concepts. Second, we wanted to evaluate various ontologies constructed on various parts of documents, such as titles, abstracts and texts. In addition, we also tried to evaluate the content compliance between titles, abstracts and entire bodies of texts of the related documents. Finally, we also wanted to experiment with various values of the parameter k used by OntoGen's K-means clustering algorithm.

From the 214 documents obtained by our search in the PubMed Central database, we created three input text files: a file with 214 titles, a file with 214 abstracts and a file with 214 bodies of texts without their respective titles and abstracts. Each text file was used separately as an input for OntoGen; in the process of semi-automatic ontology construction, we used OntoGen to construct several top-level ontology concepts and describe them with suggested keywords. The ontologies were built with two values for the parameter k: first, with k=8, which was automatically suggested by OntoGen, and second, with k=5, which experimentally turned out to be a well-balanced trade off between complexity and comprehensibility in this domain. Moreover, the results obtained with k=5 were more in accordance with the concepts found in the autism survey literature (Zerhouni, 2004) and were also evaluated well by an expert in the autism domain.

In this way, OntoGen generated eight and five concepts respectively on the first level of domain ontology for each of the input files (titles, abstracts and bodies of texts). Each concept was described with the three most relevant keywords as suggested by OntoGen. Our evaluation of the obtained ontology concepts was first performed at vocabulary level by comparing keywords of various concepts and analysing the sets of documents that corresponded to each concept. Next, concept descriptions were presented to the medical expert, who also evaluated the concepts from her perspective.

3.2 Experimental results

In this subsection we present the results of our experiments. Each table from Table 1 to Table 6 contains ontology concepts described using three keywords (labelled Keywords) and the number of related documents (labelled No. Docs).

Table 1: Eight concepts of autism ontology generated from 214 titles.

ID	Keywords	No. Docs
0	Root	214
1	preference, assessment, effects	31
2	reinforcement, children_autism, early	27
3	genes, susceptibility, specific	32
4	functioning, syndrome, analysis	26
5	autism, teach, child	25
6	vaccination, schedules, activated	24
7	social, evidence, chromosome	17
8	disorders, linkage, case	32

Table 2: Eight concepts of autism ontology generated from 214 abstracts.

ID	Keywords	No. Docs
0	Root	214
1	sensory, sounds, auditory	
2	stereotypy, behavioral, probl_beha	26
3	reinforcers, preferred, stimulus	41
4	teach, question, procedure	18
5	gene, linkage, regional	60
6	parent, mmr, vaccine	16
7	language, age, children	28
8	vaccine, mmr, mmr_vaccine	17

Table 3: Eight concepts of autism ontology generated from 214 bodies of texts.

ID	Keywords	No. Docs
0	root	214
1	executive, nv, cortical	26
2	stereotypies, reinforcement, prob_be	27
3	reinforcement, session, aggression	38
4	prompted, script, teaching	21
5	linkage, family, gene	55
6	ht, secretin, legs	
7	chemical, infant, sleep	14
8	vaccine, mmr, mmr_vaccine	25

Table 4: Five concepts of autism ontology generated from 214 titles.

ID	Keywords	No. Docs
0	root	214
1	autism, children_autism, children	67
2	syndrome, detection, social	19
3	disorders, spectrum, neurodevelopmental	39
4	genetic, chromosome, linkage	50
5	reinforcement, effects, behavior	39

Table 5: Five concepts of autism ontology generated from 214 abstracts.

ID	Keywords	No. Docs
0	Root	214
1	reinforcers, behavioral, problems_behavioral	49
2	language, foxp2, children	52
3	reinforcers, vaccine, aggression	46
4	linkage, gene, regional	55
5	virus, infection, trim5alpha	12

Table 6: Five concepts of autism ontology generated from 214 bodies of texts.

ID	Keywords	No. Docs
0	root	214
1	reinforcement, session, trial	2
2	reinforcement, sleep, infant	37
3	vaccine, mmr, mmr_vaccine	24
4	linkage, family, gene	71
5	infection, pml, patients	10

4 Evaluation of the obtained ontologies

In most cases, ontologies are rather complex structures. It is therefore often more reasonable to focus the attention on the evaluation of separate levels of ontology, rather than on the direct evaluation of whole ontologies (Brank et al., 2005). In our comparison of the ontology concepts from autism, built using OntoGen, we focused at the vocabulary level of the obtained concept descriptions and related concept documents. We observed the distribution of documents within individual ontology groups on the first level of each ontology model (first-level subgroups of autism domain), considering terminology that was selected by OntoGen for the presentation of concepts.

4.1 Ontology concepts from various parts of texts

The distribution of documents among eight concepts of title ontology (Table 1) is fairly uniform. In contrast, the ontologies of eight abstract concepts (Table 2) and eight text concepts (Table 3) both show one major subgroup of documents that treat genetics and another important group that describes reinforcers or stimuli for autists. Document distributions in ontologies of five subgroups are a little different. There are two major groups of titles (Table 4) and texts (Table 6). The biggest group of titles describes autism in general, whereas the largest text group relates to reinforcement trials. The second major group in both cases (titles and texts) deals with genetics. The distributions of abstracts (Table 5), in contrast, show two very important groups that both treat differing aspects of genetics. While the first group is described using clear genetic keywords, the second group includes, among others, the keyword *foxp2*, which is a gene important for the development of speech.

The evaluation of the obtained results show considerable differences between ontology concepts constructed from titles, abstracts and related bodies of texts. Figure 1 shows the result of the comparison of five ontology concepts generated from abstracts and entire bodies of texts. One major similarity is identified between the groups of genetic documents, which include the same 51 articles from the observed dataset. In addition, a relatively large similarity can be seen also between the text and abstract groups that deal with virus infections. Slightly less specific is the similarity between abstracts and texts from the groups: reinforcement, session, trial and reinforcement, sleep, infant. Although the concept matching presented in Figure 1 is not completely evident, a general tendency can clearly be found in the diagonal elements.

Compared to the analysis of matching bodies of texts and abstracts, we observed significantly lower similarity between texts and titles of the related articles, as well as between their abstracts and titles. Articles about genetics are the only fairly important group of documents that apparently use more similar vocabulary in their titles and abstracts and in the entire bodies of their texts. The likely cause for this observation lies in the genetic terminology and in the genetic context itself, which is reasonably specific when compared to other fields of autism research.

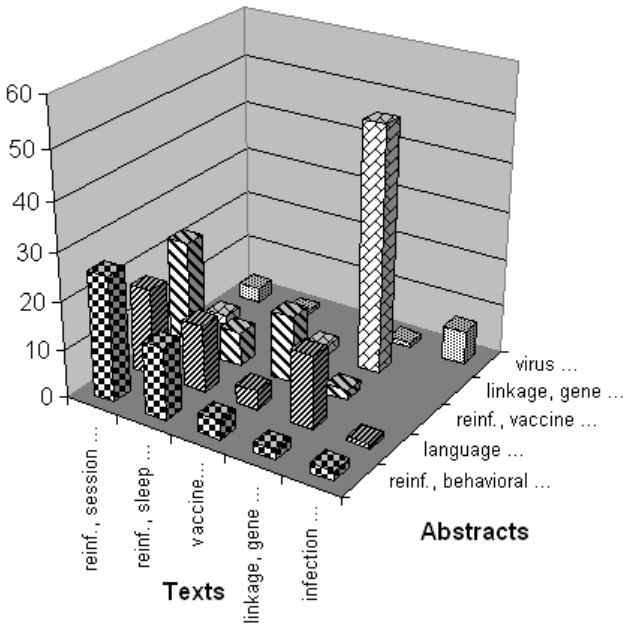

Figure 1: Comparison between the distributions of documents belonging to the ontology concepts of abstracts and bodies of texts.

The obtained high-level concepts were presented to the expert in autism. She found the tables informative and in accordance with her line of reasoning in autism. In particular, the clustering of the selected articles was in most

cases fairly intuitive, although the keyword description of some of the generated concepts was not so straightforward. An important confirmation of the resulting ontology construction is also the recent state of autism research as described by Zerhouni (2004), which summarises the main scientific activities of autism research in the major areas of epidemiology, genetics, neurobiology, environmental factors and specific treatments of autism. As advocated by OntoGen's literature (Fortuna, 2006), we renamed the concepts accordingly, based on the suggested keywords. The resultant ontology concepts are presented in Figure 2.

4.2 Ontology concepts with various values of *k*

Clustering algorithms, such as *K*-means clustering, are useful tools for data mining; however, when we have to cluster datasets, it is not always clear which is the most appropriate number of clusters (parameter *k*) to use (Jain et al., 1999). OntoGen automatically proposes the use of eight clusters as a default. However, it is strongly recommended to experiment also with various other values of *k* in order to determine the best result for the domain under investigation.

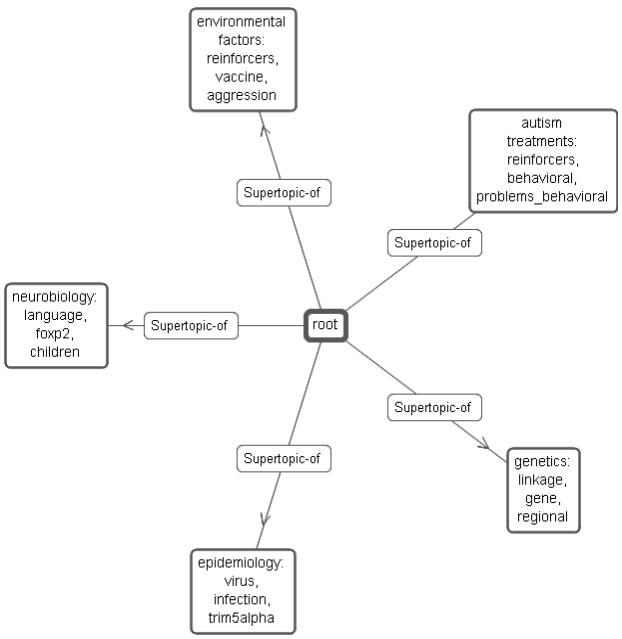

Figure 2: Top-level autism ontology concepts as suggested by OntoGen and renamed according to autism survey literature. Original concept descriptions are included for easier identification.

After experimenting with OntoGen's default parameter, *k*=8, we also constructed top-level ontology concepts with several other values for *k*, ranging from 2 to 15. As a result, we discovered that the value 5 for *k* represents a well-balanced trade off between the complexity and comprehensibility of the single-level ontology concepts in this domain. Although the concepts generated with other values of *k* also revealed some interesting domain properties, they were either too broad when *k* was small or too narrow when *k* was large. Therefore, a careful selection of the value of *k* is a very important prerequisite when constructing ontologies in a semi-automatic way.

5 Conclusion

Using tools for semi-automatic ontology construction from scientific articles can significantly speed up the process of becoming acquainted with the domain of interest. Instead of reading piles of literature, researchers and students can first generate top-level domain ontology concepts and thus obtain a general overview and understanding of the domain. After that, a detailed study of the concepts of interest might be in order. In such a way, semi-automatically constructed ontologies actually helped us to review and understand the complex and heterogeneous spectrum of scientific articles about the autism domain.

Our next motivation was to investigate how separate parts of articles, such as titles, abstracts and full texts, influence the constructed ontology. In this comparison, we decided to take into account only the top-level ontology concepts, mostly because comparing full-scale ontologies can become a very intricate task (Brank et al., 2005). Our graphic presentation of compared ontologies clearly exposes the main clusters of autism articles, which are shown as the highest columns in the graph in Figure 1. This therefore provides a powerful way to visualise the most important similarities between observed ontologies; it can be seen that the largest collection of autism documents always deal with genetics.

Determining the proper number of top-level concepts (the value of parameter *k*) for a specific domain is very important when constructing ontologies in a semi-automatic way. The goal is to find a well-balanced trade off between the complexity and comprehensibility of the single-level ontology concepts in the domain. However, experimenting with other values of *k* may also reveal some interesting domain properties.

The experimental results show that there is a substantial similarity between constructed ontology concepts from abstracts and full texts, while there is less similarity between ontology concepts from titles and abstracts and titles and full texts. These findings suggest that titles are not informative enough to be taken as the only source for constructing ontologies.

Compared to general knowledge on autism, ontology concepts from abstracts show the highest resemblance. Our results confirm the intuitive expectation that constructing ontologies from abstracts is a rational choice when uncovering the structure of a given scientific field. The titles as well as the full texts are typically less useful for the given task. When dealing with full texts, some preprocessing tasks such as stemming and stopping can improve the utility (Cohen et al., 2005).

For further work, we consider experimenting also with sources that are mixtures of titles, abstracts and full texts. Often, there are some articles available as abstract-only and some other articles as full texts. A practical question that we would like to investigate is the following: is it wise to join the two sets unaltered or is it better to include also the latter set in abstract-only form?

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Simulation Based Group Learning

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This article describes an experiment investigating simulation based group learning. For this purpose, we have conducted a four-group Solomon experiment under four different conditions: a_1) the determination of strategy with the application of the system dynamics (SD) model without group interaction and with a pre-test, a_2) the determination of strategy with the application of the SD model and group information feedback and with a pre-test, a_3) the determination of strategy with the application of the SD model and without a pre-test, and a_4) strategy determination with the application of the SD model and group information feedback and without a pre-test. The observed variables were the criteria function values and frequency of the simulation runs. The hypothesis that simulation model application and group feedback information positively influence the convergence of the decision process and contribute to faster decision-making was confirmed. A model of the learning during the decision-making process was developed. Students' opinions were analyzed as well and the results show that management students thought that the application of the simulation model did contribute to an increased understanding of the problem, the faster finding of solutions and the increased confidence of participants. All participants agree that the clear presentation of the problem motivates participants to find the solution.

Key words: group decision, learning model, system dynamics, feedback, experiment design

Učenje, podprto s simulacijskim modelom

V prispevku so raziskani principi učenja, podprtega s simulacijskim modelom. V ta namen smo izvedli Solomonov poskus štirih skupin pod naslednjimi pogoji: a_1) definiranje strategije, podprto s simulacijskim modelom brez sodelovanja skupine s predtestom, a_2) definiranje strategije, podprto s simulacijskim modelom s sodelovanjem skupine s predtestom, a_3) definiranje strategije, podprto s simulacijskim modelom brez sodelovanja skupine brez pre-testa (v zveznem času) ter a_4) definiranje strategije, podprto s simulacijskim modelom s sodelovanjem skupine brez pre-testa (v zveznem času). Pri tem smo opazovali spremenljivki: vrednost kriterijske funkcije (kvaliteta odločitve) in pogostost simulacijskih tekov (dinamika iskanja rešitve). Domneva, da simulacijski model in sodelovanje skupine pozitivno vplivata na enostnost skupine in prispevata k hitrejšemu odločanju je bila potrjena. Razvili smo model, ki ponazarja učenje v procesu odločanja. Izvedli smo tudi mnenjsko anketo udeležencev poskusa. Rezultati ankete kažejo, da se študentje managementa strinjajo s trditvami, da uporaba siulacijskega modela v podporo odločanju pripomore k boljšemu razumevanju problema, hitrejšemu odločanju ter večjemu zaupanju udeležencev. Udeleženci so si enotni, da jasna predstavitev motivira udeležence k reševanju problema.

Ključne besede: skupinsko odločanje, model učenja, sistemska dinamika, povratna zanka, načrt poskusa

1 Introduction

The decision processes in contemporary enterprises are primarily based on the participating subjects. Decisions generated in organizational systems are, therefore, not dependent on an individual decision on a subject but rather on a group of experts working in a specific field. The group better understands the system in question and provides synergistic effects (Hale, 1997). Their interaction in the process of problem solving (decision-making), supported by advanced group support tools and interactive business simulators, could enable more effective individual and group analyses of the problem (Vennix, 1996; Richardson and Andersen, 1995; Kwok and Khalifa, 1998; Langley and Morecroft, 2004; Škraba et al. 2003). Quality decisions can only be made if the decision group has the appropriate information: both anticipative and as feedback. This assumes knowledge of a model of a system, the criteria function and the state of nature. These have been intensively discussed in the literature (Chekland, 1994; Forrester, 1961; Rosen, 1985; Simon, 1997; Sterman, 1994, 2000). The ideal for learning organizations can be approached by the application of SD models (Warren in Langley, 1999). The use of SD models for testing the vision of the evolution of business systems is widely used (Forester, 1961; Simon, 1997; Sterman, 2000). However, the connection of SD models with group support systems (GSS) for the purpose of decision-making support is not

commonly used and researched. An interesting model, intended to explain group learning phenomena, was described in (Lizeo, 2005), where the group learning process was modelled from structural, interpersonal and cognitive factors in the form of a causal loop diagram (CLD) and an SD technique. Experiential learning, as in learning from an enterprise simulation, is researched in the experiment by Gopinath and Sawyer (1999), where the effects of learning during determination of broader business strategy on a business simulator were examined. The application of SD models for strategy determination encourages strategic decision-making and systematic work. In the experiment with the global oil microworld computer of Langley and Morecroft (2004), they explore the effects of various types of feedback on individual learning (outcome feedback and structure feedback). The results suggest that structure feedback positively influences the understanding of the problem and the time for the completion of the task.

However, in complex systems, to make a formal experiment in order to prove that efficacy and usefulness of group decision and using a simulation model for decision assessment is a demanding task. There are problems of validity in the design of the research (Chun and Park, 1998). It is difficult to create a laboratory environment in which subjects are motivated to creatively participate in finding the solution as they would in a real world. The dilemma is also in planning the problem (organizational systems), which is inherently complex. There is also the problem of the layout of the interface, as it affects the effectiveness of the subject in the process of problem solving (Howie et al., 2000).

Three learning methods (case learning, simulation method and action learning) were researched by Jennings (2002). The participants rated the simulation method as superior to the action learning and case learning methods. In the paper by Škraba et al. (2003), the process of strategy determination was described as well as the impact of group interaction on subject performance by applying the SD model of a simplified business process. The hypothesis that the model application and group information feedback positively influence the convergence of the decision process and contribute to increased criteria function values was confirmed. The experiment was later enhanced with a new group in order to analyze criteria function as well as dynamics of using a simulation model while searching for optimal parameters (Kljajić Borštnar et al., 2006). The goal of the repeated experiment was to acquire knowledge of the dynamics of the decision process supported by the SD model and the influence of group feedback information. Although the results of the criteria function were similar to the previous experiments, it was surprising that the frequency distribution was different among experimental groups at the beginning of the experiment. The decision-making process was divided into four time intervals; in the first interval, the technical conditions were the same for both the groups using the simulation model. When the first time interval elapsed, subjects had to submit their decisions to the network server. After submitting their decisions, one of the groups continued working individually with the simulator and the other group received information about the decisions made by other group members – group information feedback. The difference in the frequency of the simulation runs suggested that group membership might have affected the group work.

This paper describes the four-group Solomon experiment based on the following hypothesis:

H_1) Individual information feedback introduced into the decision-making process by a simulation model contributes to higher criteria function values (individual learning).

H_2) Group information feedback introduced into decision-making process by a group support system contributes to an increased convergence of the group and increased criteria function values (group leaning).

H_3) The interaction of the pre-test (group process facilitation) and treatment (group information feedback) contributes to a higher frequency of simulation runs in the search of optimal parameter values.

The results of the experiment confirm the hypothesis; the learning model developed in the causal loop diagram technique explains learning under different conditions.

2 Method

2.1 Simulation Model

Figure 1 shows the model of the production process as a black box with input parameters r_1, r_2, r_3 and r_4 (where r_1 is Product Price, r_2 Salary, r_3 Marketing Costs and r_4 the Desired Inventory) and the criteria function J as the output under experimental conditions a_1), a_2), a_3) and a_4), described later in the text. The task of the participants is to find the parameter values r_i in order to maximize the criteria function.

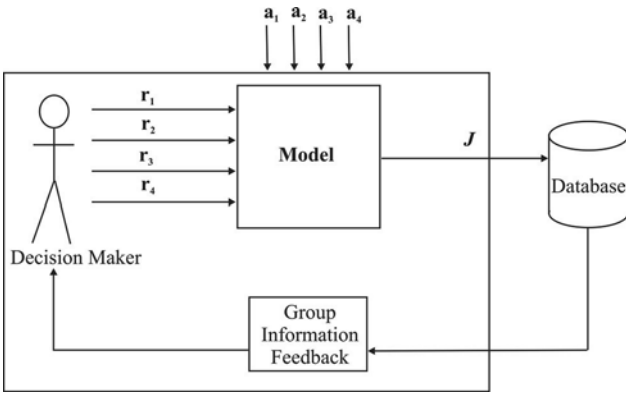

Figure 1: Business model with input parameters under different experimental conditions

In Figure 1, a_i represents four experimental (decision-making) conditions described later in the text. The model developed by the SD method, which was used in the experiment, is shown in Figure 2. The model described in

(Škraba et al., 2003) consists of the production, workforce and marketing segments, which are well known in literature (Forrester 1961; Hines 1996; Sterman 2000). It was stated that the product price (r_1) positively influences income. However, as prices increase, demand decreases below the level it would otherwise have been. Therefore, the proper pricing that customers would accept can be determined. If the marketing costs (r_3) increase, demand increases above what it would have been as a result of marketing campaigns. The production system must provide the proper inventory level to cover the demand, which is achieved through the proper determination of the desired inventory value (r_4). Surplus inventory creates unwanted costs due to warehousing; therefore, these costs must be considered. The number of workers employed is dependent on production volume and workforce productivity, which is stimulated through the salaries (r_2). Proper stimulation should provide reasonable productivity.

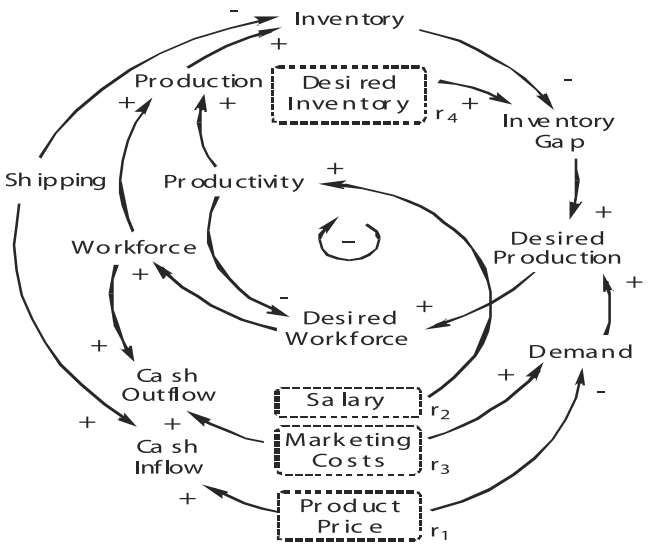

Figure 2: Causal loop diagram of a production model

Participants had the task of promoting a product with a one-year life cycle on the market. They had to find the proper values of parameters r_i defined by the interval $r_{min} \leq r_i \leq r_{max}$. The model was prepared in the form of a business simulator (Škraba et al., 2003). The participants changed the parameter values via a user interface, which incorporated sliders and input fields. After setting the parameters in the control panel, the simulation could be processed. The end time of the simulation was set to twelve months. The output was shown on graphs representing the dynamic response of the system and in the form of a table where numerical values could be observed. Each participant had no limitation to the simulation runs, which he/she intended to execute within the time frame of the experiment. The parameter values for each simulation run were set only once, at the start of the simulation. It was assumed that the business plan was made for one year ahead. The criteria function was stated as the sum of several ratios that were easily understood and known to the participants. It was determined that the Capital Return Ratio (CRR) and Overall Effectiveness Ratio (OER) should be maximized with minimal Workforce and Inventory costs determined by a Workforce Effectiveness Ratio (WER) and Inventory / Income Ratio (IIR). The simulator enabled simultaneous observation of the system response for all the variables stated by the criteria function during the experiment.

2.2 The Solomon Four-group Experimental Design

Although Hypotheses 1 and 2 have already been confirmed by previous experiments described in (Škraba et al., 2003; Škraba et al., 2007), Hypothesis 3 remained unexplained. Due to the homogeneity of the population and its random allocation into groups, We expected that the results of the criteria function and the frequency of testing in the first 8 minutes would be identical. However, a difference was noted in the temporal course of the variables. This phenomenon cannot be explained by the pre-test - post-test experiment in (Škraba et al., 2003; Škraba et al., 2007). Therefore, we conducted a new experiment according to the Solomon Four-Group Experimental Design. We expect to estimate the effect of group belonging (as a result of the group information feedback that was introduced) and the pre-test effect (as a result of facilitation of the group decision process) on the decision-making results (criteria function value) using this test. Solomon's design for the suggested experiment is shown in Figure 3.

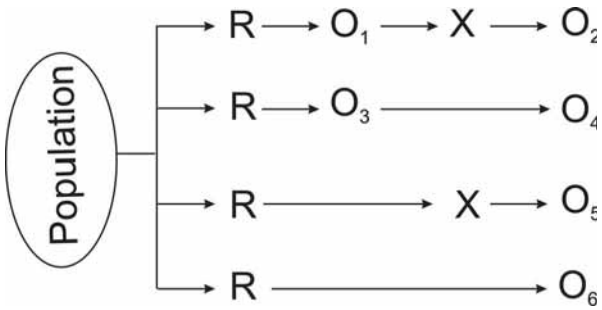

Figure 3: A Solomon four group experiment design; R means random, O_i means observed and X is the treatment groups.

Figure 3 shows the random assignment of the population of senior management students into four decision groups. The first two groups in Figure 3 represent the pre-test – post-test design (decision groups are facilitated and measured four times during the experiment, after the 8th, 16th, 24th, and at the end after the 30th minute). The last two groups represent the post-test only design. All four groups were supported by a simulation model of a business system. One of each of the two groups (a_1 and a_2) had additional group information feedback at their disposal. Thus we could asses whether the interaction between the pre-test (in our case this also means the facilitation of the group decision process) and the treatment (group infor-

mation feedback) exists. In pre-testing, the subjects were directed by a facilitator. They were told to submit their best chosen parameter values into the network database. After the submission, they continued with the search for the optimal combination of the parameter values. On the other hand, the decision-making process of the two groups working without pre-tests was continuous, without facilitation. All the measurements were automatic and group information feedback was available at all times. For this purpose, we developed a new interface for data acquisition and proceeding.

2.3 Subjects and Procedure

118 senior undergraduate students (52 female and 66 male, between the ages of 20 and 26) from the University of Maribor participated in the experiment in order to meet the requirements of their regular syllabus. The students were randomly assigned to eight groups with 14 to 15 subjects, who were then assigned to work under one of the four experimental conditions: a_1, a_2, a_3 and a_4. The subjects who participated in the experiment became accustomed to the business management role facing the stated goal objective, which was in our case presented in the form of a criteria function. A presentation of the decision problem was prepared in the form of uniform 11-minute video presentation, which differed only in the explanation of the experimental condition at the end of each video presentation. The problem, the task and the business model were explained. The structure of the system considered was presented and the main parameters of the model were explained. The evaluation criteria for the business strategies were also considered. The work with the simulator was thoroughly explained in the video. A printed version of the problem description was provided for each subject as well. The participating subjects were familiar with SD simulators; therefore, working with the simulator was not a technical problem. Subjects were awarded for their participation in the experiment with a bonus grade.

2.4 Experimental Conditions:

a_1) an individual decision-making process supported by a simulation model with testing after the 8th, 16th, 24th and 30th minutes, assumes that each participant submitted the best-achieved set of parameter values $\{r_1, r_2, r_3, r_4\}$ to the network server at the end of each time interval.

a_2) a decision-making process supported by a simulation model and group information feedback with testing after the 8th, 16th, 24th and 30th minute. Each participant submitted the best-achieved set of parameter values $\{r_1, r_2, r_3, r_4\}$ to the network server at the end of each time interval. Information on the best-achieved parameter values was fed back into the group support system. The participants got feedback on the defined strategies of all the participants in the group $R_i = \{r_1, r_2, r_3, r_4\}$; $i = 1, 2, \ldots n$ as well as the aggregated values in the form of parameter mean values $\{\bar{r}_1, \bar{r}_2, \bar{r}_3, \bar{r}_4\}$. For example, if the parameter considered was Product Price and there were ten participants involved in the decision process, then all ten values for Product Price, recognized as the best by each participant, were mediated via feedback as well as the mean value of the Product Price. The mean value provided the orientation for the parameter search and prevented information overload. In addition to the criteria function as the results of decision making under different conditions, simulation frequency in order to follow the decision makers' activity was also analyzed.

a_3) an individual decision-making process supported by a simulation model without a pre-test (testing after the 30th min) assumed the individual assessment of the decision-maker when determining model parameter values $\{r_1, r_2, r_3, r_4\}$ by the maximization of the criteria function using the SD model. At the end of the experiment, the subjects submitted the best-achieved parameter values to the network server.

a_4) a decision-making process supported by a simulation model and continuous group information feedback without the pre-test (testing after 30th min). Each participant submitted the best-achieved set of parameter values $\{r_1, r_2, r_3, r_4\}$ to the network server at the end of experiment. However, information about the instantaneous optimization of the group is always at the subjects' disposal.

3 Results and Discussion

A total of 118 students (52 female and 66 male), randomly assigned into 8 groups of 14 to 15 subjects, participated in the experiment. 30 students (two groups) participated in condition a_1, 29 students (two groups) in condition a_2, 30 students (two groups) in condition a_3 and 29 (two groups) in the experimental condition a_4. For the purpose of analysis of the results, the criteria function was optimized by Powersim Solver™ using two methods: incremental and genetic algorithms. The optimal value of the criteria function was thus set to 1.5. The highest values of the criteria function were selected by the participants of group a_2 ($\hat{J}_{a2}$=1,237, σ_{a2}=0,210), followed by the results of group a_1 ($\hat{J}_{a1}$=1,170 , σ_{a1}=0,338) and the results of group a_4 ($\hat{J}_{a4}$=1,157 , σ_{a4}=0,290). The lowest results were gathered by the group a_3, supported by the simulation model ($\hat{J}_{a3}$=1,147 , σ_{a3}=0,272). The criteria function values selected by the participants working under four different conditions after 30 minutes of experiment time are presented in Figure 4. On the X-axis, the number of participants is shown and on Y-axis the values of criteria function are arranged in ascending order. Figure 4 clearly shows that the selected criteria function values for the four experimental conditions does not differ significantly (this is confirmed by a Kruskal-Wallis test at p=.677). This supports our prior experiment results, where we proved that 30 minu-

tes is sufficient time for solving this particular decision-making problem when supported by a simulation model (Škraba et al., 2007).

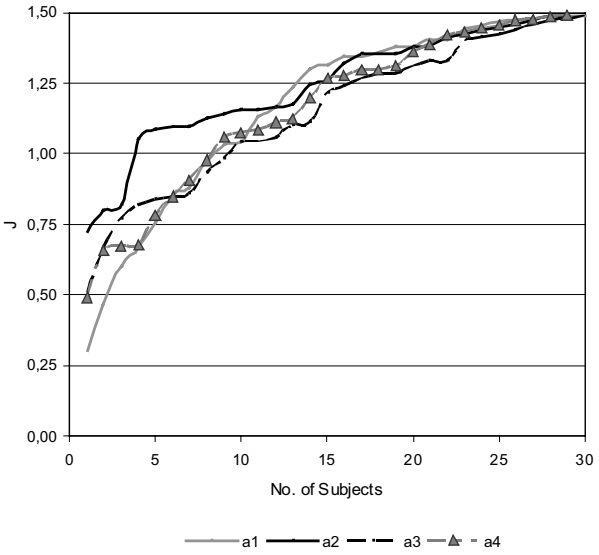

Figure 4: Criteria function values achieved by the participants under experimental conditions: a_1, a_2, a_3, and a_4.

Nevertheless, we continue to present the in-depth analyzes of the dynamics of the decision-making process.

3.1 Learning During the Decision-Making Process

Figure 5 shows the Coefficient of Variation of the criteria function values achieved by the participants under experimental conditions: a_1 and a_2 at the end of each time interval (pre-test and post-test). The results of Friedman's ANOVA confirmed that criteria function values increase during the experiment time (χ_{a1}=30.57, p_{a1} =.000; χ_{a2}=27.30, p_{a2} =.000), therefore we can conclude that learning takes place during the decision-making process.

The results show that the subjects' decisions did not differ after the first eight minutes, when the same conditions were in place. This was confirmed by a Mann-Whitney test (U=415) at p=.762. After group a_2 had received group information feedback, they rapidly approached the optimum criteria function value. The biggest increase in criteria function values is observed after the first time group information feedback was introduced (after the 16th minute), confirmed by a Wilcoxon test (z=-2.995, p=.002). Criteria function values significantly increase after the 24th minute (confirmed by a Wilcoxon test, z=-3.165, p=.001), but hardly changed towards the end of the experiment (in the last eight minutes). This was confirmed by a Wilcoxon test (Z=-.660, p=.510). On the other hand, the group without group information feedback slowly continues to approach the optimal solution and significantly

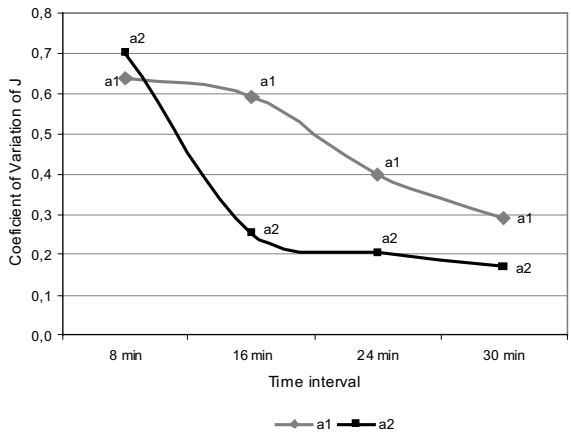

Figure 5: the Coefficient of Variation of criteria function values (J) achieved by the participants under experimental conditions: a_1, a_2 at the end of each time interval

improves their results in the final phase of the experiment (after 30th minute). A Wilcoxon test confirmed that the criteria function values significantly improved after each experimental phase (z_1=-2.584, p_1=.009; z_2=-2.259, z_2=.023; z_3=-2.869, p_3=.004). This means that group a_2 took eight minutes less to solve the decision-making problem than group a_1. The results prove that learning occurs in the decision-making process supported by the simulation model. On the basis of analysis, we can conclude that the group information feedback introduced into the decision-making process contributes to a higher convergence of the decision group and helps achieve faster decision problem solving.

3.2 Analysis of Feedback-Seeking Behaviour in Two Treatment Groups

In addition to recording every simulation run executed by a subject, we also recorded every insight into group information feedback. Group information feedback was available to the subjects from the non-pre-test group (a_4) at all times from the beginning of the experiment, while the pre-tested group (a_2) had group information feedback introduced after each time they had to submit their decisions to the network database. Figure 6 shows the feedback seeking behaviour (an insight into group information feedback) of two groups during the experiment by minute, and Figure 7 shows the number of simulation runs of the two groups per minute during the experiment. We have confirmed with a Mann-Whitney test that the feedback seeking behaviour for group information feedback of the pre-test and non-pre-test treatment groups differs significantly (U=202, p=.001). While group a_2 had shown great interest in the group information feedback and an almost constant interest in simulation runs, the interest of group a_4 in group information feedback and simulation runs increased almost proportionally. In fact, the frequency of simulation runs for group a_2 is almost twice as high as group a_4 at the beginning of the experiment and

then decreased after the 24th minute, while the subjects of group a_4 had continued to increase the frequency of the simulation runs. We can explain this by 40% of the subjects who stopped performing simulation runs in the last experiment phase (after the 24th minute). These were the subjects that had already approached the optimal solution.

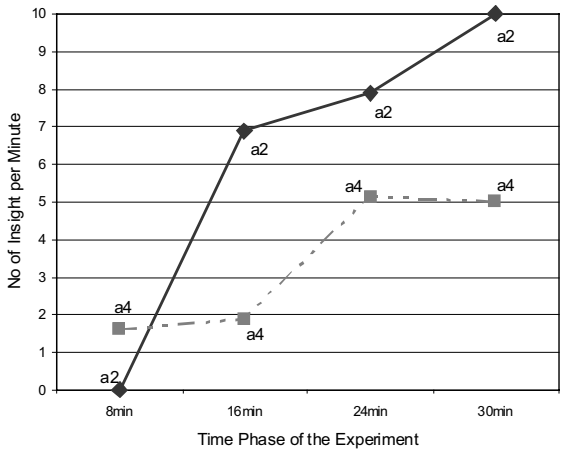

Figure 6: Feedback seeking behaviour (insight into group information feedback per minute) of groups a_2 and a_4

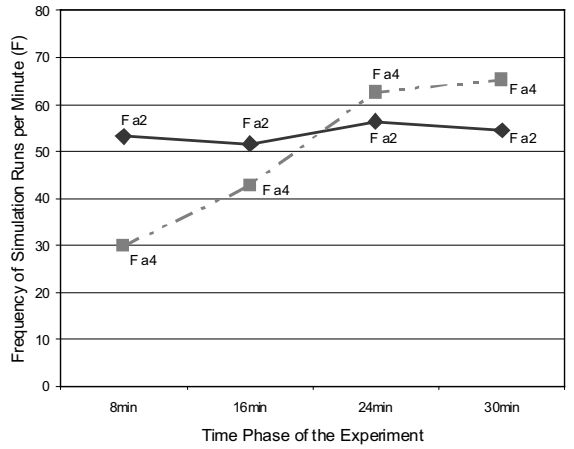

Figure 7: Frequency of simulation runs per minute during the experiment time of groups a_2 and a_4

In order to prove that a correlation between the frequency of simulation runs and criteria function value exists, we have performed the Spearman r test. The test confirmed that a reasonably strong correlation exists between the frequency of simulation runs and the criteria function value under experimental conditions a_1 (r=.443, p=.014), a_3 (r=.432, p=.017) and a_4 (r=.500, p=.005), but not under condition a_2 (r=.231, p=.227).

3.3 The Interaction of Pre-test and Treatment

Figure 8 shows the frequency of simulation runs at the pre-test and post-test (8th and 30th minute) for all four experimental conditions. It is noticeable that the frequency of group a_2 (pre-test treatment group) is slightly higher in the first eight minutes than the frequency of the pre-tested non-treatment group a_1 and that both have higher frequencies than the two non-pre-tested groups (a_3 and a_4). Towards the end of experiment time, all the groups show an equidistant increase in frequency, except for group a_2 (pre-test plus treatment). The groups' frequency of simulation runs is almost constant.

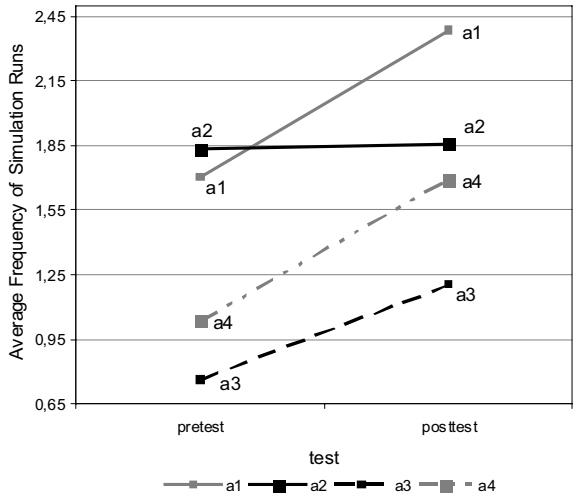

Figure 8: Solomon test for the Frequency of simulation runs

From Figure 8 we can conclude that the pre-test influenced the number of simulation runs performed. Also, it is evident from Figure 8 that group information feedback impacts the number of simulation runs performed. We have conducted the two way ANOVA test, which confirmed that treatment alone (group information feedback) does not influence the frequency of simulation runs (F=.000, p=.9982), that pre-test (facilitation of the decision process) influences the frequency of simulation runs (F=6.895, p=.01) and that interaction between the pre-test and treatment together influence the frequency of the simulation runs (F=4.076, p=.046).

3.4 Learning Model

In order to explain the influence of individual information feedbacks (assured by the simulation model) and group information feedback (brought into the decision-making process by GSS) on the efficacy of problem solving, we have developed a CLD model of learning during the decision-making process. The model shown in Figure 9 was modified according to (Lizeo, 2005) and consists of three B and one R loops.

Loop B1 represents the decision-making process supported just by a formal CLD model (see Figure 2), paper and pen (described in Škraba et al., 2003; Škraba et al., 2007). The decision maker solves the problem by understanding the problem and the task. The higher the gap between the goal and the performance, the more effort one should put into understanding the problem. Loop B2

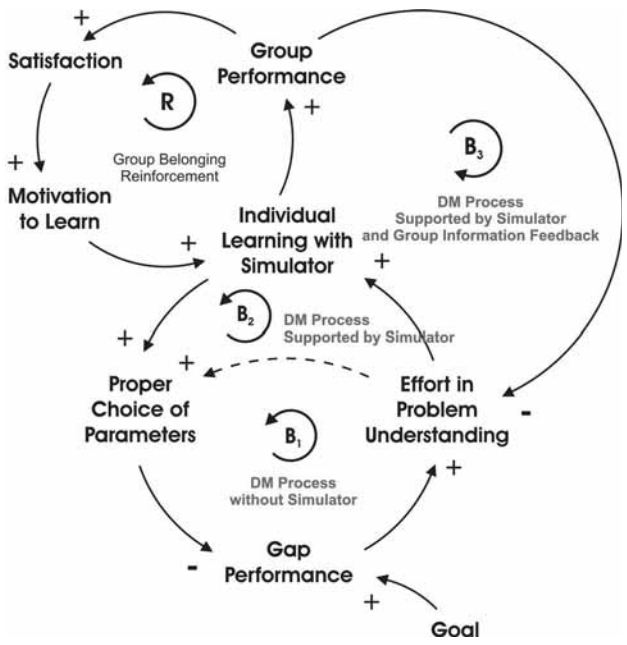

Figure 9: A learning model of decision group under various decision-making conditions

represents the decision-making supported by a simulation model and corresponds to experimental conditions a_1 and a_3. The higher the gap between the goal and the performance, the higher the frequency of simulation runs. The search for the optimal parameter values is based on trial and error. The more simulation runs that the decision maker performs, the more he or she learns (on an individual level) and the smaller is the gap between performance and goal (in our case the optimized criteria function). The correlation between the frequency of the simulation runs and the criteria function value was confirmed (p_{a1}=.014; p_{a3}=.017). We named this loop "Individual Learning Supported by Simulator". Loop B3 represents the direct contribution of the group information feedback, while loop R suggests the reinforcing effects of the group influence on problem solving at group a_2 and a_4. The decision maker of loop B3 understands the problem and the goal. He or she is supported by the simulator and the group information feedback. While the use of the simulator supports individual learning, the introduced group information feedback enhances the group performance. Consequently, the increased group performance reduces the need to experiment on the simulator. In other words, the decision maker supported by the group information feedback has a broader view of the problem, an insight into new ideas and needs to put less effort into problem solving. On the other hand, the group information feedback stimulates the group members to actively participate in the problem solving, so they perform more simulation runs in the process of searching for the solution. This can be observed from Figures 6, 7 and 8. The frequency of simulation runs in group a_2 is higher than that of the other groups' in the first 16 minutes of the experiment, when the majority of the subjects were still searching for the solution. When the group is satisfied with its performance, the frequency of the simulation runs decreases. Loop R can be further explained by the interaction between group information feedback and facilitation of the decision-making process. As we have observed in Figures 6 and 7 (and is confirmed by a two-way ANOVA), the group information feedback together with facilitation contributes to increased feed-

Table 1: Average agreement with the statements in the opinion questionnaire and its standard deviation

		Experimental Condition			
Q	Short descpription of the question	a1	a2	a3	a4
1	the general quality of the experiment	5,733 (0,785)	5,724 (0,996)	5,867 (0,900)	5,483 (1,022)
2	presentation of the decision problem	5,733 (0,980)	5,552 (1,183)	5,833 (0,791)	5,379 (1,208)
3	understanding the decision problem	5,833 (1,392)	5,690 (1,256)	5,733 (0,944)	5,448 (1,378)
4	the simplicity of the use of simulator	6,600 (0,498)	6,586 (0,733)	6,067 (1,143)	6,103 (1,113)
5	the contribution of the simulator to understanding the problem	5,067 (1,484)	5,931 (1,132)	5,833 (1,085)	5,586 (0,867)
6	evaluation of the problem solving time	5,167 (1,683)	5,931 (1,307)	5,100 (1,710)	5,138 (2,031)
7	the motivation for solving the problem	4,733 (1,530)	4,966 (1,149)	5,100 (1,494)	4,345 (1,471)
8	the benefit of participation in the experiment in the course	5,833 (1,020)	6,034 (0,981)	6,133 (1,010)	5,483 (1,089)
9	the organization of the experiment	6,400 (0,894)	6,483 (0,949)	6,333 (0,661)	6,310 (0,712)
10	the contribution of the simulator to the quality of decision	5,900 (1,269)	6,276 *0,797	6,333 (0,884)	5,793 (0,940)

back seeking behaviour and more commitment to problem solving. In this case, facilitation serves as motivation and orientation towards the goal. The subjects of group a_2 had to make their decisions three times during the experiment before they submitted their final decisions, while their colleagues in group a_4 were left to their own pace and had to make their final decision at the end of the experiment.

3.5 Opinion Questionnaire Analysis

The participant's opinions on their involvement in the experiment were solicited by questionnaires. Participants filled in the questionnaires via a web application. Questions were posed in the form of a statement and agreement with that statement was measured on a 7-point Likert-type scale, where 1 represents very little agreement, 4 a neutral opinion and 7 perfect agreement. The average value of the answers to the statements in the opinion questionnaire and its standard deviation are shown in Table 1.

From Table 1, it is evident that the participants expressed high agreement to most of the statements. In fact, only Statement 7 regarding the motivation for participating in the experiment, was evaluated a bit lower. In other words, it was closer to the neutral point, but not negative.

We performed an ANOVA test to explore the differences in opinions among the four experimental conditions. The ANOVA test showed a high level of agreement between groups as well. The groups' opinions only differ significantly for two questions: 4) the simplicity of use of the simulator (F=3.067, p=.031), and 5) the contribution of simulator to understanding the problem (F=3.274, p=.024), which can both be explained by the different experimental conditions requiring a slightly different user interface and thus different levels of man-computer interaction.

From the opinion questionnaires, we can make some general observations:

1. 99% of the participants agreed on the general quality of the experiment.
2. 83% of all the participants agreed that the decision problem was correctly presented.
3. 68% of all the participants agreed that they understood the decision problem presented.
4. 93% of all the participants agreed that the simulator was easy to use.
5. 84% of all the participants agreed that the use of simulator contributed to their understanding of the problem.
6. 70% of all the participants agreed that there was enough time for decision making.
7. 63% of all the participants agreed that they were motivated to solve the problem.
8. 88% of all the participants agreed that they benefited from participating in the experiment.
9. 97% of all the participants agreed that the experiment was well organized.
10. 92% of all the participants agreed that the use of the simulator contributed to better decision-making.

These are the across-group averages and represent the overall agreement to the statements. We can say that, in general, the students were satisfied with the experiment as a method of teaching and the use of the simulation in decision support.

4 Conclusion

In prior experiments (Škraba et al, 2003; Škraba et al., 2007), we have already proved the positive impact on the decision-making process of individual information feedback assured by a simulation model and group feedback information. However, the results suggested that differences in the frequency of the simulation runs in the first eight minutes of the experiment, where two simulation groups had same conditions, might be caused by the phenomena of group belonging. Hence, a new experiment was introduced - a pseudo Solomon experimental design - and the following experimental conditions were formulated: a_1 – an individual decision-making process supported by a simulation model with pre-testing after the 8^{th}, 16^{th}, 24^{th} and 30^{th} min, a_2 – a decision-making process supported by a simulation model and group information feedback with pre-testing after 8^{th}, 16^{th}, 24^{th} and 30^{th} minute, a_3 – an individual decision-making process supported by a simulation model but without a pre-test (testing only after the 30^{th} min) and a_4 – the decision-making process supported by a simulation model and continuous group information feedback but without the pre-test (testing only after the 30^{th} min). The hypothesis that the application of individual information feedback assured by the simulation model positively influences the learning process of an individual decision-maker was confirmed by Friedman's ANOVA at p=.000. The hypothesis that additional applications of group feedback information contributes to a higher convergence and group unity was confirmed by the Mann-Whitney U-test at p=.006. On the basis of analysis, we can conclude that the group information feedback introduced into the decision-making process contributes to increased convergence of the decision group and helps achieve faster decision problem solving (eight minutes). The results of the analysis have confirmed that there is an interaction of treatment (group information feedback) and testing effects (facilitation) that affects the dynamics of the decision-making process (the frequency of simulation runs at p=.046). Therefore, group feedback and the facilitator are extremely important during complex problem solving.

A causal loop diagram model of the learning taking place during the decision-making process by means of simulation model was developed. The results of an opinion analysis show that management students thought that the application of the simulation model does contribute to increased understanding of the problem, faster solution finding and more confidence on the part of the participants.

All the participants agreed that a clear presentation of the problem motivates the participants to find the solution.

5 Acknowledgements

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The Dropout Rate from E-Learning Courses and the Satisfaction of Students with E-Learning

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This paper deals with the dropout rate for e-learning academic courses in correlation with student satisfaction with distance education. This study explores two main ideas: student satisfaction with e-learning and the locus of control. The results show that the main reason for persistence with e-learning academic courses is a significantly high level of satisfaction with e-learning and satisfaction with the students' own academic performance.

Key words: e-learning, dropout rate, success, satisfaction

Osip in uspešnost študentov pri e-študiju

Prispevek obravnava osip študentov e-študija in razloge, ki študente vodijo k opustitvi študija. Osredotoči se na povezavo med zadovoljstvom študentov z e-okoljem in uspešnostjo pri študiju, pri čemer upošteva tudi lokus kontrole. Rezultati kažejo, da so glavni razlogi, ki študente e-študija odvračajo od opustitve študija, zelo visok nivo zadovoljstva z e-študijem in z lastno uspešnostjo pri študiju.

Ključne besede: e-študij, stopnja osipa, uspešnost, zadovoljstvo

1 Introduction

A few decades ago, it would have been impossible to imagine that students would study at universities without any classrooms at all. Asynchronous Learning Networks (e-learning or e-study) is the main medium to study over the Internet (Thor, 2004). Distance education has existed for about 500 years, since the first book was printed, meaning that a reader could learn directly without a teacher being present to explain the topic. With e-study, we think of learning and teaching through the internet or in a virtual environment but then e-learning is just one way of studying and teaching in a distance learning courses.

There are a significant number of articles that offer definitions of e-study, e-education. Various authors state that e-education is education that involves electronic media in the process of education (Jereb and Šmitek, 2006).

On-line study basically differs from traditional forms that take place in traditional classrooms; e-students have their own pace of study and they can study whenever and wherever they want, providing Internet access is available.

A student can co-operate and work with a mentor, professor and peers on a daily basis in an asynchronous and synchronous way using different communication tools.

This is doubtless of the utmost importance in the society where continuous and life long education has become a necessity in order to maintain a work position or to acquire a better one. E-learning is also more interactive than traditional learning in traditional classrooms. (Jereb and Bernik, 2007)

There are several practical factors that speak in favour of e-learning: There is no need for commuting to and from lectures, which contributes to reducing costs and time that would be used for commuting can be better spent on study itself. There are no costs incurred from living away from home or renting a room or flat. Employed students don't have to ask for days off and there are no classes at the weekends. Beside the flexibility of time, e-studying also offers better learning management. Without e-study, many students would be unable to complete their studies because of family obligations or work time. Later, the concept of dropout and the satisfaction with e-study

will be presented, as well as the methodology and results of this research.

2 Defining the Terms Dropout and Satisfaction with E-Study

Levy (2004) offers an appropriate definition of the term dropout student: these are students who voluntarily withdraw from e-learning courses, acquiring financial penalties in the process.

There is no add/drop period in Slovenia and thus it is not possible to drop out without penalties even in the first two weeks after the beginning of the term. Existing Slovenian literature referring to dropout rates in e-learning does not abound because only a few first steps have been made into e-learning. Foreign literature states a distinctive quantity of drop outs in e-courses and distance courses before the introduction of the internet (Tinto, 1975). A number of authors agree that dropout is a complex phenomenon (Billings, 1988; Parker, 1999; Volkwein and Lorang, 1995; Williamson and Creamer, 1988). Xenos (2004) states that administrators and teachers must determine the causes of the dropout rate. Munro (1987) states that dropout is a symptom and its causes can be quite numerous and can differ substantially. Kember's model is based on Tinto's and involves demographic factors, student motivation, academic abilities and student social factors. Moreover, Kember reproaches Tinto for not taking into account the job motivation of adults. (Kember, 1989).

A number of authors believe that demographic factors do not influence the dropout rate.

(Volkwein and Lorang, 1995; Williamson and Creamer, 1988). Dille and Mezack (1991) concluded that little research has been conducted on the personality traits that characterize a completer student in telelearning courses. They suggested that there exists an important correlation between the age and success of students in distance education courses. They claimed that older and employed students drop out more frequently (Levy, 2006) than younger students. Moreover, the results indicate that gender and family status do not have an important role as in predicting dropout from distance education courses.

Cheyung, Winiecki and Fenner (1998) pointed out that the main cause of dropout from distance courses is (dis)satisfaction with the study itself. The study then defines Slovene students' satisfaction with e-study.

Parker (1999) conducted a study of numerous variables as predictors of students' dropout from distance education courses. The focus of her study was in locus of control and some demographic characteristics such as gender, age and employment status. She concluded that locus of control was the main variable in predicting dropout rates with an overall accuracy of 80%. Locus of control also plays an important role in understanding the nature of the learning process in different kinds of learning situations.

Rotter (1966) proposes locus of control as a measure of individual perceptions on outcomes of their own behaviour relative to their perceptions on outcomes resulted from actions of someone else. An internal locus of control is developed by those students who believe that their academic success is attributed to internal factors (their own academic abilities). Therefore they are firmly convinced that they have control and this motivates them. An external locus of control is significant for those students who develop a learned incompetence because of fear of failure. They attribute their successes to external, »outer« factors such as chance, luck, fate or the actions of others.

A key factor that the literature states referring to dropouts is the satisfaction of the student with e-study. Several researches report that the satisfaction of the student is the most important factor in making the decision whether to drop out or not. Cheyung (1998) reported that 42 percent of the students who dropped out gave dissatisfaction with the learning environment as the reason. Fredericksen et al. (2000), also noted that students who are very happy with the learning environment and e-learning in general, get higher grades, strive for better results and do better in exams taken for the first time. Fredericksen et al. (2000) also state that older students have developed a higher degree of dissatisfaction with e-learning than younger students. Levy (2000) carried out a survey of 200 students and found that satisfaction with e-learning is one of the key points for successful study. Sachs and Hale (2003) noted that universities and educational institutions should put a major emphasis on student satisfaction with the study because this is the key predictor in dropout rate. The factors that cause (dis)satisfaction with e-study are pedagogic, the forms of work and the development of study programmes (Shea, Pickett, Peltz, 2003). Their research shows that student satisfaction has a strong correlation with the clarity and precision of the instructions, the organization of e-subjects, communication with mentors and professors and interaction with mentors who give instructions online. Richardson and Swan (2003) examined social role in e-learning courses as one of the key factors for successful e-study as well as co-operation with mentors, which is strongly connected with mastery of study topics. The sensation that a student can master academic topics fills a student with enthusiasm for further study and such a student will never drop out.

3 Methodology

Hypotheses

From the relevant literature above, it is evident that satisfaction with e-study is a potential factor related to student dropout rates from academic e-courses. Reasons for dropout and satisfaction with e-study was researched through a survey distributed among e-students of the second and third grade of a three and four year business school. We defined several layers of questions, which were then categorized and supported with a programme for statistical analysis, SPSS.

The answers to our questions in the survey will help us understand which factors are related to dropout rates in e-courses and which factors encourage e-students to

continue and complete them. 152 students answered the questionnaire. We inquired about satisfaction with e-study and the success of the students, satisfaction with their own academic performance, reasons for not taking up traditional forms of academic course and also the age and gender of the students for correlation with successfulness.

The study proposes the following hypotheses:

1. The causes that affect the dropout rate and success of students are: a profile of an e-student, reasons for taking up e-study and satisfaction with e-study.
2. The dropout rate is lower for e-students than for traditional ones.
3. If students are satisfied with the e-study itself, then they tend to be more successful than those who are less skilled in e-technology and thus dissatisfied.
4. Considering gender, more women decide to take up e-study than men mainly because women are generally more persistent than men and this could be an additional reason for the lower dropout rate of women in e-study.
5. E-study is taken up by younger people because they are better acquainted with information technology and they seem to be closer to the virtual classroom.
6. E-study offers time flexibility for accomplishing tasks, which is an additional reason why the dropout rate is lower than in traditional study.
7. Distance from academic centres makes a significant difference when deciding to take up e-courses.

After stating these hypotheses, research was carried out on students of the Business High vocational school in Maribor.

Instrument

There are two instruments employed in the research. The first is a survey that follows Likert's five level scales. Students were asked to rate each item on a five-score Likert-type scale ranging from 1 »Strongly disagree« to 5 »Strongly agree«. By means of the survey we have determined demographic factors, the time of the day when the students fulfil their study obligations, the reasons for taking up e-study, satisfaction with the co-operation with mentors, professors and organizers of the e-study, satisfaction with their own performance and academic achievements, satisfaction with the work in the programme environment and their opinion on team work.

The second instrument was a Bures seven item survey (2000), which is used in order to measure the students' satisfaction with e-learning. This survey is also based on Likart's five level scales where 1 means »Strongly disagree« and 5 »Strongly agree«. The statements are:

1. Using the WebCT (Web Course Tools) was frustrating.
2. Learning to use the WebCT was easy.
3. WebCT was an effective way to learn the course content.
4. I learnt a lot through using of WebCT.
5. WebCT facilitates my work with other students in the course.
6. Group on-line activities did not improve the quality of my education.
7. I will not voluntarily take another course using WebCT.

4 The Results of the Research

We ascertain that the **dropout rate for e-students is not larger in number than for traditional students.** The reverse is true. The data from the Statistic annual of Republic of Slovenia (2005) shows that the dropout rate of students who are partly or fully employed reaches almost 50 percent - out of 2438 students enrolled in the 1st grade of high school courses in the year 2001/2003, 1074 students graduated, making 44.05 percent. In on-line study, the dropout is lower than expected as, 14.9 percent of students dropped out in 2003/2004, meaning that a little over than 85% of students successfully completed the course (for a business secretary). The percentage of dropout was a bit higher in the on-line commercialist course, where 15.8 percent dropped out. A year later (2004/2005) the dropout from the business secretary course reached 16.9% and 16.8 percent for the commercialist course. In 2005/2006, the figures were 16.6% of students on the business secretary course and 15.2% on the commercialist course, as shown in Fig 1.

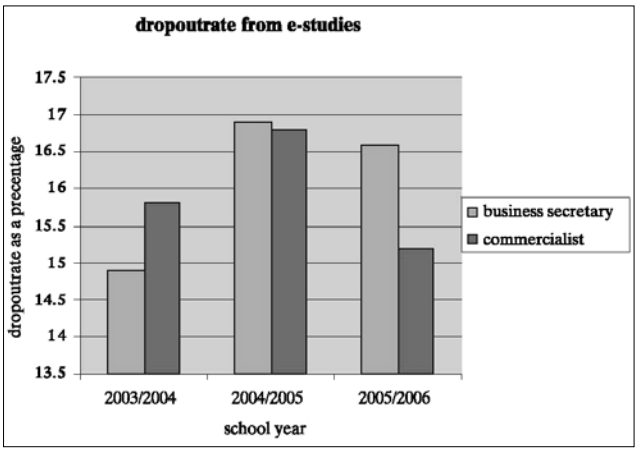

Fig 1: Dropout from e-studies in the school years of 2003/4, 2004/5 and 2005/6

Such a low percentage of dropouts is due to various factors: e-study is taken up by people who are already employed and need further education and knowledge to get promotion at work or to get a job. This is why these students do not procrastinate. They want to complete their studies as soon as possible because they have a number of obligations – besides work, they usually have a family to look after and obligations connected with their study. Besides, for most students in Slovenia, e-study is quite a handful financially so they really do their best to complete it. Students have strong support from their mentors, who are constantly within reach and the course is designed in such a way that it demands serious, devoted and hard work. If a student deviates from their personal week-

ly plan, the organizers and councillors will get in touch with them and kindly invite them to continue with the work.

If students are satisfied with e-study, they are successful. This statement matches Levy's findings (Levy, 2006). Table 1 shows that students are generally happy with the course (the average in the last year is 5.3 on the scale from 1 to 7). It is clear that most students are satisfied and even very happy with their own performance and success (in over 87 percent of valid answers from the students questioned).

Table 1: Students satisfaction with the course, professor, mentor and materials

	Programme	Professor	Mentor	Materials
2003/2004	5,3	6,1	6,0	5,2
2004/2005	5,2	6,0	6,1	5,0
2005/2006	5,3	6,0	6,0	5,3

Table 2: Estimation of the students' own academic performance

Grade	1	2	3	4	5
Number of students	0	0	18	47	78

Students who labelled themselves as successful were also more satisfied with the course, professors, mentor and materials (Table 2). Students who have difficulties with information technology are more dissatisfied and also less successful. The question is though, whether they are less successful because they are dissatisfied or they are dissatisfied because they are less successful.

We later interviewed a further 49 students and asked them about the final grade they got in the exam (from 1 to 10, 6 meaning pass and 10 meaning excellent). We also asked them about their satisfaction with the course (on the scale from 1 to 5). We found that if the final grade improves, their satisfaction with the course will also rise and vice versa. Our hypothesis is confirmed, though rather weakly: students who are satisfied with the course are more successful in the examinations (r=0,328, α=0,05, p_α=0,035).

We present the contingent table below, which shows the two observed variables where the distribution by individual values of both variables is presented.

Table 3: Correlation between the final grade obtained at the exam and satisfaction with e-study

		satisfaction			Total
		2	3	4	
grade	6	3	4	5	12
	7	0	2	5	7
	8	0	5	11	16
	9	0	3	8	11
	10	0	1	2	3
Total		3	15	31	49

It can be seen (Table 3) that there are only students with the lowest grades (6) among those who are less satisfied (2) and nobody got a better grade in this group. The students with higher grades have higher level of satisfaction (3, 4). This fits our hypothesis, although the value of the chi square test on such categorial data is 10.5 which, at 8 degrees of freedom, is not statistically significant. To get a stronger confirmation, more units of observation would be needed because in our case there are too many empty cells.

More women than men get education through e-learning. This statement was confirmed in the present research. As mentioned in the introduction, 36 females and 13 males responded to the question on gender, which means that three times as many woman than men took up e-courses (over 70 percent). According to the data in the table below (the Guide for e-study 2006/7), the result is to be expected.

We can confirm the statement that the rate of women who take up e-learning courses is higher than men (Table 4). It can be seen that women prevail among the enrolled students in all years. The representation of women is growing over the years (t=7,398, α=0, 05, p_α=0,000). With a negligible level of significance, we deny the hypothesis and accept the alternative that more women than men take up e-learning courses. In all the given years (from 2007 to 2007), more women enrolled in e-learning courses than men (Fig. 2). Women are generally more diligent. They have to try harder than men to achieve a certain status, they have become more ambitious and they crave better jobs. A number of women were forced to give up traditional forms of study for family reasons or work but nowadays study, education and graduation are available and possible even if they have family and job obligations.

Table 4: Representation of the sexes as a percentage in three and four-year high school for the years 2002 to 2007. (Guide for long distance study, 2006/2007)

	Three year course		Four year course	
	women	men	women	men
2002/2003	57,00	43,00		
2003/2004	75,00	25,00		
2004/2005	75,00	25,00		
2005/2006	69,00	31,00	81,6	18,4
2006/2007	73,80	26,20	68,9	31,10

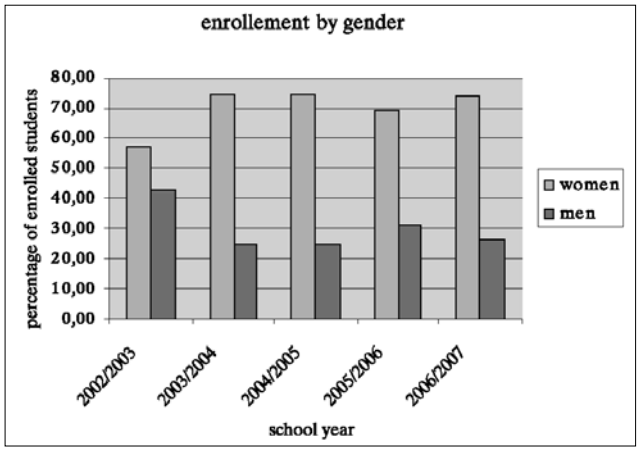

Fig 2: Enrolment in e-learning courses by gender

The statement that it is mostly young people who take up e-study because they are more acquainted with information technology is inconsistent with the facts.

The data obtained by the survey show a student age structure as can be seen in Table 5.

It can be seen that more than half the students who answered the question belong to the third age group, which means quite a large number of students in this age group. 70 percent of all the students in e-courses are over 35 years old. In this case, the statement that it is the younger students who take up e-study is inconsistent with the present situation.

The distribution of students into a particular group can be calculated using the chi square test. The observed (factual) frequencies and the expected (theoretical) frequencies are presented in Table 6.

Table 5: The age structure of e-students

	Up to 24 years	25-34 years	35-44 years	above 44 years
Percentage	2	29	56	13
Number of students	1	14	27	6

Table 6: The distribution of students according to age

	Up to 24 years	25-34	35 - 44	From 45 years on	total
O	1	14	27	6	48
E	12	12	12	12	48

O - observed (factual) frequency in the cell of i column and J row of the contingence table
E - expected (theoretical) frequency in a particular cell

Table 7: The age and gender of e-students

	Up to 24 years	25 - 34	35 - 44	From 45 on	TOGETHER
Women	1	10	20	4	35
Men	0	4	7	2	13
TOGETHER	1	14	27	6	48

Table 8: The age and gender of e-students in percentage

	Up to 24 years	25-34	35-44	From 45 on
Women	3	29	57	11
Men	0	31	54	15

Table 9: The age and gender of e-students, a table of observed (factual) frequencies

	Up to 24 years	25 - 34	35 - 44	From 45 on	TOGETHER
Women	1	10	20	4	35
Men	0	4	7	2	13
TOGHETHER	1	14	27	6	48

Table 10: The expected frequencies

EXPECTED	Up to 24 years	25 - 34	35 - 44	from 45 on	TOGETHER
Women	0.729	10,208	19,688	4,375	35
Men	0.271	3,792	7,312	1,625	13
TOGETHER	1	14	27	6	48

Categorization of the enrolled students by their age reveals that there are different percentages of students in the different age groups and we cannot claim that age has no influence on enrolment. This can be confirmed by a statistical test using Pearson's chi square test

(χ^2=8,042, α=0, 05, p_α=0,045). We deny the hypothesis and confirm the statement that age structure is not even and constant among e-students. The majority of students are in the 35 to 44 age group .

Next (Table 7, Table 8), we will calculate if gender and age are correlated.

It is evident that the percentage by age groups among the sexes are similar and we cannot define the difference between gender and age as significant. The hypothesis is verified by the chi square test (Table 9, Table 10).

Even at a hasty glance it is evident that the frequencies are closely connected and correlated. The value of the chi square test will be quite low. Comparison of the e-students by gender and age shows that the number of women prevails in every age group. The comparison also shows that the share of students in the individual age groups is the same for both sexes. It means that we can not conclude that there is difference between males and females in the age structures in e-study. Pearson's chi square test confirms our findings. (χ^2=0,015, α=0, 05, p_α=0,998).

Young people up to 24 years old prefer to take up traditional forms of study because of social and companionable specifics. It is also quite possible that the fee for e-study is too high.

The fact that students over 45 are in a minority (3 percent), as is shown in fig. 3 below, is not connected to knowledge and skills in computing but is because people over 45 have already established their position in society and are not prepared to change it any more. They are not willing to go back to studying even online. (Fig.3).

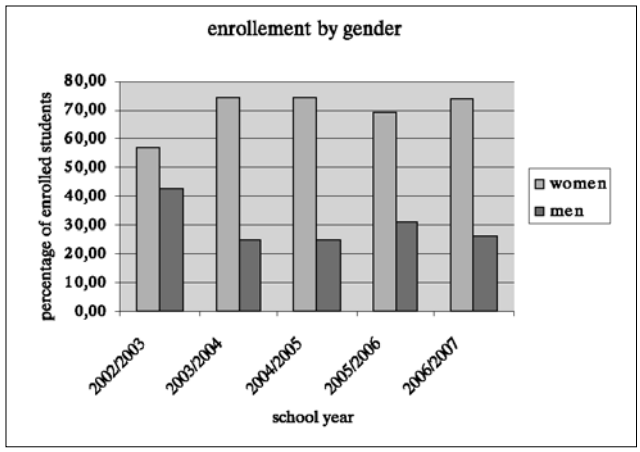

Fig 3: The age of e-students as a percentage for each school year

Students take up e-learning courses because of their time flexibility. This is the reason why almost half of the e-students decided to take up e-learning courses, as can be seen in the table below (Table 11):

From Table 11, it is evident that almost half of the students named time flexibility as a specific reason for taking up an e-learning course. In all the given years, the values for this reason exceeded 40 percent and are far above all the other reasons. Calculation of a statistical t-test for the year 2006/07 (42 percent) counting the average numbers for all the reasons shows that this value is statistically different from others and so our hypothesis can not be confirmed. (t=-4,508, α=0, 05, p_α=0,006).

Table 11: Reasons for taking up e-study in percentages

	02/03	03/04	04/05	05/06 three year course	06/07 four year course
Time flexibility	**41**	**44,0**	**40,0**	**43,0**	**42**
Independence	15	10,0	19,0	18,0	18,0
Family	18,0	21,0	17,0	19,0	18,0
Distance from the study centre	7,0	7,0	5,0	5,0	7,0
Job	11,0	15,0	15,0	7,0	12,0
Novelty	6,0	3,0	4,0	4,0	3,0

Table 12: The reasons for joining e-courses in percentages

	02/03	03/04	04/05	05/06 three year course	06/07 four year course
Time flexibility	41	44,0	40,0	43,0	42
Independence	15	10,0	19,0	18,0	18,0
Family	18,0	21,0	17,0	19,0	18,0
Distance from the study centre	**7,0**	**7,0**	**5,0**	**5,0**	**7,0**
Job	11,0	15,0	15,0	7,0	12,0
Novelty	6,0	3,0	4,0	4,0	3,0

Students do not decide to take up e-learning courses because of their distance from study centres. The distance from study centres in Slovenia is of minor importance because Slovenia is not a vast country where distances would make a serious difference. Study centres are not really out of reach. In spite of or maybe just because of that, we are not used to commuting and we do not want to travel for an hour or more to a study centre. The table below shows that geographical distance does not present an obstacle for taking up an academic course and we will deny the sixth hypothesis as only 7 percent of students stated that the main reason for taking an e-learning course was distance from the study centres. It is shown in Table 12.

It is evident from Table 12 that only 7 percent of students named distance as the main reason for taking an e-learning course in the last year. In comparison with the other reasons, this is a rather low value and our expectations in this study that distance could be a reason for taking up e-learning course turns out to be inconsistent with the present situation. This can be confirmed by a statistical t-test (t=1,723,α=0, 05, p_α=0,146). Fig. 4 shows the reasons for taking up e-study.

Students accomplish their academic obligations in the evening and not during the day. Almost half of the stu-

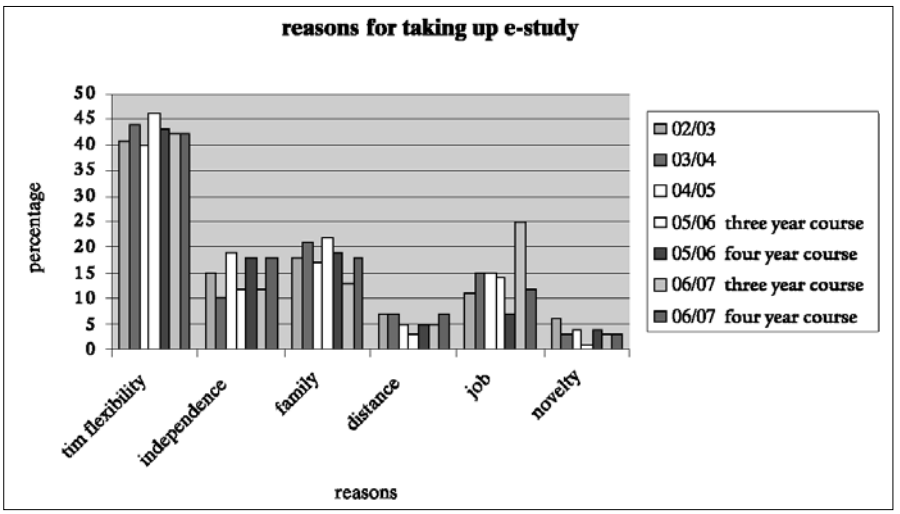

Fig. 4: Reasons for taking up e-study

Table 13: The time of day when students perform their academic obligations

Time of day for academic obligations	1	2	3	4	5
Morning	81	3	28	16	42
Afternoon	4	12	32	28	76
Evening	**4**	**0**	**24**	**28**	**96**
During work	100	8	28	8	0

dents who were asked only study in the evening – and only about one tenth of the students perform their academic duties in the morning before going to work, as can be seen from the table below:

Table 13 shows that the students questioned do not support the notion that they perform their academic duties in the morning or during work. Conversely, they study in the afternoon and especially in the evening. This hypothesis is strongly supported by out study: students mainly accomplish their academic duties in the evening.

The highest average points to the evening (4. 4 out of 5), as can be seen in Fig. 5. We take each part of the day and we get an average, as seen in Fig. 5.

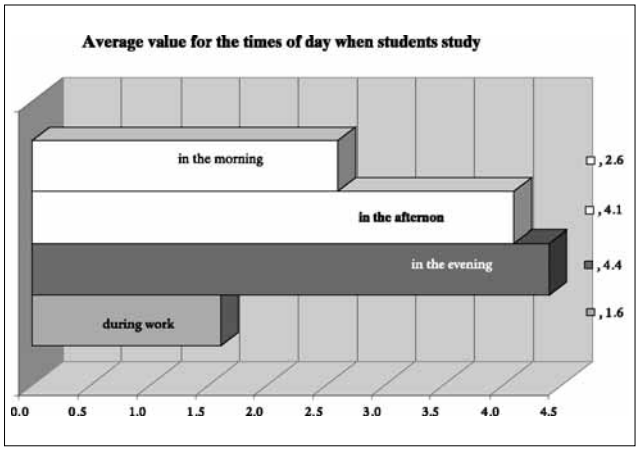

Fig 5: The average value for the times of day when students fulfil their academic obligations

It is evident that the evening value is significantly different from the values for morning and work time (with values of 2.6 and 1.6) as opposed to the afternoon (with a high average of -4.1), which means that students mainly do their academic study assignments in the evening, only partly in the afternoon and almost never in the morning or during work.

In Table 13 we can see that students study and perform their academic tasks mainly in the afternoon and evening. The validity of this statement can be checked with a statistical chi square test. (χ^2=21,377, α=0,05, p_α=0,045). Students mainly perform their academic tasks in the evening and in the afternoon (Table 14).

5 Conclusion

The results received show that persistence in e-learning courses is higher if students are satisfied with the e-study and if they are happy with their academic achievements. It is evident that the dropout rate in e-learning courses is lower than the in traditional studies. Considering gender, women prevail over men. The majority of the students belong to the age group between 35 and 44. E-learning courses are mainly taken up because of the flexibility of study. The students themselves manage their own time and decide on the part of the day when they want to perform their academic tasks. Geographical distance from study centres is irrelevant when deciding to take up e-learning course.

The contribution of this paper is twofold: firstly, it attempts to stimulate research into dropout and the reasons why students do not complete the on-line academic courses. It is intended to invoke new researches that would help concentrate on the factors behind the dropout rate in e-learning courses.

The other contribution is the findings concerning e-learning courses related to student satisfaction with e-study, which is a very important predictor of success or failure in academic courses. The results of the study are greatly consistent with the existing literature, though there is a discrepancy in the percentage of dropouts. The paper offers an insight into some key factors that influence the success of e-study.

The main limitation of the research is the lack of data on e-students from different institutions. The survey was carried out in only one institution, which deals with e-learning academic courses, thus the situation in other institutions must be considered and studied.

Additional research is needed into the field of motivation and the locus of control, which lead either to dropout or a successfully completed course. Such research should focus on students who complete the study successfully as well as those who drop out. Thus we will be able to understand the reasons and mechanisms that lead to dropout.

It would be of utmost interest to make a comparison between the academic success of on-line and traditional students.

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Table 14: The time of day for performing academic tasks:

FACTUAL						
O	1	2	3	4	5	TOGETHER
In the morning	81	3	28	16	42	170
In the afternoon	4	12	32	28	76	152
In the evening	4	0	24	28	96	152
During work	100	8	28	8	0	144
TOGETHER	189	23	112	80	214	618
EXPECTED						
E	1	2	3	4	5	TOGETHER
In the morning	52,0	6,3	30,8	22,0	58,9	170
in the afternoon	46,5	5,7	27,5	19,7	52,6	152
In the evening	46,5	5,7	27,5	19,7	52,6	152
During work	44,0	5,4	26,1	18,6	49,9	144
TOGEHTER	189	23	112	80	214	618
O- E	29,0	-3,3	-2,8	-6,0	-16,9	0,0
	-42,5	6,3	4,5	8,3	23,4	0,0
	-42,5	-5,7	-3,5	8,3	43,4	0,0
	56,0	2,6	1,9	-10,6	-49,9	0,0
	0,0	0,0	0,0	0,0	0,0	0,0
O-E^2	841,6	11,1	7,9	36,1	284,5	0,0
	1805,0	40,2	19,8	69,3	546,0	0,0
	1805,0	32,0	12,6	69,3	1880,6	0,0
	3131,7	7,0	3,6	113,2	2486,4	0,0
	0,0	0,0	0,0	0,0	0,0	0,0
SUM(O-E)^2		13202,8				
SUM E		618,0				
CHI-SQUARE		21,36372				
DF		12				

1 strongly disagree, 5 strongly agree

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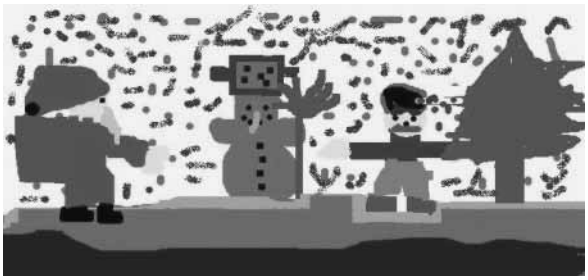

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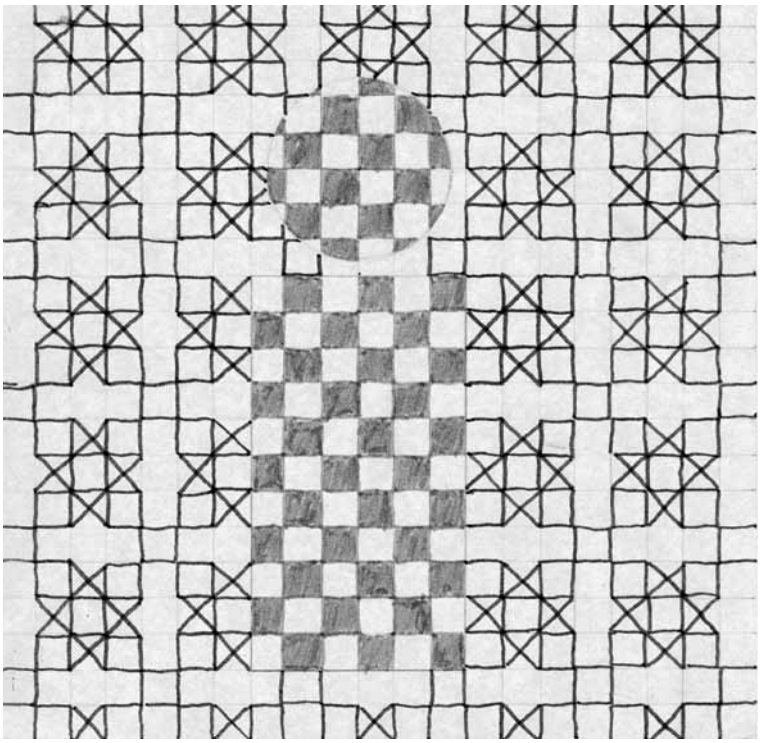

Samo Pahor

The Educational Challenges of E-representing the International Classification of Nursing Practice

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Teaching about classification also plays an important role in nursing education. The International Classification for Nursing Practice is a unified professional language devoted to nurses, other health workers and broader areas. In this paper, the e-version of this classification is presented as a challenge for an efficient educational practice searching for new information solutions in different environments using information and communication technology. Clients on a personal computer, the internet and PDA-hand-held computers are all presented. The combination of those clients in health-care education is analyzed.

Key words: education, health care, nursing, classifications, information technology

Izobraževalni izzivi e-predstavitve Mednarodne klasifikacije prakse zdravstvene nege

Klasifikacije zasedajo pomembno mesto v izobraževanju zdravstvenih delavcev. Mednarodna klasifikacija zdravstvene nege je poenoten profesionalni jezik namenjen medicinskim sestram, drugim zdravstvenim delavcem in pa tudi laikom. V članku je predstavljena e-oblika klasifikacije kot izziv za učinkovito izobraževanje z uporabo sodobne informacijske in komunikacijske tehnologije. Predstavljene so rešitve za osebne računalnike, na spletu in za dlančne računalnike. Analizirana je kombinacija treh predlaganih rešitev kot možnost za uspešno izobraževanje v zdravstvu.

Ključne besede: izobraževanje, zdravstvo, zdravstvena nega, klasifikacije, informacijska tehnologija

1 Introduction

The International Classification for Nursing Practice (ICNP®) is a professional language for communication among people (Mortensen, 1999; Hardiker and Coenen, 2006). An important goal of this is also to facilitate informatization in the whole field of health care. It is a good base to support nursing process (Potter and Griffin Perry, 2003; Taylor et al., 2001; Yu et al., 2006) and their computerization - along the lines of patient records, minimal data sets, etc (van Bemel and Musen, 1997; Šušteršič et al., 2003; van de Castle, 2006; Müller-Staub et al., 2007). Therefore, in nursing education, it is not only important that students become familiar with ICNP®, but also that they develop critical thinking/reasoning concerning its usage in nursing documentation and the informatization of nurses' work (Eldh et al., 2007). To meet these challenges, ICNP® must be widely accessible, not just as a book (International Council of Nurses, 1999; Cibic et al., 2000), but also on electronic media such as personal computers, Internet and PDA computers (Bond, 2006; Norton et al., 2006; Saranto, 2007).

In this paper, three versions of clients for the different media above mentioned are presented. User can browse Slovene and English version of ICNP® beta 2. Each version is discussed in terms of its technical advantages and disadvantages. Teaching critical thinking enables nurses

and other health workers not only to select the most suitable access to ICNP® for a given situation, but also to evaluate the role of the information and communication technology (ICT) as a tool for adding value to their work.

2 ICNP® and its Expectations

ICNP® can be viewed as an information tool for describing nursing processes in practice (Mortensen, 1999; International Council of Nurses, 2005). It encourages the unified acquisition, storage, processing and dissemination of nursing data in the framework of a health information system. This data can then be used by practitioners, researchers and educators (van Bemel and Musen, 1997; Scholes et al., 2000; Hammon and James, 2006; Hardiker and Coenen, 2007).

This data are also the basis for quality management in nursing – and consequently the need for possible changes in education, management and health care strategy become more evident.

As an information system, ICNP® supports unified coding, which is significant for electronic patient record and data exchange among the different information solutions. A formalized health care language supports process methods of work (McEwan and Wills, 2007) and standardizes the way nurses work with patients/clients. It also makes the exchange of "best-practice" experiences easier.

With the e-representation of ICNP®, we would like to contribute to the achievement of these goals. The classification should be accessible to nurses during their education and work in different situations, where it can be used for describing nursing diagnoses, interventions and outcomes. Different clients and a book offer the possibility for all nurses to choose the most suitable access to ICNP® for themselves.

3 Clients

A client must offer flexible access to ICNP® with the aid of information and communication technology. Therefore the book version (International Council of Nurses, 1999) is extended significantly. Besides the usual advantages of e-representation, it is important to mention multilingual access to ICNP® - in our case a combination of Slovene and English.

Different clients can be used in different areas of nursing education and work. Therefore, the advantages and disadvantages of each client must be known. From our experience, no single solution can serve as a replacement for the others. We propose a complementary approach to the use of different clients. Thus, a nurse should have access to all the clients. It is up to her/him to choose the most appropriate for each case.

3.1 The Internet Version

The Internet client can be accessed on the web (http://lopes1.fov.uni-mb.si/icnp). A screenshot is shown in Figure 1. It offers browsing in a hierarchical tree structure, searching for keywords (in both languages and for codes) and full-text search. Searching is conducted on the server side and results are transferred to the user. In the case of multiple search results, the user can move backwards and forwards among them. Access to the database is only possible through the search engine on the server in order to secure the database.

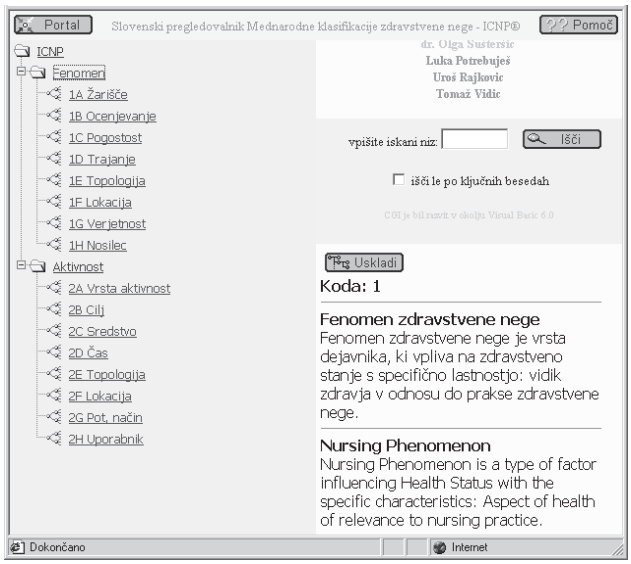

Figure 1: Screenshot of the web-based client

One of the main advantages is the ease with which changes are implemented on the central computer, always offering users the latest version of ICNP®, which is a live language and still undergoing some changes. Access to this version is based on access to the Internet. To a certain degree, the Internet connection can present a problem. Therefore, the tree structure is built on the client's side.

From an educational point of view, this is a good example of using internet the when teaching students about the ICNP® and ICT concepts together. In combination with other teaching materials, it also encourages distance learning.

3.2 The Personal Computer Version

A user must install this version in order to use it. It is available on a CD-rom together with installation software. A screenshot is given in Figure 2. There is a flexible user interface offering more ways for searching than the other versions. Having the database on a personal computer means that this client is the fastest.

It offers keyword and full-text searching. There are alphabetically ordered lists of codes and keywords in both languages. The tree structure changes instantly according to the position of a search result in a the hierarchical structure.

Compared to the Internet version, we would like to emphasize the speed and multiple search methods. The friendly user interface offers flexibility so it can be custo-

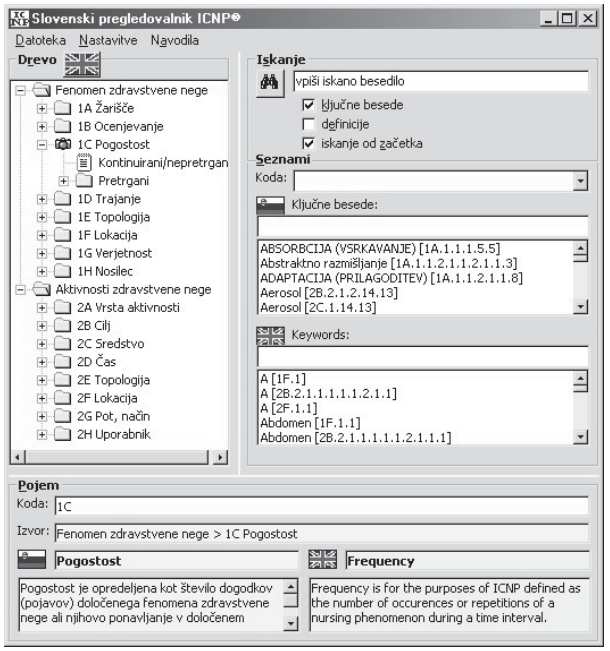

Figure 2: Screen of the client for a personal computer

mized to fit the user. This version can be viewed as a step forward toward information system solutions.

According to our experience, the PC version is suitable for the classroom and for individual student's work on documentation in nursing. Because the Slovenian Ministry of Health produced the CD-ROM and PC client (Rajkovic et al., 2004) and made it available free of charge, students can use the software at their homes on their own PCs.

3.3 The PDA (Palm) version

The PDA hand-held computer version (Figure 3) is based on the Palm operating system and the database was adapted to suit it. The solution takes advantage of the PDA's characteristics such as convenience, short start-up time, different user interfaces, etc. The most significant one is that a nurse can always carry a PDA in her/his pocket. This way, ICNP® is kept close at hand. Among the disadvantages, we should mention the processing speed and small screen size.

The PDA does not offer a wide view of the tree structure. A user can browse the hierarchical structure by moving up or down one level, searching for keyword, code or through full-text. In the latter case, the client returns the list of keywords where the search string was found.

Even when PDAs and mobile phones will be combined into a single device, this version will allow cheaper access in comparison to the mobile version using the WAP protocol.

Using PDAs, students can realize the strengths and weaknesses of the available mobile applications. They always have some ICT support with them, which is especially important as they work with patients at sites that are far from classrooms and often far from other ICT support.

Figure 3: Screenshot of the client on a PDA

4 Conclusion

Classification ICNP®, which is widely accessible in the professional community by electronic means, contributes toward the more rapid development of the standardization of nursing diagnoses, interventions, outcomes and documentation in the field of nursing care. It also encourages a multilingual approach, which is important in a multicultural environment where different languages are used. Consequently, it means a better information picture of the whole nursing process. It encourages integration with other segments of health care as well as the usage of existing data for research and development purposes (Bohanec et al., 2000; Sustersic et al., 2002). With the e-representations of ICNP®, we also bring the spirit of e-services nearer to practice.

To achieve these goals, we recommend the use of the clients presented here as tools in education on several levels from ICT literacy through the whole nursing process to the students' practical work with patients.

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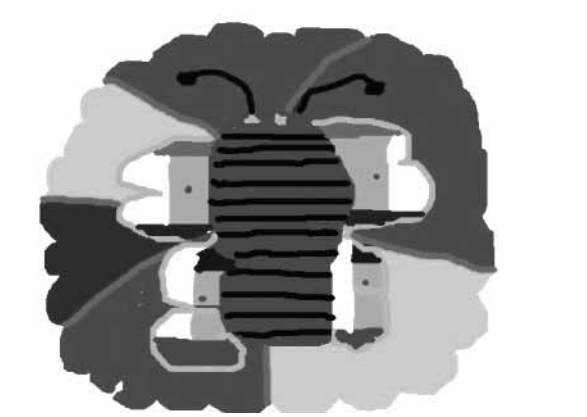

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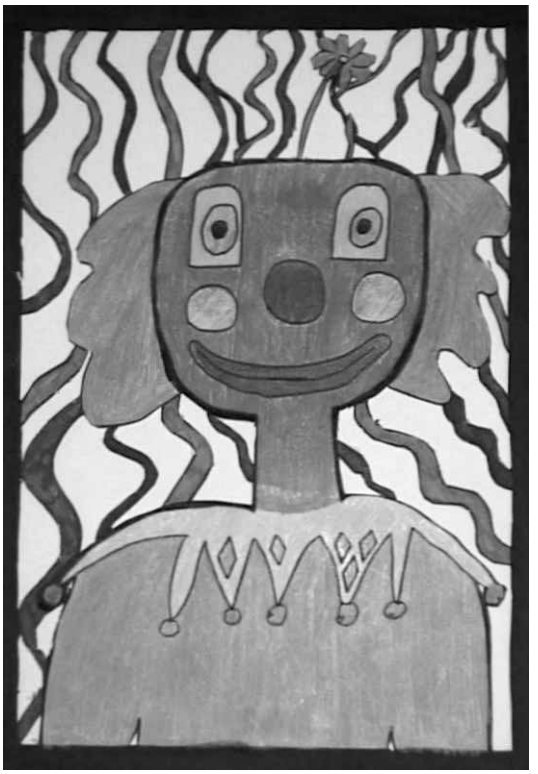

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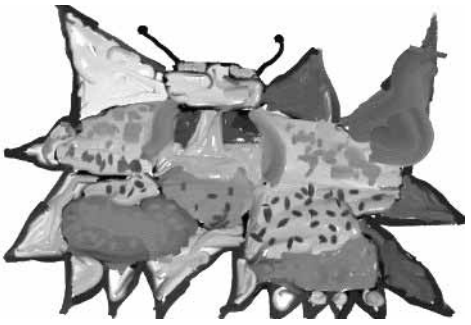

Luka Pečnik

From Fragments of Knowledge Towards a Bigger Picture: How Can the Process be Supported

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In this paper we deal with the problem of information that is dispersed and growing so fast that it is difficult to connect it together into a coherent picture as needed for complex problem solving. We present two examples and some methods that have potential to contribute towards putting pieces of knowledge together. The first consists of finding complementary pieces of knowledge in literature that supports hypothesis generation by a well-defined and computer supported method. The second one is sharing and upgrading knowledge in collaborative settings, which still has many non-technical issues to be solved, although well developed in its technical aspects.

Key words: Knowledge management, education, data mining, networked organizations

Kako od posameznih delov do celovitejše slike znanja

V članku je obravnavan problem hitrega naraščanja in raztresenosti informacij, kar otežkoča njihovo povezovanje v smiselno celoto, potrebno za reševanje zahtevnih problemov. Predstavljamo dva primera, ki prinašata obete v tej smeri. Prvi je iskanje komplementarnih kosov znanja iz literature, kar podpira generiranje novih hipotez z dobro definirano računalniško metodo. Drugi je izmenjava in nadgrajevanje znanja v sodelovalnih okoljih, kar je tehnično sicer že zelo dobro podprto, vendar pa prinaša s sabo še veliko nerešenih, predvsem netehničnih vprašanj.

Ključne besede: Upravljanje znanja, izobraževanje, rudarjenje podatkov, mrežne organizacije

1 Introduction

To cope with the increasingly complex problems of our society, it is important to take into account many different aspects and connect them into a bigger picture. This often requires an interdisciplinary approach and a lot of collaboration across different boundaries. Vast amounts of data and knowledge are available nowadays, but sometimes it seems that its value is not fully recognized and it are not used efficiently, mainly due to the fact that it is dispersed and cannot easily be connected due to quantity and diversity. Knowledge technologies provide tools and techniques that can help in overcoming these problems. Among them, data mining and decision support deserve attention due to a wide range of successful applications in different areas (Mladenić et al., 2003).

In the field of education, the importance of these trends has been recognized and changes supporting the process have begun. One of the important issues is the incorporation of knowledge technologies into study programs. A review paper (Urbančič et al., 2002) analyzed data mining and decision support education based on investigations of the materials available on the world-wide web. They present several complete postgraduate programs with an emphasis on data mining and decision support. Also important for the spread of such methods is the incorporation of these topics into study programs for non-computer science students. Among them, several interesting examples combine technical content with various areas such as medicine, e-commerce and bioinformatics. In interdisciplinary study programs, students not only get information and knowledge from different disciplines, but also learn how to combine it efficiently for problem-solving in different professional fields. The interaction of technical, economical, social, environmental and other aspects must be understood and different pieces of knowledge must be combined into a meaningful view of the whole. Here, the approach of using well defined methods

for well structured problems usually doesn't work. As is described nicely in (Burns and Jordan, 2006), one of the most difficult things to teach is the defining of the problem itself. The paper also discusses alternative ways that the capability of seeing the whole can be developed. A similar problem also appears within disciplines that seem to be coherent from the outside, but are still divided in separate subfields that too often don't have enough intersection and communication. One such example is medicine. For example, autism is investigated in the framework of behavioural psychology, genetics, biochemistry, brain anatomy and physiology, but there is a lack of studies that would connect these diverse findings into a coherent picture (Belmonte et al., 2004).

Another aspect of putting fragmented knowledge together is combining knowledge and information available at different locations through collaborative settings. This brings new challenges, the non-technical being often more limiting than technical ones. Therefore it is not surprising that training in communication, networking and teamwork is also mentioned explicitly in the list of necessary improvements given in the proposal of the European Commission on how to modernize Europe's universities (Europa Press Release, 2006). At the same time, the educational institutions themselves have become very active in thematic networks where all these issues come across at a different level, but in a similar way.

In this paper, we deal with both aspects. First we present literature mining as a method that can provide very useful technical support when uncovering hidden connections in bibliographic databases. As such, it is a simple but powerful tool that helps in establishing bridges between disciplines and different professional communities. Then we focus on the process of complementing knowledge in a collaborative setting. Although at the moment the first aspect is mainly associated with the discovery of knowledge in science and the second with professional collaborative work settings such as virtual enterprises, we strongly believe that they are relevant for education in different ways - as already indicated above. Besides the more direct implications, we must also think about how future generations will be educated and trained in order to deal successfully with these issues.

2 Finding Complementary Knowledge in literature

The amount of information available on-line is growing with enormous speed. A good example is Pubmed, the United States National Library of Medicine's bibliographic database, which covers more than 15 million citations and increases by more than 1,500 complete references a day. It is obvious that no human expert could manage this stream of new information without the suitable support of a computer.

Since the expert fields are getting more and more specialized, scientists and other professionals tend to function in more or less "closed" sets of specialized professional literature, in general without many cross-references to other research or professional communities. On the other hand, the problems of today's society are becoming more and more complex. Many phenomena, such as complicated disorders or diseases, can only be understood when different partial findings are combined and all support for this process is very welcome.

A simple, but extremely powerful method was proposed by Swanson (1990). If phenomenon C is to be explained and if there is a hypothesis that C is connected with agent A, then C may be from one field of expertise and A from another. In this case, literature about A and literature about C very often don't have any intersection. Swanson suggested finding a bridging term, B, which can be found in the literature on both A and C. If a closer look at such appearances in literature shows that A causes B and B influences C, this might support the hypothesis of A influencing C.

In one of his examples, Swanson was interested in the hypothesis that magnesium deficiency can cause migraine headaches. In this case, migraine played the role of C and Magnesium played the role of A. At that time, there were 38,000 articles about magnesium and 4,600 articles about migraine in Pubmed, with no direct evidence of any connections between the two. However, Swanson found several bridging terms B and more than 60 pairs of articles connected A to C via the terms of B. For example, in magnesium literature there is a statement that magnesium is a natural calcium channel blocker. On the other hand, in migraine literature there is the statement that calcium channel blockers can prevent migraine attacks. (the Calcium channel blocker plays role of B in this case.) Similarly, he connected the facts that stress and type A behaviour can lead to loss of magnesium in the body, while stress and type A behaviour are also associated with migraine. Also, in the magnesium literature, he found that magnesium has anti-inflammatory properties and, in the migraine literature, that migraine may involve the sterile inflammation of cerebral blood vessels. In this way, he found 11 pairs of documents that were, when put together, suggestive of and supportive for a hypothesis that magnesium deficiency may cause migraine headaches.

Swanson tested his method on different problems and actually found hypotheses, unknown at that time, which were later confirmed by clinical trials. His applications include connecting fish oil and Raynaud's syndrome, anticipating adverse drug reactions, etc.

We believe that this method provides a very valuable base for knowledge discovery in huge textual databases. In our paper (Urbančič et al., 2007), we mention several researchers who followed his idea and applied it to different problems. In the same paper, we also upgraded his method by proposing a new way for selecting hypotheses. The question we wanted to answer was: Being interested in phenomenon C, how do we find a candidate agent A as a potential cause of C? In other words, being interested in migraine, why did Swanson focus on magnesium and not on something else? Swanson is not very specific about this choice in his paper and he comments that success de-

pends entirely on the knowledge and ingenuity of the searcher. In our method, to explain phenomenon C, we are looking for interesting rare terms in literature about C. Then we inspect literature about these rare terms and look to see if they have any intersections via joint terms. From these joint terms, candidates for term A are selected and a hypothesis that A influences C is tested using Swanson's ABC model. We tested our method (called RaJoLink) in the area of autism and found previously unknown relations that were evaluated by a medical expert as interesting and promising, helpful towards a better understanding of this complex phenomenon.

3 Sharing and Upgrading Knowledge in Collaborative Settings

New media and computer networks enable business, medicine, science, etc. to be done in a collaborative setting without geographical boarders - resulting in eBusiness, eMedicine and eScience. Due to this development, networked organizations are becoming increasingly important. Their activities are facilitated by the use of shared infrastructure and standards, decreasing risk and costs. A virtual enterprise is a specific form of networked organization (Camarinha-Matos and Afsarmanesh, 2003) in which a group of organizations or individuals voluntarily join to share their knowledge and resources in order to better respond to a particular business opportunity through collaborative work, supported by information and communication technologies. This greatly increases the possibilities of choice since one can select their co-workers across organizational and geographical boarders, having their competences to accomplish a task at the front of the mind. The networked organization is as strong as it is capable to use potential of all its members and combine it into a successful way. As knowledge is one of the most important assets of a network, the knowledge of the members should be shared and combined in order to enable the successful functioning of the network as a whole.

A specific technical infrastructure is needed to support networked organizations in their activities. One of the important issues to be covered by this infrastructure is collecting dispersed information from partners, storing it in a consistent, understandable, computationally accessible and flexible way and making it available to the partners of the network and to the external audience. This functionality is available through web systems and can be achieved successfully using available techniques and tools (Jorge et al., 2003). So, in principle, could we now work successfully with anybody in the world?

Things are not that simple. Kling and Lamb (2000) pointed out that interorganizational computer networks are also social networks where relationships are complex, dynamic, negotiated and interdependent. They claim that the organizational changes required when "going digital" are often neglected and refer to them as the "hidden costs of computing".

We experienced this in a virtual enterprise SolEuNet (*http://soleunet.ijs.si*), where 12 academic and business partners from 7 European countries joined forces with the aim of offering their data mining and decision support expertise to the European market. Collaborative work by geographically dispersed teams had a well established Internet support and infrastructure (Jorge et al, 2003), the participants were professional experts and really devoted to the project. However, since the engineering side of the project did not have a suitable counterpart in the organizational aspects, the organizational model evolved through different stages mainly on the basis of lessons learned during the project - including the "discovery" of the danger of information asymmetries, the importance of the IPR issues and the key role of building trust among the partners of the network (Lavrač and Urbančič, 2003). The main direction of these changes was towards increased flexibility as, in the final model, every partner on the network was given the opportunity to be the net broker in particular projects. This resulted in enhanced choice of project partners and consequently in less tensions between them. The need for additional efforts in knowledge management (Smith and Farquhar, 2000) needed to be fulfilled since in such a model, the information and knowledge needed for the role of a net broker had to be organized, stored and maintained in a way that made it accessible to all partners (Jermol et al., 2004).

One of the lessons learned was that trust modelling and management should be a part of knowledge management when establishing and managing a virtual enterprise. A more detailed discussion with examples is provided in (Lavrač et al., 2007).

Partners in a collaborative setting must face the psychological challenge of shifting from a culture of the enterprise and motivation of the individual towards a network culture where sharing knowledge brings advantages, not danger – providing that IPR issues are properly handled. The concept of network intelligence as the capability of going beyond fixed individual identity through dialogue, mutuality and trust (Palmer, 1998) is an unavoidable counterpart to the technological preconditions of networked organizations. Building this kind of intelligence is a long-lasting but very important process, which should be strongly encouraged in society, starting with the education system, which, unfortunately, still strongly prioritises individual competition over cooperation.

5 Conclusion

As knowledge is becoming one of driving forces in our economy and society, it is important to support its development, sharing and use in an efficient way. This is difficult, due to the fact that information is growing so fast and that it is very dispersed. In this paper we presented some technical ideas to bridge these problems, and also pointed out some non-technical issues connected with it.

We also presented our belief that education programs should and could support the process by preparing the

next generations for the use of knowledge technologies and also by educating them for work in the collaborative settings required. Both are unavoidable for solving the complex problems of today and of tomorrow.

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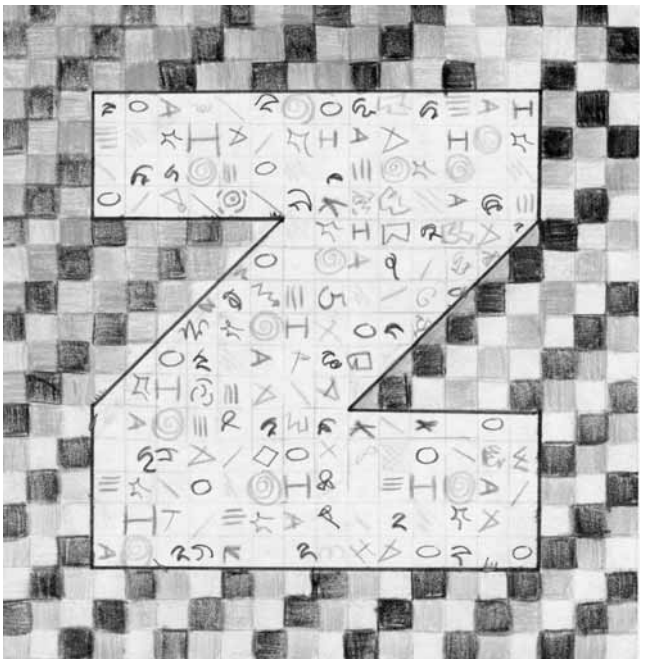

Nina Kočar

Games for Learning and Learning from Games

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This paper details a model of game-based learning and suggests how this can be applied to both the playing of computer games and learning within the classroom environment. The authors document the results from a University level course, created in a role-playing form for designing educational games and highlights the student's attitudes and beliefs regarding game design as a career. They also suggest that educational games can be used successfully for the transfer of knowledge to domains outside the world of computer games and highlights several case studies in the area of health and medicine.

Key words: game-based learning, recursive learning loops, games for learning

Igre za učenje in učenje iz iger

V prispevku je predstavljen model učenja na osnovi iger in možnosti uporabe modela v različnih okoljih: pri igranju iger kakor tudi pri uporabi iger za učenje v razredu. Opisane so izkušnje in rezultati tečaja na univerzitetni ravni, ki je bil zasnovan kot role-play igra, ter mnenja študentov o poklicni karieri na področju koncepcije iger za učenje. Znanje, pridobljeno s pomočjo iger za učenje, je moč uspešno uporabljati in prenesti v različne domene izven računalniških iger, kar je prikazano na primerih in študijah iz zdravstva.

Ključne besede: učenje na osnovi iger, rekurzivne zanke učenja, igre za učenje

1 Background and Introduction to Game-Based Learning

Over last few years an emerging trend been observed towards games in the area of e-learning. From early isolated reports on conferences and books reflecting on possible application of digital games for learning purposes (Gee, 2003), more and more practitioners and researchers have embraced the idea, including the e-learning community. In 2006 one of the biggest European e-learning conferences, Online Educa in Berlin, introduced a special game track. The two day session hosted an open discussion between academics, teachers and industry practitioners, focusing on the potential of game-based learning in Universities and lifelong learning institutions as well as possible software solutions.

The discussions are primarily focused on the Pros and Cons of applying games for learning and trying to find answers to questions like *Why don't we use games more often in classrooms?* Often, the difficulty of finding games that cover the curricular topics is pointed at, as well as the low tolerance of that environment towards games, where they are often perceived as an unserious activity, with some lecturers fearing that the learning objectives wouldn't be reached. Others might encounter difficulties with the technical resources that schools are lacking. Another important factor is the quality of the games intended for learning, where games should have an explicit learning purpose and can be used, adapted and adopted for supporting, improving and fostering the learning processes (SIG-GLUE).

Kasvi (2000) lists the seven requirements, suggested by Norman (1993), for an effective learning environment as:

1. Providing a high intensity of interaction and feedback;
2. Having specific goals and established procedures;
3. Be motivational;
4. Provide a continual feeling of challenge - not being so difficult as to be frustrating or so easy as to create boredom;
5. Providing a sense of direct engagement with the task involved;
6. Providing the appropriate tools that fit the task; and

7. Avoiding distractions and disruptions that destroy the subjective experience.

Kasvi (2000) suggests that computer games fulfil all of these requirements and believes that they "satisfy them better than most other learning mediums" (p.6). However, it is very difficult to find a game that includes a learning curriculum that is appropriate for different schooling levels. Popular games such as 'Maths Blaster' from Vivendi Universal, has captivated children but only targets ages 8 to 9 years. Even if the game were upgraded to include a higher level of mathematics, it would be doubtful if today's 14 year old students would play this type of game. But take a constructivists point of view and ask that same student to design an educational game, the response would be quite different, as described in chapter 3.

Today's students are captivated by computer and console video games. Humans have always used games of all types for learning - from playing with blocks for counting skills through to flight simulators for more specialised skills (Pivec, 2006). Although the skills involved when playing games differ dramatically from those needed to create one, players exhibit the same addictive nature seen in a person who is driven to succeed. A computer game can take anywhere between 3 months and 3 years to create. From the initial concept, design, coding, testing and error correction through to the artwork, music, packaging, promotion and distribution, developers must stay focused and committed to the project throughout this entire time, often doing tedious tasks but always learning new and innovative techniques for their craft. These people are usually young adults and have also been avid game players themselves. They learn in a different way from the earlier generations and are often motivated by instant feedback and rewards for success.

Game-based learning can be applied as an additional option to classroom lecturing. The intention of game-based learning is to address new methods of ICT based instructional design while at the same time providing learners with the possibility of acquiring skills and competencies later required in the business world. By means of digital games, and digital educational games especially, learners should be able to apply factual knowledge, learn on demand, gain experiences in the virtual world that can later shape their behavioural patterns and directly influence their reflection, etc.

2 Recursive Loops of Game-Based Learning

Based on the example of an educational adventure game, let us consider how and when learning occurs when learners interact - e.g. playing a game. The main characteristic of an educational game is that the instructional content is blurred by game characteristics. The game should be motivating, so that the learner repeats cycles within a game context. While repeating e.g. playing a game, the learner is expected to elicit desirable behaviours based on emotional or cognitive reactions resulting from interaction with and feedback from the game play.

The purpose of an adventure game is entertainment or edutainment. In adventure games, there are very complex environments - i.e. microworlds - with no deterministic problem representation. An example of a typical edutainment game is Chemicus (by publisher Heureka-Klett; or TIVOLA for the US market), a puzzle-adventure game for the self-directed learning of chemistry. Similar to Chemicus, one can find an entire series of titles e.g. Physicus, Hystorion, Informaticus, etc. from the same publishers and built upon the same game concept.

Adventure games use the intrinsic motivation of the player to explore the game world. Intrinsically motivating games incorporate learning activities in this game world. To increase the immersion of the player, the game offers an extensive story at the start, often related to some murder or mystery. The game characters have to solve the mystery by solving a number of interrelated problems. In each case, the problems are part of the game and the players are motivated to seek the knowledge to provide a solution in order to continue. In this game, enjoyment is strongly related to the learning activity, which can be viewed as a desirable outcome.

Commercial computer games are known for creating social environments and cult followings surrounding the gameplay, character attributes and the player's abilities, and this is where affective learning occurs (Kearney and Pivec, 2007). Garris et al., (2002) describes affective learning as containing "feelings of confidence, self-efficacy, attitudes, preferences and dispositions" (p.457). Skills-based learning appears to comfortably fit within the micro game cycle (*figure 1*), or the levels within the game. For example, Rosser et al. (2007) found that playing commercial action games improved the surgical skills of laparoscopic physicians and decreased their error rate. There was no documented debriefing session for Rosser's study and it is assumed that the development of technical or motor skills occurs within the game itself.

Figure 1 also shows how player ability and experience affects the challenge element and the level of learning (the Zone of Proximal Development), and how the level of cognitive challenge can be appropriate for the learner's current abilities. The model shows the inclusion of instructional design and game characteristics as critical elements of a game, enabling the achievement of the learning outcomes, as well as the additional factor of player ability. Defining learning as the acquisition of knowledge or skills suggests that Game-Based Learning is the vehicle that fosters the acquisition of the learning outcomes. The model includes a time element to allow the player to progress through the game, increasing their knowledge and acquiring new levels of ability. This suggests that knowledge - declarative, procedural and strategic - is acquired over time and that abilities or skills are incremented through experience.

This model can also be applied to role-play within the classroom. As the student's abilities are supplemented (through tuition or guided instruction), their knowledge

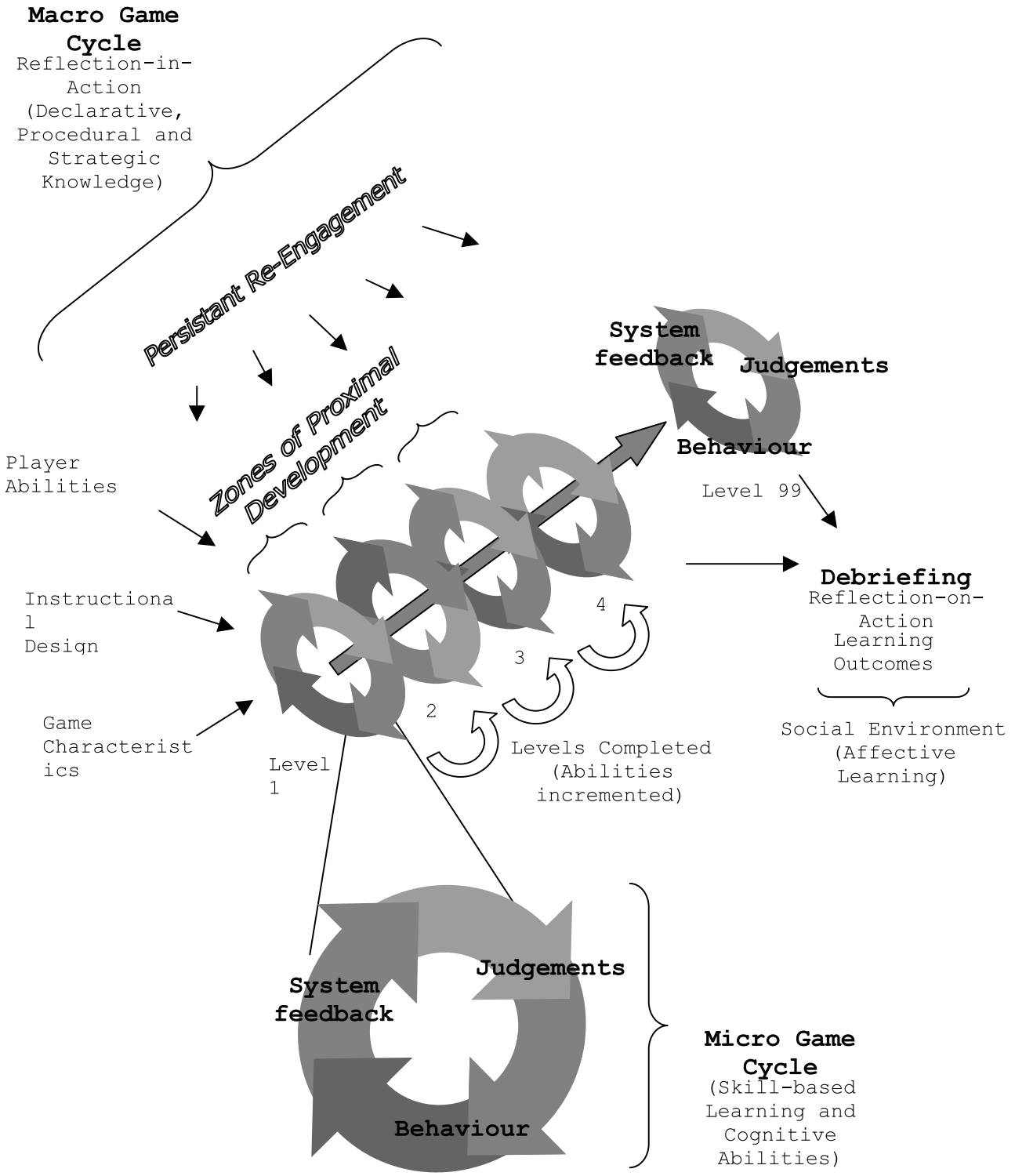

Figure 1: The Recursive loops of Game-Based Learning (Kearney & Pivec, 2007).

and skill level is incremented and they move to the next level or next phase of the project. The role-play course on game design detailed in the next chapter was structured in such a way that the students added to their game design concept as their knowledge and skill increased.

3 A Game About Game Design: Role-Play in the Classroom

This chapter documents an educational game design course created by the authors and taught to 75 information design students at the University of Applied Sciences of Joanneum in Austria, where we wanted to introduce this topic to the new generation of potential game designers and make them aware of this new discipline and its specifics. The challenge for students was to create a concept proposal for a publisher of educational games. Based on the course work and results, we analysed how the students perceived the area of educational games for teaching and as a career path.

The class was a role-play game itself i.e. a game about designing a game, where students had to work in teams to create a game design company and take a specific role and responsibilities within the team - e.g. game producer, game developer, programmer, etc. - to contribute to the task accomplishment. The progress of the work and the problems they encountered were documented in the company blogs (as an example, see http://legalaliengames.blogspot.com/, the blog of "the best in the show" group)

The course covered topics including the process of commercial game design, taking into consideration the pedagogical design required to achieve the desired learning outcomes. When we design games for learning, both the target audience and the learning outcomes have to be considered in the initial conception of the game. In this way, teachers can easily recognise the value of this resource and the possibilities of including such games in the curriculum. Aspects of educational game design are tackled more in detail in (Pivec, Koubek & Dondi, 2004).

The game concepts ranges in excellence in areas from the innovative use of technology to their possible market potential. The class finished with the presentation of the Golden Pineapple awards for concepts (Golden Pineapple Award, 2006). Two of the awarded concepts were focused on medical content (*Figure 2*). Anaphylactic from Dudary Entertainment is a real time strategy game introducing the principles of the immune system of the human body. Keep Me Alive from Stardust Enterprises is an ICQ game focusing on various infectious diseases and how to prevent and treat them. It also has the potential to include real pharmaceutical products as well as relevant medical advice.

The students were surveyed both before and after completing the course, both on their opinion on games in general and regarding the potential of application of games for learning. We also inquired into the motivational momentum of designing a game in terms - if they were more motivated and achieved better learning results. Based on this survey, we also wanted to assess if they saw educational game development as a possible career path.

On the post survey, 66% of the students agreed that designing educational games was a highly motivational topic and suggested that they now felt competent enough to write a professional educational game concept document. They also agreed that designing educational games could provide future career opportunities, though only 35% of them would consider this for their own career. The majority of the students found the course to be successful, with 70% of the students enjoying the topic despite not considering themselves to be game players. Those who did play computer games, only did so for recreation and had not involved games in any of their schooling. However, upon completion of the course, 60% of the students suggested a preference for using games to learn.

4 The Application of Game-Based Learning

With the intention of outlining the potentials of applying games in the area of medicine (as a serious discipline in contrast to the computer games that are often seen simply as a leisure activity or even as a waste of time), some

Figure 2: Student Designs

known and documented cases of the application of game-based learning targeting various user groups are presented. The cases vary from an educational game created for interdisciplinary learning to context based environments supporting the application of specific knowledge for medical and veterinarian students and the application of commercial-off-the-shelf games (cots) to improve the laparoscopic performance, embedded in the curricula.

Suzanne de Castell and Jennifer Jenson from Canada created Contagion, a role-playing adventure game fostering interdisciplinary learning and targeted at children aged 10-15 (de Castell and Jenson, 2006). The game is based on traditional school subjects and related fields such as technology, biology and medical sciences, as well as human and social sciences. The goal of the game is twofold. On one hand, the game should introduce health related topics and educate players through "serious play" about diseases such as Severe Acute Respiratory Syndrome (SARS), West Nile Virus (WNV), Avian Flu and Acquired Immune Deficiency Syndrome (AIDS), as well as possible preventive behaviours. On the other hand, the game also provides a career preparation environment; where players can learn about and role-play various occupations of interest e.g. community health officer, physician or medical researcher. The player entering the game world chooses one of these roles, which effects the development of the game play and the point of view on the situation throughout the game. In the game, the player is confronted with the situation of a medical and humanitarian crisis and acts out the situation differently based on the respective role. The majority of the learning is based on active exploration.

At the University of Edinburgh, students interact with virtual patients from their first year of study through to completion. The virtual patients are related to various curricular topics enlivened with narrative elements, thus creating a realistic context (Begg et al., 2006). Each student interacts with the same virtual patients - e.g. George - several times throughout their study. His condition gets more complicated as they progress in their studies. The aim of George is to provide an opportunity to apply concepts learned in isolation - e.g. the social and cultural factors of health and communication skills. By interacting with these virtual patients, students are role playing as a "doctor" until the end of their education, when they actually become doctors. Labyrinth is a similar application based on the virtual patients and realistic scenarios that were created for the College of Medicine and Veterinary Medicine's Learning Technology Section at the University of Edinburgh. The scenarios are focused on decision-making, i.e. the students' decisions and courses of action influence further development of the scenario. At the start, the student is placed in the role of being in charge of an admissions unit at the start of the night shift. The student is confronted with a situation based on a short descriptive text and asked what to do next. They are offered a set of choices, some of which are more appropriate than others. Based on the development of the scenario, they get feedback on their reflection and choices made. With technology - i.e. virtual scenarios - one has the advantage of being able to restart the session and repeatedly try out "what if" reflections.

Newly published research suggests that video games may be a teaching tool for training laparoscopic skills (Rosser et al., 2007). The study involved thirty three male and female surgeons with various specialities and was centred at the Rosser Top Gun Laparoscopic Skills and Suturing Program, where the goal is to build skill sets that enable surgeons to function effectively in the video-endoscopic surgical environment. One part of the study included playing three cots video games. At the end of the study the results of laparoscopic performance were grouped in categories based on gaming experience - i.e. past players and current players - and demonstrated skills in the games as a part of the study before comparing them to the laparoscopic results of the non-players. The published results showed that current video game players made 32% fewer errors (P=0.04), performed 24% faster (P=0.04) and scored 26% better overall (time and errors) (P=0.005) compared with their non-paying colleagues (Rosser *et al.,* 2007). Based on the research carried out, Rosser argues that video games "may help reduce the technical interface between surgeons and screen-mediated applications", thus contributing to improved performance in laparoscopic surgery in terms of faster completion and fewer errors.

5 Conclusions

In many cases, the application of serious games and simulations for learning purposes provides an opportunity for learners to apply acquired knowledge and to experiment and get feedback in form of consequences, thus getting experiences in a "safe virtual world". There are specific educational domains where game-based learning concepts and approaches have a high learning value. These domains are interdisciplinary topics where skills such as critical thinking, group communication, debate and decision making are of high importance. Such subjects, if learned in isolation, often cannot be applied in real-world contexts.

Games can provide the motivation to learn, increasing the likelihood that the desired learning outcomes will be achieved. Learning is defined as the acquisition of knowledge or skills through experience or practice, and what better way to learn than through a game.

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Distance Education Models and New Communication Trends in Education

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Last decade's technological developments in the field of information technology have boosted its range of uses in distance education and given new dimensions to this type of education. Distance learning nowadays is practised in several theories, each differing from the other in its formal access, in the analysis of its teaching and learning materials, in its methods and range of counselling and the range of its communication with participants, as well as in its didactic concept of preparing and forming learning materials, etc. Distance education is an important criterion for new communication trends in education. Therefore, it shall be covered more thoroughly in this work.

Key words: Distance learning, distance education, distance teaching and learning models, didactic models, communication models, web-based education, web-based learning material

Modeli izobraževanja na daljavo in novi komunikacijski trendi v poučevanju

Povzetek: V zadnjem desetletju je napredek na področju informacijsko-komunikacijskih tehnologij odprl nove možnosti poučevanja in učenja na daljavo in s tem dal temu področju nove dimenzije. Z izobraževanjem na daljavo se danes ukvarja množica teorij, ki se medsebojno razlikujejo po formalnem pristopu, po analizi gradiva, po obsegu in načinu svetovanja in komunikacije z učenci, po didaktičnem konceptu priprave in oblikovanja gradiv itd. Izobraževanje na daljavo pomeni tudi pomemben kriterij komunikacijsko – didaktičnih trendov v izobraževanju, ki jih bomo v tem prispevku analizirali.

Ključne besede: Učenje na daljavo, izobraževanje na daljavo, modeli učenja in poučevanja na daljavo, didaktični modeli, komunikacijski modeli, spletno izobraževanje, spletno orientirani učni materiali,

1 Introduction

The results of sociological as well as pedagogical and psychological research (Gerlič, 2000) in our country indicate an increasing tendency toward changes in the field of education, with an increasing amount of interest in school reform(s) being recorded throughout this part of the world relating to well-developed educational systems. Political, economical and technical changes, as well as the development of the democratic society, have led to the need for some crucial changes in the existing school (educational) system, which – in its present situation – often finds itself in a state of social, pedagogic (educational) as well as financial crisis. Some of the most developed countries find themselves today on a firm course toward a developmental phase called *information society*. This new type of society tends to solve the problems of industrial production coming to a halt through a mass introduction of robots and computers, as well as through the powerful development of education and research. Such a society puts much emphasis on the role of the process of providing the educational system with informational technology when introducing modern information and communication technologies as well as when searching for more modern and more innovative forms of learning and teaching (Roblyer, Edwards & Havriluk, 2001). A society such as this feels and is increasingly becoming aware of the changes in its own society and in the human activities that indicate the need for an improvement of the existing educational systems as well as the adjustment of the latter to modern needs in the educational process. The solutions that are on their way or that are already available in the field of telecommunications as well as in the field of information technology make it possible for the experts to establish a number of new forms of educational environment where the process of so-called *distance teaching and learning* is gradually gaining importance.

Distance teaching and *learning* represent the form of direct or indirect education, respectively, where there is a physical or even time-based separation between a teacher

and a learner. The teacher or tutor consequently checks the learner's progress. The teaching and learning materials are communicated over long distances in print format or in electronic form with the help of various media. As Keegan et al. (2003) puts it, distance education and learning represent a form of indirect education that enables the learners to learn in their own (i.e. home) environment or in a distant environment. This form of education is very popular and widely used in the process of permanent education involving people who have already finished some form of formal education and who now want to extend their knowledge and skills or to qualify for some other job or gain some additional skills useful in their work experience. Distance teaching and learning is aimed at all those who want to gain some additional education in their particular field of activities, because the very system of distance teaching and learning is a very flexible one and at the same time enables anonymity over the whole course. That is exactly why we can find people of nearly all ages involved in the process of distance teaching and learning. Thus, this system also represents an important element of permanent, i.e. life-long, learning.

2 Commucinological and ditactic analysis of the development od distance education

Distance teaching and learning around the world boasts a long tradition. As stated by Bregar (1998), it is not something that has been invented recently, but had already existed in some form or other since the eighteenth century, from when the first beginnings of distance teaching and learning can be traced. The development of postal services and printed materials, for example, enabled people living in distant parts of North America to educate themselves on their own without having to attend any of the then rather traditional, remote educational institutions that were beyond their reach. The knowledge that these people gained in this way was – thanks to some appropriate evaluation systems and certificates – valued as formal education. However, it was only in the second half of the nineteenth century that the process of distance teaching and learning started to appear more widely, when the so-called system of *correspondence-based education* was successfully introduced in the USA, Canada, Australia, Sweden, Germany and Great Britain (Gerlič, 2000). The knowledge acquired in this way too was also – thanks again to appropriate evaluation systems and certificates – valued as formal education. The methods used in this correspondence-based education depended greatly on the stage of the development of the mainstream educational forms and educational processes, especially on the development of technology, i.e. technological development. The use of mass media has been on the increase and has contributed greatly to the increasing number of communication channels available, i.e. channels of knowledge and information transfer. The more that educational technology – and the various forms of computer-assisted educational forms, group work and project-based work along with it – has developed, the more the system of distance teaching and learning has opened up and become ready to take on new ways of working. Thus, the process of distance teaching and learning can – according to Taylor (Bregar, 1998) – be divided into four individual generations or periods, respectively, which – in order to present them in a transparent way and in order to make a better analysis – can be united and presented as a system of the so-called didactic models (Gerlič, 2000) as follows:

First-generation model, which is based on the so-called *correspondence models*; where the text is based on the form of a two-way written communication, i.e. on the correspondence between the teaching staff (teachers) on the one hand and the participants of this form of distance teaching and learning (students) on the other. (See the classical didactic triangle shown in Figure 1.)

Second-generation model based on various forms of *multimedia* that represent some new media used in the transfer of knowledge or teaching and learning materials, the purpose of which is to enrich the already existing printed materials, e.g. audiotapes, videotapes, materials for computer-assisted learning and interactive video. Thus, the written or printed materials, i.e. text-based materials, represent only one of the sources, whose importance in the correspondence model, however, has been lost. (See the corrected didactic triangle shown in Figure 2.)

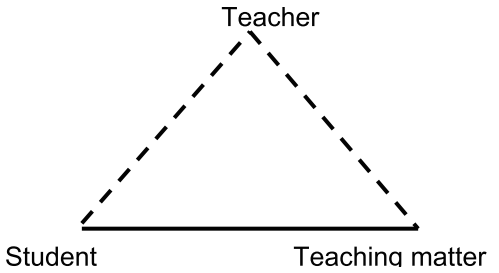

Figure 1: Communicological and didactic 1st generation model of distance education

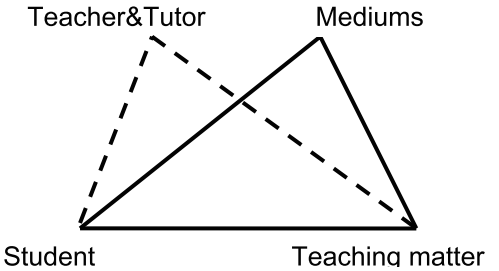

Figure 2: Communicological and didactic 2nd generation model of distance education

Third-generation model based on the systems of *distance teaching and learning* in the literal sense of the term. We can talk about this form of distance teaching and

learning when there are many different sources of knowledge at our disposal (e.g. radio, TV, audio-conferences, videoconferences), which render possible a knowledge transfer over distances that requires on the part of participants a higher and higher level of external and internal interactivity, i.e. communication. (See the didactic square shown in Figure 3.)

Fourth-generation models characterised by *flexible learning*, which is based on interactive multimedia systems, on computer-assisted intranet communication, on an intranet itself, as well as on some of the more recent information and communication technologies (International Knowledge Technologies (IKT)). The current period has seen a much higher level of interaction between individuals, and has done so with the use of various multimedia and Internet-based teaching and learning aids, whose main purpose is to give the learners more independence and greater flexibility in the process of their learning, thus assuring the highest level of external and internal interactivity – i.e. communication – in the didactic as well as the communicological sense. (See the didactic polygon shown in Figure 4.)

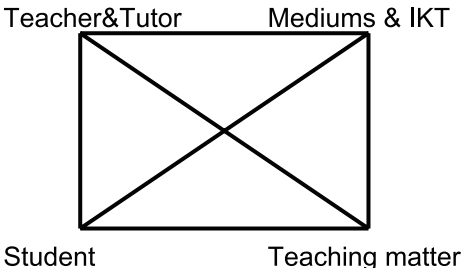

Figure 3: Communicological and didactic 3rd generation model of distance education

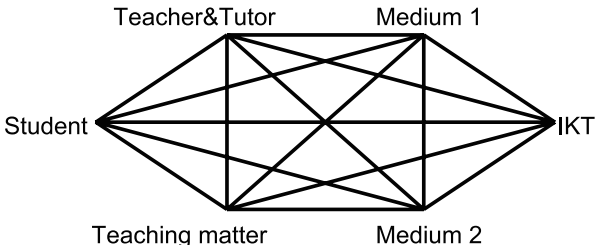

Figure 4: Communicological and didactic 4th generation model of distance education

3 Other important sub-system of distance education

Lessons and lectures in their basic form always represent a deliberate action, i.e. planned and organised forms of education, which particularly holds true in the process of distance teaching and learning: it is *purposeful*, since it determines in advance what the participants should acquire; it is *planned*, because the teaching and learning materials are chosen and arranged into a series of logic and time-bound units, because the educational process follows in its steps the methods and techniques predicted, and because it is aimed at attaining some educational goals that have been set systematically and deliberately. And finally, distance teaching and learning is an *organised* activity, since it is carried out in specific institutions, at a specific place, at a specific time, and is undertaken by staff that have been appropriately trained in their task. Thus, we can show the results of the system analysis of the distance teaching and learning process (Gerlič, 2000) in the form of four crucial interactively interconnected sub-systems: the professional, the technological, the organisational, and the didactic sub-systems (Figure 5).

The professional sub-system of distance teaching and learning is based on the short-term and long-term preparation of teaching and learning materials. It leads to a deeper understanding and mastery of the knowledge and skills by both the teacher and participant. The participant is not supposed to master all the knowledge at the expert level only, but he/she should also be able to operate with the knowledge given to him/her in the same way as his/her tutor (teacher), who – on the other hand – is (or should be) able to pick out from a huge mass of data and knowledge the particular bits and pieces that may be of great help or interest to the student. Thus, it is the ability to choose accurately particular information out of a huge quantity of knowledge and

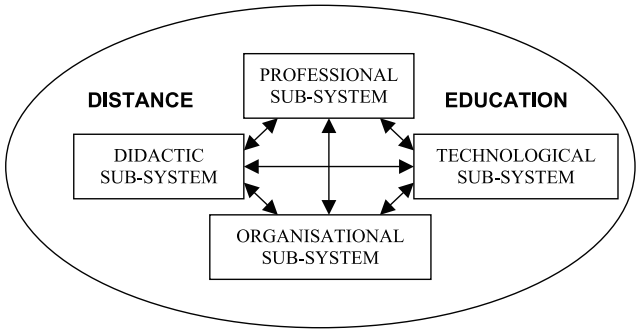

Figure 5: Sub-systems of distance education

the ability to transfer this particular information to the participant(s) that is of utmost importance, as well as the ability to deliberately make such pieces of information an integral part of the curriculum that – on its part – determines which subjects should be taught and the order in which these subjects should be taught as well as how much time should be given to them. Here, we also have to bear in mind the *lesson plan*, which helps realise the aims stated in the curriculum by assigning within each individual subject the extent of the knowledge that should be acquired by the student in this particular subject, as well as by rendering possible the correlation of individual subjects. Thus, the professional sub-system is based on scientific accuracy and correctness and, furthermore, on the suitability of the teaching and learning materials as well as on the process of systematisation. It is also based on the level of respect paid to the learner's developmental stage

and on its capability of establishing a link between theory and practice. It also indicates the possibilities of coordinating individual subjects, as well as the evaluation and enhancement of the learner's progress and success. It is exactly this last requirement that is of utmost importance, since it is based on the learning process, which must be

- reasonable (i.e. it must be based on the learner's understanding);
- economical (i.e. it must lead to the desired goal in the shortest period of time possible and with as little energy and financial means used as possible, which, however, must include the use of appropriate teaching and learning aids);
- real (authentic; i.e. it must be closely connected with the environment in which it takes place);
- rational (i.e. it must lean on the theories of the psychology of learning, which recommends certain appropriate techniques of the acquisition of knowledge); and
- evaluation-based (i.e. the teaching and learning process must include certain different ways of evaluating the extent of the knowledge acquired by the learner).

The technological sub-system of distance teaching and learning is based on the recent idea that the quality of distance teaching and learning depends on the educational technologies used, which can basically be divided into two groups: the *developmental technologies* on the one hand, and the *teaching technologies* (Scheffknecht, 1999) on the other.

In the course of the development of the teaching and learning process, the technology is made up of the software and the hardware that are used in developing and preparing the teaching and learning materials and that thus determine

- the final products (various types of teaching and learning materials used in the process of distance teaching and learning, e.g. printed materials, web-based materials, sound-based materials, videos);
- the program tools needed for the construction of the entire course of distance teaching and learning or its components, respectively (programming languages, graphic tools, multimedia tools, authoring systems, etc.);
- the program tools enabling the execution of the processes of distance teaching and learning; and
- the basic hardware needed for the production part of the development of teaching and learning materials.

In the course of the transmission of the teaching and learning process, the technology is made up of the software and the hardware that analyses and determines globally the following:

- The basic teaching and learning goals, which we want to reach in the process of distance teaching and learning (e.g. active cooperation, management of knowledge, assistance with working processes, asynchrony and synchrony in the educational process, evaluation of knowledge).
- The various types of transmission of educational programmes (transmitting media) and technologies used for the transmission of educational programmes (e.g. traditional, multimedia, web-based ones).
- The software and hardware of the users.

The organisational sub-system is based on the ambition to optimise and rationalise the educational system. Within the production and work processes, however, this ambition is not new – it has already been present and emphasised as well as explored to an increasing extent for some time. The heads of the production firms have already come to the conclusion that only a well-prepared and well-organised working process can run smoothly, without interruptions, being successful in both the economic and the technical sense. Therefore, some of the elements of organisation science have also been implemented in the process of distance teaching and learning. The essence of this sub-system is a comprehensively described methodical and methodological approach that provides for the analysis of all teaching and learning situations as well as an accurately outlined scheme of work (execution) based on this analysis. According to this, Debevc (Gerlič et al., 2002) divides the experience gained in this field into the following three distance teaching and learning models:

- The model of independent education;
- The model of a distributed classroom; and
- The model of open and classroom-based education.

The model of independent education (Figure 6) represents one of the most interesting and current models of distance teaching and learning and is in fact the most frequently used model. In this model, the participants (i.e. the learners) stay at home and receive the teaching and learning materials in the classic or electronic form – on floppy discs or CD-ROMs. The participants also receive a certain amount of the teachers' additional notes and instructions containing hints for the participants as to what the latter should especially be careful about while stud-

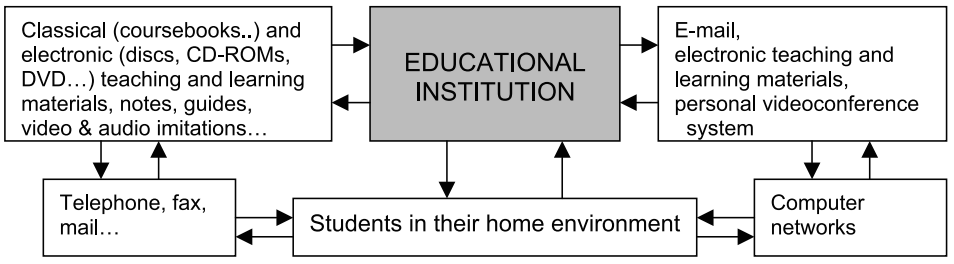

Figure 6: Model of independent distance education

ying these materials and which parts of the learning materials are of greater importance and need to be studied more thoroughly, etc. Teaching and learning materials of a higher level are made up of video and sound recordings of lectures, which can be accessed by the participants at any time, thus making the participants totally independent from any specific time and place in which the process of distance teaching and learning occurs. Owing to the rapid development of information technology, it can be expected that the participants will be connected more frequently via the Internet with school and educational systems as well as information systems.

Indirect communication taking place between learners and teachers can – with regard to what sort of technology the learners can access – be carried out with the help of telephone and/or fax machines, as well as videoconference systems. The process of direct communication, on the other hand, uses traditional postal mail, e-mail, sound-based mail, and – recently – video-based mail. For successful independent learning and to tackle the exercises, the participants can receive special mail packages containing all the elements that are necessary for the participant in their undertaking of the exercises in a particular field or area.

The model of a distributed classroom (Figure 7) is a classical model, where lectures can be transmitted (i.e. broadcast) from one place to many educational centres. Here, an educational institution makes use of several educational centres throughout the country, where the participants of this form of education are assigned so-called tutors who usually help the teachers. The latter occasionally visit these educational centres; however, videoconference systems can be used to establish a connection between the main educational institution on the one hand and the educational centres mentioned above on the other. In such cases, the teacher does not need to travel to individual educational centres. The distribution of teaching and learning materials is the same as in the case of the model of independent education, which means that the participants are given their teaching and learning materials in classical or electronic form. The participants also receive the texts of the lectures and various navigational systems for better orientation in their learning. A higher level of transmitting teaching and learning materials is made up of multimedia-based video and sound clips stored on floppy discs or DVDs or transmitted via the Internet.

The third model – which is the most expensive and thus not as easily affordable for educational institutions – is the *model of open and classroom education* (Figure 8). Here, a teacher presents a lecture that, with the help of a number of video cameras and an efficient video-conference system located in the lecture hall, as well as with the help of a so-called quick network (e.g. multi-channelled ISDN, high-speed optic network or ATM-network), is transmitted (broadcast) to lecture halls in other towns and cities that are also equipped with cameras and videoconference systems. The participants also make use of teaching and learning materials in the classical form that is typical of traditional lectures. This model is – from the teachers' point of view – the simplest, since teaching is undertaken in the traditional way. However, teachers are required to become familiar with working with modern information and communication technologies.

The didactic sub-system of distance teaching and learning is at the core of distance teaching and learning, since it is based on all of the three sub-systems already mentioned. It reflects the performer's, i.e. the teacher's, didactic and methodical and methodological skill and knowledge,

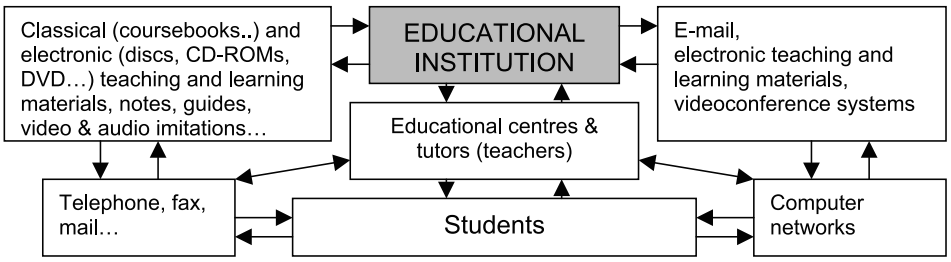

Figure 7: Model of a distributed classroom

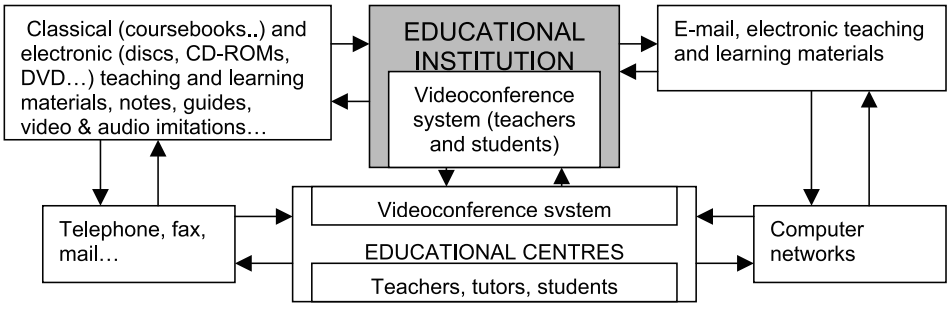

Figure 8: Model of open and classroom distance education

as well as his/her pedagogic surveillance and his/her "art of teaching". Since this sub-system is not as well known, and since not much attention is being paid to it, let us have a look at some of its essential principles or problematic fields, which are as follows:

- An analysis of the distance teaching and learning system as a teaching and learning process (e.g. distance teaching and learning and their correlation with learning, with the learning sources and conditions for successful learning, as well as the stages of learning, etc.)
- The learning and didactic principles in distance teaching and learning
- The choice and arrangement of teaching and learning materials
- The preparation and formation of teaching and learning materials (the traditional as well as the electronic kind)
- The internal organisation of distance teaching and learning (the teaching methods and the teaching forms and techniques, as well as the structure and articulation of an individual teaching and learning unit)
- The internal organisation of distance teaching and learning (the teaching and learning environment, the communication techniques, the teaching and learning aids, the didactic and organisational requirements, etc.)
- The special methodology of tutorship
- The evaluation of learners' progress and the prevention of bad results
- Evaluation and grading
- The information and communication technology used in the process of distance teaching and learning, etc.

4 Conclusion

As can be seen in this short analysis, distance teaching and learning represents a process that is extremely detailed and complicated and that requires a *team-based approach or work* at each stage of its preparation, execution and evaluation (Rowntree, 1994). The need for team-based work or a similar approach is determined by the complexity of the problems and the complexity and variability of the knowledge, as well as the increasingly swift changes occurring in the fields of professional careers, technology and organisation, and particularly in the field of teaching and methodology.

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Urta Rihtartič

Project CALIBRATE – Calibrating eLearning in Schools

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One of the main issues that the European Union supports through the IST Programme is the exchange and collaborative use of learning resources. CALIBRATE (Calibrating eLearning in Schools) brings together eight European countries to carry out a multi-level project designed to support the collaborative use and exchange of learning resources in schools. Its main aim is to provide a brokerage system among national repositories of educational materials. This paper reports on the main goals of this project, which include developing an open-source technical architecture to support content exchange/collaboration between ministries of education and other owners of educational repositories, to develop a teaching toolbox that supports the collaborative use of learning resources, research and testing new approaches that can improve semantic interoperability related to the discovery and evaluation of learning resources. One relatively important issue developed through the project concerns the guidelines with which the metadata resources in the repositories should be equipped. We will report on two major guidelines the resources in CALIBRATE should follow. A number of practical examples of preliminary versions of tools will also be outlined.

Key words: e-learning, metadata, repositories, learning resources

Projekt CALIBRATE

Izmenjava in sodelovalna uporaba učnih vsebin sta eni temeljnih vodil, ki ju podpira Evropska Unija skozi programe IST. Projekt CALIBRATE (Calibrating eLearning in Schools) povezuje osem evropvskih držav v večnivojskem projektu, katerega načrt je podpreti sodelovalno uporabo in izmenjavo učnih gradiv v šolah.Njegov glavni cilj je pripraviti izmenjevalni sistem med nacionalnimi skladišči izobraževalnih gradiv. Članek poroča o glavnih ciljih projekta, med katerimi so razvoj odprtokodne arhitekture, ki bo podpriala izmenjavo/sodelovanje med ministrstvi za šolstvo in drugimi lastniki skladišč izobraževalnih gradiv, razvoj učne orodjarne, ki bo podpirala sodelovalno uporabo učnih gradiv, raziskave in preizkupanje novih postopkov na področju odkrivanja in ocenjevanja učnih vsebin. Eden od pomembnih rezultatov doseženih med projektom so smernice o tem, katere metapodatke naj imajo gradiva v skladiščih. Poročali bomo o dveh glavnih smernicah, ki naj jim gradiva v projektu CALIBRATE sledijo. Predstavili bomo tudi nekaj razvojnih različic orodij.

Ključne besede: e-učenje, metapodatki, skladišča gradiv, učna gradiva

1 Introduction

Despite the fact that there are numerous learning resources available on the World Wide Web (WWW), there is a constant problem of finding appropriate learning resources to use in the classroom. The CALIBRATE (Calibrating eLearning in Schools) project is aimed to help with this challenge. It will provide solutions (tools and services) that support the interoperability and adaptability of learning resources on the European scale. The project brings together eight European countries to carry out a multi-level project designed to support the collaborative use and exchange of learning resources in schools. Its main aim is to provide a brokerage system among the national repositories of educational materials.

In this paper, we will present the main goals of the CALIBRATE project, discuss some problems in adapting educational resources for international use and present a number of illustrative examples.

2 About the project

CALIBRATE is a 6th Framework project led by European Schoolnet (EUN) that brings together eight countries that are interested in supporting the exchange and collaborative use of learning resources in schools. With

support from the European Commission's Information Society Technologies (IST) Programme, the project is expected to develop a European Learning Resource Exchange for teachers and pupils. The work builds on the results of three previous IST projects (CELEBRATE, ITCOLE and VALNET). Alongside eight ministries of education (or their representatives), the project also involves 17 partners from Austria, Belgium, Czech Republic, Estonia, Hungary, Lithuania, Poland and Slovenia. As the project proposal states, the project will

- develop an open-source technical architecture to support content exchange/collaboration between ministries of education and other owners of educational repositories;
- develop an open-source, toolbox of learning that supports the collaborative use of learning resources;
- research and test new approaches that can improve semantic interoperability relating to the creation and evaluation of learning resources; and
- validate CALIBRATE project results in up to 100 schools using an advanced validation methodology.

The CELEBRATE (Context eLearning with Broadband Technologies) pilot project has demonstrated that, although teachers are willing to use learning materials from the WWW, this usage is seriously limited by the fact that such materials are insufficiently available; in particular, not enough areas are covered.

The main goal of CALIBRATE was to alleviate this shortcoming: to make the resources sufficiently available and easily accessible to teachers. For this purpose, the project brought together the ministries of education from eight EU member states, each with their own repository of learning materials. Six of the participating countries are new EU member states, the choice of which was a conscious decision with the goal of promoting educational uses of ICT (Information and Communication Technology) in the enlarged Europe. One partner that took part in the project, representing its Ministry of Education, was the University of Ljubljana (through its Department of Mathematics, Faculty of Mathematics and Physics, Laboratory for Telecommunications, and Faculty of Electrical Engineering). The CALIBRATE project started in October 2005 and will run until March 2008.

The idea of this project is relatively simple, although the underlying technology is quite advanced. Essentially, the project will create a network or federation of learning-content repositories. The network will allow teachers and pupils to freely access both learning resources and learning assets (images, simple text files, audio clips, etc.) that can be used in the classroom. The search for these assets should be performed in a way teachers are already familiar with and in their own language. Technology behind it will take care of producing and federating appropriate searches through participating repositories.

3 Finding educational teaching resources

A relatively substantial amount of teaching and learning resources is obtainable through the Internet. If we take mathematics as an example, sites such as http://www.mathcentre.ac.uk, http://www.e-um.si/, http://www.mathe-online.at, http://www.matheprisma.de, http://www.math.com and http://planetmath.org are just a few instances of various portals where educational maths teaching resources can be found. A simple search on Google with the keywords *maths*, *teaching*, *resources* provides more than 6.5 million hits. However, a survey conducted in 2005 within Slovene teachers' groups has shown that teachers do not use enough of the resources that are available. The main reason they claim for not using teaching resources is that they need **suitable** teaching resources in order to be able to incorporate information technology into their teaching processes. The observation of the active usage of e-materials in teachers' work has shown that access to a large number of e-materials (mostly due to the organisation of the Slovenian portal (SIO) with links to various educational resources in 1995) after the (expected) initial boom actually led to the reduction of their use in teaching. Interviews with teachers showed several reasons that led to the observed decline in usage. The quality of electronic teaching materials (Dinevski et al, 2006), problems with distribution of the materials, difficulties in modifying them and the lack of proper classification are only some of those most often mentioned as being the most important reasons for giving up or stopping such usage (Jakončič-Faganel and Lokar, 2006).

On the other hand, the use and preparation of suitable teaching materials in Slovenia is relatively challenging. A small population (two million) and the obligation to use only native language materials in schools mean that the market is small and the number of potential authors limited.

We therefore have an overwhelming amount of teaching resources in other languages and a lack of suitable ones in the Slovene language (Lokar, 2006). The same problems were also observed in other countries. Problems with quality suggest that the use of national repositories with quality evaluation and/or control may be necessary. But this would mean a significant drop in available resources all over Europe. Thus, an obvious remedy of this situation is to connect repositories and search through all of them. As soon as we try to reduce the number of possible hits, we encounter problems with proper keywords, different age settings in different school systems across Europe, etc., and therefore, the reasons for initiating the CALIBRATE became clear.

4 Main goals of CALIBRATE

CALIBRATE has been set several goals according to the most pressing needs established by the CELEBRATE project. Based on these goals, five work packages were formed.

Classification of teaching resources. School programmes (curricula) in European countries differ significantly, but they mostly cover the same set of topics. For learning resources to be easily accessible, there has to be a way to

search for them based on the curriculum in each teacher's own country. That is, teachers cannot be expected to be familiar with the large variety of school systems across Europe. The task of the first work package is therefore to find the mappings between curricula in several states and create a taxonomy – a set of keywords – with unique mapping to each curriculum.

Learning resource exchange (LRE). As mentioned before, the initial availability of resources is crucial for the success of the project. Since most countries already have their own repositories of learning materials, the natural step is to bring them all together. Most learning resources are accompanied by metadata, which contain a description and data intended to simplify searching. The goal of the LRE is to enable the exchange of this metadata. For this purpose, an international standard format, LOM (learning object metadata), is used; this has been adapted in several minor points to better fit LRE needs. The metadata in the repositories are generally not stored in LOM format. Therefore, every participating country has to provide an interface for searching and converting its metadata to LOM. The EUN office provides the central brokerage system, the necessary federated search system through all the national repositories, as well as basic software support to simplify the connection to the brokerage system.

The initial goal was to have all the metadata available in English. Unfortunately, this is generally not the case. Other projects (e.g. Metadata Ecology for Learning and Teaching (MELT)) have the specific goal of enriching the metadata and providing English translations.

LeMill: a toolbox for adapting and producing teaching resources. To help teachers adapt the learning material to the specific needs of the class and share the adapted content with others, a web-based authoring system named LeMill is being developed. The design and adaptation of learning objects in LeMill is based on the cooperative model of work: the materials are stored on the web server, and every update is instantly available to the whole community. All the resources in LeMill are covered by the Creative Commons share-alike licence (Creative-Commons (CC-SA licence)), which fits such purposes very well. One of the problems that arose is the import of resources from national repositories to LeMill. This is an important part of the CALIBRATE integration, but it requires the imported resources to carry the same CC licence, which is often not the case in the national repositories (they are mostly older than the CC licence).

Despite this, the cooperative model has several advantages, especially considering the international aspects of CALIBRATE. A suggested common scenario is the following: a Slovene teacher finds a resource in the Hungarian repository using the federated search. Based on the description (hopefully in English) in the metadata, she decides that she could use it for her classes. If the resource carries the CC-SA licence, she can import it into LeMill. She connects with a Hungarian teacher from the LeMill community with a request to translate the resource from Hungarian to English (or another language with which they are both familiar). As the last step, she translates it to Slovene and adapts it for the Slovene curriculum. The next time, the situation is reversed – and therefore everybody wins. As a side effect, the quantity of content available in mediatory languages (e.g. English) grows, so no work needs to be duplicated the next time.

Evaluation. The evaluation of the project by a test group of teachers is important, partly to understand the strong and the weak points of our approach, but mainly to create the strategy of how to disseminate the finished product to as wide a group of teachers as possible. The evaluation is currently running in 20 schools in four states. A set of expertly prepared questionnaires will be used to judge the results.

Dissemination. The goal of the project is not only to produce the tools, but also to educate the teachers on how to use them and how to create new resources. We hope to reach the "critical mass" of teachers, which will enable further use to spread on its own.

5 Classification and metadata

The main goal of the CALIBRATE project is to help teachers to find and use teaching materials not only from their own country's repositories but from all over Europe.

The first question that usually arises is: why should they use CALIBRATE in place of Google? Almost all resources available are already indexed by Google, but it is difficult for a text-based search engine to differentiate between a teaching resource about "linear function" and an article that just happens to mention "linear function" in the context of, say, the economy. Then there is the issue of language – standard search engines find many English resources provided that the query is in English. But what about finding an Estonian resource with a Slovene query? In educational repositories, however, metadata is augmented with educational information, with quality evaluations, with copyright information, etc., and therefore, the search can be much more "educationally oriented".

CALIBRATE helps with these issues by using metadata along with the resource. Metadata contains a lot of information that helps the search: a simple description, language-neutral keywords (defined by an international thesaurus), the approximate age at which the subject is taught, etc. A great deal of metadata already exists in the national repositories, and missing pieces are currently being added to them by other projects such as MELT.

An idea that seems to have even more potential is that of curriculum mapping. This is still far from finished, but when operational, a teacher can simply click on the day's lecture in the school programme and obtain all related resources throughout Europe.

With this approach, a teacher can search through repositories in his own language, but the results he obtains are often in a language he does not speak. We hope the community process as described in the paragraph about LeMill will help here. In the future also, solutions based on controlled languages (see Mitamura, 1999, for exam-

ple) could find a place in the development of learning materials.

6 Adapting educational teaching resources

One of the important findings during the evaluation is that resources that are mostly text-based do not fit very well with the needs of CALIBRATE. There are several reasons for this:

- These resources do not "travel well" – they have to be translated into every language to be of any use, and the amount of work needed for translation is in many cases nearly equal to the amount of work needed to create the resource from scratch.
- Teachers have pointed out that the most important benefit they expect from the use of ICT is a way of motivating their pupils – and a text-filled page is just as boring as a schoolbook.
- Almost every school topic is already covered well by Wikipedia, so most teachers will first look there for textual content.

So what are the resources that best fit the philosophy of CALIBRATE? Well-known examples are short movies, simulated experiments and interactive exercises – these contain little text to translate and produce a good motivational effect. Moreover, interactive exercises provide instant feedback, providing the pupil with a better opportunity to learn from his own mistakes while relieving the teacher of the tedious task of correcting.

In our opinion, the heart of the problem is the poor ability to exchange content, as CALIBRATE is all about exchange. The materials in CALIBRATE must work on different computers in different countries and different languages. The teacher has to be able to cut them, translate them and adapt them to this year's curriculum and today's lecture.

7 The validation framework

Evidence about the usefulness of the products is gathered from the schools in two broad areas: the performance of the product itself; and its general value and potential for supporting new models of pedagogy and schooling, content management and organisational change. A common framework for assessing the impact of interventions in school has been made. As can be seen (Calibrate Newsletter 1), it has several dimensions:

Systemic dimension. This concerns aspects of the national schooling system. These aspects, for example, education policy, teacher education, the legal context, the curriculum and external examinations, are largely outside the control of the individual school. Nevertheless, they affect what happens in schools. The project will study results from the other five dimensions and highlight implications resulting from the project that should be communicated to policy-makers.

Institutional dimension. Here we look at the changes brought about by the CALIBRATE project in the school as a whole: changes in teaching, collaboration and sharing good practice, as well as changes in the school's ICT culture and its e-maturity.

Pedagogical dimension. This aspect covers teaching and learning at the individual teacher, student and class levels. The main observation regarding teachers will focus on the impact digital learning resources have on the practice of classroom teaching, mostly on teaching strategies and teaching styles. We will be looking at the methods teachers use to author, adapt, modify and share learning resources. In the area of learning, we will examine four disciplines: Mathematics, Science, Environmental Science and English as a Foreign Language.

Technology dimension. This part mainly deals with how the project results work in practice. This concerns the technical performance of project outputs in real situations. Implications for ICT resourcing in the school, localisation issues, technical support, integration with existing ICT technology and adaptability to the school's needs are examined.

Economic dimension. This component brings together financial issues, e.g. purchase, set-up and usage costs, wider costs incurred and scalability.

Cultural dimension. This is an important but often neglected aspect. It covers issues related to different political and educational cultures across European countries and specific linguistic concerns. Schools will report on cultural aspects of localisation, support for multiple languages and intercultural and trans-national collaboration.

8 Some practical examples

In this section, we present some preliminary snapshots of CALIBRATE and LeMill portals, illustrating principles and features mentioned above.

The main method of searching and conducting the CALIBRATE LRE will be through national portals. However, as interfaces are still in the development stage and there has been a need to evaluate federated searches, a language-dependent entry point for searching the resources through all connected repositories has been made (Picture 1).

When a user tries to search for a certain resource, a search is performed through all interconnected resources. Results are joined and displayed regardless of the language in which the keyword, topics, age group, etc. has been entered in a particular repository. At the present moment, searches can be made on the basis of keywords, subject, age group and language of the resource, but there are no obstacles to developing much more elaborate search interfaces.

For each resource found, the user can be shown relatively elaborate metadata, as can be seen in Picture 2.

As mentioned before, an important part of the CALIBRATE project is the learning toolbox LeMill (Picture 3). LeMill is a web community for finding, authoring and

Picture 1: CALIBRATE search entry point

sharing learning resources. First of all, the user can find a variety of learning resources. She can then use the resources she finds in her own teaching or learning. She can also add her own learning content to LeMill. She may edit her content and combine larger chunks of learning resources from individual media pieces. If she wishes, she may also join available groups producing or editing learning resources.

One of the most important features of LeMill is the idea of the community-performed translation of educational materials. Let's look at a simple scenario.

A teacher performs a search through the CALIBRATE LRE (Picture 4) and finds an interesting resource about linear function that has been already uploaded to the LeMill repository (Picture 5).

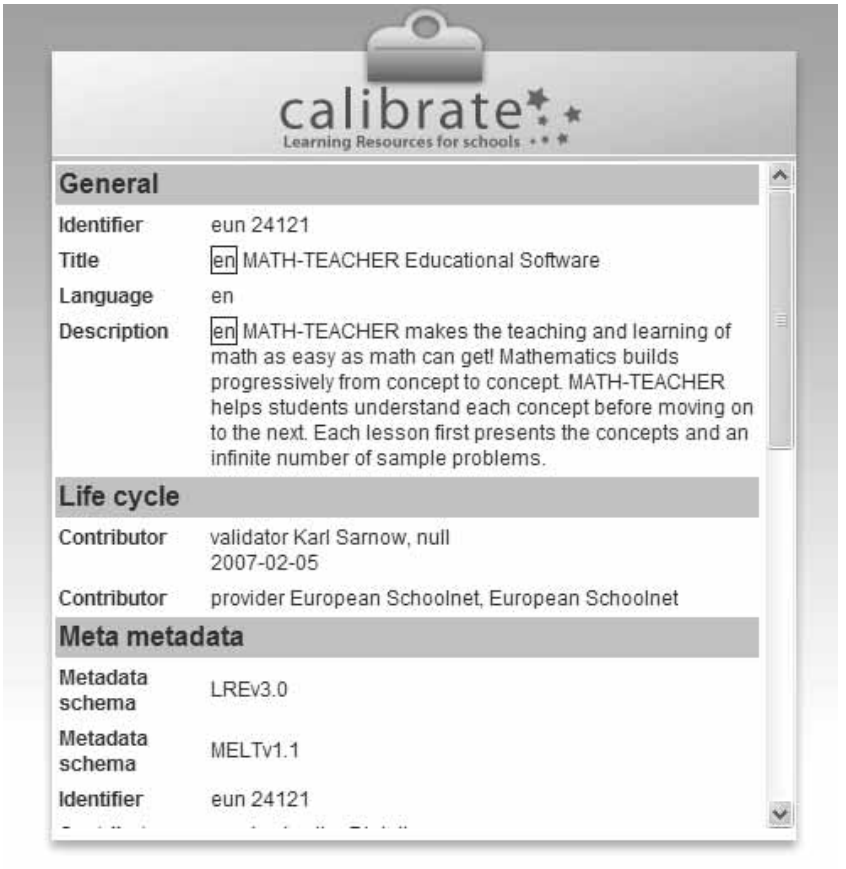
Unfortunately, it is in an Estonian language with which he is not familiar.

As a result, he searches through the LeMill community to find a member who speaks Estonian and is willing to translate the resource into a language with which they are both familiar (Picture 6).

The benefits of this approach are not only in the number of appropriate resources in native languages but also in the establishment of a community of EU teachers.

9 Conclusion

It is expected that the outcomes of the CALIBRATE project could help EU teachers and pupils in their search for suitable electronic teaching resources as well as creating a solid foundation of open-source tools for future repositories. We should not forget, however, that CALIBRATE and similar projects provide only a framework, which each country and partner involved should make the most



Picture 2: CALIBRATE metadata

Picture 3: LeMill

Central & inscribed angle Lesson

Authors: Borivoj Brdicka

Tags: mathematics, geometry, quadrangle, angle, calibrate

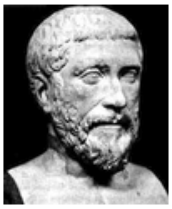
Language: English

Crop circle challenge and patterns

Authors: Ivan De Winne

Tags: math geometry challenge collaboration computer supported

Language: English



Pythagoras ja tema kuulus teoreem

Authors: Vilve Lepik , Martin Sillaots

Tags: pythagoras, täisnurkne kolmnurk

Language: Estonian

MathCast

Authors: Hans Põldoja

Tags: mathematics, equation editor, open source, windows

Language: English

Picture 4: An interesting resource has been found

of through systematic work on the production of electronic teaching resources and on encouraging the appropriate use of it – something which we in Slovenia in the last few years have seriously lacked. If the repositories are not professionally maintained with sufficient support staff, and if there is no systematic action on ensuring quality, even the best tools and guidelines will not help it to move forward.

10 Acknowledgments

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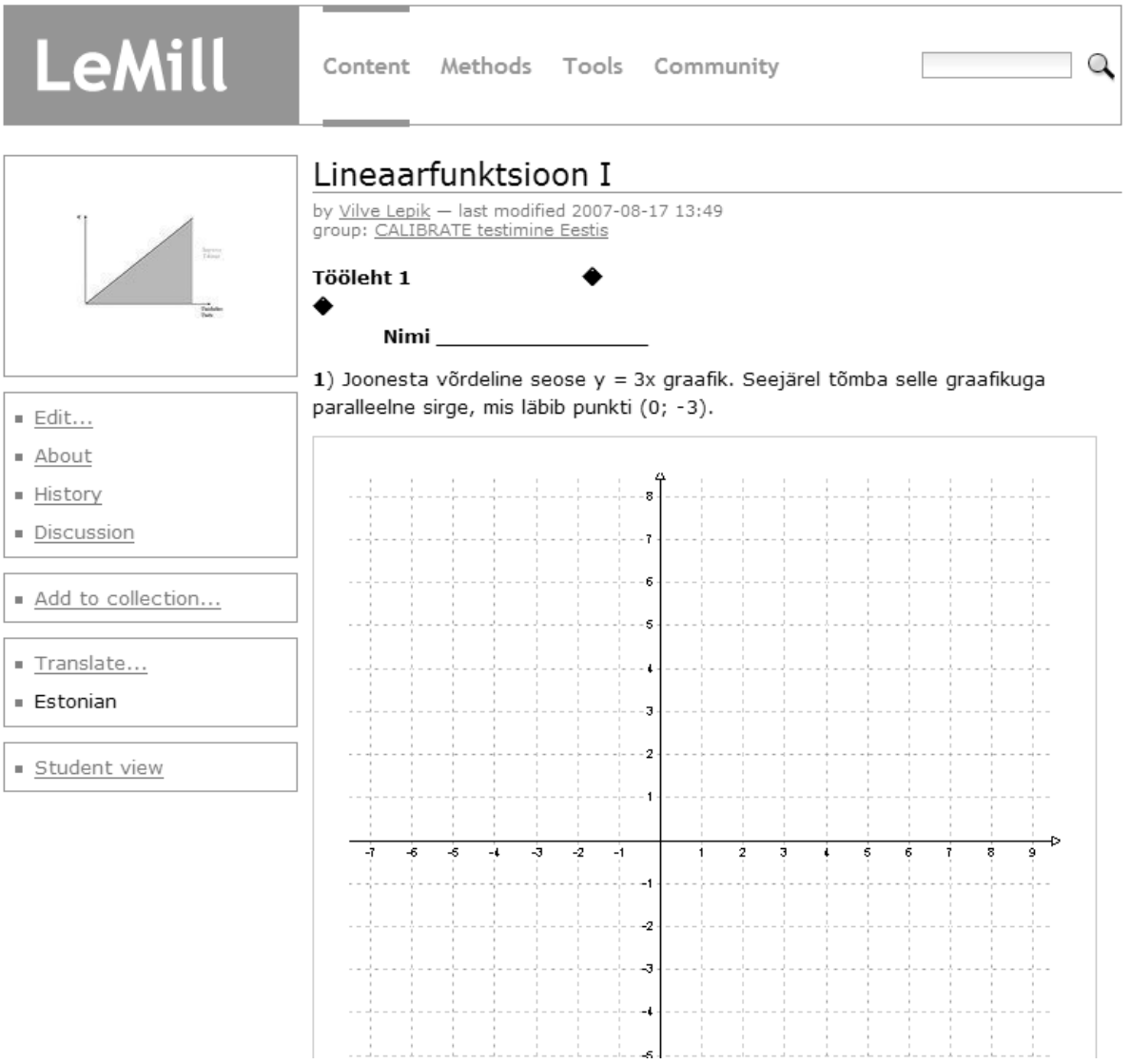

Picture 5: Tool for translation

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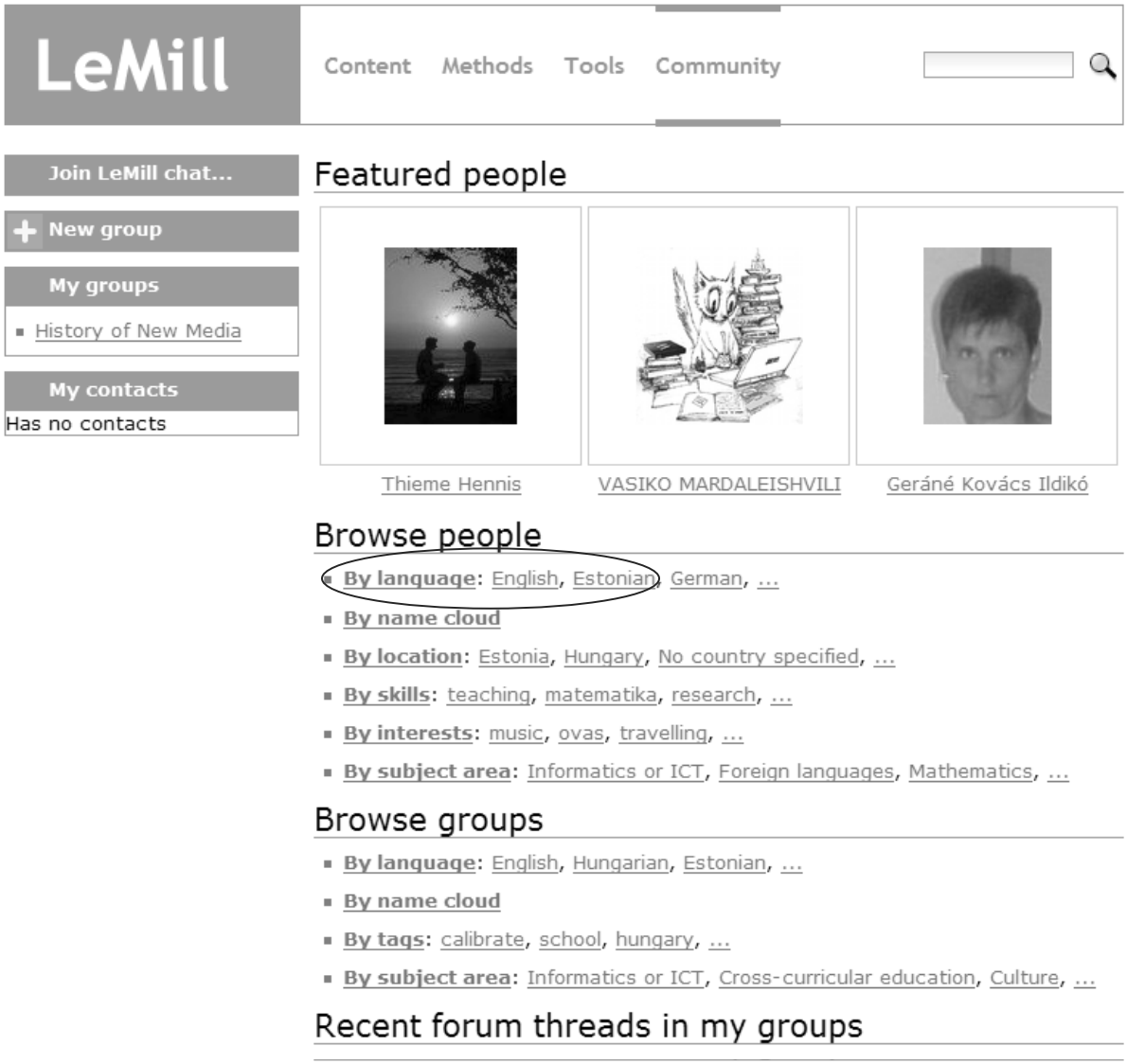

Picture 6: Searching for translators

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ICT Use in Boarding Schools

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Information technology has for some time now been an integral part of education and management processes in boarding schools. New contemporary work methods, used by tutors who are motivated to introduce necessary and inevitable novel methods into pedagogic practices, have been put into effect. In this article, we will list a number of basic skills and knowledge that tutors and headmasters of boarding schools should know. Of course, these skills and knowledge should be known also by other teachers in schools and other institutes, but here we will only mention boarding schools in this article, because they are the focus of our research.
A survey was carried out in boarding schools, searching for the opinions of headmasters and tutors on the advantages and disadvantages of keeping an electronic diary of a tutor's work. The survey searched for eventual weaknesses and strengths of the process that may be important for the introduction and application of innovation in a pedagogic process. At the same time, the attitudes of pedagogic staff on this novel method were also investigated.

Key words: knowledge of ICT, tutors, headmasters, skills, pedagogic process, research, boarding schools

Uporaba IKT v dijaških domovih

Informacijska tehnologija je v sodobnem času sestavni del vzgoje, izobraževanja in menedžmenta v dijaških domovih. Vzgojitelji v dijaških domovih so motivirani, da nova znanja, ki jih ponuja sodobna tehnologija, vključujejo v vzgojno izobraževalni proces. V našem članku prikazujemo rezultate raziskave, s katero smo želeli izvedeti, koliko in katera znanja s področja informacijske tehnologije imajo vzgojitelji in ravnatelji dijaških domov v Sloveniji. Zanimalo nas je tudi, katere vsebine naj bi imel elektronski dnevnik vzgojiteljevega dela, ki se kot inovacija pojavlja v vse večjem številu dijaških domov. Da bi pridobili željene podatke, smo anketirali vzgojitelje in ravnatelje dijaških domov.

Ključne besede: znanje s področja IKT, vzgojitelji, ravnatelji, pedagoški proces, raziskava, dijaški domovi

1 Preface

Slovenia's transition into the European Union demands an adjustment of our educational system with the standards and measures of the EU. The previous eight-year schooling is becoming a nine-year one; changes are also occurring in secondary and higher education. These changes are increasing the competitiveness of offers within the environment and provides new possibilities of education to youths and adults.

ICT (Information and Communication Technology) has its place in our education system. Computers and ICT are used at all levels of education (Gerlič, 2006: 136). Information technology has for some time now been an integral part of education and management processes in boarding schools. In recent years, various forms of electronic diaries of tutors' work have appeared.

This is why we created a questionnaire in the first phase of our project. With this, we have attempted to look at what knowledge and skills from the fields of ICT headmasters and tutors possess and what skills they still need to be offered. Indeed, it is most important that during the process we help tutors to understand and learn how to use the electronic school book and that we ensure the technology is available to them.

Our paper deals with the content, significance, objectives and the advantages and weaknesses of using an electronic diary for a tutor's work (Blyth 1998: 14). The diary is a basic pedagogic document containing legally required data on students, tutors and their work with a pedagogic group and represents as such an important link between the tutors, students, headmaster, adviser, technical staff, school, parents and the rest of the school environment, locally as well as globally. The diary contains daily written notes representing the chronological recording of pedagogical processes. It contains most of the important information on students, on the pedagogical group and on their interactions. The electronic diary is an innovation serving

as a new type of recording pedagogic work and contributes new and more diverse forms and content as it taps into the field of information technology, which offers almost unlimited graphical possibilities. Electronic recording accelerates the registration of data and offers education staff possibilities of creativity, development, professionalism and innovation (Davies, 1998: 165). The electronic form of a diary of a tutor's work accelerates this and increases access to it by authorised staff and those interested in information on a pedagogic group and on individual students, as the data may be conveyed through an intranet and the Internet.

2 Understanding of ICT – knowledge and skills

Boarding schools are increasingly left with unused infrastructure and social, intellectual and cultural assets of its employees. In the new global environment, therefore, boarding-school tutors and headmasters must have knowledge of ICT.

Here, we will list a number of basic skills and knowledge that tutors and headmasters of boarding schools should know. Of course, these skills and knowledge should be known also by other teachers in schools and other institutes, but here we will only mention boarding schools in this article, because they are the focus of our research.

A tutor in a boarding school should be confident in using a wide range of software (Higgins and Packard, 2004: 21):

- word-processing (such as Microsoft Word);
- drawing, painting and image manipulation (Microsoft Paint, Adobe Photoshop, etc.);
- presentation software (such as Microsoft PowerPoint or Apple Keynote);
- spreadsheets and graphing programs (such as Microsoft Excel);
- databases (e.g. Microsoft Access; Claris Filemaker);
- Internet software (e.g. e-mail programs and web browsers such as Internet Explorer, Netscape, Safari).

They will also need to develop skills in using a range of equipment (Higgins & Packard, 2004: 21):

- computers (possibly with a variety of operating systems – Windows, Macintosh, Acorn) and certainly with different versions of operating systems (Windows 2000, XP, skills in using tablet PCs, etc.);
- input devices (e.g. wireless keyboards and mice; keyboards and switches for learners with special needs);
- getting images onto a computer (scanners, digital stills and video cameras);
- output devices (printers, speakers, presentation technologies – such as data projectors and electronic (or interactive) whiteboards);
- control technology (such as temperature sensors or switches controlled by a computer).

It will also not be possible to develop all of this expertise "during" their course. There simply is not enough time. Tutors should therefore try to identify particular areas where they feel a need to concentrate as they undertake their training and build on opportunities as they become available (for example, using an electronic whiteboard if they are in a boarding school or classroom that has one available).

3 Curriculum and ICT

The use of ICT is not a crucial part of a student's dormitory curriculum. At the moment, in Slovenia, a review of the national curriculum is being undertaken, and this is why we think it is a good time to introduce the use of ICT processes into the curriculum. In this way, tutors will need to develop their knowledge of the curriculum and what skills in using ICT are expected for various student age groups.

One of the issues that tutors will have to tackle is learning what software (and occasionally hardware) is appropriate for the various pupil age groups to use. The types of applications that are found in schools are similar to those in the list above and used by adults, but many of them have been adapted and developed for use by younger learners (Higgins & Packard, 2004, 20):

- text handling (RM's TextEase or FirstWord, Microsoft Publisher, etc.);
- drawing and painting (e.g. KidPix (The Learning Company); Dazzle (SEMERC); Colour Magic (RM));
- data handling (spreadsheets such as Number Magic (RM), graphing programs and databases such as Pictogram/Dataplot (Kudlian Soft), PickaPicture (Black Cat), Junior Pinpoint (Longman Logotron), FlexiTree (Flexible), etc.);
- specific curriculum software (programs to teach aspects of mathematics such as LOGO, or appropriate CD-ROMs for history for learners in different age groups);
- specialist software for younger children (such as My World (Granada)), or for special needs (such as Inclusive Writer (Inclusive Technologies));
- other ICT equipment (such as programmable robots, digital cameras, etc.).

ICT is currently undergoing large advances, which is why we have chosen to undertake this survey so that many new knowledge needs in the ICT fields can be met. The tasks of tutors are that they follow these new skills and knowledge so that they can keep up to date with what this knowledge can offer them.

4 Understanding ICT capability

The term ICT 'capability' was first applied to pupils as a way of evaluating how they were developing their understanding of IT in the early days of the national curriculum. Skills and knowledge are not enough, however. Using ICT effectively is also about developing an under-

standing of what technology has to offer (Higgins & Packard, 2004: 67).

For pupils, this is about not just assessing what skills they have been taught but also how they make use of those skills in other contexts. They may have been taught how to alter the size and font of a document, for example, but can they make use of these skills appropriately when designing a poster?

The same concept can be applied to aid our own understanding of how to use ICT in our professional life. It is not just about acquiring skills but also about developing understanding and judgement about how to use those skills appropriately. Once we can use PowerPoint or another presentation software and have access to a data-projector in our classroom, we could create a presentation for each lesson that we teach. However, this would somewhat miss the point about what ICT is useful for. A tutor needs to decide when such a presentation is an effective use of the technology (in terms of what possibilities PowerPoint offers and how we can present information with it), but the teacher also needs to make a judgement about the class or group of pupils that he or she is teaching. It may be, for example, that the tutor has already used a similar presentation the previous day (Higgins & Packard, 2004: 17).

There is then a danger that the children will not find the presentation so compelling. It may be that, though the tutor is teaching and educating young children who may enjoy the spectacle, they may in fact gain little from the content (Černetič & Dečman Dobrnjič, 2006: 89). The tutor thus has to make a decision about *why* this would be better than another teaching technique. At this stage in training, the overlap between what the teacher knows, what they can do with ICT and what they know about the curriculum and opportunities for using ICT, may be limited. The teacher may have used a word-processing software to write essays or letters, for instance, and he or she will therefore be able to see how such software could be used in schools to help children learn to write (particularly in redrafting and improving their writing) without laborious copying out by hand (Chalkey & Nicholas 1997: 105).

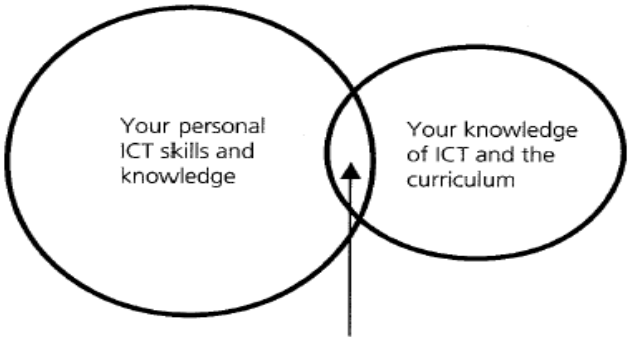

Figure 1: A teacher's initial ICT capability (source: Higgins & Packard, 2004: 17)

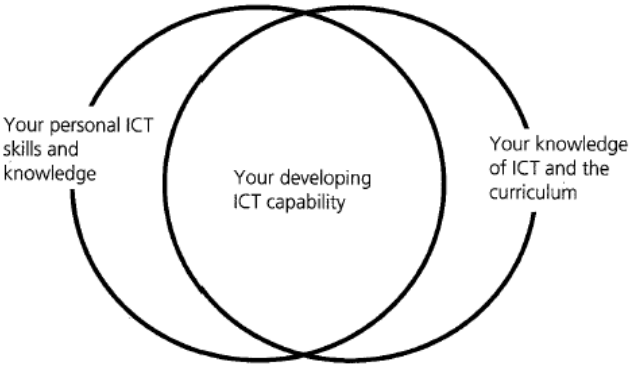

Figure 2: Developing a teacher's ICT capability (source: Higgins & Packard, 2004: 18)

4.1 The QTS skills test

Everyone who wants to be a tutor, a teacher or a headmaster will need skills in ICT. Required skills are (Chalkey & Nicholas, 1997: 106):

1. **general** ICT skills such as
   - finding one's way around the computer; opening programs and files;
   - choosing appropriate applications;
   - copying between files and applications;
   - using the mouse (double clicking, highlighting); printing (and altering print settings);
2. **specific** skills for handling or coping with information:
   - researching and categorising information;
   - using an e-mail program and address book;
   - searching a database (including using precise queries);
   - using a web browser effectively (navigating forwards and backwards and
   - using hyperlinks);
   - finding one's way around a spreadsheet;
   - developing and modelling information:
   - adding records to a database, finding and sorting;
   - using functions and tools in a word processor (inserting pictures, using styles);
   - using a spreadsheet (including basic formulas);
   - organising records or layouts or data and numbers in a spreadsheet;
   - filtering e-mails;
   - moving text, pictures and slides around different programs;
   - presenting and communicating information;
   - displaying and managing text (font, style, layout, margins, etc.);
   - formatting data (including between spreadsheets and tables);
   - managing e-mails (copying, forwarding);
   - preparing a presentation (altering styles, adding buttons, and transitions).

Many of these skills will be those that the teacher can already do or will be able to practise during his or her

course. The teacher should also look to see which he or she may need to work on further (Ainsworth, Bibby & Wood, 1997: 96).

ICT equipment is part of a tutor's working environment and as such it can have positive effects on a tutor's motivation and his or her personal technical knowledge (Dečman Dobrnjič & Černetič, 2005, 406). The required workforce is in place, and human resources managers seek to ensure that people are well motivated and committed so as to maximise their performance in their different roles. Training and development has a role to play, as do reward systems to maximise effort and focus attention on performance targets.

5 ICT skills in the practices of boarding schools – research

Knowledge in fields relating to ICT is becoming more and more important in today's society. Schools that permanently educate their tutors in ICT will therefore become more competitive (Hativa & Cohen, 1995: 402). Technology is not transformative on its own. Schools and boarding schools too can ensure the effective use of educational technology in the classroom and create new learning environments (Anderson, Miloseva & Walker, 2006: 15).

Our goal is innovation – the electronic school book is becoming part of the curriculum at student boarding schools in Slovenia. In the first phase of our study, therefore, we carried out research on ICT knowledge amongst tutors and headmasters of boarding schools.

5.1 Basic Data on Research

Research was carried out into boarding schools in Slovenia. There are 39 boarding schools in Slovenia in which there are employed 240 tutors and 39 headmasters. In February 2007, we sent questionnaires by e-mail to tutors and headmasters and kindly asked them to return the answered questionnaires by e-mail. This is why this research has not been conducted anonymously.

The research is based on the QTS (Qualified Teacher Status) skills test by Davies (1998: 165). The basic issues at the core of our research were

- what skills and knowledge from the fields of ICT do tutors of boarding schools have?
- what skills and knowledge from the fields of ICT do headmasters of boarding schools have?
- what topics should be included in an electronic school book?

The research covered 60 tutors and 39 headmasters of boarding schools in Slovenia. The research was based on the quantitative research paradigm. To achieve an in-depth insight into occurrences, these were combined with the elements of qualitative research. As a method of working, questions were asked as part of a questionnaire. The following were the issues at the centre of the research questions (Davies, 1998: 165):

1. **Basic use of ICT:**
   - Basic operations (opening programs, shutting down)
   - Organising work (saving, managing files and folders)

Table 1: Basic use – Tutors: N = 46; Headmasters: N = 21

Statement: In Using...	I have no use for it	I have no use for it	I am a beginner	I am a beginner	I am confident	I am confident	I am an expert	I am an expert
	F of T	F of H	F of T	F of H	F of T	F of H	F of T	F of H
Basic operations (opening programs, shutting down)...	3	-	-	1	42	-	1	20
Organising work (saving, managing files and folders)...	3	-	-	1	42	18	1	2
Using a network (finding files, saving work)...	3	-	-	1	42	16	1	14

Legend: T – tutors; H – headmasters, N – the number of investigators; F – frequency

- Using a network (finding files, saving work)

2. **Software**
   - Word processing
   - Drawing, painting
   - Spreadsheets and graphing programs
   - Databases
   - Internet software
   - Presentation software
   - Educational software
3. **Equipment**
   - Desktop computer
   - Data projector
   - Printers
   - Digital camera/videos
   - Scanner
   - Electronic whiteboard
   - Control technology

5.2 Analysis of the questionnaire replies

We sent questionnaires with data sheets to tutors and headmasters via e-mail. Tutors returned 46 useful questionnaires and headmasters returned 21. We also received four questionnaires via postal mail.

Most answers were statements of confidence in ICT. But from Table 1, we can see that three tutors do not use the computer. This means that tutors who are not using ICT cannot do their job professionally. All headmasters use computers, however, and most feel they have a basic knowledge of how to use them. Most of them – 14 – also feel that they have expert skills in their use. Only one tutor saw himself as expert.

From the results in Table 1, we can therefore assume that, compared to tutors, headmasters have more knowledge and skills in the use of ICT.

Mioduser, Tur-Kaspa & Leitner (2000: 56) stress the importance of knowledge and use of ICT in education and believe that those who do not use ICT in their work will quickly become non-competitive.

Results from Table 2 show that three tutors do not use the applications and that tutors and headmasters do use databases at their work. Headmasters do have good skills in word processing, internet applications and graphical applications. Only one tutor and headmaster saw himself as expert. Kirkwood (2000: 511) believes that the use of computers and applications show a tutor's development in the fields of ICT.

Table 2: Software – Tutors: N = 46; Headmasters: N = 21

Statement: In Using...	I have no use for it	I have no use for it	I am a beginner	I am a beginner	I am confident	I am confident	I am an expert	I am an expert
	F of T	F of H	F of T	F of H	F of T	F of H	F of T	F of H
Word processing...	3	-	-	1	42	19	1	1
Drawing, painting...	17	-	6	8	22	12	1	1
Spreadsheets and graphic programs...	3	-	12	3	20	17	1	1
Databases (ORACLE, MY-SQL, etc.)...	38	17	6	2	2	1	-	1
Internet software...	12	-	-	2	33	18	1	1
Presentation software (PowerPoint, etc.)...	23	6	2	3	20	11	1	1
Educational software...	17	3	4	1	24	16	1	1

Legend: T – tutors; H – headmasters, N – the number of investigators; F – frequency

Table 3: Equipment - Tutors: N = 46; Headmasters: N = 21

Statement: In Using...	I have no use for it	I have no use for it	I am a beginner	I am a beginner	I am confident	I am confident	I am an expert	I am an expert
	F of T	F of H	F of T	F of H	F of T	F of H	F of T	F of H
Desktop computer...	17	2	2	1	26	17	1	1
Data projector...	20	1	14	1	11	18	1	1
Printers...	3	-	7	1	35	19	1	1
Scanner...	19	2	3	4	13	14	1	1
Electronic whiteboard...	46	20	-	1	-	-	-	-
Digital cameras/video...	32	1	5	6	8	13	1	1

Legend: T – tutors; H – headmasters, N – the number of investigators; F – frequency

Table 3 shows the skills in use for additional equipment. Fewer answers can be found on the use of the electronic whiteboard. No tutors use it, which means that we can say that they do not know how to use it; only one headmaster uses it with his work, but he has only just started to do so.

Most skills are demonstrated regarding printers and very few for digital cameras, scanners and projectors. Sixteen tutors use laptops at home. Twenty headmasters use laptops in their free time, 18 of whom also use printers, 15 use video cameras, 12 use scanners, 6 use projectors and 1 uses the electronic whiteboard. Only one tutor and one headmaster saw themselves as expert in all the statements.

5.2.3 What topics should be included in an electronic school book?

Tutors and headmasters were also asked for their opinion on what topics should be included in an electronic school book. The most frequent answers were the following:

1. *Main topics:*
   - Annual year plan of the whole boarding school
   - Data of students (name, surname, address, parent's phone number, e-mails of student and parents, parents' education, student's interests, etc.)
   - Annual year plan of each tutor
   - Goals of education
   - Educational methods
   - Work with educational groups (monthly workshops, meetings with students, learning hours, other common activities, work with individuals, etc.)
   - Individual education plans for students with special needs and problematic behaviour
   - Interactions of tutors and groups in educational work
   - Continuing field education of tutors for current school year
   - Professional development plan for tutor – current, short-term and long-term
   - Work with parents
   - Cooperation with school: school teachers and school philology
   - Mid-term reports for headmaster
   - Overall year report
2. *Additional topics:*
   - Tutors' and students' interests (goals, plans, realisation and mid-term reports)
   - Implementation of students' and tutors' projects (plans, implementation, evaluation)
   - General activities of tutors and students
   - Summer camps
   - Participation in national and international volunteers projects
   - Dormitory strategies (long- and short-term strategies)

We can also add that an electronic school book would allow tutors to include various types of digital records (digital cameras, internet access, pictures, etc.)

6 Conclusions

Knowledge in the fields of ICT in today's global information society is increasingly becoming a basic necessity for tutors and headmaster. We believe that tutors and headmasters who do not use ICT cannot do their jobs professionally. Our research is based on the QTS test. With this

research, we aimed to gather information on tutors' and headmasters' knowledge and skills in the fields of ICT. We can conclude from the results of this research that skills and knowledge in ICT is greater for headmasters than for tutors. Because of the low frequency of some answers, we can also conclude that tutors and headmasters do not take up every new thing to emerge in the fields of ICT.

We have come to this latter conclusion by the fact that most of them (only one headmaster) do not use the electronic whiteboard. In addition, the answers on database use and the use of projectors and presentation applications show that they do not use as much ICT technology in their work as we would like. It was very rare for tutors or headmasters to judge themselves as experts in the fields of ICT (only two answers).

There is quite a difference amongst answers from tutors and headmaster, and this may be because they were expected to undertake different kinds of work and activities than usual in their work (this also affects financial possibilities on the use of ICT). Nevertheless, we think that, before we start to implement electronic school books into the boarding schools, we will need to educate tutors and headmasters in the skills of ICT.

According to this, the type of educational writing is also changing. One of most important documents in dorm houses is the log of tutors' work – the school book. This research also provided us with a great deal of interesting and useful information on topics that need to be covered in an electronic school book.

This research has provided us with information regarding the insufficient skills and knowledge in ICT of headmasters and tutors in boarding schools. We therefore conclude that the headmasters of boarding schools must carry out strategic management and education policies on how to enlarge the skills and knowledge in the fields of ICT by employers of various methods of and approaches to education.

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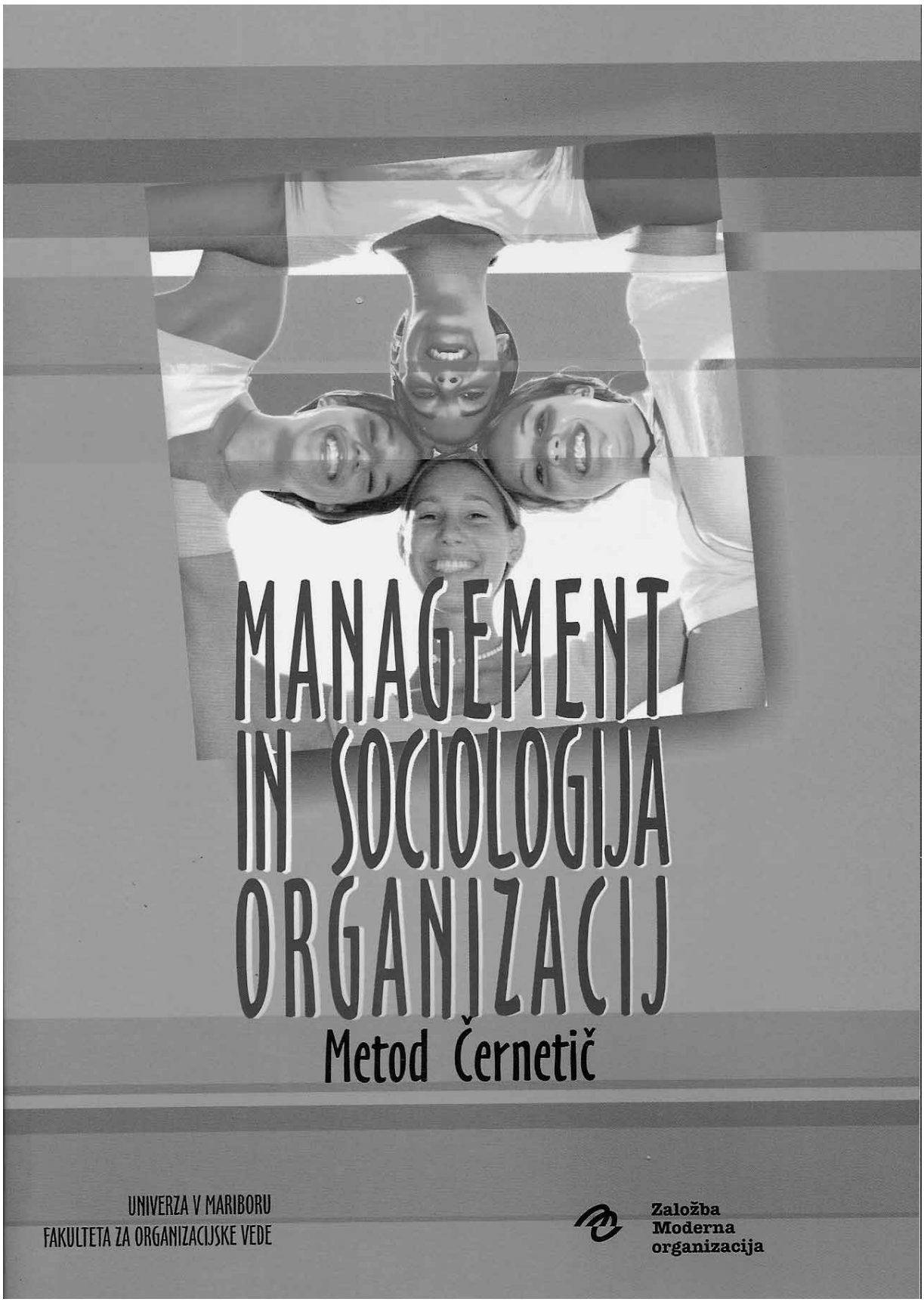
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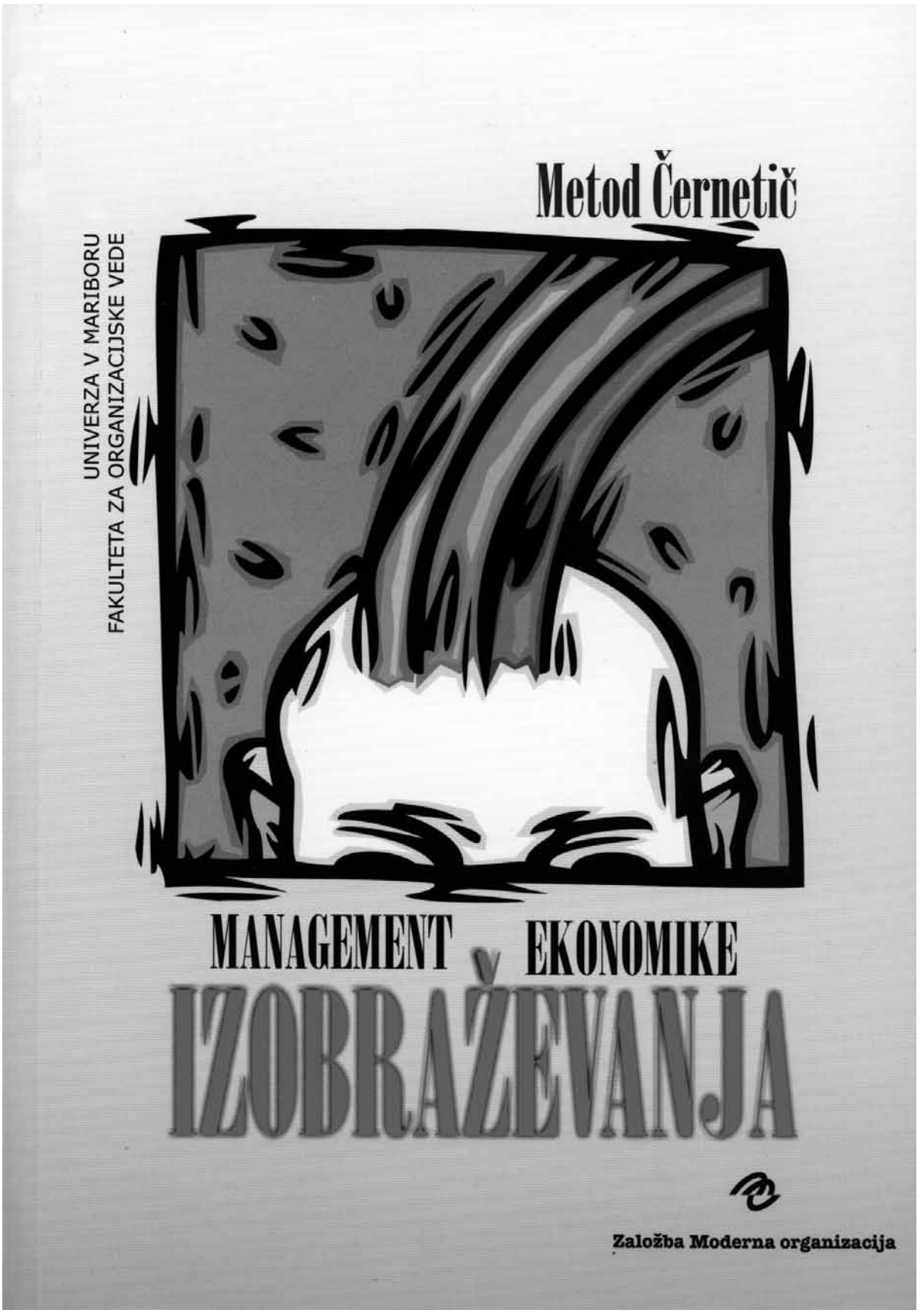
Metod Černetič
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Učni cilji pouka računalništva v osnovni šoli – slovenski in ACM K12 kurikulum

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Z uvedbo devetletke, je računalništvo[1] kot izbirni predmet spet ugledalo luč sveta. Kurikulum za pouk Računalništva še ni bil opredeljen, učbenikov ali delovnih zvezkov za računalništvo ni bilo. V ospredje je prišla ideja o vključevanju informacijsko komunikacijske tehnologije v osnovno šolo, zaradi vedno večje odvisnosti človeka od njene uporabe. Nezadostno poučeni in nepripravljeni učitelji so morali pogosto prirediti učne cilje pomanjkljivim učnim sredstvom in svojemu pomanjkljivemu znanju.
Ker je računalništvo še vedno le izbirni predmet in se ga učenci udeležijo le po lastni izbiri, ga tako površno zastavljen šolski sistem še vedno zadržuje na stopnji krožka in ne priznava nepogrešljive vloge, ki jo ima v današnji družbi.
Medtem je vodilna svetovna strokovna organizacija za področje računalništva in informatike ACM (Association for a Computing Machinery) pričela oblikovati navodila za poučevanje računalništva in informatike od vrtca do konca srednje šole, ki so jih tudi pričeli uporabljati v vrsti držav. Priporočila bi lahko uporabili tudi za opredelitev in prenovo učnih ciljev za poučevanje predmeta v Sloveniji. Postavlja se osnovno vprašanje: »Ali je slovenski kurikulum za Računalništvo sploh dobro oblikovan?«

Ključne besede: kurikulum, K12, IKT, primerjava, prenova

1 Uvod

V ameriškem sistemu javnega šolstva (NCD, 2004a-c) ugotavljajo, da je prednost tehnologije je v tem, da nudi odlično platformo, kjer učenci zbirajo informacije iz več virov in jih nato organizirajo, povezujejo in odkrivajo povezave med dejstvi in dogodki. Takšen skupek orodij za zbiranje informacij in za razmišljanje in izražanje omogoča študentom več različnih pristopov k izobraževanju ter polno uživanje življenja v globalni digitalni in informacijsko osnovani prihodnosti, ki jih čaka. Po drugi strani Zupan (2007) ugotavlja za Slovenijo, da se najmlajše generacije že v otroštvu soočijo z najnovejšimi tehnologijami, zato napredku najlažje sledijo. Tako si je na primer 78% mladih med 16 in 24 letom veščine v zvezi z uporabo računalnika pridobilo v šoli ali na univerzi, medtem ko si je 82% otrok, starih od 10 do 15 let, te veščine pridobilo s samoizobraževanjem in praktičnim delom. Delež samoizobraževanja se zmanjša na 61% pri osebah, starih 35-44 let; 22% te starostne skupine pa si potrebno znanje za delo z računalnikom pridobi z izobraževanjem ob delu oz. na zahtevo delodajalca. Podatki nas opominjajo, da otroci vplivajo na opremljenost gospodinjstev z računalnikom (Zupan, 2007). Natančneje isti vir navaja, da je med gospodinjstvi brez otrok imelo dostop do interneta 47% in osebni računalnik 55% gospodinjstev, za razliko od gospodinjstev z otroki kjer sta številki 75% in 92%. Očitno je, da se mladi veselijo dela z računalnikom in bi bilo potrebno to dejstvo izkoristiti v prid otrokom tako, da bi omogočili vsem učencem dostop do znanja, ki ga bo kasneje od njih zahteval delodajalec. Namreč kar 29% podjetij z 10 ali več zaposlenimi osebami, ki so v letu 2005 zaposlovali osebe, za katere se zahteva računalniško znanje, je pri tem naletelo na težave. Največ teh podjetij, 70%, je imelo težave zaradi pomanjkanja oseb z ustreznim znanjem uporabe računalnika oz. programov, 53% jih je imelo težave zaradi pomanjkanja informatikov (Kačič, 2006).

Ti podatki kažejo predvsem na velik odstotek premalo računalniško opismenjenih oseb v splošni populaciji. Še bolj zaskrbljujoča je nižja udeležba in padec kakovosti uvrstitev na raznovrstnih tekmovanjih iz znanja računalnika – sestavljanje algoritmov, programiranje ipd. (IOI, 1998-2006; ACM ICPC, 2007; ZOTKS, 2007; Tomazin, 2007). Omenjena tekmovanja predstavljajo vrh piramide računalniškega izobraževanja in kakovost vrha je neobhodna za kakovost osnove.

Za računalniško opismenjevanje je pripravljenih veliko različnih tečajev, medtem ko za rabo računalnika ni dovolj poskrbljeno. Ravno zato, ker teh dveh področij

[1] Z izrazom računalništvo v prispevku mislimo na angleški pojem Computer Science, ki se v slovenščino prevaja tudi kot pojem računalništvo in informatika.

(računalništvo kot orodje oz. pripomoček in računalništvo kot stroka) ne ločimo in imamo trenutno premajhen poudarek na rabi računalnika, je nujna sprememba kurikuluma. Pri tem bi se veljalo zgledovati po uveljavljenem ACM K12[2] kurikulumu (Tucker et al., 2007), ki predvideva tudi urjenje zahtevnejših sposobnosti kot je sestavljanja enostavnih algoritmov in programiranje.

2 Šolski kurikulum

2.1 Nekaj o zgodovini

Računalništvo se je pojavilo kot izbirni šolski predmet v slovenskih srednjih šolah ža leta 1971 in postal obvezen v vseh srednjih šolah. V letih svojega razvoja je doživel zelo velike metodološke in vsebinske spremembe (Krapež et al., 2001) – nekatere pozitivne, druge manj. Zaradi teh sprememb smo predmet preimenovali v Informatiko, Računalništvo pa je postalo izbirni predmet v zadnji triadi devetletke.

Že leta 1972 je bilo izdano gradivo za učitelje, leta 1974 pa učbenik za učence. Zaradi pomanjkanja ustrezne opreme je bil pouk pretežno teoretičen, s poudarkom na algoritmih in programskih jezikih (programiranje v Fortranu in Pascalu). V šolskem letu 1980/81 so bile ustanovljene srednje računalniške šole, sredi osemdesetih je k nam prišel programski jezik Logo, ki je našel svoje mesto tudi v šolskih krožkih (Krapež et al., 2001). Celo revija Ciciban (Slenc in Rovtar, 1988) je namenila prostor »risanju z želvico«. Ustvarili smo narečje *LogoS*, s katerim smo, čez ustrezni vmesnik, lahko krmilili igrače-sestave *Fischer Technik* in *Lego*.

Kasneje je Računalništvo in informatika postal obvezen enoletni predmet na vseh štiriletnih srednjih šolah in je zajemal osnove računalništva in informatike, baze podatkov, programiranje in urejanje besedil. Ker predmet ni bil uvrščen med izbirne maturitetne predmete, je zanimanje zanj upadlo (Krapež et al., 2001). Predmet Računalništva in informatike se je počasi umikal iz višjih razredov in tako, v srednjih šolah na Obali, nobena srednja šola nima informatike v svojem programu dlje kot do drugega letnika. Izjema je le Srednja tehniška šola Koper, ki s svojim programom tehnične gimnazije vsebuje tudi predmete Osnove računalniških sistemov, Informatika, Računalništvo in računalniška omrežja ter Laboratorijske vaje (STŠK, 2007).

2.2 Zakaj prenova

Informatika naj bi v srednji šoli predstavljala nadgradnjo predmeta Računalništva iz osnovne šole, vendar je Računalništvo v osnovni šoli le izbirni predmet. Ker Računalništvo ne sodi v sklop obveznih učnih predmetov, morajo učitelji upoštevati predznanje svojih dijakov pri načinu poučevanja. Tako je cilj predmeta Informatika lahko ponovno zgolj informacijska pismenost (Krapež et al., 2001).

Računalniška opismenjenost je nujna, saj je na večini delovnih mest računalnik standardno orodje. Pomagala bo pri zaposlovanju, pri napredovanju na delovnem mestu in nadaljnjem izobraževanju – formalnem in neformalnem (Rosenberg McKay, 2007).

Biti računalniško pismen ne pomeni, da moramo znati uporabljati vso programsko opremo ali znati pisati programe ali povezovati računalnike v omrežja. Potrebno je poznati osnove, kot je na primer shranjevanje in odpiranje dokumentov, uporaba urejevalnika besedila, prebiranje e-pošte ipd. (Rosenberg McKay, 2007). Tako so na voljo številni začetni in nadaljevalni tečaji za računalniško opismenjevanje, ki jih ponujajo različni zavodi, zasebne šole in podjetja. Tudi preko spleta so na voljo številni tečaji – elektronske šole (Sawyer, 2005; Tenbusch, 1998; Internet4Classrooms, 2007), in strani za samopreverjanje osvojenega znanja (Ledbetter, 2007; Sawyer, 2005). S spleta prenesemo na računalnik izobraževalno programsko opremo za samostojno učenje (npr. K-12 software, 2007; WIMS, 2007), izobraževalne računalniške (Macaulay, 1998) in spletne (Kindersite, 2007) igre – govorimo o *edutainment*-u (*Linux4Kids*) za zabavno učenje. Najpogosteje ponujeni računalniški tečaji so tisti, s katerimi se naučimo uporabe urejevalnikov besedil, oblikovanja preglednic, upravljanja z bazami podatkov, izdelave predstavitev in uporabe telekomunikacij ter interneta. Vsebina teh tečajev je že vsebovana v ACM kurikulumu, v slovenskem pa manjka upravljanje z bazami podatkov. Zakaj torej ne bi poskrbeli za osnovno opismenjenost že v osnovni šoli?

Ker je Računalništvo le izbirni predmet, velik delež otrok zaključi osnovno šolanje premalo poučeni o računalniku in njegovi rabi predvsem glede na potrebe delovnega trga in vsakdanjega življenja. Po drugi strani analize kažejo, da je Računalništvo med najbolj priljubljenimi izbirnimi predmeti, saj se zanj odloči povprečno 75% učencev (Krapež et al., 2001). Posledica obeh ugotovitev je potreba in utemeljitev, da se Računalništvo in informatiko uvede kot obvezni učni predmet v osnovni šoli.

Na ta način bi se v srednji šoli znanje nadgrajevalo (predvsem v tehnično in naravoslovno usmerjenih srednjih šolah). Pospešeno bi prešli na osvajanje zahtevnejših veščin (sestavljanju algoritmov, programiranju, ustvarjanju in upravljanju podatkovnih baz), ki bi ponovno postavile dovolj dobre temelje za razumevanje snovi pri nadaljnjem študiju. Pred tem je seveda nujno na novo spremeniti koncepcijo izobraževanja, opredeliti cilje, metode poučevanja in učenja. Naj ne bo cilj le v maturitetnem predmetu, temveč v sistematičnem povezovanju prizadevanj od vrtca, preko osnovne šole in srednje šole do univerze. Le na ta način je možno zadovoljiti potrebi po kakovostni računalniški pismenosti.

[2] K12 pomeni Kindergarten to 12th grade.

2.3 Primerjava ACM K12 in slovenskega kurikuluma

Prva velika razlika med slovenskim (Batagelj et al., 2002) in ACM K12 kurikulumom (Tucker et al., 2007; NCD, 2004a-c) je vsekakor v časovnem obdobju, ki ga pokrivata in drugih vsebinah, ki naj bi jih v teh obdobjih usvojili oziroma ciljih, ki naj bi jih dosegli. Gerlič (2005) ugotavlja zaskrbljujoče dejstvo, da na več kot polovici (53,9%) osnovnih šol samo 10% učiteljev aktivno skrbi za razvoj uporabe IKT (na 4,2% osnovnih šol pa 0% učiteljev). Na nadaljnjih 31% osnovnih šol samo od 20% do 30% učiteljev, kljub temu da je več kot polovica (69,4%) učiteljev in šol seznanjena z možnostmi dodatnega izobraževanja oz. spopolnjevanja za uporabo IKT pri poučevanju in učenju predmeta in kljub prizadevanju Ministrstva za šolstvo in šport za računalniško opismenjevanje šolskega kadra, opremljanje šol z razno računalniško in informacijsko strojno in programsko opremo (projekt Šolski tolar). Celotno stanje daje občutek, da bo ostala tehnološka pismenost naših učencev še nekaj časa precej oddaljena prihodnost.

Takemu ravnanju se zoperstavljajo ideje ACM kurikuluma, saj ta jasno opredeljuje učne cilje, ki jih mora učenec doseči v vsaki triadi oziroma celo posebej v vsakem razredu. Namreč tudi ACM kurikulum je oblikovan tako, da omogoča tehnološko opismenjevanje preko integracije učnih ciljev v pouk različnih šolskih predmetov. ACM kurikulum je bil oblikovan ob ideji, da se osebo usposablja za uporabljanje tehnologije tako, da svoje spretnosti razvija postopoma, preko aktivnosti na raznovrstnih področjih izobraževanja, ne pa s posluževanjem po specifičnih tečajih (NCD, 2004a-c). Pouk računalništva po ACM kurikulumu poteka vseh devet let šolanja v osnovni šoli. Po Thorndikejevem poskusu z mačko (Musek in Pečjak, 1997:140) vemo, da je zaradi tega, ker se izobraževanje razteza skozi obdobje devetih let in se tako pojmi in razumevanje pomena le-teh konstantno obnavljajo, njihovo pomnjenje olajšano.

V grobem se *K12 standardni tečaj za pridobitev računalniških/tehnoloških spretnosti*[3] na razredni stopnji osredotoča na bistvene veščine in spretnosti, na predmetni stopnji pa se te nadgrajujejo in izpopolnjujejo tako, da jih učenci uporabljajo v raznih projektih in pri reševanju nalog. V devetem razredu naj bi učence pripravili na uspešno opravljanje male mature. Po drugi strani slovenski kurikulum *deli* učne vsebine na *minimalne*, *temeljne* in *zahtevnejše*, ACM kurikulum obravnava računalniško in tehnološko opismenjevanje kot *celoto* in se kvečjemu *osredotoča* na pomembnejša področja (*Focus Areas*), ki predstavljajo temelje za nadaljnje učenje. Slovenski osnovnošolski kurikulum cilje računalništva *razvršča v tri sklope*: *osnove informatike in računalništva*, *obdelava podatkov in komuniciranje z uporabo informacijske tehnologije* ter *programiranje*. Slednji sklop se izvaja le kot dodatna vsebina, odvisno od zanimanja in predznanja. Poleg tega slovenski kurikulum snov računalništva oblikuje v tri med seboj *neodvisne učne teme*: *urejanje besedil*, *računalniška omrežja* in *multimedija*.

ACM kurikulum oblikuje tri vsebinsko povezane celote, kjer posamezna enota nadgrajuje znanje prejšnje enote. Vsaka vsebinska celota vsebuje tri ključne učne cilje: a) *razumevanje težav, ki jih prinaša in so odvisne od družbe, ki je tehnološko osnovana ter etično obnašanje pri uporabi računalnika in druge tehnologije*; b) *obvladanje znanja in spretnosti pri uporabi računalnika in druge tehnologije* ter c) *znanje pri uporabi različne tehnologije za dostop do informacij, za njihovo analizo, interpretacijo, sintetizacijo, uporabo in sporazumevanje*. Ključni cilji so podrobneje opredeljeni in vsebinsko opisani za vsak razred posebej, pri čemer je tudi vsaka vsebina dodatno opredeljena v šest kategorij (*socialno/etična problematika*, *podatkovne baze*, *preglednice*, *uporaba tipkovnice/urejanje besedil/namizno založništvo*, *multimedija/predstavitev*, *telekomunikacije/internet*).

V prvi triadi teži ACM kurikulum k doseganju prvih dveh učnih ciljev. Prvi je osredotočen na razumevanje pomena tehnologije v družbi, upravljanje z informacijmi, vpliv tehnologije na družbeno varnost, in uporabo pridobljenih izkušenj za zadovoljevanje lastnih potreb. Drugi pa je osredotočen na uporabo enostavnih računalniških operacij in programov, ki učencem omogočajo samostojno delo, na uporabo tipkovnice, na oblikovanje besedila, preglednic in na uporabo multimedijskih izdelkov. Za osvajanje tretjega učnega cilja, ki predvideva uporabo računalniškega znanja in pridobljenih spretnosti ter poznavanja tehnologije, podrobno analiziranje informacij in oblikovanje baz podatkov, preglednic in diagramov ter posredovanje teh informacij, pa imajo učenci v prvi triadi še premalo znanja in izkušenj.

V slovenskem kurikulumu je zapisano, da je eden od ciljev tudi pravilna in natančna uporaba izrazov, bogatenje besednega zaklada in skrb za pravilno slovensko izražanje. ACM kurikulumu vsebuje natančno izdelan slovar izrazov, pojmov in simbolov, katere umesti v eno izmed šestih vsebinskih kategorij ter v obdobje njihovega obravnavanja.

Dalje, v slovenskem kurikulumu je nazornost kodiranja podatkov opredeljena kot eno od meril za dodelitev ocene izdelku, a je po drugi strani programiranje le dodatna vsebina. Med drugim, področje programiranja, v operativnih učnih ciljih, ne moremo povezati z nobenim splošnim učnim ciljem slovenskega kurikuluma. Kako lahko potem v okviru multimedije, v devetem razredu, kot edino zahtevnejše znanje opredelimo pisanje algoritmov, ki rešijo zahtevnejši problem ali celo izdelavo in spremembo računalniškega programa?

Če bi uporabljali ACM kurikulum, to ne bi bilo tako nenavadno. Tam se že v prvi triadi učenci naučijo, kako s pomočjo ničel in enic predstavimo informacije, v drugi triadi kako razumeti delovanje nekaterih algoritmov, v tretji kako uporabljati različne strategije za reševanja nalog.

[3] K-12 Computer/Technology Skills Standard Course of Study

Poleg vsega naštetega naj še pripomnimo, da vsebina teme *računalniška omrežja*, v slovenskem kurikulumu, nima ravno veliko povezave z omenjeno temo. Večina vsebin se namreč ukvarja s pisarniškimi programi in z izdelavo spletnih strani, kar bolj pripada sklopu *urejanja besedil* in *multimedije*. ACM kurikulumu na tem področju govori o omrežnem usmerjevanju, o fizični povezavi omrežij, o omrežni varnosti ipd. V resnici se prvo leto ukvarjajo učenci s spoznavanjem osnovnih pojmov za uporabo računalnika, kar bi lahko poimenovali *uvod v računalništvo* in se šele drugo leto učijo *urejanja besedil*.

Končna ugotovitev je, da ACM kurikulum pokriva takorekoč vse cilje slovenskega kurikuluma. Izrecno nista v ACM učnih ciljih opredeljeni področji, kot sta estetsko oblikovanje informacij in krepitev pozitivne samopodobe.

Po ACM kurikulumu morajo učenci ob zaključku prvega triletja znati (NCD, 2004a):

1. za uspešno rabo računalnika uporabljati vhodne naprave (na primer miško, tipkovnico, daljinski upravljalnik) in izhodne naprave (na primer zaslon, tiskalnik) ter videorekorder, zvočne kasete in drugo tehnologijo;
2. uporabljati različne medije in tehnološke vire za vodeno in samostojno učenje;
3. se pravilno izražati z uporabljanjem primernih in natančnih izrazov;
4. uporabljati primerne multimedijske vire (na primer interaktivne knjige, izobraževalno programsko opremo, osnovne multimedijske enciklopedije) za podporo pri učenju;
5. delati v skupini, sodelujoč med sabo, z družino in drugimi, ko uporabljajo tehnologijo v razredu;
6. prikazati pozitivno družbeno in etično obnašanje, ko uporabljajo tehnologijo;
7. odgovorno uporabljati tehnološke sisteme in programsko opremo;
8. ustvariti primerne multimedijske izdelke s podporo učiteljev, družinskih članov in sošolcev;
9. uporabljati tehnološke vire za reševanje problemov, komunikacijo in predstavitev zamisli, idej in zgodb – na primer programe, ki spodbujajo logično mišljenje, digitalne kamere, orodja za risanje in za pisanje;
10. zbirati informacije in se sporazumevati z drugimi z uporabo telekomunikacijskih sredstev, s podporo učiteljev, družinskih članov in sošolcev.

Te kompetence deloma pokriva snov urejanja besedil v slovenskem kurikulumu. Razlog je v tem, da učenci, ki obiskujejo prve tri razrede, še nimajo dovolj znanja, da bi lahko opravili vse dejavnosti in dosegli vse omenjene cilje.

Učenci, ki zaključijo drugo triletje šolanja, morajo po ACM kurikulumu znati (NCD, 2004b):

1. uporabljati tipkovnico in druge običajne vhodne in izhodne naprave učinkovito in uspešno;
2. kako se vsakodnevno uporablja tehnologija in poznati njene prednosti in slabosti;
3. opredeliti osnovno problematiko odgovorne uporabe tehnologije in poznati posledice ob neprimerni uporabi le-te;
4. uporabljati računalnik in dodatna tehnološka sredstva, ki izboljšajo delovno produktivnost, ublažiti ali odpraviti težave, ki jih imajo zaradi pomanjkanja določenih spretnosti in olajšati učenje veščin, ki so opredeljene v kurikulumu;
5. uporabljati tehnološka sredstva za samostojno in skupinsko ustvarjanje prispevkov, predstavitev in komuniciranje v razredu ali s širšim občinstvom;
6. učinkovito uporabljati telekomunikacije za dostop do informacij širom po svetu, za komunikacijo z drugimi in v podporo vodenega in samostojnega izobraževanja ter za doseganje osebnih ciljev;
7. uporabljati multimedijska sredstva (kot so na primer elektronska pošta, forumi, digitalne kamere, itd.) za sodelovanje pri reševanju problemov, ki se tičejo ustvarjanja rešitev in izdelkov, ki služijo razredu in širši okolici;
8. uporabljati tehnološka sredstva, kot so kalkulatorji, video kasete in izobraževalna programska oprema, za reševanje problemov, samostojno učenje in pri drugih izobraževalnih aktivnostih;
9. določiti, katera vrsta tehnologije je uporabna, in izbirali primerna orodja in tehnološka sredstva, s katerimi se bodo lotili opravljanja nalog in reševanja problemov;
10. vrednotiti natančnost, ustreznost, primernost, razumljivost in pristranskost elektronskih virov informacij.

Opisane kompetence pokrivajo minimalno in temeljno zahtevano znanje v sklopu teme *urejanje besedil* in *računalniška omrežja* iz slovenskega kurikuluma.

Ob zaključku osnovnega šolanja, pa morajo učenci, po ACM kurikulumu, znati (NCD, 2004c):

1. uporabljati različne strategije za prepoznavanje in reševanje običajnih vsakodnevnih težav s strojno in programsko opremo;
2. pokazati poznavanje sprememb v informacijski tehnologiji in posledice, ki jih te spremembe prinašajo na delovnem področju in v družbi;
3. pokazati etično in zakonito obnašanje ob uporabi informacij in tehnologije in razpravljati o posledicah zlorab;
4. uporabljati orodja, ki so specifična za določeno vsebino, programsko opremo in simulacije v podporo učenju in raziskovanju;
5. uporabljati multimedijska in drugačna orodja v podporo osebni produktivnosti, sodelovanju v skupini in ob učenju ob različnih vsebinah kurikuluma;
6. oblikovati, razviti in predstaviti širši javnosti nek izdelek z uporabo takih tehnoloških sredstev, ki dokazujejo poznavanje koncepta kurikuluma razredu in ostalim interesentom;
7. sodelovati s člani oblikovane skupine, s strokovnjaki in ostalimi z uporabo telekomunikacijskih orodij za raziskavo izobraževalnih problemov, težav in informacij ter oblikovati rešitve teh problemov za razred in ostale interesente;
8. izbirati primerna orodja in tehnološka sredstva za izvrševanje nalog in reševanje problemov;
9. pokazati poznanavanje pojmov, ki so povezani s strojno in programsko opremo, algoritmi in njihovo praktično uporabo;

10. poiskati in ovrednotiti natančnost, ustreznost, primernost, razumljivost in pristranskost elektronskih virov, ki posredujejo informacije o zunanjem svetu.

Ob koncu šolanja torej ACM kurikulum pokrije vse minimalne in temeljne učne cilje slovenskega kurikuluma. Če pregledamo celoten obseg ACM kurikuluma, lahko izluščimo še vsebine, ki v slovenskem kurikulumu predstavljajo zahtevnejše znanje in jih ta uvršča v področje programiranja. Če pregledamo končno poročilo ACM delovne skupine (Tucker et al., 2007), zasledimo primer aktivnosti, ki naj bi spodbujala osnovno razumevanje pojma algoritem, z imenom »*The orange game*« (Igra s pomarančami). V tej igri učenci druge triade obdelajo enostaven algoritem za omrežno usmerjanje. Vsak učenec ima na svoji majčki zapisano različno število in vsak od otrok ima v vsaki roki eno oštevilčeno pomarančo, razen enega otroka, ki ima eno roko prosto. Za vsakega od otrok obstajata natančno dve pomaranči z njegovim številom. Otroci sedijo v krogu in si morajo podajati pomaranče (podaja poteka samo med otrokom s prazno roko in enim od njegovih sosedno sedečih sošolcev) toliko časa, dokler vsak ne drži v rokah pomaranči s svojim številom. Namreč vsak usmerjevalnik ima omejeno zmožnost prejemanja in pošiljanja podatkov in je zato pomembno, da se delo porazdeli med različnimi usmerjevalniki.

Piaget (Musek in Pečjak, 1997:158) pravi, da predvsem dva procesa pripomoreta k pomnjenju in osvajanju znanja – asimilacija in akomodacija. Bistvo asimilacije je v tem, da nek dogodek ali predmet umestimo v že pridobljeno miselno shemo (prilagajanje okolja človeku - otrok dešifrira dogodek na podlagi elementov, ki jih že pozna), bistvo akomodacije pa je v spremembi načina razmišljanja tako, da omogočimo razumevanje in sprejmemo novo znanje, s pomočjo novih izkušenj (prilagajanje človeka okolju - če ima otrok težave v razumevanju določene snovi, bo moral, na podlagi novih izkušenj, preiti na drugačen način razmišljanja). Ta dva procesa se izmenjujeta zaradi konstantnega iskanja ravnotežja – ko se učimo nekega novega pojma, tega najprej ne znamo interpretirati, zato je otrok v stanju neravnovesja in poskuša priti do ravnovesja s tem, da spreminja način razmišljanja in k temu vključi nova spoznanja.

ACM kurikulum predvideva, da otrok različna znanja v zvezi z računalnikom in tehnologijo pridobiva v okviru različnih predmetov, tudi različnih od Računalništva. Kakor pravi Papertovo načelo (*Papert's principle*) (Wikipedia, 2007): »Nekateri izmed najbolj odločilnih korakov v razvoju mišljenja temeljijo, ne le na pridobivanju sposobnosti, ampak na uporabi osvojenega znanja na drugih področjih.« Otroci razvijejo nekakšno sproščenost in domačnost do tehnologije, ki jih spremlja v učnem procesu.

3 Za konec

V prispevku smo pokazali na nujnost kurikularne prenove. Oblikovati moramo kurikulum, ki bo prepoznal ključno znanje in veščine ter dejstvo, da morajo biti vsi študenti aktivni ter vključeni v vseživljenjsko učenje v tehnološko intenzivnem okolju. Tehnologija se namreč hitro razvija in spreminja ter nam ponuja dnevno novo izboljšano in naprednejšo opremo. Kurikulum bi moral biti zastavljen tako, da bi oblikoval temelje za trajno učenje in da bi se primerno prilagodil spreminjajoči se tehnologiji in inovacijam.

Uspešna integracija tehnologije za podporo učnim ciljem je odvisna od več dejavnikov. Prvi je vizija in vodstvo za uspešno izvedbo in dolgoročen uspeh. Nato dostop do programske in strojne opreme, dostopnost te opreme v učnem okolju, čas in spodbuda za podporo dodatnega izobraževanja za učitelje ter čas za načrtovanje učinkovite integracije v nove in obstoječe kurikulume. Potreben je čas za pregled in vrednotenje novih tehnologij in virov in finančna podpora za vzdrževanje tehnološke infrastrukture.

Prav tako je integracija odvisna od jasne predstave o tem, kaj lahko na posamezni stopnji pričakujemo in kaj moramo zahtevati. V ACM kurikulumu se raziskuje več različnih stopenj učenja računalništva preko vseh K12 let. Jasno je, da karkoli dosežemo v srednji šoli, je odvisno od zmožnosti dostopa do tehnologije za učenca in od dosežkov računalniško podprtega učenja v osnovni šoli. Če osnovne šole opremijo učence z osnovnim znanjem, bodo šole višje stopnje učinkoviteje izvajale zahtevnejše programe računalništva.

Nekaj, česar ne moremo razumeti, je dejstvo, da kljub ogromnemu številu odprtokodnih programov in drugačnih odprtokodnih pripomočkov ter projektov za uvajanje Linuxa v šole, ne slovenski ne ACM kurikulum ne posvečata zadostno pozornost osveščanju svojih učencev o odprtokodni tehnologiji.

Menimo, da potrebuje slovenski kurikulum preporod in svetujemo, da ne izumljamo izumljenega, temveč enkrat napravimo tako, kot to naredijo običajno v tujini – uporabimo že zelo dodelan ACM kurikulum in ga samo nekoliko prilagodimo našim potrebam.

Ker nujno potrebujemo več računalniškega znanja, računalniško izobražemega kadra, moramo misliti na ustrezne vsebine že od začetka osnovne šole. Vemo, da je na vsakem področju izobraževanja določen osip učencev, posebno na področju naravoslovja in tehnike.

Če pa tudi to ni zadosten razlog, da bi Računalništvo postalo obvezen učni predmet, pomislimo, koliko učencev, ki ne bo nadaljevalo šolanja po osnovni šoli, bo potrebovalo tečaj računalniškega opismenjevanja.

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E-uprava: Kaj pričakujejo od nje slovenska podjetja?

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Pričujoči prispevek predstavlja rezultate raziskave, katere namen je bil ugotoviti stopnjo uporabe storitev e-uprave s strani slovenskih podjetij, njihovo zadovoljstvo z obstoječo ponudbo in mnenja glede prihodnjega razvoja e-uprave v Sloveniji. Po predstavitvi rezultatov sorodnih raziskav, so predstavljeni rezultati raziskave, opravljene na Inštitutu za informatizacijo uprave v začetku leta 2006. Rezultati razkrivajo, da je večina anketiranih podjetij sicer že uporabila vsaj eno upravno e-storitev, vendar pa je nabor uporabljenih storitev bolj skop, pa tudi zadovoljstvo s temi storitvami ni na najvišji ravni. Kot kaže, bi podjetja k pogostejši uporabi e-uprave najbolj spodbudili hitrejši postopki v primerjavi s klasičnimi ter možnost, da se pri uporabi e-storitev lahko kadarkoli obrnejo na osebo za pomoč. Na koncu v ospredje postavljamo najzanimivejše rezultate raziskave, ki jih skušamo primerjati z rezultati sorodnih raziskav in podamo nekaj napotkov za nadaljnji razvoj slovenske e-uprave.

Ključne besede: e-uprava, upravne e-storitve podjetja, uporaba, zadovoljstvo, mnenja glede prihodnjega razvoja e-uprave, pričakovanja

1 Uvod

Po nekaj začetnih letih evforičnega navdušenja nad možnimi koristmi e-uprave, počasi prehajamo v bolj zrelo razvojno obdobje, v katerem lahko ob upoštevanju dosedanjih izkušenj bolj objektivno ovrednotimo dosedanje dosežke in učinke na poslovanje organizacij, slabosti dosedanjega razvoja kakor tudi do sedaj še neizkoriščene priložnosti. Javna uprava je za veliko število podjetij eden od najpomembnejših 'poslovnih' partnerjev, zato ni nobenega dvoma, da e-uprava potencialno prinaša v poslovanje podjetij z javno upravo celo vrsto poenostavitev, ki lahko pomembno vplivajo na zmanjševanje stroškov poslovanja, skrajševanje poslovnih ciklov in posledično večjo učinkovitost. V ta namen pa potrebujejo podjetja upravne e-storitve, ki bodo v kar največji meri izkoriščale razvojne potenciale IKT in prinašale ustrezno dodano vrednost v primerjavi s klasičnimi upravnimi storitvami.

Dosedanji razvoj e-uprave v svetu in pri nas ravno v tem pogledu izkazuje vrsto pomanjkljivosti. V prvem razvojnem obdobju, nekje od leta 2000 dalje, so skušale organizacije javnega sektorja po svetu in pri nas slediti razvoju e-poslovanja v zasebnem sektorju ter v čim krajšem času zagotoviti največji možni nabor upravnih e-storitev za občane in podjetja. Pri tem je bilo premalo pozornosti namenjeno sistematičnemu izboru storitev glede na potrebe in pričakovanja njihovih uporabnikov, prav tako pa tudi kakovosti njihovega razvoja. Tako je ponudba e-storitev relativno naglo naraščala, kot se je kasneje izkazalo pa njihova uporabna vrednost ni dosegla pričakovanj. Posledica takšnega razvoja je, da uporaba upravnih e-storitev danes močno zaostaja za njihovo ponudbo.

Tudi v Sloveniji je bila storjena ista napaka. Glede na meritve iz leta 2006 (CapGemni, 2006) se Slovenija v okviru EU uvršča po razvitosti ponudbe e-storitev na visoko sedmo mesto, ko pa podrobneje pogledamo podatke o njihovi dejanski uporabi, je slika, kot bomo prikazali v prispevku, veliko manj bleščeča. Razlogi za ta velik razkorak med 'ponudbo' in 'povpraševanjem' po storitvah e-uprave so nedvomno v tem, da je šel razvoj storitev v veliki meri mimo dejanskih potreb in pričakovanj njihovih uporabnikov.

Namen pričujočega prispevka je konkretneje osvetliti pričakovanja in zadovoljstvo slovenskih podjetij z dosedanjim razvojem e-uprave. Pri tem se bomo v prvi vrsti naslonili na izsledke obširne empirične raziskave, ki smo jo izvedli na Inštitutu za informatizacijo uprave v letu 2006 in ki je bila v celoti namenjena analizi zadovoljstva in pričakovanj uporabnikov z e-upravo v Sloveniji. Čeprav smo v raziskavi analizirali različne skupine uporabnikov e-uprave (Vintar et al., 2006), se bomo zaradi omejenega prostora v tem prispevku omejili le na tisti njen del, ki se ukvarja s podjetji. Rezultate naše raziskave bomo soočili tudi z izsledki podobnih raziskav iz tujine.

2 Pregled sorodnih raziskav

Za razliko od raziskav, ki se osredotočajo na občane (npr. Berner Fachhoschule & Unisys, 2006; eUser, 2005;

AGIMO, 2005; Accenture, 2004; MORI, 2004), so raziskave, ki merijo uporabo, zadovoljstvo in mnenja glede prihodnjega razvoja e-uprave s strani podjetij, manj pogoste. Eden od razlogov je prav gotovo v tem, da je v nasprotju z občani takšno raziskavo med podjetji kredibilno veliko teže izvesti, saj je v množici nekaj sto podjetij zelo težko zadeti ljudi, ki to problematiko res dobro poznajo in lahko kompetentno odgovarjajo v imenu celotnega podjetja.

Med prvimi je prav gotovo raziskava (Momentum, 2000), ki je razkrila, da je kar 83 % anketiranih ameriških podjetij že uporabilo internet z namenom uporabe upravnih storitev ali informacij. Na evropski ravni je bila ena prvih tovrstnih raziskav opravljena leta 2002 (SIBIS, 2003), ko so rezultati razkrili, da več kot polovica anketiranih podjetij, ki sicer imajo dostop do interneta, **ne** uporablja upravnih e-storitev.[1].

Tabela 1 prikazuje rezultate novejših raziskav, ki so pod drobnogled vzele podjetja. Ker prihaja med njihovimi metodološkimi pristopi do precejšnih razlik, njihovih rezultatov ne moremo neposredno primerjati. Če pa pogledamo rezultate posameznih raziskav, lahko vidimo, da je uporaba storitev e-uprave med podjetji relativno nizka. Tako je na primer v 25 članicah EU leta 2005 le 19 % anketiranih podjetij v celoti opravilo postopek z upravo preko interneta (Eurostat, 2005), največ (51 %) pa jih je spletne strani organov javne uprave uporabilo za pridobivanje informacij. Nadalje je raziskava BISER (2004) razkrila, da je vsaj eno od štirih upravnih e-storitev, po katerih so spraševali, uporabilo le 25 % anketiranih podjetij iz 28 evropskih regij. Prav tako nizko uporabo storitev e-uprave je razkrila raziskava (Thompson et al., 2005), kjer so ameriška podjetja stopnjo uporabe devetih upravnih e-storitev na lestvici od 1 (nikoli) do 5 (zelo pogosto) v povprečju ocenila z oceno 1,88. Po drugi strani je upravne e-storitve uporabilo 56 % majhnih in srednje velikih podjetij iz Velike Britanije (Adeshara et al., 2004).

Še bolj različni kot pri meritvah uporabe, pa so kazalniki, ki merijo zadovoljstvo z e-upravo (Tabela 2). V raziskavi (Adeshara et al., 2004), na primer, so želeli ugotoviti, kako učinkovite so upravne e-storitve za majhna in srednja podjetja, pri čemer je slaba polovica anketiranih podjetij menila, da upravne e-storitve za njih niso zelo učinkovite. V raziskavi BISER (2004) so zadovoljstvo merili z deležem podjetij, ki so že uporabila upravne e-storitve in bi slednje tudi ponovno uporabila – teh je bilo 85 %. Nadalje je zadovoljstvo z 20 upravnimi e-storitvami (glej CapGemini, 2006) merila raziskava 'Top of the web' (2004), in sicer na lestvici od 1 do 6, pri čemer je 1 pomenila najslabšo oceno, 6 pa najboljšo. Oceni 5 in 6 je podalo 63 % anketiranih podjetij iz šestih članic EU.

Tabela 1: Rezultati nekaterih raziskav, ki so merile uporabo storitev e-uprave s strani podjetij

Raziskava	Geografsko področje	Kazalnik	Rezultati
Eurostat, 2005 in 2006	EU-25	uporaba storitev e-uprave v podjetjih z več kot 10 zaposlenimi (2005 / 2006)	pridobivanje informacij na spletnih straneh organov javne uprave: 51 / 55 % pridobivanje uradnih obrazcev na spletnih straneh organov javne uprave: 49 / 56 % vračanje uradnih obrazcev na spletnih straneh organov javne uprave: 33 / 45 % popolno vodenje elektronskega postopka (transakcijske storitve): 19 % / ni podatka
Koran, 2006	Češka	najpogosteje uporabljene upravne e-storitve	javna naročila: 26 % napoved dohodnine: 25 %
Thompson et al., 2005	ZDA	stopnja uporabe 9 storitev preko spletnih strani organov javne uprave (1-nikoli, 5-zelo pogosto) v podjetjih z manj kot 500 zaposlenimi	1,88
Top of the web, 2004	EU-6	delež preko spleta oddanih napovedi DDV glede na vse oddane napovedi	Danska: 45 % Norveška: 20 % Finska: 16 % Belgija: 5 % Švedska: 3 %
BISER, 2004	28 evropskih regij	uporaba upravnih e-storitev	plačilo socialnih prispevkov za zaposlene: 15 % oddaja davčnih napovedi: 14 % oddaja carinskih deklaracij: 4 % sodelovanje pri javnih naročilih: 7 % vsaj ena: 25 %
Adeshara et al., 2004	VB	% majhnih in srednje velikih podjetij, ki so uporabila upravne e-storitve	56 %

[1] Vendar pa je potrebno na rezultate gledati z določeno mero distance, saj v raziskavi opozarjajo, da IT managerji, ki so odgovarjali v imenu podjetij, morda niso najbolj primerni za vprašanja, povezana z uporabo e-uprave.

Tabela 2: Rezultati nekaterih raziskav, ki so merile zadovoljstvo podjetij z e-upravo

Raziskava	Geografsko področje	Kazalnik	Rezultati
Adeshara et al., 2004	VB	učinkovitost upravnih e-storitev za majhna in srednje velika podjetja	niso zelo učinkovite: 46 % niso učinkovite: 20 % so učinkovite: 13 %
BISER, 2004	28 evropskih regij	% podjetij, ki bi ponovno uporabila upravne e-storitve (med uporabniki upravnih e-storitev)	85 %
Top of the web, 2004	EU-6	povprečno zadovoljstvo z 20 upravnimi e-storitvami (1-zelo slaba, 6-zelo dobra)	% ocen 5 in 6: 63 % % ocen 3 in 4: 25 % % ocen 1 in 2: 12 %

Prav tako je iz različnih kazalnikov moč razbrati mnenja podjetij glede prihodnjega razvoja e-uprave (Tabela 3). Že leta 2000, na primer, je raziskava (Momentum, 2000) pokazala, da si podjetja (56 %) želijo vse upravne e-storitve opraviti preko enega samega spletišča. Nadalje je največ podjetij izjavilo, da sta hitrost (51 %) in prikladnost oz. udobnost e-uprave (43 %) največji koristi e-uprave, in da bi večja varnost (50 %) ter intenzivnejša promocija e-uprave (14 %) najbolj pripomogli k pogostejši uporabi upravnih e-storitev (Momentum, 2000). Na ravni EU je bila ena prvih raziskav (IDA, 2002), ki je (posredno) razkrila tudi pričakovanja podjetij, opravljena leta 2002, ko so rezultati pokazali, da podjetja pripisujejo visoko po-

Tabela 3: Rezultati nekaterih raziskav, ki so razkrili pričakovanja podjetij glede nadaljnjega razvoja e-uprave

Raziskava	Geografsko področje	Kazalnik	Rezultati
Koran, 2006	Češka	slabosti upravnih e-storitev	nizka stopnja poznavanja: 31 % nezadovoljiva integracija elektronskih registrov: 21 % zapletenost in tehnične zahteve: 15 % tehnološka neudobnost, potrebe po namestitvi posebne programske opreme: 14 % nezanesljivost: 11 % nezaupanje v varnostne ukrepe: 8 %
Thompson et al., 2005	ZDA	prihranki časa zaradi uporabe upravnih e-storitev (1-sploh se ne strinjam, 5-popolnoma se strinjam)	iskanje splošnih informacij na spletiščih organov javne uprave: 1,97 iskanje upravnih organov, obrazcev in formularjev preko spletišč organov javne uprave: 2,38 izpolnjevanje in vračanje obrazcev preko spletišč organov javne uprave: 2,05 izvajanje transakcijskih e-storitev (popolno vodenje elektronskega postopka): 1,73
Top of the web, 2004	EU-6	izkušene koristi z upravnimi e-storitvami	prihranek časa: 84 % bolj prikladne: 58 % več in boljše informacije: 44 % hitrejša storitev/odgovor: 39 % prihranek denarja: 37 % več kontrole: 32 % boljša pomoč: 30 % ni koristi: 8 %
Top of the web, 2004	EU-6	izkušene težave z uporabnostjo (% odgovorov 'ne')	enostavnost dostopa do storitve - ali ste našli, kar ste iskali: 17 % enostavnost uporabe: 15 % razumljivost jezika: 9 % enostavnost dostopa do spletišča, kjer je storitev – ali je bilo enostavno najti spletišče: 8 % zadovoljiva hitrost: 7 %
BISER, 2004	28 evropskih regij	ovire pri uporabi upravnih e-storitev (% odgovorov 'popolnoma se strinjam' in 'se strinjam')	upravne e-storitve niso potrebne: 50 % e-uprava se zdi manj varna kot uporaba tradicionalnih načinov: 33 % upravne e-storitve so težke za uporabo: 30 % upravne e-storitve so drage: 18 %
Adeshara et al., 2004	VB	problemi majhnih in srednje velikih podjetij pri uporabi upravnih e-storitev	varnost transakcij: 28 % kršenje zasebnosti: 21 % hitrost in enostavnost uporabe storitev: 21 % stroški storitev: 20 %

membnost ponudbi e-storitev, ki bi zadovoljevale njihove dejanske potrebe (76 %).

Podobno, približno tretjina čeških podjetij meni, da je slabost storitev e-uprave nizka stopnja poznavanja le-teh (Koran, 2006), medtem ko ameriška podjetja pri uporabi možnosti, ki jih ponuja e-uprava, še najmanj časa prihranijo na račun e-storitev (Thompson et al., 2005). Nadalje je moč opaziti, da le 30 % anketiranih podjetij iz šestih članic EU meni, da so pri uporabi upravnih e-storitev deležni boljše pomoči, kar 17 % pa jih ni našlo želene storitve (Top of the web, 2004). Zanimivi so tudi rezultati evropske raziskave BISER (2004), v kateri je polovica vprašanih izjavila, da njihovo podjetje upravnih e-storitev ne potrebuje, kar 33 % pa jih meni, da je uporaba upravnih e-storitev manj varna od tradicionalnih, zaskrbljujoč pa se zdi tudi delež podjetij (30 %), ki se jim zdi uporaba upravnih e-storitev zapletena. Skrb glede varnosti upravnih e-storitev je tudi najpogostejši problem pri uporabi tovrstnih storitev, ki ga navajajo podjetja iz Velike Britanije (Adeshara et al., 2004).

3 Metodološki pristop

Raziskava podjetij je bila izvedena februarja 2006 z uporabo metode CATI (računalniško podprto telefonsko anketiranje, ang. Computer Assissted Telephone Interviewing) na vzorcu 349 podjetij v štirih reprezentativnih velikostnih skupinah: velika in srednja podjetja (50 in več zaposlenih), majhna podjetja (5 do 49 zaposlenih), s.p. in mikro podjetja (manj kot 5 zaposlenih) ter organizacije javnega sektorja.

Vzorčni okvir je predstavljal Poslovni register Slovenije – IPIS, ki vsebuje podatke o vseh poslovnih subjektih (v nadaljevanju podjetjih), registriranih v RS. Vzorčenje je potekalo na podlagi metode iskanja kvot z upoštevanjem ustrezne porazdelitve dejavnosti in regionalne zastopanosti podjetij. Vzorec je zato reprezentativen samo na ravni posameznih velikostnih skupin, znotraj katerih lahko rezultate posplošujemo ob upoštevanju 95-odstotnega intervala zaupanja in števila odgovorov na posamezno vprašanje. Ciljna oseba je bil v velikih in srednjih podjetjih vodja informatike ali splošnega sektorja, v majhnih in mikro podjetjih pa direktor. V primeru nedosegljivosti je bilo anketiranje opravljeno tudi z drugo odgovorno osebo.

Tabela 1: Velikostne skupine (kvote) podjetij za analizo rezultatov

	anketirane enote	%
s.p. in mikro podjetja	95	27,2
mala podjetja	95	27,2
srednja in velika podjetja	77	22,1
organizacije javnega sektorja	82	23,5
Skupaj	349	100,0

3.2 Uporaba elektronskih upravnih storitev

Anketirana podjetja smo spraševali po uporabi petih elektronskih upravnih storitev, bodisi preko interneta ali z uporabo standardizirane izmenjave podatkov, ki jo omogočajo npr. RIP, XML in SOAP. Medtem, ko vsaj eno upravno e-storitev uporabljajo prav vsa anketirana srednja in velika podjetja, 96 % organizacij javnega sektorja, 92 % malih podjetij in 75 % podjetij iz skupine s.p. in mikro podjetij (Slika 1), pa podrobnejša analiza razkriva skromen nabor uporabljenih storitev, saj je le 16 % organizacij javnega sektorja zatrdilo, da poleg omenjenih petih uporablja še druge upravne e-storitve, pri ostalih skupinah podjetij pa se je ta delež gibal med 5 in 10 %.

Zanimivo je, da je delež podjetij, ki uporabljajo vsaj eno upravno e-storitev, večji od deleža podjetij, ki uporabljajo e-bančništvo in e-poslovanje s poslovnimi partnerji. Rezultati raziskave namreč kažejo, da e-bančništvo uporablja 80 % organizacij javnega sektorja, 97 % srednjih in velikih podjetij, 100 % malih podjetij ter 83 % anketiranih s.p. in mikro podjetij, druge oblike e-poslovanja s poslovnimi partnerji pa uporablja 82 % organizacij javnega sektorja, po 81 % srednjih in velikih ter malih podjetij in 62 % anketiranih s.p. in mikro podjetij.

Kot kaže Slika 2, je pri vseh velikostnih skupinah podjetij najbolj uporabljana storitev posredovanja podatkov (npr. letnih poročil, bilanc ipd.) na Agencijo za javno pravne evidence in storitve (AJPES), saj jo uporablja 83 % organizacij javnega sektorja, 81 % velikih in srednjih podjetij, 66 % malih podjetij ter 46 % s.p. in mikro podjetij; najmanj pa sta uporabljani storitvi sodelovanja v postopkih javnih razpisov oz. naročil in e-Zaposlitve na spletnih straneh Zavoda RS za zaposlovanje (ZRSZ).

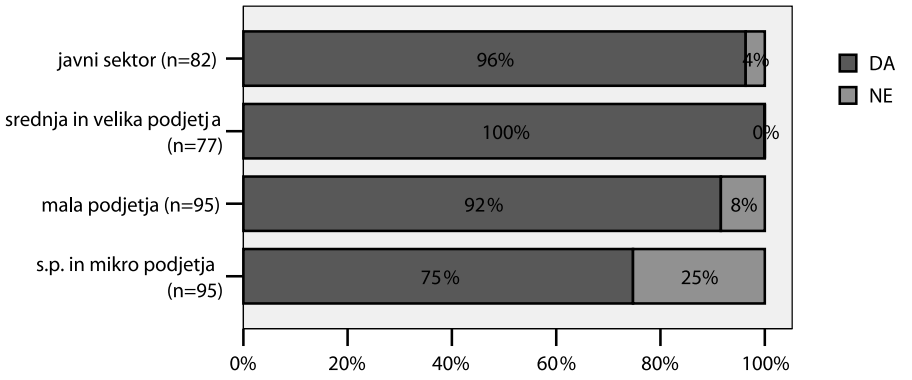
Uporabnike upravnih e-storitev smo povprašali tudi po uporabi digitalnih potrdil pri poslovanju z organi javne uprave. Analiza pokaže, da to možnost uporablja od 41 % (s.p. in mikro podjetja) do 52 % (organizacije javnega sektorja) anketiranih podjetij.

Zanimali so nas tudi razlogi za neuporabo posameznih elektronskih upravnih storitev. Kot kaže, večina podjetjih teh storitev ne uporablja zato, ker jih, niti v klasični niti v elektronski različici, ne potrebujejo, pa tudi zato, ker imajo raje klasične načine urejanja zadev z upravo. Slednji razlog, za razliko od ostalih storitev, prevladuje pri posredovanju obračuna davkov na DURS.

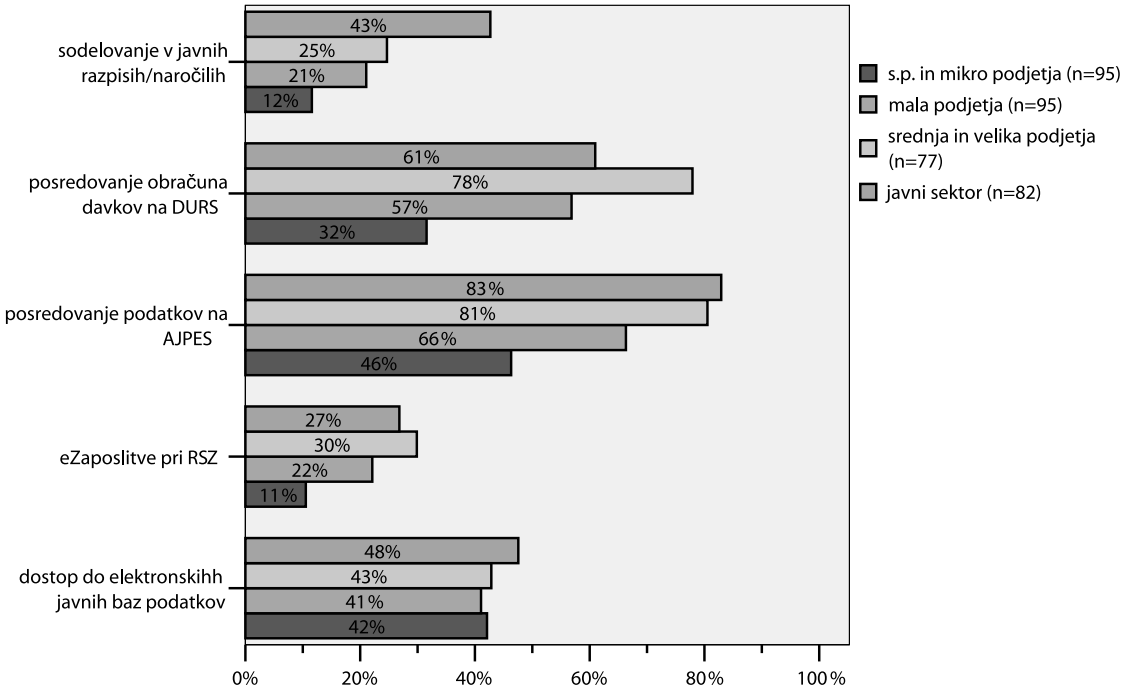
3.3 Zadovoljstvo z e-upravo

Rezultate o zadovoljstvu podjetij z e-upravo smo dobili skozi več vprašanj:

- najprej smo podjetja prosili, naj ocenijo zadovoljstvo z uporabo posameznih upravnih e-storitev;
- nato so podjetja, ki so že uporabila vsaj eno elektronsko upravno storitev, ocenjevala splošno zadovoljstvo z e-upravo;
- stopnjo zadovoljstva z e-upravo pa je moč razbrati tudi skozi stopnje (ne)strinjanja s sedmimi trditvami.



Slika 1: Uporaba vsaj ene upravne e-storitve glede na vsa anketirana podjetja



Slika 2: Uporaba posameznih elektronskih upravnih storitev glede na vsa anketirana podjetja

V nadaljevanju smo podjetja tudi prosili, naj ocenijo svoje zaupanje v e-upravo.

V vseh primerih so podjetja podala ocene od 1 do5, pri čemer je 1 vedno pomenila najslabšo oceno (zelo nezadovoljen, sploh se ne strinjam, sploh ne zaupam) ocena 5 pa je vedno pomenila najboljšo oceno (zelo zadovoljen, popolnoma se strinjam, zelo zaupam).

Kot kaže, so z uporabo elektronskih postopkov javnih razpisov oz. naročil najbolj zadovoljne organizacije javnega sektorja (3,7), nekoliko manj s.p. in mikro podjetja ter mala podjetja (3,6), sledijo srednja in velika podjetja (3,2) (Slika 3).

Z elektronskim posredovanjem obračunov davkov na DURS je ponovno najbolj zadovoljen javni sektor (4,4), precej manj pa s.p. in mikro podjetja ter mala podjetja (4,0), ponovno najmanj pa srednja in velika podjetja (3,9).

Bolj izenačene kot pri prejšnjih dveh storitvah so ocene zadovoljstva z elektronskim posredovanjem podatkov na AJPES, vendar ponovno izstopa razmerje med najbolj zadovoljnimi, to so organizacije javnega sektorja (4,3) in najmanj zadovoljnimi, to so srednja in velika podjetja (4,1).

V nekoliko drugačnem razmerju med posameznimi skupinami podjetij so ocene zadovoljstva z uporabo e-Zaposlitev na spletnih straneh Zavoda RS za zaposlovanje. Pri pozitivnih ocenah je ponovno na prvem mestu javni sektor (4,1), vendar pa so storitve najslabše ocenili s.p. in mikro podjetja (3,6). Vmes so mala podjetja (4,0) ter srednja in velika podjetja (3,8) (Slika 3).

V nasprotju z večino ostalih storitev so vpoglede v elektronske javne evidence oz. baze podatkov najbolje ocenila srednja in velika podjetja (4,1), najslabše pa mala

podjetja (3,8), vendar se tudi povprečni oceni pri s.p. in mikro podjetjih (3,9) ter organizacijah javnega sektorja (4,0) le malo razlikujeta (Slika 3).

Rezultati tudi kažejo, da je zaupanje v e-upravo nekoliko večje kot zadovoljstvo; največje je v organizacijah javnega sektorja (4,1), najmanjše pa v malih podjetjih, mikro podjetjih in pri s.p. (3,9). Podobno je tudi zadovoljstvo največje v organizacijah javnega sektorja (4,0), najmanjše pa pri majhnih podjetjih (3,8) (Slika 3).

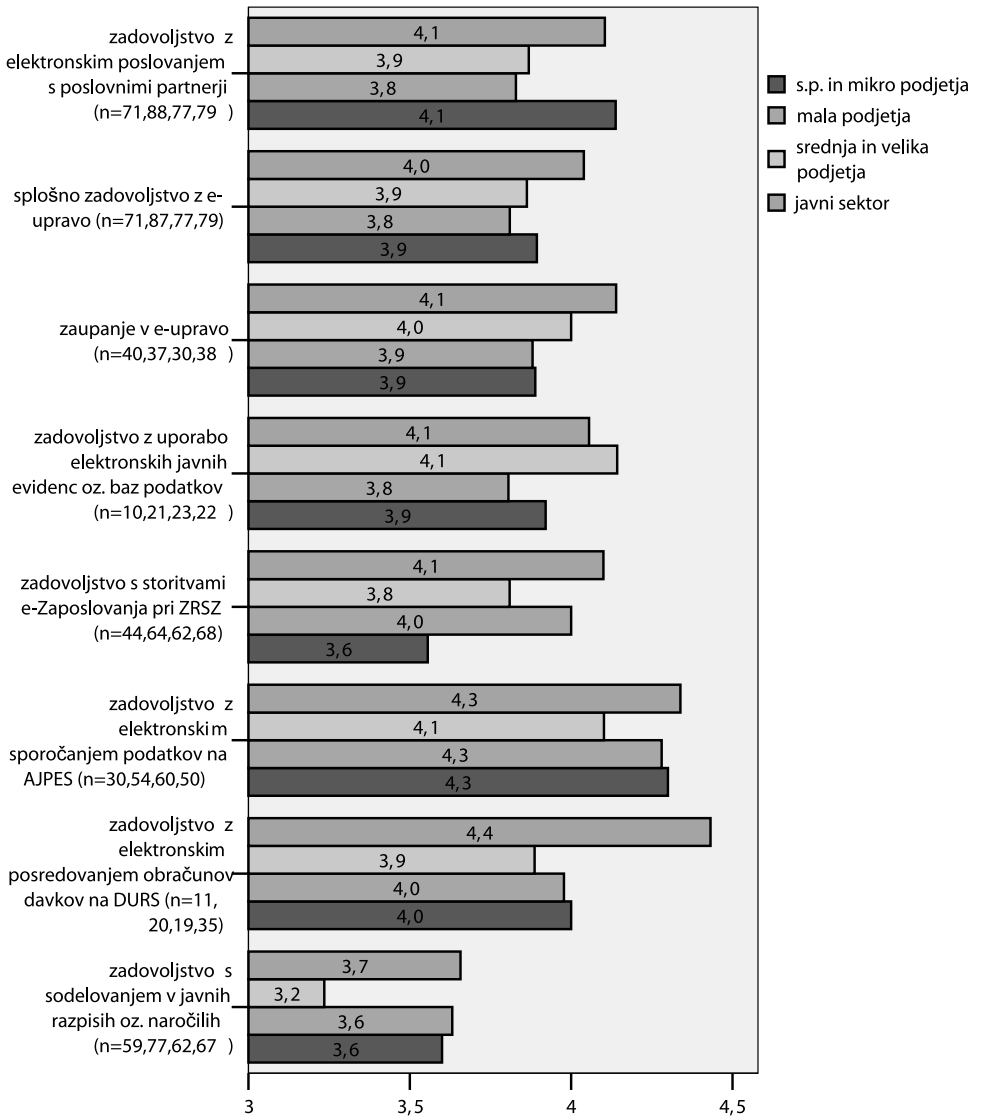
Zanimiva pa je tudi primerjava med splošnim zadovoljstvom z e-upravo in zadovoljstvom z e-poslovanjem s poslovnimi partnerji. Kot kaže, so podjetja s slednjim zadovoljna nekoliko bolj kot z e-upravo (Slika 3).

Tabela 4 prikazuje srednje vrednosti ocen strinjanja podjetij s sedmimi trditvami o e-upravi. Rezultati kažejo, da se s prvo trditvijo ('storitve elektronske uprave so zapletene za uporabo') najbolj strinjajo mala, srednja in velika podjetja (3,1), najmanj pa s.p. in mikro podjetja (2,9).

Z drugo trditvijo ('informacije in upravne e-storitve, dostopne preko spleta, ne zadovoljujejo potreb v našem podjetju') se vse velikostne skupine podjetij nekoliko bolj ne strinjajo kot pa strinjajo, pri čemer so največje nestrinjanje izrazila mala podjetja (2,7), sledijo s.p. in mikro podjetja ter organizacije javnega sektorja (2,8), najvišjo oceno pa so podala srednja in velika podjetja (2,9) (Tabela 4).

S tretjo trditvijo ('storitve e-uprave so preveč razpršene – preoblikovati bi jih morali na podlagi poslovnih dogodkov (npr. zaposlitev delavca)') se vse velikostne skupine podjetij bolj strinjajo kot ne, vendar nobena povprečna ocena ne presega vrednosti 4. Največ strinjanja so izrazile organizacije javnega sektorja in mala podjetja (3,9), nekoliko manj pa s.p. in mikro podjetja ter srednja in velika podjetja (3,8) (Tabela 4).

Da se je z uporabo storitev e-uprave v postopkih z organi javne uprave zmanjšala količina papirja, se bolj stri-



Slika 3: Ocene (1-5) zadovoljstva in zaupanja v e-upravo ter ocene zadovoljstva z nekaterimi upravnimi e-storitvami (število odgovorov n je navedeno po vrsti od s.p. in mikro podjetij do organizacij javnega sektorja)

Tabela 4: Strinjanje s trditvami glede e-uprave med anketiranimi podjetji, ki uporabljajo upravne e-storitve

Trditev	povprečje (1-sploh se ne strinjam, 5-popolnoma se strinjam)			
	s.p. in mikro (n=71)	majhna (n=88)	sr. in vel. (n=77)	org. javnega sektorja (n=79)
storitve elektronske uprave so zapletene za uporabo	2,91	3,07	3,11	2,99
informacije in upravne e-storitve, dostopne preko spleta, ne zadovoljujejo potreb v našem podjetju	2,80	2,74	2,85	2,75
storitve e-uprave so preveč razpršene – preoblikovati bi jih morali na podlagi poslovnih dogodkov (npr. zaposlitev delavca)	3,78	3,87	3,77	3,88
z uporabo storitev e-uprave se je v postopkih z organi javne uprave zmanjšala količina papirja	3,41	3,72	3,08	2,84
z uporabo storitev e-uprave so se skrajšali postopki z organi javne uprave	3,56	3,77	3,35	3,41
z uporabo storitev e-uprave so se poenostavili postopki z organi javne uprave	3,52	3,83	3,43	3,43
v podjetju smo premalo seznanjeni z možnostmi, ki jih ponuja e-uprava	3,41	3,77	3,73	3,46

njajo kot ne vse skupine podjetij, razen organizacij javnega sektorja. Pri tem se s to trditvijo najbolj strinjajo majhna podjetja (3,7), sledijo s.p. in mikro podjetja (3,4) ter srednja in velika podjetja (3,1), kot rečeno pa so organizacije javnega sektorja izrazile nekoliko večje nestrinjanje (2,8) (Tabela 4).

S peto trditvijo ('z uporabo storitev e-uprave so se skrajšali postopki z organi javne uprave') se najbolj strinjajo majhna podjetja (3,8), sledijo s.p. in mikro podjetja (3,6), najmanj pa se s trditvijo strinjajo organizacije javnega sektorja ter srednja in velika podjetja (3,4) (Tabela 4).

Da so se z uporabo storitev e-uprave poenostavili postopki z organi javne uprave, se najbolj strinjajo majhna podjetja (3,8), sledijo s.p. in mikro podjetja (3,5), najmanj pa se s trditvijo strinjajo srednje in velika podjetja ter organizacije javnega sektorja (3,4).

Tudi z zadnjo trditvijo ('v podjetju smo premalo seznanjeni z možnostmi, ki jih

ponuja e-uprava') se vse skupine podjetij bolj strinjajo kot ne, pri čemer so največje strinjanje izrazila majhna podjetja (3,8), nekoliko manj srednja in velika podjetja (3,7), najmanj pa se s trditvijo strinjajo organizacije javnega sektorja ter s.p. in mikro podjetja (3,5 in 3,4) (Tabela 4).

3.4 Mnenja glede prihodnjega razvoja e-uprave

Da bi od podjetij pridobili smernice za nadaljnji razvoj e-uprave v Sloveniji, smo uporabili tri sklope vprašanj, na katera so odgovarjala podjetja, ki uporabljajo računalnike. Vprašali smo jih, kako pomembno se jim zdi, da lahko preko interneta opravljajo upravne storitve, da si lahko na standardiziran način (npr. z uporabo RIPa, XMLa ali SOAPa) z organi javne uprave izmenjujejo podatke in da lahko preko spleta dostopajo do podatkov javnih registrov oziroma baz podatkov. Nato pa smo jih še prosili, naj ocenijo pomembnost posameznih dejavnikov za nadaljnji razvoj e-uprave ter stopnjo, do katere bi jih posamezni dejavniki v bodoče najbolj spodbudili k začetku oz. pogostejši uporabi e-uprave.

Podjetja so podala ocene od 1 do 5, pri čemer je 1 vedno pomenila najslabšo oceno (popolnoma nepomembno, sploh me ne bi spodbudilo) ocena 5 pa je vedno pomenila najboljšo oceno (zelo pomembno, zelo bi me spodbudilo).

Analiza pokaže, da so podjetjem najpomembnejše elektronske upravne storitve, najmanj pa standardizirana izmenjava podatkov z organi javne uprave. Pri tem je možnost opravljanja elektronskih upravnih storitev naj-

Tabela 5: Pomembnost obstoja posameznih možnosti e-uprave med podjetji, ki uporabljajo računalnike

Možnost e-uprave	povprečje (1-popolnoma nepomembno, 5-zelo pomembno)			
	s.p. in mikro (n=88)	majhna (n=95)	sr. in vel. (n=77)	org. javnega sektorja (n=82)
možnost uporabe elektronskih upravnih storitev preko interneta	4,25	4,18	4,27	4,51
možnost izmenjave podatkov z organi javne uprave na standardiziran način (z uporabo RIPa, XMLa, SOAPa ipd.)	3,45	3,87	3,87	4,30
možnost vpogleda v informatizirane javne baze podatkov	3,85	3,94	4,12	4,36

Tabela 6: Pomembnost posameznih dejavnikov za nadaljnji razvoj e-uprave med podjetji, ki uporabljajo računalnike

Dejavnik nadaljnjega razvoja e-uprave	povprečje (1-popolnoma nepomembno, 5-zelo pomembno)			
	s.p. in mikro (n=88)	majhna (n=95)	sr. in vel. (n=77)	org. javnega sektorja (n=82)
uvedba ponudbe celotne e-uprave na enem spletnem mestu	4,52	4,55	4,49	4,57
poenostavitev upravnih postopkov znotraj organov javne uprave	4,62	4,54	4,57	4,72
večja varnost elektronskega poslovanja javne uprave	4,56	4,43	4,45	4,67
poenostavitev uporabe storitev na internetu	4,44	4,36	4,26	4,52
uvedba reševanja zadev v zvezi s poslovnimi dogodki v paketu oz. enem koraku (npr. zaposlitev delavca ali ustanovitev podjetja)	4,41	4,35	4,28	4,32
poenostavitev uporabe standardizirane izmenjave podatkov z organi javne uprave (preko RIPa, XMLa, SOAPa ipd.)	4,33	4,23	4,12	4,35
razširitev ponudbe e-uprave	4,15	4,14	4,19	4,32
uvedba dostopa do e-uprave na javnih mestih (upravni organi, informacijski centri ipd.)	3,61	3,84	3,78	4,20

pomembnejša organizacijam javnega sektorja (4,5), najmanj pa malim podjetjem (4,2), možnost standardizirane izmenjave podatkov je zopet najpomembnejša organizacijam javnega sektorja (4,3), najmanj pa podjetjem iz skupine s.p. in mikro podjetij (3,4), podobno pa velja tudi za možnost vpogleda v elektronske javne evidence oz. zbirke podatkov.

Raziskava je tudi pokazala (Tabela 6), da se zdijo anketiranim podjetjem vsi dejavniki, po katerih smo spraševali, razen uvedbe dostopa do e-uprave na javnih mestih, pomembni do zelo pomembni za nadaljnji razvoj e-uprave. Večjih razlik med posameznimi skupinami podjetij ni, razen pri uvedbi dostopa do e-uprave na javnih mestih, ki je za organizacije javnega sektorja precej bolj pomemben dejavnik kot za ostala podjetja.

Pri dejavnikih, ki bi utegnili podjetja spodbuditi k začetku oz. pogostejši uporabi storitev e-uprave (Tabela 7) je analiza pokazala, da so hitrejši postopki v primerjavi s klasičnimi najpomembnejši spodbujevalni dejavnik za podjetja v vseh velikostnih skupinah, saj so vse skupine podjetij ta dejavnik ocenile z najvišjimi ocenami (4,6 - 4,7) ali povedano drugače, skoraj tri četrtine podjetij meni, da bi jih hitrejši postopki v primerjavi s klasičnimi zelo spodbudili k večji uporabi storitev e-uprave.

Tudi večja informiranost o možnostih e-uprave (4,3 - 4,5), enostavnejša uporaba in popolnejša ponudba (4,4 - 4,7), možnost, da se lahko kadarkoli obrnejo na osebo za pomoč (4,5 - 4,6) ter večja varnost prenosa podatkov (4,3 - 4,6) bi podjetja v precejšnji meri spodbudila k večji uporabi storitev e-uprave (Tabela 7).

Po drugi strani pa so nižje takse oz. druge finančne spodbude (presenetljivo) najmanj pomemben spodbujevalni dejavnik za vse skupine podjetij, med katerimi je še najbolj pomemben za s.p. in mikro podjetja (4,2), se pa z velikostjo ta pomembnost zmanjšuje. Najmanj je ta dejavnik pomemben za organizacije javnega sektorja (3,7).

4 Kaj nam sporočajo podjetja?

Na tem mestu izpostavljamo najzanimivejše rezultate raziskave, ki jih bomo skušali primerjati z nekaterimi raziskavami, predstavljenimi v drugem razdelku. Ker se metodološki pristopi raziskav razlikujejo, je potrebno na te primerjave gledati z določeno mero distance. Na koncu podajamo še nekaj napotkov za nadaljnji razvoj slovenske e-uprave.

Tako ne moremo spregledati, da so deleži podjetij, ki uporabljajo vsaj eno upravno e-storitev (75 - 100 %), re-

Tabela 7: Pomembnost spodbujevalnih dejavnikov za večjo uporabo storitev e-uprave med podjetji, ki uporabljajo računalnike

Spodbujevalni delavnik	povprečje (1-sploh me ne bi spodbudilo, 5-zelo bi me spodbudilo)			
	s.p. in mikro (n=88)	majhna (n=95)	sr. in vel. (n=77)	org. javnega sektorja (n=82)
hitrejši postopki v primerjavi s klasičnimi	4,62	4,68	4,57	4,72
obstoj možnosti, da se lahko kadarkoli obrnete na osebo za pomoč	4,55	4,64	4,49	4,54
enostavnejša uporaba in popolnejša ponudba e-storitev na spletu	4,58	4,55	4,36	4,66
večja informiranost o možnostih e-uprave	4,43	4,46	4,33	4,52
večja varnost prenosa podatkov	4,43	4,43	4,31	4,63
nižje takse oz. druge finančne spodbude	4,23	4,07	3,99	3,73

lativno visoki, celo večji od uporabe e-bančništva in drugih oblik e-poslovanja s poslovnimi partnerji. Vendar pa nabor storitev, ki jih podjetja uporabljajo, ni ravno obsežen. Omejen je v glavnem na storitve eDavkov in storitve AJPESa. Kakorkoli, če te rezultate primerjamo z rezultati uporabe v 28 evropskih regijah v letu 2004 (BISER, 2004), lahko ugotovimo, da je stanje v Sloveniji danes bistveno boljše. Rezultati omenjene raziskave so namreč razkrili, da je preko spleta davčne napovedi oddalo zgolj 14 % anketiranih podjetij (pri nas je to preko interneta ali z uporabo standardizirane izmenjave podatkov storilo 61 % organizacij javnega sektorja, 78 % malih podjetij, 57 % srednjih in velikih podjetij ter 32 % s.p. in mikro podjetij), na javnih razpisih pa je preko spleta sodelovalo le slabih 6 % anketiranih podjetij (pri nas je preko interneta ali z uporabo standardizirane izmenjave podatkov na javnih razpisih sodelovalo 43 % organizacij javnega sektorja, 25 % malih ter 21 % srednjih in velikih podjetij in 12 % s.p. in mikro podjetij) .

Anketirana podjetja posameznih upravnih e-storitev po večini ne uporabljajo zato, ker menijo, da določene storitve ne potrebujejo, ker jo raje opravijo na klasičen način, ker je ne poznajo, ker storitev (zaradi različnih vzrokov) ni uporabna za njihovo podjetje, pri posredovanju podatkov na DURS in AJPES pa tudi zato, ker storitev opravljajo zunanji izvajalci. Verjetno ni naključje, da je evropska raziskava (IDA, 2002) že pred nekaj leti razkrila, da podjetja pripisujejo visoko pomembnost ponudbi e-storitev, ki bodo zadovoljile njihove dejanske potrebe.

In kot kaže, so vse velikostne skupine anketiranih slovenskih podjetij na splošno z e-upravo relativno zadovoljne. Vendar pa ocena splošnega zadovoljstva pri nobeni skupini podjetij ne presega vrednosti 4 (zadovoljen sem), kar pušča izboljšavam še dovolj prostora. To potrjuje tudi dejstvo, da so anketirana podjetja svoje zadovoljstvo z e-upravo ocenila nekoliko slabše od zadovoljstva z elektronskim poslovanjem s poslovnimi partnerji. Po drugi strani ocene zadovoljstva s posameznimi storitvami kažejo, da so podjetja bolj zadovoljna s tehnološko bolj razvitimi storitvami (storitve eDavkov in AJPESA), precej manj pa z elektronskimi postopki javnih razpisov oz. naročil, kar je tudi razumljivo, saj je ta storitev zgolj informacijske narave. Ne gre tudi spregledati, da zaupanje v e-upravo ni na zavidljivi ravni, saj so ga podjetja ocenila le nekoliko bolje od zadovoljstva.

Kje so največje možnosti za izboljšave, lahko razberemo iz ocen strinjanja s posameznimi trditvami. Iz rezultatov raziskave izhajajo naslednja priporočila, ki bi jih država, po mnenju podjetij, morala upoštevati pri razvoju e-uprave:

- storitve e-uprave so preveč razpršene po različnih spletiščih, zato bi jih bilo treba preoblikovati v pakete na podlagi poslovnih dogodkov in ponuditi na enem mestu in v enem koraku (npr. zaposlitev delavca);
- v podjetjih so premalo seznanjeni z možnostmi, ki jih ponuja e-uprava;
- organizacije javnega sektorja po večini menijo, da se z uporabo storitev e-uprave količina papirja ni bistveno zmanjšala;
- mala, srednja in velika podjetja po večini menijo, da so storitve e-uprave za uporabo bolj zapletene kot ne;
- informacije in upravne e-storitve, dostopne preko spleta, le delno zadovoljujejo potrebe podjetij;
- z uporabo storitev e-uprave so se le delno poenostavili in skrajšali postopki z organi javne uprave.

Pri nadaljnjem snovanju politik s področja e-uprave pa velja imeti v mislih še, da sta po mnenju anketiranih podjetij najpomembnejša dejavnika nadaljnjega razvoja e-uprave:

- poenostavitev upravnih postopkov znotraj organov javne uprave in
- uvedba ponudbe vseh informacij in upravnih storitev na enem spletnem mestu.

Poleg tega pa bi anketirana podjetja storitve e-uprave uporabljala v večji meri predvsem:

- če bi bili postopki v primerjavi s klasičnimi hitrejši,
- če bi pri uporabi upravnih e-storitev imeli možnost, da se lahko kadarkoli obrnejo na osebo za pomoč in
- če bi bila uporaba upravnih e-storitev enostavnejša, ponudba pa popolnejša.

Ti rezultati se ujemajo tudi z rezultati raziskave (Koran, 2006), kjer je največ (31 %) čeških podjetij kot slabost čeških e-storitev navedlo nizko stopnjo poznavanja le-teh, 21 % pa jih kot slabost vidi nezadovoljivo integracijo elektronskih registrov. Prav tako lahko rezultate primerjamo z rezultati raziskave 'Top of the web' (2004), kjer je imelo 20 % podjetij težave pri iskanju upravnih e-storitev, le 30 % pa jih je menilo, da so pri uporabi upravnih e-storitev deležni boljše pomoči. Spregledati ne gre niti raziskave (Adeshara et al., 2004), kjer je 21 % podjetij navedlo hitrost in enostavnost uporabe kot problem pri uporabi upravnih e-storitev, in tudi ne raziskave BISER (2004), v kateri se je 30 % podjetij strinjalo ali zelo strinjalo, da so upravne e-storitve zapletene za uporabo.

5 Zaključek

Pričakovanja slovenskih podjetij glede nadaljnjega razvoja e-uprave so torej precej jasno izražena. Verjamemo, da si država želi zagotavljati prijazno poslovno okolje, ki bo imelo neposredne učinke na njen nadaljnji ekonomski razvoj in na gospodarsko rast. Pri nadaljnjem načrtovanju razvoja e-uprave v Sloveniji bi zato vsekakor veljalo upoštevati vsaj nekatere od izsledkov predstavljene raziskave. V nasprotnem primeru bodo ti rezultati, kljub svoji dragocenosti, ostali zgolj predmet akademskih razprav.

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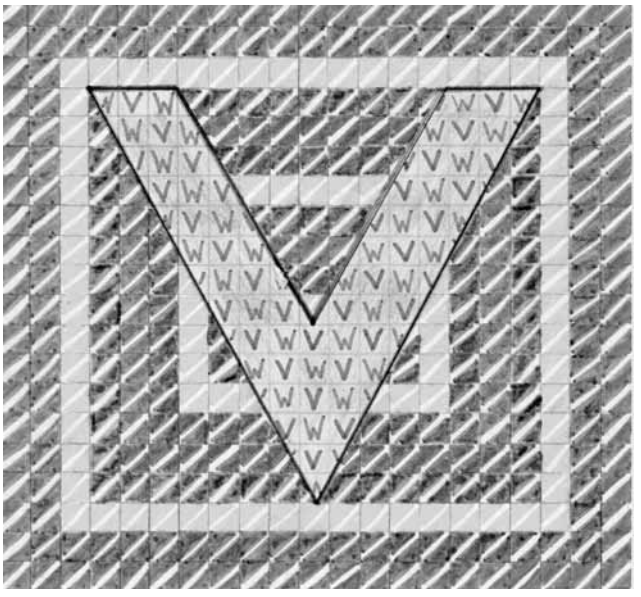
Mateja Kunstelj je leta 2002 magistrirala s področja prenove procesov v upravi na Fakulteti za računalništvo in informatiko Univerze v Ljubljani. Zaposlena je kot asistentka za predmetno področje informatike na Fakulteti za upravo v Ljubljani, kjer poleg pedagoškega dela raziskuje različne vidike razvoja in uvajanja e-uprave. Trenutno se največ ukvarja z merjenjem in vrednotenjem stanja razvoja e-uprave, prenovo procesov v e-upravi in razvojem integriranih e-storitev oz. življenjskih situacij.

Tina Jukić je leta 2007 na Fakulteti za upravo zaključila magistrski študijski program Uprava, kjer je sedaj mlada raziskovalka. Pri različnih projektih s področja e-uprave je na Fakulteti začela sodelovati že kot dodiplomska študentka. Tekom študija je prejela dve priznanji Fakultete za posebne raziskovalne dosežke in priznanje za najuspešnejšo diplomantko magistrskega študijskega programa Uprava II. stopnje.

Mirko Vintar je prodekan za znanstveno-raziskovalno dejavnost, predstojnik Raziskovalnega centra in Inštituta za informatizacijo uprave na Fakulteti za upravo. Že več kot dvajset let se ukvarja z informatizacijo uprave in v zadnjih letih intenzivno tudi z razvojem e-uprave. Je vodja vrste raziskovalnih in razvojno-aplikativnih projektov s tega področja. Je član več mednarodnih znanstvenih in strokovnih teles, ki se ukvarjajo z raziskovanjem obravnavanega področja (EGPA; Study group on Informatization of Public Administration, IFIP; WG 8.5, NISPAcee; WG on E-government).



Matej Vodušek

Bojan Cestnik, Ingrid Petrič, Tanja Urbančič, Marta Macedoni-Lukšič

Structuring Domain Knowledge by Semi-automatic Ontology Construction

In this paper, we present a case in semi-automatic ontology construction from literature. For this, we concentrate on the articles about autism obtained from the PubMed Central database. Our motivation was to investigate how separate parts of articles, such as titles, abstracts and full texts, influence the constructed ontology. Our results confirm the intuitive expectation that constructing ontologies from abstracts is a rational choice when uncovering the structure of a given scientific field. In addition, when compared to general knowledge of autism, ontology concepts from abstracts show the highest similarity.

Key words: Knowledge management, education, concept learning, ontologies, autism

Mirjana Kljajić Borštnar, Andrej Škraba, Vladislav Rajkovič, Miroljub Kljajić

Simulation Based Group Learning

This article describes an experiment investigating simulation based group learning. For this purpose, we have conducted a four-group Solomon experiment under four different conditions: a_1) the determination of strategy with the application of the system dynamics (SD) model without group interaction and with a pre-test, a_2) the determination of strategy with the application of the SD model and group information feedback and with a pre-test, a_3) the determination of strategy with the application of the SD model and without a pre-test, and a_4) strategy determination with the application of the SD model and group information feedback and without a pre-test. The observed variables were the criteria function values and frequency of the simulation runs. The hypothesis that simulation model application and group feedback information positively influence the convergence of the decision process and contribute to faster decision-making was confirmed. A model of the learning during the decision-making process was developed. Students' opinions were analyzed as well and the results show that management students thought that the application of the simulation model did contribute to an increased understanding of the problem, the faster finding of solutions and the increased confidence of participants. All participants agree that the clear presentation of the problem motivates participants to find the solution.

Key words: group decision, learning model, system dynamics, feedback, experiment design

Alenka Gortan, Eva Jereb

The Dropout Rate from E-Learning Courses and the Satisfaction of Students' with E-Learning

This paper deals with the dropout rate for e-learning academic courses in correlation with student satisfaction with distance education. This study explores two main ideas: student satisfaction with e-learning and the locus of control. The results show that the main reason for persistence with e-learning academic courses is a significantly high level of satisfaction with e-learning and satisfaction with the students' own academic performance.

Key words: e-learning, dropout rate, success, satisfaction

Uros Rajkovič, Olga Šušteršič, Vladislav Rajkovič, Darja Cibic

The Educational Challenges of E-representing the International Classification of Nursing Practice

Teaching about classification also plays an important role in nursing education. The International Classification for Nursing Practice is a unified professional language devoted to nurses, other health workers and broader areas. In this paper, the e-version of this classification is presented as a challenge for an efficient educational practice searching for new information solutions in different environments using information and communication technology. Clients on a personal computer, the internet and PDA-hand-held computers are all presented. The combination of those clients in health-care education is analyzed.

Key words: education, health care, nursing, classifications, information technology

Tanja Urbančič

From Fragments of Knowledge Towards a Bigger Picture: How Can the Process be Supported

In this paper we deal with the problem of information that is dispersed and growing so fast that it is difficult to connect it together into a coherent picture as needed for complex problem solving. We present two examples and some methods that have potential to contribute towards putting pieces of knowledge together. The first consists of finding complementary pieces of knowledge in literature that supports hypothesis generation by a well-defined and computer supported method. The second one is sharing and upgrading knowledge in collaborative settings, which still has many non-technical issues to be solved, although well developed in its technical aspects.

Key words: Knowledge management, education, data mining, networked organizations

Maja Pivec, Paul Kearney

Games for Learning and Learning from Games

This paper details a model of game-based learning and suggests how this can be applied to both the playing of computer games and learning within the classroom environment. The authors document the results from a University level course, created in a role-playing form for designing educational games and highlights the student's attitudes and beliefs regarding game design as a career. They also suggest that educational games can be used successfully for the transfer of knowledge to domains outside the world of computer games and highlights several case studies in the area of health and medicine.

Key words: game-based learning, recursive learning loops, games for learning

Ivan Gerlič

Distance Education Models and New Communication Trends in Education

Last decade's technological developments in the field of information technology have boosted its range of uses in distance education and given new dimensions to this type of education. Distance learning nowadays is practised in several theories, each differing from the other in its formal access, in the analysis of its teaching and learning materials, in its methods and range of counselling and the range of its communication with participants, as well as in its didactic concept of preparing and forming learning materials, etc. Distance education is an important criterion for new communication trends in education. Therefore, it shall be covered more thoroughly in this work.

Key words: Distance learning, distance education, distance teaching and learning models, didactic models, communication models, web-based education, web-based learning material

Vladimir Batagelj, Iztok Kavkler, Matija Lokar

Project CALIBRATE – Calibrating eLearning in Schools

One of the main issues that the European Union supports through the IST Programme is the exchange and collaborative use of learning resources. CALIBRATE (Calibrating eLearning in Schools) brings together eight European countries to carry out a multi-level project designed to support the collaborative use and exchange of learning resources in schools. Its main aim is to provide a brokerage system among national repositories of educational materials. This paper reports on the main goals of this project, which include developing an open-source technical architecture to support content exchange/collaboration between ministries of education and other owners of educational repositories, to develop a teaching toolbox that supports the collaborative use of learning resources, research and testing new approaches that can improve semantic interoperability related to the discovery and evaluation of learning resources. One relatively important issue developed through the project concerns the guidelines with which the metadata resources in the repositories should be equipped. We will report on two major guidelines the resources in CALIBRATE should follow. A number of practical examples of preliminary versions of tools will also be outlined.

Key words: e-learning, metadata, repositories, learning resources

Olga Dečman Dobrnjič, Metod Černetič

ICT Use in Boarding Schools

Information technology has for some time now been an integral part of education and management processes in boarding schools. New contemporary work methods, used by tutors who are motivated to introduce necessary and inevitable novel methods into pedagogic practices, have been put into effect. In this article, we will list a number of basic skills and knowledge that tutors and headmasters of boarding schools should know. Of course, these skills and knowledge should be known also by other teachers in schools and other institutes, but here we will only mention boarding schools in this article, because they are the focus of our research.

A survey was carried out in boarding schools, searching for the opinions of headmasters and tutors on the advantages and disadvantages of keeping an electronic diary of a tutor's work. The survey searched for eventual weaknesses and strengths of the process that may be important for the introduction and application of innovation in a pedagogic process. At the same time, the attitudes of pedagogic staff on this novel method were also investigated.

Key words: knowledge of ICT, tutors, headmasters, skills, pedagogic process, research, boarding schools

Matejka Tomazin, Andrej Brodnik

Learning aims for Computer Science in the elementary school - Slovenian and ACM K12 curriculum

With the nine-year elementary school, Computer Science re-appeared as an elective subject. However, there was virtually no curriculum for Computer Science to be used, no textbook, no exercise book. There was only an idea to include information and communication technology in the elementary school, because of society's growing dependence on it. Not properly trained and severely underprepared teachers had to adapt competency goals to the inappropriate teaching equipment.

Because Computer Science is still only an elective subject and hence students attend it at their own will, the quality and importance of the subject is still at the level of an out-of-class activity not recognizing its indispensable role in the modern society.

Meanwhile, the leading international professional society ACM (Association for a Computing Machinery) started forming guidelines for teaching curriculum for Computer and Information Science from Kindergarten to Grade 12 (K12) that are already used in several countries. The guidelines could be also used as a reference to define and renew competency goals for teaching in Slovenia. There appears a fundamental question: "Is the Slovenian curriculum for Computer Science well designed?"

Key words: curriculum, K12, ICT, comparison, renewal

Mateja Kunstelj, Tina Jukić, Mirko Vintar

E-government: What do Slovenian companies expect from it?

The paper presents the results of the research intended to ascertain the level of Slovenian companies' usage of and satisfaction with government e-services as well as their opinions regarding the future development of e-government in Slovenia. After the presentation of studies in the field, the results of the research conducted at the Institute for Informatization of Administration in the beginning of 2006 are given. The research revealed that the majority of companies surveyed have already used at least one government e-service, but the range of services used is in fact not very wide, and the satisfaction with those services is not at the highest level. It turns out that the most important stimulating factors for using e-government are faster electronic procedures in comparison to conventional ones and the possibility of personal assistance at all times during use of government e-services. At the end, we put forward the most interesting results of the research, we try to compare them with some related studies and offer some instructions for further development of Slovenian e-government.

Key words: e-government, government e-services, companies, usage, satisfaction, opinions regarding the future development of e-government, expectations

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