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Editorial

When will students carry only a USB stick to school? We often hear this question. Technological means are available. Nevertheless, there is an abundance of obstacles, ranging from real to imaginary, encompassing different stakeholders from cellulose manufacturers and manufacturers of school bags, including those on wheels, to teachers and parents who would have to change their work styles.

Many wonder what is to be in fact gained in terms of education. It is true that George Polja already back in 1944 published a book on problem solving titled »How to solve it« which is still relevant today, however computers at that time were only in their embryonic phase. It is exactly the education for problem solving that is one of the fundamental missions of the school which can be carried out without a computer. What do we then expect from the computer?

General accessibility and handiness of the paper and the pencil as thinking tools enabled science, engineering, education and other fields to blossom. Everyone was able to visualize and model a fraction of their thoughts. With the emergence of the computer the story repeated itself at a higher technological level. We gained a universal machine for modeling and visualization of data. It assists our thinking processes and consequently problem solving. This challenge is being implemented in the processes of education for years already. The technology is there to support us with solutions such as laptop computers, also tablet computers, computer networks, USB sticks, etc.

This unfortunately is not enough. The contemporary educational system is still heavily based on several assumptions that suited the circumstances of the 19th and 20th centuries. The basic teaching method back then was verbal knowledge transfer, while the role of the student was to listen and to best memorize the learning materials. Despite living in the information age we are still too often restricted by the old ways.

No regulation can loosen these restrictions. This is only possible by a conscious search for new methods of modern education and teaching. With this special issue we want to contribute to the research and development of flexible learning which includes e-learning, distance learning, e-content and other fields aiming at reengineering of education processes with the goal of developing competent thinking and work of all generations.

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Codes of Ethics and Codes of Conduct for Using ICT in Education

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Codes of conduct and codes of ethics are a way of ensuring that positive impact in the community prevails. Tertiary education environments that have standardised ICT management show higher quality of performance if compared to those that have not yet standardised it. Moreover, characteristic of these environments is their strong willingness for change. University is a place of scientific communication and, thus, ICT and especially the Internet represent the entry point into a new developmental phase to which the best universities are strongly dedicated. In this way, ethics returns to the core of the mission undertaken by higher education institutions. Many countries around the world are adopting National Educational Technology Standards (NETS) that have been developed and are continuously updated within the ISTE Association and at the same time represent a code of conduct for students, faculty teachers, administrators and all others involved in high-quality study. Those standards must be supported by codes of ethics as they depend on the compliance with the relevant moral values.

Keywords: code of conduct, code of ethics, ethical maturity, idea of university, National Educational Technology Standards (NETS), ISTE

1 Ethical challenges of ICT

Heinz Zemanek, one of the last living pioneers of global computer science, pointed out in his lecture in Maribor that "High technology requires high ethics!" (Zemanek, 2006). This realisation emerged into computer science at the very beginning, which is a particularity in technical fields; although it would be a lie to say that it is present among all computer experts in the world. Norbert Wiener linked technology and ethics with his concept of "cybernethics" in his famous dissertation entitled The Human Use of Human Being from the middle of the previous century (Wiener, 1954). His example of thorough reflection and his warning against the ethical consequences of ICT use were followed by almost every significant scientist in this field, based on which James Moor was able to define the "law" which states that ethical problems caused by the use of ICT increase proportionally to the growth of the social influence of ICT (Moor, 2005, 117).

The need for reflection on social influence of ICT certainly has not decreased in today's omnipresent recession, as the allegations that the crisis was, among other things, brought about by the abuse of new technology posing as "new economy" are proving not to be mere fabrications after all. On the other hand, those who believe that ICT is the last hope for getting out of this crisis are more numerous every day (van Reenen, 2010)

Codes of ethics and/or codes of conduct are a way to decrease the negative influences of ICT use on the social development. They are based on a vision of excellence and a positive mission, which is the goal of both individuals and professional associations and have been present in some professions since ancient times (e.g. the Hippocratic Oath). Stuart Gilman (2005) argues for distinction between codes of ethics and codes of conduct, although both methods of regulation interlace and interchange in real life. If the code of ethics is directed more towards the moral values and principles, then the code of conduct is more a model of standard behaviour in predictable situations of a professional activity. Instead of trying to combine both approaches, the code of conduct could represent an extension to the code of ethics. It is necessary to update the standards of conduct constantly, especially in the case of ICT, which develops rapidly, whereas the leading values do not change quite as quickly. If we do not do that, then the codes should be very general. Furthermore, some kind of "confession service" would be required, which gives advice on how to solve real ethical issues. This often happens when lawyers are entrusted to create a code, which then immediately includes quasi case law of disciplinary bodies because they stick to what they know and are unable to think outside the

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box. Nowadays, school life is more involved with laws and rules than pedagogical principles (codes of conduct), and then people wonder why educational issues are being resolved with the aid of lawyers.

The statement that the emergence of the information society raises ethicality is confirmed by the fact that modern organizations that use ICT largely cannot exist anymore without codes of conduct. This also applies to higher education as indicated by Davies, Moen and Dykstra (2009), Papp and Wertz (2009), Yahr, Bryan and Schimmel (2009), McKay, Kidwell and Kling (2007) et al. Their common finding is that higher education environments that have a code of ethics differ significantly from those that do not because their ethical sensibility is considerably higher. The difference also stems from the "projective nature" of codes that imply some ideal situation for which one needs to work hard, which already include the tendency towards positive changes. Higher education reforms often begin with a moral critique of the existing situation and such reforms are usually successful. On the other hand, reforms without a moral agreement are unsuccessful even if they are "technically" impeccable. Codes speed up the positive transformation because they prioritise the following:

- trust and credibility,
- respect for the individual,
- the culture of open and polite communication,
- making an impact by being a model,
- implementing legitimacy,
- preventing conflicts of interests,
- implementing transparency,
- concentrating on content rather than form,
- loyalty, and
- performing good deeds.

Codes sense the "the spirit of time" sooner than reform projects, which Victor Hugo had in mind when he wrote: "Nothing is more powerful than an idea whose time has come."

2 Ethics of ICT and higher education studies

Jürgen Habermas (1988, 170) defines university as "a communication form for scientific argumentation". It represents the space organized for the intense exchange of information and knowledge where the role of ICT is essential. The allegations that ICT itself disintegrates the university by subordinating it to the general "infosphere", which is outside the university's autonomy and where the academic hierarchy is disrespected, are wrong and maybe even intended to stop the impact of ICT on change in general. In reality, ICT brings back the possibility of individualization which almost disappeared at the time of mass study programmes and Karl Jaspers (1923) would approve because he was aware of the fact that "The idea of university lives above all through students' and teachers' personalities and consequently through their institution. If we disregard this kind of academic life, then no institution can save the idea of university."

Also of relevance are the warnings about ICT often entering into education through the wrong door accompanied by promises of "edutainment" instead of hard work. However, Larry Sanger, co-founder of the popular Wikipedia, says: "The declaration that the Internet reduces the need for learning or that a good memory isn't required anymore has no footing and only demonstrates the lack of understanding of the nature of knowledge. The essence of good education is… the development of judgment or understanding of questions, which require the perception of various facts and the development of thinking abilities about these facts and about their applicability. If you do not have the required spectrum of essential facts in your head, then you will not be able to make a reasonable judgement because that depends on your comprehension of these facts, regardless of how quickly you can find them somewhere else." (Oblinger, 2010).

ICT brings into higher education the need for a new learning culture, which will be based on case studies (simulations), will respect different learning styles and will allow for individualization and more teamwork. We have been waiting for new didactics, which will use numerous possibilities of interactivity and more individual responsibility for learning achievements and project work. Elements of innovation in digitally supported learning are also global dimension of sources, comparative access, intercultural understanding, etc. Manja Klemenčič (2010) from Harvard states that quality of studies is the critical point of the Slovenian high education system, the (non-)use of ICT being indicative of this state.

Unlike "digital immigrants", i.e. the majority of older people, provided that they are not just "digital tourists", the majority of today's students are "digital natives". "Digital immigrants" use ICT if they cannot reach their goals otherwise. "Digital tourists" use ICT by coincidence only. "Digital natives", however, accept it instinctively and expect from the university that:

- it enables digital access and e-participation everywhere;
- e-business prevails on its "territory";
- it offers efficient infrastructure for digital communication;
- it works towards digital literacy;
- it uses Netiquette;
- it arranges relationships on the basis of digital law;
- it provides digital healthcare;
- it ensures digital security, etc.

With regard to digitalization, good universities are ahead of their peers and some elements of "territorial independence" are returning to the university autonomy in a surprising manner; elements, which were once required for academia to accomplish its mission in environments, unfriendly to reason. The Internet represents a good example of a regulated university communication system, which was also accepted by the "outside world", although academics must defend their freedom all the time, something that is incomprehensible to businessmen. Just in case, we also have independent academic networks. It is not surprising that the Internet is closely linked to "open source", the natural habitat of universities (although not ours which are that, and why?).

Robert Nash (2007) was the first to realize that learning of ethics must also be ethical. It is necessary to distinguish between three "moral languages" – the language of background beliefs (zero-level values), the language of moral character and the ethical language of codified rules and principles.

While learning ethics, the attention is focused on "the third moral language", whereas as far as the first two are concerned, it is better to be reserved. That is why students have difficulties to express:

- which main moral question occupies them;
- ethical conflicts they become aware of;
- holders of ethical discrepancies;
- possible consequences and challenges of ethical decisions;
- basic beliefs they cannot renounce;
- feelings during ethical acts;
- limits which arise from the character of personality;
- the relevance of the accepted codes of professional ethics;
- discrepancies between legal and ethical responsibility.

Daniel Callahan (1980), one of the "fathers" of biomedical ethics, set up the following five aims for learning ethics: 1. Stimulation of moral imagination. 2. Recognition of ethical problems. 3. Cultivation of the feeling of moral duty. 4. Development of capability for ethical analysis. 5. Patient solution of ethical disputes.

Ethicality is not an additional skill and we must not expect from ethics to be a "tool" which automatically separates good and bad instead of us. Ethicality is a personal attitude of an individual and only one rule was applied at the beginning of ethics development: imitate an ethical person and you will always be on the right track. Gradually, things became more complicated and it is not as simple to determine any more what ethical maturity is.

Lawrence Kohlberg (1969) constructed a model of ethical maturing which happens on three levels and in six degrees: (i) the first level is pre-conventional, where the egocentric view prevails, obedience due to fear of punishment and motivation due to pleasure are characteristic for this level; (ii) the second level is conventional, which takes into consideration the opinion of the environment due to which it is necessary to take on some social roles and respect the appropriate social conventions; (iii) the third level is post-conventional, when an individual actively co-shapes social agreements, is capable of critical judgment from the point of view of universal ethical principles. A diagnosis to find out which level our students are at is not easy and cannot be generalised.

Universities once had ethics as the core of their mission, which, along with academic freedom also gave them autonomy of research. In the absence of freedom, however, they converted to "ancillas" of some type of tyranny or another. A characteristic of scientific research is that it interferes with an unknown reality, which is not legally regulated; hence ethical responsibility is much more important for scientists. The university must transfer this attitude to its students by:

- providing awareness about ethics within the regular curriculum, which includes the understanding of ethical concepts, the skill of ethical argumentation, the knowledge of cultural values;
- accustoming students to trans-disciplinarity;
- providing training for ethical action, which includes critical skills, creativity, estimation of benefits and risks, foreseeing of future development;
- supporting personality development, which includes the understanding of ethical views and conducts, both one's own as well as that of others, respect for life, cultivation of the feelings of duty, honour and responsibility.

3 Standards of ICT use in education (NETS)

The International Society for Technology in Education (ISTE), with its headquarters in Washington (www.iste.org), was founded in 1979 when the Association of Computer Science (IACE) and the International Council for computer Education (ICCE) merged and represents today's most influential professional organization in this field. It establishes de facto standards, respected by UNESCO where ISTE is in charge of the ICT competency framework for teachers (ICT-CFT). Supported by a wide circle of professional associations (80), it is relying particularly on the research potential of Johns Hopkins University and SRI International.

ISTE established national educational technology standards (NETS) as follows: standards for students (NETS.S) in 1998 and renewed in 2007, standards for teachers (NETS.T) in 2000 and renewed in 2008, and standards for administrators (NETS.A) in 2001 and renewed in 2009. Standards for teachers are supplemented by technology leadership standards (NETS.TL), by technology facilitation standards (NETS.TF) and by computer science standards for acquiring additional qualification for computer science education (NET.CS). Besides the USA, these standards are also in use in forty countries around the world.

- Educational technology standards for students represent the code of conduct for digital media which support the following skills in students:
  - creativity and innovation;
  - communication and cooperation;
  - research and information fluency;
  - critical thinking, problem solving and decision-making;
  - digital citizenship;
  - understanding of technology operations and concepts.
- Educational technology standards for teachers represent the code of conduct for ICT, which direct their professional attention to:
  - facilitating and inspiring student learning and creativity;
  - designing and developing digital age learning experiences and evaluation;
  - revising a model of digital-age work and learning;
  - implementation of the principles of digital citizenship and responsibility;
  - engaging in professional growth and leadership.
- Educational technology standards for administrators in education represent the code of conduct for ICT, which include:
  - visionary leadership in the sense of complete integration of technology as catalyst for the transformation of the education system;
  - digital age learning culture;
  - excellence and professional practice;

  - systemic improvements;
  - digital citizenship.
- Additional standards for decision-makers about education technology and for maintenance staff who require the knowledge of:
  - technology operations and concepts;
  - planning and forming of learning environment and practice;
  - methods of teaching, learning and curriculum structure;
  - evaluation strategies and methods;
  - productivity and quality factors of educational practice;
  - social, ethnic, legal and humane views on ICT use;
  - strategies and tactics of project management.
- For teachers who are specialized for computer education, additional standards are required in order to obtain qualification for:
  - programming and developing of algorithms;
  - presentation of components, organization and functioning of computer systems;
  - presentation of data and information organization;
  - explanation of the social view on computer science;
  - curriculum planning;
  - teaching;
  - evaluation of the educational process;
  - one's own lifelong learning.

Among the abovementioned standards, there are many that express an ethical attitude and presume the respect towards ethical values:

- personal characteristics such as creativity, critical skills, responsibility, cooperation, communication skills:
- education with vision and pedagogic excellence;
- social, ethical, legal and humanitarian aspects of ICT use, which also include problems such as digital divide, or contents selection or censorship;
- digital citizenship.

"Digital citizenship" itself opens a wide ethical front because its meaning changed considerably during the last few years. Citizenship in general represents the complete participation in a state community, whereas digital citizenship means "online participation". It is related to the "digital divide" which was previously almost exclusively explained in the technical sense of accessing ICT. Now, the emphasis lies on the actual participation in social processes. Traditional participation required certain qualifications and the adoption of common ethical principles from people, which, under the circumstances of "online participation", becomes even more demanding. It is necessary to pay much more attention to "digital citizenship" now because exclusion from it causes fatal negative consequences for the economic, political and social position of an individual (Mossberger, 2007, 2).

The experience with the use of NETS warns us that these standards are often explained as "technical" by quoting statistics about available equipment, which is supposed to be the ultimate proof of meeting the standards. It is often overlooked that the C in ICT does not stand for "computer", but for "communication", which means content and not empty "channels". This vague situation brings numerous misunderstandings related to new technologies, including constant attempts of their "satanization" or some milder form of public discredit because they cause demoralization. Similarly, the press had been condemned as evil at its beginnings and today passes for "saintly" compared to the Internet. Nancy Willard revealed that the World Wide Web is nothing more than a mirror of the society, although clearer than all the previous ones, which is why moral "sins", which could have been hidden before, can be seen now (Willard, 1997).

At the same time, when ICT use is introduced to students, it is necessary to also teach them that:

- remote functioning without any feedback does not mean that we do not cause damage, guilt or pain to someone;
- the possibility of anonymous performance and, essentially, the reduced probability of being discovered or punished does not dismiss us from moral responsibility and bad conscience;
- the new digital environment with new and changed circumstances requires new and updated ethical principles;
- social discrepancies and corruption take on new forms and we must develop additional sensors to recognise them.

Humanity has no guarantee that ICT will work for its prosperity and not for its demoralization with its fantastic possibilities without a very serious effort of the whole educational pyramid, starting with the university, to teach people about new ethical risks. As it was already demonstrated at the beginning, the pioneers of computer science were aware of "walking a thin line" and warned against it, and hoped that the information age would be the victory of a morally mature society.

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Kodeksi etike in kodeksi ravnanja pri uporabi IKT v izobraževanju

Kodeksi ravnanja in etični kodeksi so način zagotavljanja prevlade pozitivnih vplivov v skupnosti. Visokošolska okolja, ki so standardizirala ravnanja z IKT, izkazujejo višjo kakovost delovanja od tistih, ki tega niso storila. Značilna je tudi njihova večja pripravljenost za spremembe. Univerza je prostor znanstvene komunikacije, zato ji IKT in še posebej internet predstavlja vstop v novo razvojno fazo in temu se najboljše univerze močno posvečajo. S tem se tudi etika vrača v jedro poslanstva visokošolskih institucij. Številne države po svetu sprejemajo standarde uporabe izobraževalne tehnologije (NETS), ki so nastali in se stalno dopolnjujejo v okviru združenja ISTE in predstavljajo kodeks ravnanja študentov, učiteljev, administratorjev in drugih nosilcev kakovostnega študija. Ti standardi morajo biti podprti z etičnimi kodeksi, saj so odvisni od sprejemanja ustreznih moralnih vrednot.

Ključne besede: kodeks ravnanja, etični kodeks, etična zrelost, ideja univerze, standardi izobraževalne tehnologije (NETS), ISTE

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Educational Possibilities of the Project Colour Visualization of Music

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We propose a system of colour visualization of music based on a system of colour signs, which are connected to musical tones. Tones, which are in harmonic relationships, are represented by related colours. First, we outline the foundations on which the system of colour signs is based – the mathematical model of harmony. We discuss several possibilities of visual representation of expressive elements of music – melody, composition, rhythm and harmony. These relationships enabled us to develop a computer program that employs these elements for visualization. The program mimics human perception in which the parts are determined by the perception of the whole. Furthermore, the program enables the development of tools that can enhance music understanding during listening or performing. Music performance can acquire a new quality with the use of interactive coloured musical instruments, which by using colours show the performer different possibilities for forming musical harmonies and thereby change the composing of music into a game and attractive colour-aural journey. Here we stumble upon a challenge for educational science and methodology: how to use such upcoming multimedia tools. These tools would bring the processes of learning and playing a game closer together since playing games is a child's most natural form of functioning. Furthermore, in the area of artistic creation we can once again establish a balance between our logical and intuitive nature.

Keywords: visualization, music, colours, learning, creativity

1 Introduction

In his book Optics, published in 1704, Isaac Newton connected seven tones of the octave with the seven colours of the rainbow. Probably the only explanation for his division of the rainbow into seven colours was his wish to achieve an alignment with the seven tones of the octave and possibly with the seven celestial bodies known at that time. He also described the colour wheel (Figure 1) and proposed several solutions for connecting the colour wheel to the tones (Collopy, 2009).

However, the study of harmony may have started even earlier. Pythagoras studied the nature of musical harmony in the 6th century BCE and discovered the first natural law based on small integer arithmetic. This influenced his students – the Pythagoreans and Plato heavily. They expanded the mathematical model to encompass the harmony of nature and the entire universe. A known example is Plato's work on Harmony of the spheres (Plato, The Republic, 380 BCE). In some way, his discovery marks the start of science (Benson, 2006, Tramo et al., 2001).

Throughout history a lot of composers, musicians and syneasthetes sensed particular properties of music visually or with colours. Richard Wagner believed in *Gesamtkunstwerk*, a musical creation for all senses. Alexander Scriabin included a colour piano in his orchestral composition Prometheus: The Poem of Fire. The piano was supposed to project coloured light onto a screen in a concert hall, but Scriabin died before its realization. Pioneers of abstract painting, such as Wassily Kandinsky and Paul Klee, connected their art with musical language. However none of the systems for representation of music with colour came into widespread use, with the exception of some teaching methods, tools for visualization of music for the deaf and for entertainment.

Our project started with the desire to find a system for colouration of musical tones that could show fundamental harmonic relationships between the twelve semitones. Most assignments of colours to musical tones that are based on

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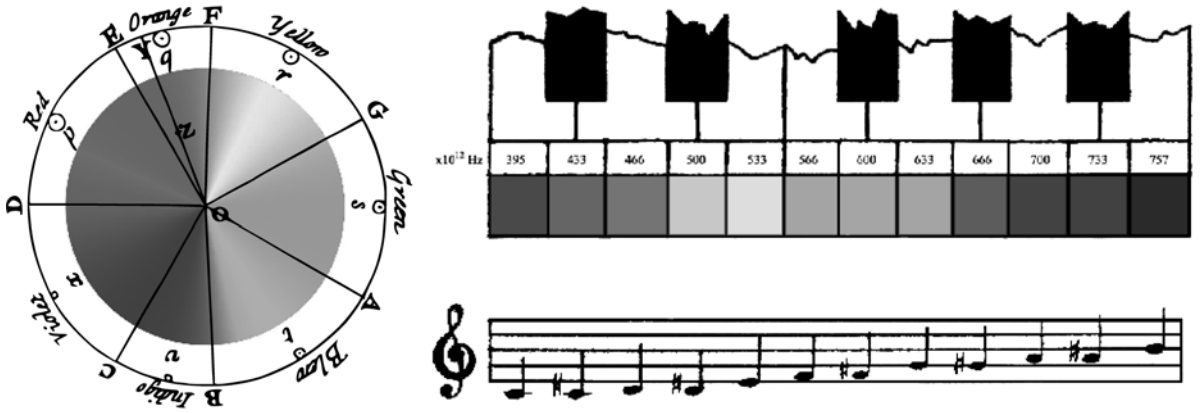

Figure 1: Newton's colour wheel with reconstructed colours[1] and distribution of the colours in order of rising frequencies.

physical properties of sound distribute the tones linearly in order of rising frequencies or wavelengths (Figure 1). Such distribution can show melodic distance between tones and can be used for teaching songs and melodies, but it fails to explain that some tone combinations may, when played concurrently, sound consonant or dissonant. Using the aforementioned colouring method, the consonant combinations of tones are represented by very different colours and dissonant tone combinations can have very similar colours.

A more appropriate solution is to colour similarly sounding tones or tone combinations with similar colours. We devised a method for calculating a common colour for any combination of concurrent tones (Ciuha, Klemenc & Solina, 2010), which enables us to show musical harmony with colour. Further applications include the possibility to create coloured musical instruments that enable the performer to see the possibilities for forming musical harmonies with the help of colours, which in turn has educational value. On the other side, our project could also open new ways of experiencing music for deaf people.

We created our system of colour signs based on the mathematical model of harmony. In visualization we need to visually represent expressive elements of music – melody, composition, rhythm and harmony. Meaningful solutions enable us to develop a computer program that uses these elements for visualization. The solution should be related to our perception in which the parts are determined by the perception of the whole. On that basis new musical tools and colour musical instruments could be created that would enhance understanding of music during listening or performing. Here we face new challenges for educational science. These tools could bring the processes of learning and playing games closer together, as playing is a child's most natural form of functioning. Finally, in the area of artistic creation we could re-establish a balance between our logical and intuitive nature.

The rest of the paper is organized as follows: in Section 2 we review the mathematical model of harmony. Section 3

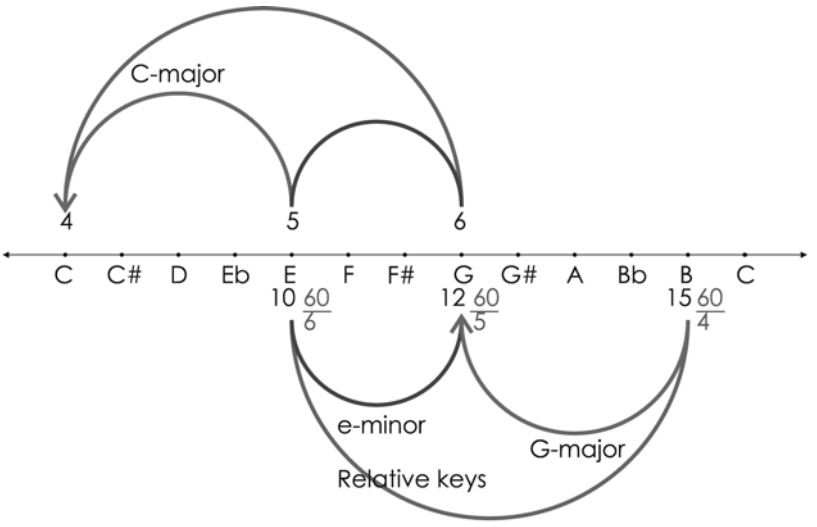

Figure 2: Comparison of major and minor.

describes the proposed mapping between tones and colours. In Section 4, we study fundamental expressive elements of music and possibilities of their visualization. Section 5 presents our project "Colour visualization of music". Interactive colour musical instruments are outlined in Section 6. In Section 7, we discuss the possibility of using the system in education and conclusions are finally drawn in Section 8.

2 Mathematical model of musical harmony

In music language two fundamental types of scales and chords are called major and minor. A musical tone consists of a basic tone at a certain frequency and of higher harmonic components with frequencies that are integer multipliers of the basic frequency (Benson, 2006).

A major triad is very similar to the fourth, fifth and sixth multiplier of the basic frequency. We experience it as an enriched form of the basic tone (Figure 2: C major triad). Minor triad does not comply with that pattern, but is instead similar to one sixth, one fifth and one fourth of a common higher harmonic component of all three tones. It can be also interpreted as the 10^{th}, 12^{th} and 15^{th} multiplier, which is the same as 60/6, 60/5, 60/4. In some way, the minor is a mirror form of the major (Benson, 2006, Parncutt, 1989). The musical character of the minor is defined by its middle tone (Figure 2: e minor), which means, that like in major, the relationship of 5:4 (or 15:12) is the most important relationship for the perception of a combination of concurrent tones. If the 10, 12 and 15 represent E, G and B, we get E minor, which is relative minor to G major (Balsach, 1997, Parncutt, 1989). E minor scale uses the same tones as the scale of G major. This holds true for majors and their relative minors.

From the times of ancients Greeks onwards we search for an explanation for the influence of music on humans and for the explanation for the music itself. Partial answer lies in the study of the mathematical relationships between musical elements. The relationships (ratios) deviate a bit from ideal values in temperate scales since they have equal distances between all semitones.

If we choose the major and minor chord as the basis for the model of harmony, we want the colours of the visualised tones to be similar. In this way the performer or the listener could see that the tones he is using form a harmonic whole. The first model of harmony was proposed in the 6^{th} century BCE by Pythagoras. He discovered that the most consonant sounding tone combinations are created by strings with special ratios of their lengths. The ratios of these lengths can be expressed by small integers. The string lengths are in inverse relationship with the frequencies of oscillation – shorter strings oscillate with a higher frequency (Benson, 2006). The ratio of 2:1 is called an octave and the tones comprising an octave are so similar that we can speak of octave equivalence. The next ratio is 3:2 or a fifth and can be used as a generator of a sequence (of an arbitrary number) of new tones. Pythagoras discovered that certain tones in the sequence are very similar and connected the sequence of tones into the circle of fifths. The fifth of the last fifth is almost equal to the first tone in sequence.

The number of fifths in the circle can differ, but often the simplest solutions are used: 5 tones (pentatonic), 7 tones of octave (diatonic scale) and 12 tones of chromatic scale (Parncutt, 1989). None of the circles of fifths is completely mathematically correct because results of multiplication by 3/2 can never give the same result as a multiplication by 2 (octave). This difference or error is distributed evenly among all the tones of the chromatic scale in the equally tempered scale. Among consonant relationships are relationships with ratios of frequencies of 2:1 (octave), 3:2 (fifth), 4:3 (fourth), 5:3 (sixth), 5:3 (third), 6:5 (minor third), 8:5 (minor sixth). They all have adequate approximations in the equal tempered scale. Less harmonic or non-harmonic ratios are 7:4 (16:9, 9:5, minor seventh), 7:5 (45:32, tritone), 9:8 (second), 15:8 (seventh) and 16:15 (minor second). These ratios have also worse approximations (Huron, 2008, Parncutt, 1989, Benson, 2006).

When we hear a musical tone, we perceive an array of different frequencies with integer multipliers of the base tone frequency. They are connected into a coherent harmonic whole

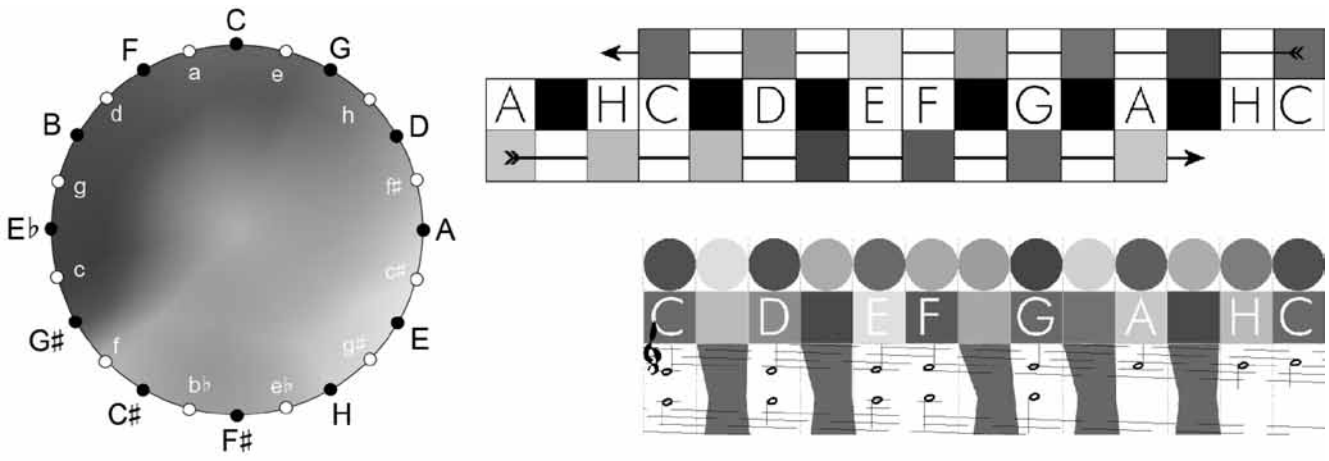

Figure 3: Coloured key spanning circle of thirds and the distribution of colours in an octave (see: http://dx.doi.org/10.2478/v10051-011-0006-9).

Figure 4: Comparison of colours of c minor (left) and C major (right).

by our aural system. Presence of order means that all frequencies came from the same sound source. Different independent sources on the other hand produce mathematically unrelated frequencies, which cause us to assure ourselves what is happening around us. We perceive them as unpleasant and dissonant, because they "wake us up" (Wells, 1980).

3 Proposed mapping of tones to colours

Contemporary systems for organising tones by harmonic relationships are usually two- or three-dimensional (Gatzsche et al., 2007, Bergstrom, Karahalios & Hart, 2007, Chew, 2000). Nearly all map the tones by a relationship of fifth (3:2) and third (5:4) (Parncutt, 1989). Our organisation of tones is a circle related to the circle of fifths where we can find all tones of a minor or major triad in a sequence called key spanning circle of thirds (Gatzsche et al., 2007). For mapping tones to colours we assign a colour wheel to the key spanning circle of thirds. We have to choose the direction of the colour wheel and initial alignment of the two circles. We chose white piano keys to have warm colours and black keys to have cold colours, but any other initial alignment would also be equal to the chosen one, so the initial alignment is not fixed and the user can change the associations by rotating and mirroring the colour wheel.

The upper right part of Figure 3 shows the basic or major colour of each tone. We can notice two rainbow-like sequences. Each tone appears twice in the key spanning circle of thirds, depending on its major and minor position. In this way, each tone has two different colours. The lower right part of Figure 3 shows the colour of relative minor added in a circle above the colour of the major. This gives us a colour arrangement where tones of the chord or tones belonging to same scale have related colours. For example on Figure 4 we can see that C major triad is (magenta) red and that the c minor triad is blue.

We implemented this tone colouring model as a part of our multimedia application for visualising music with colour (**Colour Visualization of Music**). With an algorithm for calculating a common colour for any combination of concurrent tones (Ciuha, Klemenc & Solina, 2010), we could visualize musical harmony with colour and create coloured musical instruments that enable the performer to see the possibilities for forming musical harmonies with the help of colours. Composing of musical harmonies and music itself is thus transformed into a play, which gives a child or an adult a new entrance into music creation and also enriches experience of listening to music.

4 Visualization of fundamental expressive elements of music

4.1 From melody to composition

Visualization of a musical instrument or of a singing performance can clearly show the students if the melody is rising, falling or staying at the same height, additionally they can also observe the size of any jump or movement. The line that moves between the points (tones) of different heights is a very clear model of movement of the voice or the sound of an instrument (Figure 5). Visualization of the melody with a line enables a clear presentation of the whole and simplifies the integration of observed melody into the broader knowledge and understanding or comparison with other songs and compositions to search for similarities. Such knowledge exceeds the unconnected partial knowledge and is very important for permanent and long-term memory retention. Starting with a

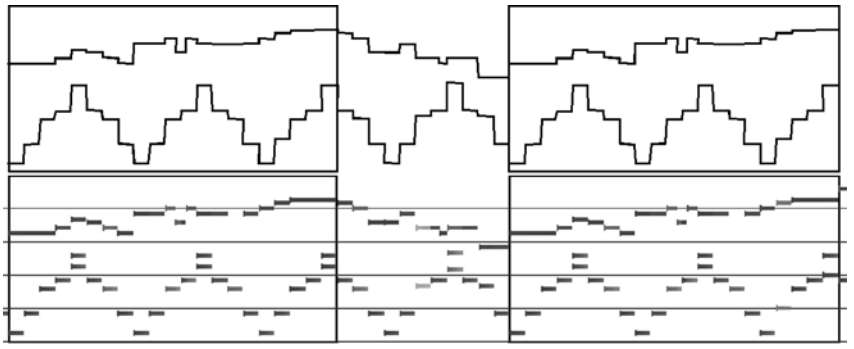

Figure 5: An excerpt from Bizet's opera Carmen. On the lower side is the visualization; on the upper side is the line of melody.

melody, it is natural to continue into the study of composition, where we study how particular shapes change and connect themselves into bigger entities.

The two frames on Figure 5 denote repeating parts. We can observe two separate melodic movements – the melody and the accompaniment. In the visualization itself the melody can be seen as a movement that predominately resembles steps. This can be seen very clearly in monophonic compositions. Compositions with a complex harmony are usually based on polyphony, where more independent voices intertwine into a more complex harmonic entity. It is not always possible to determine an unanimous monophonic equivalent that would be equal to the psychological experience.

Melody is also a theme that can repeat itself more than once or even repeats itself constantly. In complex compositions we can observe various forms of repetitions with variations.

4.2 Time and rhythm

The repetition of musical elements, tones, themes and melodies represents the next dimension of music – time and rhythm. Like a picture or a statue exists in space, music exists in time. We commonly draw time as a line of events, similar to musical notation, writing or comic books. However, time in music is predominately cyclic. We can find a lot of concurrent movements, one inside another, and how to visualize them presents a challenge. We experience the repetition as rhythm and rhythm means movement, which can be observed in its purest form in African dances. Rhythm brings the listener into motion and enables us to live (beating of the heart and breathing), additionally it connects all the participants into a community. Music and rhythm is therefore even today a fundamental part of (religious) rituals. On the other hand, music and rhythm are sometimes also used to defeat one's will. This happened in concentration camps, where music forced the exhausted people to work or slaves on galleys to row according to the rhythm of drums.

When visualising rhythm we draw events as shapes in a timeline. Usually these sounds do not have qualities like tone height so we draw them as monochrome elements. Grey appears in the centre of the colour wheel and is also the result of visualizations for certain combinations of tones. Complex rhythms draw a complex shape and we can again observe rhythms inside rhythms and variations. Loudness of an event could be visualized as the size or degree of transparency.

In our visualization program the rhythm has its own plane, where every single rhythmic voice is represented in its own line (Figure 6 left). In melodic music tones also play the role of rhythm. They construct and limit the time, speed or movement, they change with breathing in or breathing out and with the two directions of a bow movement on a stringed instrument.

4.3 Harmony and timbre

Every voice or musical instrument produces its own pattern of fundamental tones with higher partial tones of different loudness. The recognition of these patterns of partial tones enables us to differentiate between particular musical instruments and voices. If the instruments are precisely mutually tuned, the performers can play with our aural perception and connect different musical instruments together in accordance with musical language. This emphasizes single tones or parts of the melody and joins them into bigger entities. Harmony can release feelings and melody creates movement and story. The whole range between perfect harmony and disharmony enables the whole range of feelings "from heaven to hell".

Evident is also the representation of modulation of harmony that is visualised as a colourful journey (Figure 6 right).

5 Project "Colour visualization of music"

Visualization of harmony was the main purpose of our visualization program (Ciuha, Klemenc & Solina, 2010). We tried to create a mathematical model that would behave as close as possible to the human aural perception. This task is not easy because we are not dealing only with passive reception but also with active cognition and recognition of meaningful entities based also on incomplete and missing information (Meyer, 1956, Parncutt, 1989). Ear functions as a frequency analyser and is very efficient at ordering sounds with different frequencies into bigger entities. If we perceive a non-complete pattern of frequencies, the aural perception system automatically fills in the missing parts of the whole. This happens when we hear only higher harmonic partials of a tone without hearing the basic frequency. In this case the aural system adds the missing basic frequency.

The aural system tries to order the information into the simplest possible form. This means that in the process of perception each part of information gets its final meaning based

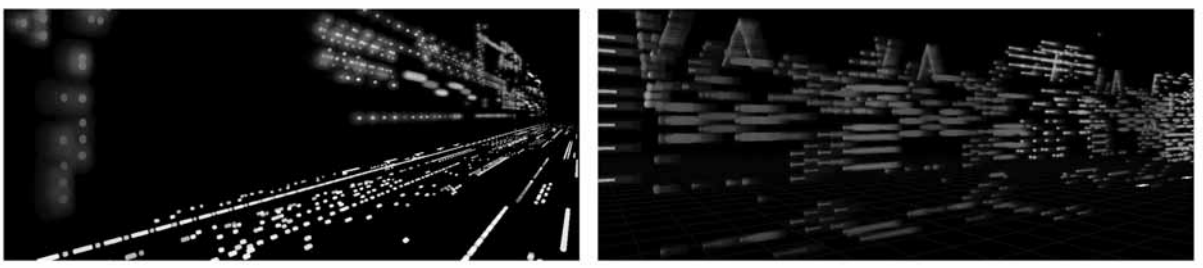

Figure 6: Three-dimensional visualization of music with colours.

on the whole entity. In other words, the whole determines the contents of each part. Consequently the tones can have different interpretations in different music context. The same is true for the ratios of tone frequencies. For example the tritone can be interpreted and used in a harmonic way – as the ratio of 7:5 (as used by Debussy and Ravel) or as a dissonant interval 45:32 which appears in medieval music and is referred to as "Diabolus in musica" (Wells, 1980, Tramo, Cariani & Delgutte, 2001). We visualise the pure tritone as grey, because the two tones that form it are located on the opposite sides of the key spanning circle of thirds (Wells, 1980, Collopy, 2009).

Like our aural system joins the tones into a whole, the program analyses the tones and assigns an appropriate colours to the concurrent tones. The colour is calculated by representing the concurrent tones as appropriate vectors in a coloured key spanning circle of thirds and adds them together. For a detailed description of the algorithm refer to Ciuha, Klemenc & Solina (2010).

The next level of harmony analysis joins sequential temporal events. The results are represented as glowing colours around the tones and can show a presence of a key for that part of the musical piece. When there is no such key, the glowing is coloured grey or with unsaturated colours or is a sequence of very different glowing colours. On this level of analysis, all musical instruments and voices are processed together. If desired, the musical instruments can be separated and displayed on parallel planes. The visualization makes use of three spatial dimensions, which enables us to observe the visualized musical elements from different views, projections and perspectives (Figure 6).

We can group separate musical instruments by their timbre and separate them visually with patterns or even colours. This complies with the idea that different instruments have different colours. For example Wassily Kandinsky compared in his essay *Concerning the Spiritual in Art* (Kandinsky, 1910) the sound of a trumpet as yellow, the sound of a string instrument like a violin as green and a cello as deep blue (Collopy, 2009). However this kind of colour mapping excludes the mapping of harmony to colours.

The remaining challenges are the differentiation between major and its relative minor (for example C major and a minor) and display of functional harmony. What is the expressional difference between major and minor is still an unsolved question. Often is the music in minor keys connected with sad and painful feelings. Leonard B. Meyer says in his work *Emotion and Meaning in Music* (Meyer, 1956) that there is no expressional difference between the major and the minor chord, but that the expressional difference is caused by usage of different scales and consequently of different melodic movements, augmented and suspended chords and also by slower tempo, different modulations and suspense (Parncutt, 1989).

Our program for music visualization (Ciuha, Klemenc & Solina, 2010) is in its current development phase still limited to tonal music. The analysis is made on music in MIDI format, which does not describe music as a sound waveform, but as a sequence of events (for example: each tone consists of two events in time - one for its start and one for its end).

Because the program is based on MIDI encoding it enables us to change the tempo of the music without distorting and changing of musical instruments (and their soundbanks). But the downside of MIDI is that the music is played by samples of sound of real instruments and is in consequence relatively lifeless compared to a real performance. In the next phase of the development of our program, direct audio signal could be used as input, followed by spectral analysis and finally by colour visualization. This is currently possible only if a third party program for conversion of audio signal into MIDI events is used. Finally, we come to a stage where we can evaluate our model of visualization with a series of experiments and measurements of physiological responses to aural-visual stimulus.

6 Coloured musical instruments

The next dimension of our project opens when a coloured musical instrument that is connected to the program is played. The program analyses the harmonic relationships during the performance in real-time and displays the results as colours on the musical instrument itself. For example, on a coloured piano the performer has keys coloured with 12 colours of a rainbow that represent the 12 major tonalities in the coloured key spanning circle of thirds (Figure 7 middle). By choosing and pressing a first key, each of the other keys colours itself in accordance with the possibility that the performer would press that key in the next moment. This means that all possibilities of playing and forming harmonies are displayed with colour. When the performer chooses and presses a second key the

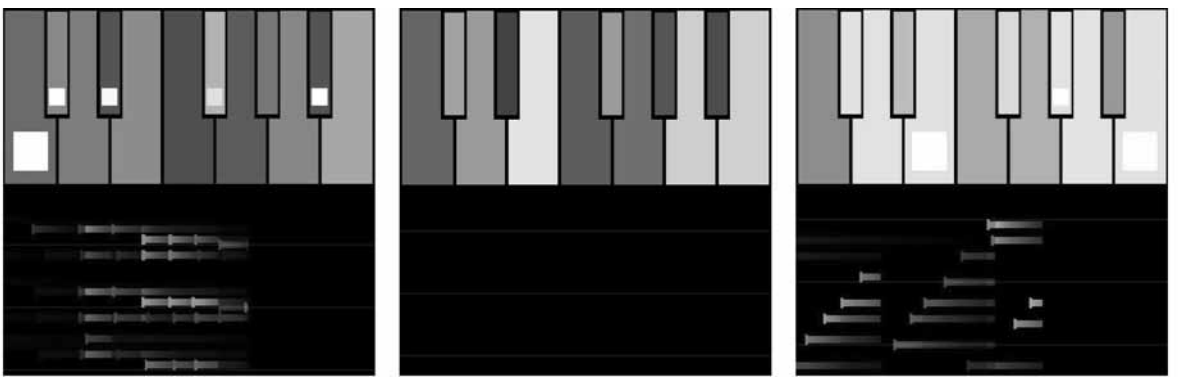

Figure 7: Initial colours of the octave (middle) and colours during playing of different chords (left and right).

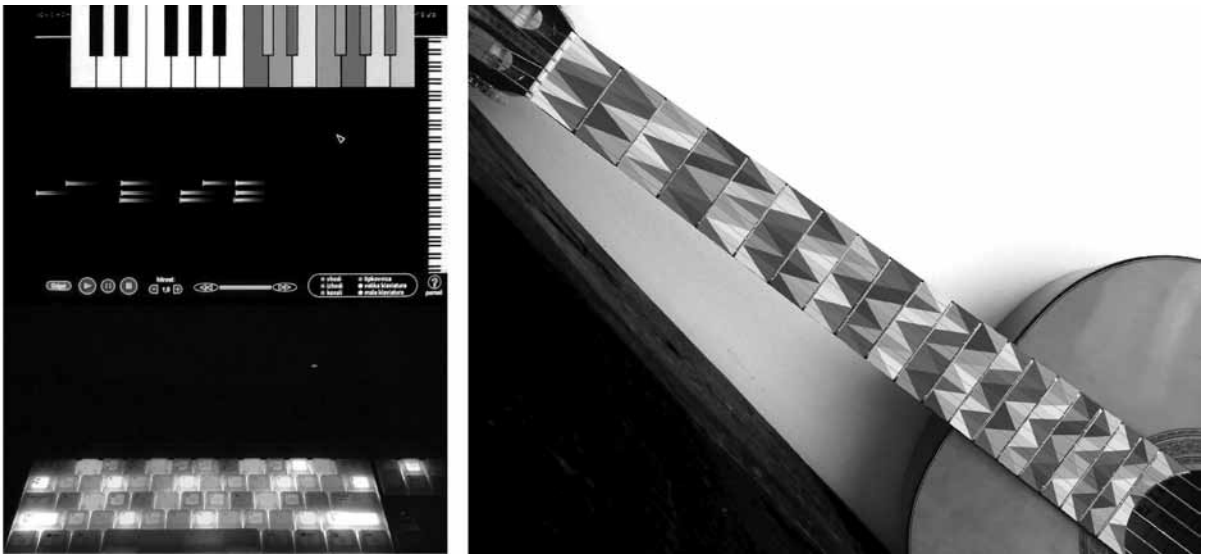

Figure 8: Coloured keyboard and coloured guitar.

process repeats itself and the results are new colours for each possible key.

Figure 7 displays virtual coloured octave during playing of chords. The performer playing on a coloured piano can choose which keys to press in every moment during his performance and his choices are not limited in any way. If he chooses vivid colours, he will stay in pure harmony and different colour nuances will lead him through different major and minor chords and tonalities. The choice of grey or unsaturated colours will bring him into dissonance or partial harmony. He can use disharmony to prevent his music to be one-dimensional or monotone.

During the performance the player can observe the computer screen or a projection with the visualization of his music and it is also possible to connect more performers together into a bigger joined performance. If they have very different musical skills, a musically inexperienced performer could offer coloured and musical cues on which the more experienced would build and improvise.

The coloured piano is currently in a prototype phase. The program can display one octave of a coloured piano. The resulting colours can be sent to a RGB LED computer keyboard (Figure 8) or a picture of the coloured piano keyboard can be projected onto real piano keys with the help of a LCD projector. Currently, we are also developing a system of RGB lit (velocity sensitive) key titles that would be placed over actual piano keys. The output of the velocity sensors would be sent to the computer program that would send back to the titles information which colours to display. A similar interface could be developed also for other musical instruments.

Another direction of the development of musical instruments would be the use of modern computer and communication technology, for example the aforementioned coloured or augmented standard keyboard. However even more interesting are modern tablet computers and mobile phones, music players and some game consoles with multi-touch displays. On these devices the interface of a coloured instrument with all interactive elements can be displayed directly on the screen.

A coloured musical instrument could also be a part of a room or a concert hall which would lit up according to the music played (Ciuha, 2001).

7 Teaching with the help of multimedia materials

On the basis of coloured instruments and computer tools for visualization different programs and games can be developed. These could lead the student not only through learning of musical theory and practice but would enable him free creation, recording and modification of his own project. In addition a connection with other performers and the teacher is possible. From a technical point of view, there are no obstacles hindering the development of such applications. A number of musical games already exist that are derived from the idea of karaoke or include playing on computer equivalents of real instruments, for example guitars or drums. With the appearance and development of better multi-touch tablet computers a new era of teaching and learning is approaching. Interactive multimedia teaching materials can make most teaching subjects very interesting and exciting. Especially those that can convert the learning content into an experiment, adventure or game. In this case a child experiences the game as the purpose of his activity, but unconsciously acquires knowledge, which enables him to succeed in the game.

The project Colour Visualization of Music offers a possibility to make a step into an unexploited direction of music teaching that could empower children and adults to create music very naturally and not only by reproducing a musical score. The practice of drawing and painting is only rarely learned only by copying other pictures but mostly by creating artwork upon a theme, by experience, by understanding or emotion. New approaches to education could transform

consumerism and copy-paste practices into new creative experiences and schools could be transformed into a creative laboratories. It is only a question of vision.

Present day's curriculum encompasses art and music and others subjects and is developing in the direction of mutual interconnection of all learned content. Realisation of this aim today depends on communication between the teachers and on their openness, knowledge, desire and readiness to experiment in new forms of work. Teaching is an open process, which means that the teacher is no longer the one who knows the answer to every question and is in control the whole time. This can be an uncomfortable situation for many teachers.

A possible preparation for teaching music connected with colour and visual art could include a slideshow that would present basic ideas, together with audio, video and pictorial examples about the interconnection of the two art forms. Multimedia slides could be supported with actual experiments. When a fundamental understating and comprehension is achieved, the class can move on to actual demonstration of the visualization or at least play the recorded visualizations of different pieces and eventually move to music and visual art creation.

For the actual execution, optimal technical conditions are necessary besides having enough time: darkened classroom, LCD projector with vivid and saturated colours, a computer with powerful computer graphics, a good sound system and a connection to a digital piano or a coloured musical instrument or to an appropriate interface. The comprehension of coloured musical tools is achieved through practical demonstration. In parallel to the musical performance on a colour instrument, the remaining students in the class could draw, paint, dance, sing or in some other way create art on the basis of concurrent musical events. In this way the process of cognition deepens and connects itself with direct expression and with search for appropriate personal art equivalents. Or vice versa, the visual artworks or colour score can initiate musical exploration. Developing new creative practices can be a challenge for a motivated teacher and for his or her students.

The feeling of creativity is wonderful and intoxicating as self-realisation is the highest level in Maslow's hierarchy of human needs. A special quality of music created with coloured instruments is, that the often lost primeval happiness and enjoyment during creation of music can be found again. It happens too often that students forget the original purpose of musical education and direct their energy only into technique, repetition and skill, but forget the simple happiness of playing, listening, discovering and expressing themselves.

Such colour improvisation can be thought of as painting of music, or being like a painter, who instead of a brush and colour uses a colour piano. A musical walk through harmonies arises from that improvisation, which is free of limitations of melody and rhythm. In such music some qualities of nature like a sound of a waterfall or a singing bird appear. These can be monotone and mildly cyclical, but also variable and unexpected. These qualities are relatively rare in omnipresent pop music but can be found among jazz, improvised and modern serious music.

The last particularity of the teaching system is the relative absence of failure and consequently frustration because a coloured instrument enables the realization of the ideal WYSIWYG (What You See Is What You Get). A failure may appear only as the result of a very superficial and disinterested approach. Such a state is not natural and is always acquired and thus can be unlearned with some help, understanding, guidance and trust. The system works if we use it and the use depends on the users themselves.

8 Conclusions: synthesis of art and science, play and project work as teaching model

The project Colour Visualization of Music is the result of an interdisciplinary approach in connecting science and art. This connection is not utilised enough on the societal level and in the context of the currently predominant scientific-technological approach. Different creative processes of science and art are based in the two specialised brain hemispheres. The left hemisphere is associated with symbols, logic and language and the right hemisphere is associated with recognition of patterns and faces, perceiving various relationships and with creativity, problem solving and intuition. The example of music and visual art shows us, that the right hemisphere can create new worlds of art, for which the science only later establishes explanations and deduces laws. Most of music and art theory was formed retrograde in this way. Thus art invents new rules and consequently meaning.

Teaching music with our visualization system is based on project work and direct experience. Project work means that the students understand the aim of the project and concrete objectives of the study – the practical project result. The knowledge that is the result of studying has a practical nature and is immediately used and tested during the learning project. Commonly, this knowledge interconnects several disciplines.

Direct experience is particularly strong in games. A game with its openness forces all participants into a repeating search for new creative solutions on the basis of rules that define admissible and forbidden moves. A related practice in science is an experiment, which is based on observation and attempt to understand the observed. Observed facts are ordered into patterns and patterns are in turn ordered into models. Results of experiments are compared with the forecasted results from the models.

The project Colour Visualization of Music can be used for observation and understanding of harmonies in music and understanding of music and music theory in general. On the other hand it could also open up new ways of experiencing music for deaf people. This, however, has not been evaluated yet. Another use of our music visualization program is a kind of a game, in which we create particular forms of music or music in general. There is no separation between theory and practice, so the project can connect the creative process of both brain hemispheres. Through observation we develop attention and enrich perception. This enables us to reach teaching objectives of stimulating curiosity, inquisitiveness, creativity and reach a creative surplus through a spiral-like development of the teaching process.

With the usage of an emancipatory approach we perceive the student or user as an equal to the mentor in the teaching process. This opens up a more efficient use of student's creative potential and stimulates activity based on a positive self-image. We offer a possibility of independent selection of teaching methods, which can be adapted to each student individually so that he can solve problems, make decisions and make reflections on the acquired learning experiences.

Creativity is essentially a skill for solving unprecedented problems and challenges, or finding better solutions for existing ones. Various art practices stimulate thinking outside of the box and in this way provide an effective development of latent creative potentials. Practicing art on regular basis can re-establish a balance between our logic and intuitive nature, which allows us to better know oneself and live a richer and more meaningful life.

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Izobraževalne zmožnosti projekta Vizualizacija glasbe z barvami

Projekt Vizualizacija glasbe z barvami temelji na sistemu barvnih znakov, povezanih z glasbenimi toni. Znaki sorodnih barv se nahajajo na tonih, ki so med seboj v harmoniji ali sozvočju. V uvodu so predstavljene osnove, na katerih je osnovan sistem barvnih znakov – matematični model harmonije. Sledi razmislek o vidnem prikazu različnih izraznih elementov glasbe – melodiji, kompoziciji, ritmu in harmoniji. Te sorodnosti omogočajo razvoj računalniškega programa, ki uporabi te elemente za vizualizacijo ali prikaz barvnih in oblikovnih struktur glasbe. Program posnema človeško slušno zaznavo, v kateri so posamezni sestavni deli določeni s prepoznavanjem celote. Omogoča tudi razvoj orodij, ki lahko povečajo razumevanje med poslušanjem ali igranjem glasbe. Igranje glasbe pa lahko pridobi novo kvaliteto z uporabo interaktivnih barvnih glasbil, ki v povezavi s programom igralcu v vsakem trenutku z barvami prikažejo raznolike možnosti tvorjenja zvočnih harmonij. S tem spremenijo komponiranje glasbe v igro in privlačno barvno-zvočno potovanje. Tu se pojavi velik izziv za pedagogiko in metodiko, da osmisli in uporabi prihajajoča multimedijska barvna orodja. Ta bi lahko v veliki meri približala proces učenja igri, ki je otrokova najbolj naravna oblika učenja in delovanja. V umetniškem ustvarjanju pa lahko ponovno vzpostavimo ravnovesje med našo logično in intuitivno-kreativno naravo.

Ključne besede: vizualizacija, glasba, barve, učenje, ustvarjanje

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Baselines for the Preparation of Electronic Textbooks

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The NAUK group (Advanced Learning Blocks group; http://www.nauk.si) is engaged in the development of theoretical and practical concepts of ICT use in all levels of education. Recently, the proposed introduction of electronic textbooks (e-textbooks) has become a major topic nationwide in Slovenia. There are multiple dilemmas to be solved, e.g. what a modern e-textbook is, what it should include, in what way should it differ from conventional textbooks, what tools and technologies should be used for its creation, etc. This paper attempts to make recommendations, which we believe should be followed by all the authors of e-textbooks.

Keywords: e-learning, electronic textbooks, e-content, recommendations

1 Introduction

In every process of education the textbook is an integral part of learning. The definition of a textbook varies greatly, as does the determination of its essential characteristics. This article shall not deal with the textbook theories, as this topic has been widely covered in numerous sources (Nose, 2003; Jurman, 1999; Turk Škraba, 2005; Šporar, 2008). Two short citations should suffice:

> *"A textbook is the basic schoolbook made for the specific needs of school education. It is a guide to other sources of knowledge, to discovering new insights. Thus it becomes a book that teaches learning." (Nose, 2003).*
>
> *"In a contemporary school a textbook is part of methodical-didactical material that cooperates with the teacher in the process of education and learning. The textbook is no longer merely didactical; it is also educational, as it affects the student's personality in both ways. The textbook thus incorporates the informative function (knowledge) and through it the conative function (values), cognitive function (abilities), and emotive function (emotions)." (Jurman, 1999).*

The role and significance of textbooks keep changing, as the fact that this is the basic schoolbook presupposes that its role reflects the changes in the educational system. "The definition of a textbook depends on the nature of the educational system. The content of a textbook is loosely determined by the state through the curricula that list the content and operative aims of a subject or a subject area. The textbook is one of the resources that help teachers and students to reach the aforementioned aims (Turk-Škraba, 2005).

However, the following fact must not be neglected: the textbook is merely one of resources used by the teacher and the student. When preparing a textbook, the authors envisage a hypothetical learning situation and hypothetical students. The teacher, on the other hand, is the one who has to adapt to the actual learning process conditions. And these conditions usually differ at least slightly from the learning process envisaged by the resource authors.

As stated by numerous authors (e.g. Gerlič, 2010), the role of the contemporary teacher is changing substantially. The teacher is changing from a verbalizer of the textbook content (i.e. a walking textbook) into a strategist, planner, pedagogical diagnostic, organizer, consultant, etc. The need for individualized approach towards the student is often emphasized as well. Therefore a very important part of the educational process is left to the teacher. That is the adaptation

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to the learning situation given and with it the preparation of the appropriate selection and combination of all learning resources available. And therefore, a contemporary e-textbook needs to be designed in such a way that its content can be promptly – nowadays manually, but soon automatically – adapted to the current learning situation and the individual that is to use the textbook, be it as a teacher or a learner (Lokar, 2009). It must not be forgotten that every teacher is an individual as well, and thus a person who has his or her own manner of teaching, set of values, and a view of which examples are best used to motivate the students.

2 E-textbooks

The form and the content of textbooks are constantly changing; partly also due to the development of information communication technology – ICT. Nowadays e-books and their real-life representations – e-readers are widely known to younger and technologically more experienced population and we can hear more and more about e-textbooks and their usage in educational process. Even on regulatory part of Slovenian educational system, e-textbooks are introduced. Namely in May 2010 Rules Amending the Rules on the Approval of Textbooks have been accepted. There explicitly e-textbooks as appropriate form of textbooks are mentioned; see Figure 1.

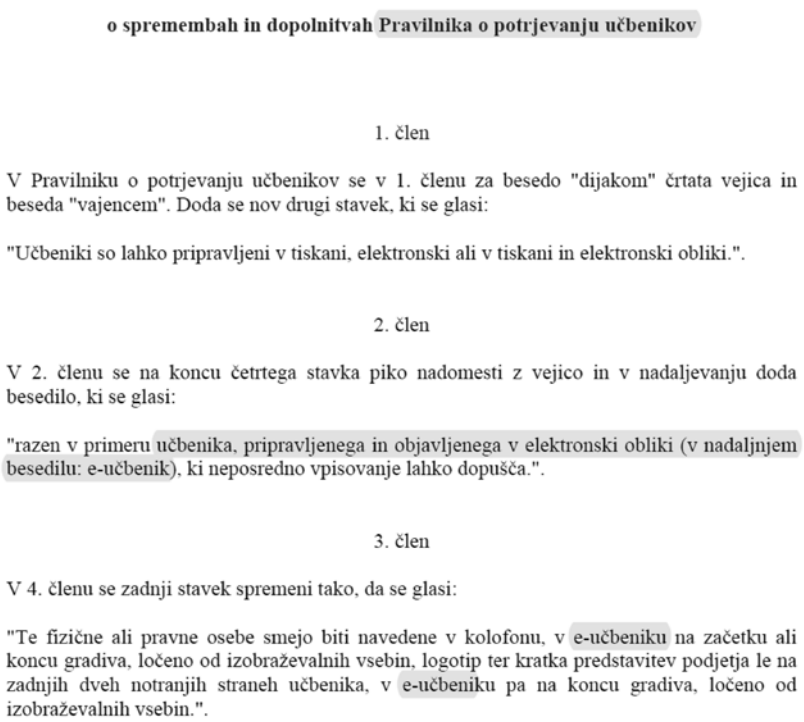
Even in daily press numerous articles with headlines such as "E-textbooks are coming into contemporary schools" were published. But behind the hype around e-textbooks it can be seen that even the definition on what the textbook is all about is not clear enough.

When making e-textbooks that are to transfer the knowledge from textbooks into digital environment, it is sensible to rely on the information acquired during different projects dealing with the making of e-resources (educational learning content) and on the standards required to manage them.

A quick overview of resources that are classified as e-textbooks will show certain shortcomings. Those that concern didactics and pedagogical theory (the number and pace of introducing new concepts, the language used, motivation stimuli, etc.) shall not be dealt with here; the ones concerning the field of technology itself, will. Of course the firstly mentioned shortcomings are the key factor that determines whether a textbook can be rated as useful and valuable. This article, however, will presuppose that the textbooks in question are well written regarding the content.

The basic "technical resentments" to the existing e-textbooks are:

- They are often realized as digitalized conventional textbooks (the addition of video clips does not yet make a true modern e-resource; if compared to paper, e-resources are completely different media and therefore the user experience obtained while using both, differs).
- Poor interactivity and limited multimedia; the lack of truly interactive exercises is very notable (the learner should be able to provide answers in the "natural form", as a drawing, a plan, to use a video camera and a microphone, to interact with e-learning content using gestures, to participate actively in the conduction of experiments, to solve problems through games, to cooperate while learning with other learners and teachers).



o spremembah in dopolnitvah Pravilnika o potrjevanju učbenikov

1. člen

V Pravilniku o potrjevanju učbenikov se v 1. členu za besedo "dijakom" črtata vejica in beseda "vajencem". Doda se nov drugi stavek, ki se glasi:

"Učbeniki so lahko pripravljeni v tiskani, elektronski ali v tiskani in elektronski obliki.".

2. člen

V 2. členu se na koncu četrtega stavka piko nadomesti z vejico in v nadaljevanju doda besedilo, ki se glasi:

"razen v primeru učbenika, pripravljenega in objavljenega v elektronski obliki (v nadaljnjem besedilu: e-učbenik), ki neposredno vpisovanje lahko dopušča.".

3. člen

V 4. členu se zadnji stavek spremeni tako, da se glasi:

"Te fizične ali pravne osebe smejo biti navedene v kolofonu, v e-učbeniku na začetku ali koncu gradiva, ločeno od izobraževalnih vsebin, logotip ter kratka predstavitev podjetja le na zadnjih dveh notranjih straneh učbenika, v e-učbeniku pa na koncu gradiva, ločeno od izobraževalnih vsebin.".

Figure 1: Rules Amending the Rules on the Approval of Textbooks.

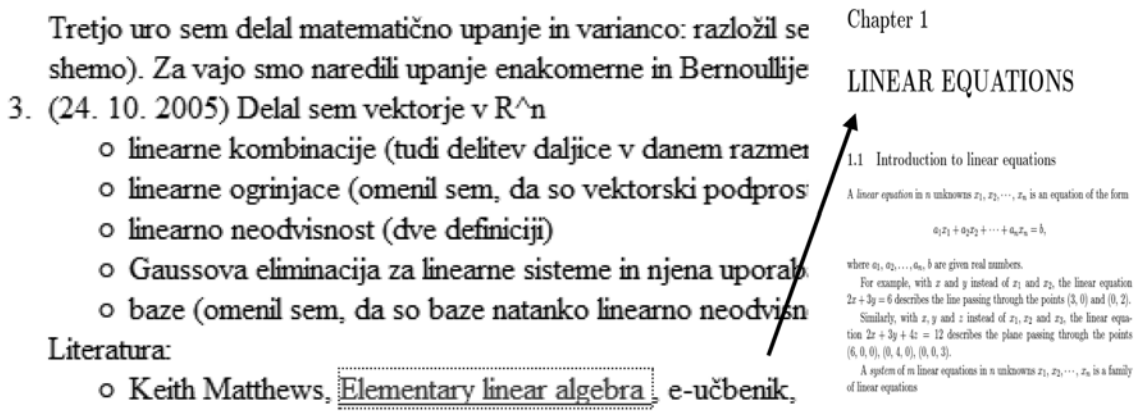


Figure 2: A PDF file as an e-textbook.

- For example: interactive use of a star chart, by solving different exercises, provides much better interactivity and learning experience than passive watching of a film, which shows the proper use of such a chart.
- Lack of contextual dependency; hardly any e-resource is able to show the content appropriate to the activities of the user thus far (this function is very useful when the learner should be taught about a mistake made a few steps back and the consequences of that same mistake).

Quite often an "ordinary text" in electronic form (for example as a PDF file) is called e-textbook; one of such examples can be seen in Figure 2.

Conceptual shortcomings are even more common:

- Monolith units (made of a single huge block, which cannot be easily modified).
- Impossible to combine with other resources (normally the teacher has its own resources that he or she wants to be used by the learner).
- Made as learning paths with linear structure.

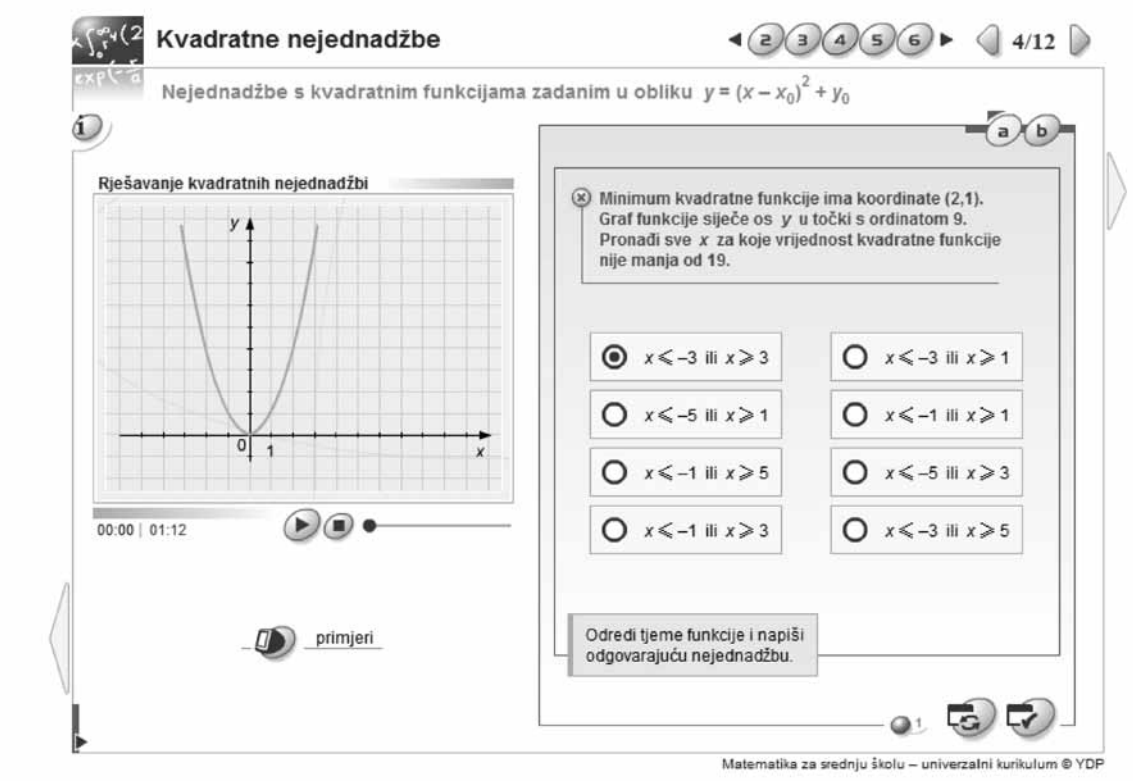


Figure 3: E-textbook as monolith Flash application.

- Heavy use of third-party technologies that cannot be adjusted for the presentation (e.g. the resource is a single huge "unchangeable" Flash file).
- No appropriate authoring and management tools for editing, upgrading, and construction of e-resources.
- Form (i.e. the representation of the e-textbook) is not separate from the content (the scenario of the e-textbook).

Quite often visually appealing resources are claiming to be a prototype of a modern (e-) textbook. One of such examples can be seen in Figure 3.

What is wrong with this resource? Mostly, it is the fact that it does not go beyond the limits of an ordinary textbook. Surely it introduces interactivity, some new approaches, but we claim it does not allow the teacher to fulfill his new role. Namely teacher cannot modify this resource to prepare it suitable for the particular group of students and the current didactical situation in the classroom. The authors of the paper believe that a contemporary e-textbook is merely a vision of the author, an idea how to present a learning path and then reach the aim of learning a new concept in a certain hypothetical learning environment and involving a hypothetical student. By no means should such e-textbooks be unalterable objects that the teacher and learner are forced to use exactly as is.

People have different learning styles which are a combination of acceptance, management and information processing; it is a combination of teaching methods that a learner is using in most learning situations (Marentič-Požarnik, 2000). This fact is the essence of the model of multiple intelligences (Gardner, 1999), which defines 7 to 9 different human intelligences. Younger generations learn differently than their teachers learned decades ago; they know how to obtain instant information from the Internet and they expect electronic learning material to be modern by all means. Thus, there is no uniform way to learn something – the learning material should (automatically) adapt to the learner.

E-textbooks should therefore be flexible. The teacher should be able to change and recombine them. Nowadays it is technically possible to recombine resources (Horvat et al., 2010). It is the authors who should respect and value the role of the teacher. The teacher must stay in control: have the option to change, correct, adapt the resource, change the order of particular elements, etc. Some of the resources should be allowed to be automatically altered by the system; this is especially useful when parts of the dynamical exercises are replaced by computerized instances, when parts of the e-learning content gets semantically linked to similar content in the system, etc.

The authors of e-textbooks will offer their own view of using the e-textbook in a hypothetical learning situation. However, the technical implementation of the e-textbook should allow the teacher to adapt it (if necessary). Therefore it makes sense to imagine the textbook as a way of recursively "assembling" and connecting basic blocks of educational resources.

The main characteristics of e-resources that are to be created within the making of e-textbooks should therefore be:

- **Availability:** the possibility of global access to the resources and their transfer to other locations.
- **Flexibility:** the option to adapt the resources to the individual needs of teachers and groups.
- **Cost effectiveness:** the increase of effectiveness and productivity through the reduction in time consumption and costs when preparing resources.
- **Permanence:** the option to adapt the resources to the changes in technology, without high costs and recoding.
- **Interoperability:** the option to use the resources in different learning environments, with different tools.
- **Re-usability:** the option to use the resources in different contexts.

3 How to design an e-textbook

The solutions for the following problems should already be thought about during the initial design of e-textbooks:

- What is the life span of the particular e-textbook?
- Adapting content to the future changes in technology? For example: GeoGebra[1] files will not work even if the changes in the player versions are minimal; can e.g. WordStar[2] files be opened today?
- The display of the e-textbook on different / new hardware? The learner experience is different on novel multitouch devices that on interactive whiteboards.
- What is the appropriate quality of multimedia resources included in e-textbooks? As before, different hardware calls for different standards, sizes and quality?
- Will the option of searching through the resources by content be available? Managing and using metadata and integration of other repositories are important.
- Will innovative highly interactive elements be part of the content? Those do not only include quizzes, but also activities in the form of drawings, games, the inclusion of a camera and microphone.
- Will the e-textbook provide integration with outside services? Searching for similar content, connecting to GIS, Moodle[3] quiz banks, etc.?

In an e-textbook interactive and multimedia elements must be connected (quizzes can include elements such as: images – choose the situation presented in the picture, "hot spots", conduction of interactivity over multimedia elements – measuring distances over an image, measuring the duration of an audio or video clip, skipping to a particular part of a video clip, full screen enlargement, etc.).

It is desirable that the content is available in different endmodes ("full" format, tailored to chosen virtual classroom or LMS, wiki, "no internet access", "on paper"), which should all, except the "full" one, function minimally curtailed (e.g. a classic wiki does not include all interactive elements).

1 GeoGebra is a geometry package providing for both graphical and algebraic input; http://www.geogebra.org.
2 WordStar was a word processor application, published by MicroPro International already in 1978.
3 Moodle LMS; http://www.moodle.org.

It must be ensured that the use of e-textbooks can be adapted as successfully as possible to different output technologies and devices (mobile education: multi-touch devices, "smart phones", interactive whiteboards; new open standards (HTML 5 and similar), use of different proprietary devices that act as readers, such as iPad and Kindle, etc.). It is also desired that different versions of same e-textbook assume the execution in different output models (e.g. a web textbook in a standard browser, an e-textbook to be used on an interactive board, etc.).

The following matter is also of great importance. The final form of the textbook should be realized with solutions that ensure support for special needs groups (hearing or vision disabled, etc.) that have their own needs and principles, behavior patterns, and are of different ages. The functional and visual standards of designing e-resources must be observed. And since such groups are numerous and varied, the problems of how to cater for different presentational needs should already be thought of during the process of design. The content shall thus remain the same; only the modes of its presentation should differ.

Therefore free access into the structure of the textbook is vital – in order to ensure the textbook's adaptability to new demands, special needs, and different paradigms. The general technical orientation is also important, regarding the choice of technologies, standards, components, frameworks and implementation tools. This ensures the simplicity and transparency of the system components maintenance (Horvat et al., 2009).

How should the resources that will comprise an e-textbook in the end be prepared then? Based on the above-mentioned requirements and needs, the NAUK group has formed the following recommendations.

RECOMMENDATION 1: The presentation of the resource should be separate from the content.

Explanation:

- Standards and technologies of transfer and display of content over the Internet change rapidly. Ever-new forms of output technologies appear (palm books, "smart phones", interactive whiteboards, multi-touch devices, such as Microsoft Surface, e-readers such as Kindle, etc.). The pedagogical didactical environment itself sometimes demands different technological executions. Therefore it is necessary to avoid the need to frequently change and remodel the content each time that the technology is changed or modernized.
- The adaptation of e-textbooks to different output technologies is to be done by automatically and not by content experts. The adaptation procedure itself should be executed automatically, regarding the settings chosen by the author of the resource and the situation when and how the resource is being used. There are already tools aware of different output technologies. For example in Figure 4: Choosing an output device without changing the content is an example of future Adobe tools, presented at Adobe MAX 2010 conference (Lynch, 2010), where you choose an output device and the content is presented accordingly. And this is not possible if you do not separate the content and its presentation.
- The resource must support the use by special needs groups (hearing or vision disabled, etc.) that have their

Figure 4: Choosing an output device without changing the content.

Figure 5: Possibility of changing the order of chapters.

own needs, principles, and behavior patterns. The functional and visual standards of designing e-resources must be observed. This is yet again not the resource author's job, but needs to be provided as an option (e.g. 508 Compliance in the USA).

- It is necessary to consider the fact that user experience is strongly affected by the speed of the connection as well as hardware and software. Keeping content in as "raw" mode as possible ensures automatic transfer of higher quality multimedia content when it becomes available or possible to be used.
- The option of the e-resources being translated into other languages, minority groups' languages (in Slovenia for example, Italian and Hungarian) must be considered.

RECOMMENDATION 2: Resources should be modular.

Explanation:

- It is only possible to reuse resources when they are constructed out of several smaller blocks, which can be used within different contexts. A building block should be a complete unit and logically indivisible, e.g. an image, an animation, a question, etc.
- Modular composition enables the adaptation of the textbook to the didactical learning situation and individualization. Teachers are therefore able to take a part of the textbook and combine it with the resources they use already. Here an analogy with the present situation is apparent; teachers nowadays often use several different traditional textbooks and/or web based resources at the same time. These changes can be very simple, but often powerful. For example a simple approach with the possibility of changing order of chapters can already seen (see Figure 5: Possibility of change) on Flat World Knowledge portals[4].
- This choice increases the flexibility of e-textbooks and enables better framework to support cross-curricular teaching.

RECOMMENDATION 3: The resources should be open standards based.

Explanation:

- In order for educational resources to be useful within the educational system, it is necessary for them to be available under a suitable Creative Commons type license which is already in use for the resources that were made in the existing e-resources constructing projects[5].
- The resources themselves must be created using open standards whenever possible (HTML, XML, CSS, JS). Solutions that assume transformation of the entire content into a proprietary (protected) format (such as Flash, QuickTime, SilverLight, etc.) do not enable straightforward modification and adaptation of the resource.
- The content (scenario that includes interactive functionalities of the content) itself should be in text-based format that enables effortless modification and supplementation.
- Separation of the scenario from the presentation of the content enables automatic (i.e. computer-based) management of the repository and computer-powered construction of new e-learning content based on the requirements (measured knowledge) of the learner.
- Free access into the structure of the textbook must be enabled, if possible without logging in.

4 Flat World Knowledge; http://www.flatworldknowledge.com.
5 NAUK repository of elearning content; http://www.nauk.si.

RECOMMENDATION 4: Resources should be metadata equipped.

Explanation:

- All e-textbooks should be metadata equipped. There already exist different ontologies as well as approaches directed towards linking existing curricula and particular e-resources (Libbrecht et al., 2008; Libbrecht et al., 2011). This enables easier searching, replacing single building blocks, and use of building blocks outside the textbooks.
- Metadata should not only contain information about the authors, but also suitable licenses for the resource units acquired from other sources. E-textbooks must namely always follow copyright laws.

RECOMMENDATION 5: E-textbooks and their parts should be transferable into different environments.

Explanation:

- Where possible, the resources should enable export in SCORM format; elementary formats of export are also desirable (XML, HTML+CSS), due to their simplicity of use and minimal consequences for the functionality.
- It is necessary to presuppose the execution of certain scripts in at least two output models: a conventional browser and the interactive board. The resources must be suitably adapted.
- Many teachers use virtual classrooms that enable the import of different types of resources. Some teachers are able to use the collection of questions in XML standardized format directly within the virtual classroom as well as to correct them and combine them with their own resources.
- Original source files must be maintained, as they alone enable the preparation of export in different forms.

RECOMMENDATION 6: E-textbooks should have a single and simple user interface.

Explanation:

- It is necessary to be aware that quality user experience is crucial for the existence and use of web-based e-learning, therefore a lot of attention must be paid to that, regarding the current technological limitations. The tools and services must be based on the Web 2.0 concept, which puts the end-user, in our case the learner, into a center.
- Different presentation channels should use the same "look and feel" – to prevent confusing the learners that use the same content in different situations (e.g. in school, at home).
- Due to the aforementioned concept, the user community development (social network management) must be regarded as well as the content collection, presentation, and offer.
- The content of the textbooks should be freely universally available (at the same time adapted for vision, physically, hearing, cognitive, and verbally disabled users; the content should not contain unnecessary moving pictures, pictures should be alternatively marked, etc.), the content should conform to the W3C recommendations.

RECOMMENDATION 7: Activities connected with the preparation of e-textbooks should be divided into the following steps:

- Development of collection of tools for the preparation of e-textbook scripts and their later-on technical execution.
- Preparation of multimedia resources and interactive scenarios for pilot e-textbooks.
- Making pilot e-textbooks.
- Improving e-textbooks.

Explanation:

- A manner of describing e-textbooks (writing standardized script or scenario) is necessary for enabling the separation of content and execution (presentation), as well as s collection of suitable tools and services that enable the authors to promptly prepare resources (such approach enables successful cooperation between the authors and technicians at first steps of e-textbook creation). Suitable tools also enable the teachers to further adapt and individualize the resources, by themselves. The tools should also enable the definition of a work-flow, community cooperation, consultants, referees, etc.
- The interactive scenario represents the actual learning path (or better, a learning network), that is, a guide how to perform the teaching of a concept with the aid of the aforementioned components. It is actually the basic nonlinear learning path as imagined by the authors. On this basis, teachers could develop new versions of the scenario and construct new learning paths. The existing scenario can serve as the base for making new or improved e-resources (and can be included in several e-textbooks).
- The script needs to determine the content of the e-resource: text, pictorial and other material (map, musical score, etc.), multimedia and interactive elements. During the script design it is necessary to respect the fact that new e-resources should enable and encourage the introduction of novel and modern approaches to teaching and learning – especially a more active role of the learner and inductive learning.

RECOMMENDATION 8: Using e-textbooks should be fun.

Explanation:

- The most efficient (classical and electronic) learning is learning without the awareness and presence of the learning process; in short term "learning without knowing it". E-textbook can only achieve this goal when it is fun using it. To achieve the ease of learning using e-textbooks, authors of the e-textbooks should use every possible way to present the knowledge in a friendly and fun way. Consequently e-textbooks should contain a lot of interaction, visualization and animation.
- An e-textbook must make sensible use of the ICT and Internet options available, and contain truly interactive elements (multiple choice exercises, text input boxes, connecting pictures and text, marking answers, dynamic – parameter equipped exercises, freehand drawing, matching exercises, simple insertion of special symbols, augmented reality, etc.). Similarly, colors, avatars, characters, humor, etc. should be used in a sensible way.

4 Conclusion

E-textbooks should not be a simple transfer of the classical printed textbooks into a more contemporary electronic format. The simple addition of multimedia elements and limited interactivity are not enough. An e-textbook should offer more. It must facilitate what a conventional textbook cannot, due to the nature of its medium. Contemporary textbooks should be prepared in such manner that will enable contextual dependence of textbook elements and thus different learning paths of reviewing & studying e-content. The process of improving the educational content should be greatly eased and therefore enable the teachers to easily and promptly adjust the learning materials with the respect to the real situation in the classroom. And what is the most important; all this should enable the learners to learn more in the same time.

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Izhodišča za pripravo e-učbenikov

V okviru skupine NAUK (Napredne Učne Kocke; http://www.nauk.si) se ukvarjamo z razvojem tako teoretičnih kot praktičnih izhodišč na področju uporabe IKT v izobraževalnem procesu na vseh nivojih. V zadnjem času je v Sloveniji zelo v ospredju problematika elektronskih učbenikov (e-učbenikov). Rešiti bo potrebno več dilem: kakšen naj bo sodoben e-učbenik, kakšne naj bodo njegove značilnosti, kaj mora vsebovati, v čem se razlikuje od klasičnega učbenika, katera orodja in tehnologije uporabiti za izdelavo itd. V prispevku smo poskusili predstaviti nekaj priporočil, za katere menimo, da naj bi jih upoštevali vsi avtorji e-učbenikov.

Ključne besede: e-izobraževanje, elektronski učbeniki, e-učbeniki, e-gradiva, priporočila


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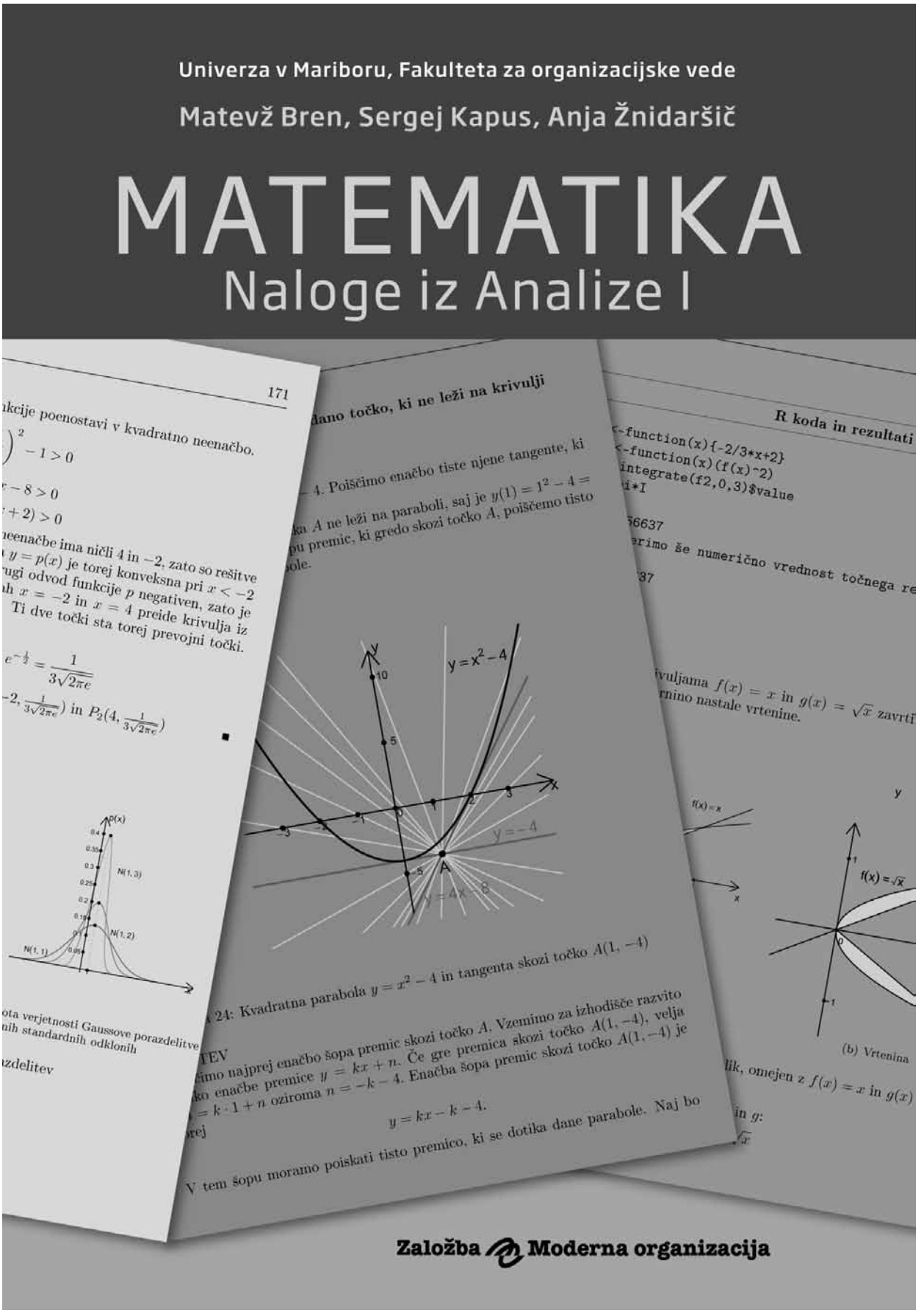
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Razvoj strategij za kakovostno izvedbo višješolskega izobraževanja

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Korektno delo in razvoj višjega šolstva zahteva tudi ustrezen pristop h kakovosti. Kakovost je potrebno presojati s izvedbo samoevalvacije na podlagi kazalnikov kakovosti. V preteklosti je bilo samoocenjevanje šol pogosto nesistematično in zgolj intuitivno. Raziskava je usmerjena k pridobivanju objektivnih kazalnikov in izhodišč, ki jih šola lahko uporabi pri pripravi strateškega načrta višje šole.
Za oblikovanje celovite ocene kakovosti lahko uporabimo mnogo instrumentov zagotavljanja kakovosti (zunanja evalvacija, notranja evalvacija, revizija, certificiranje itd.) Prispevek se osredotoča na izbran element notranje evalvacije – samoevalvacijo, znotraj katere lahko uporabimo tudi t.i. SWOT analizo (Strenghts, Weaknesses, Opportunities, Threats). SWOT analiza prinaša potrebne temeljne informacije, ki šoli zagotavljajo pridobivanje virov in kapacitet potrebnih za konkurenčnost na njenem področju delovanja. Metodologija poseže tudi po t.i. TOWS matriki, ki iz analize črpa točke za razvoj strategij, vključenih v rezultate.
TOWS matrika prikazuje posamezne strategije, ki sledijo priložnostim, strategije, ki bodo premagale slabosti, strategije za zmanjšanje ranljivosti in strategije, ki so osnova za obrambni plan.
Cilj prispevka je oblikovati zanesljivo napoved strategije, ki izvira iz celovite analize prednosti in slabosti funkcioniranja študijskih programov. Poleg znanih priporočil lahko s SWOT analizo in TOWS matriko prepoznamo medsebojne relacije, ki jih oblikujemo v ustrezno učinkovito in predvsem realno strategijo. Prispevek torej opredeljuje možnosti oblikovanja strategije z uporabo omenjenih analiz.

Ključne besede: višje šolstvo, kakovost, SWOT, TOWS

1 Uvod

Razvoj slovenskega šolstva poteka na različnih nivojih za različne potrebe izvajalcev in uporabnikov. Vsaka sprememba organiziranosti in kompetentnosti se verjetno izvaja v želji po čim večjem napredku in končnem učinku. Žal so nekateri pristopi k posameznim reformam, poleg pozitivnih teoretičnih sistemov, odkrili tudi mnogo pomanjkljivosti, ki so povzročile bodisi ukinitev delujočih modelov ali pa njihovo korenito spremembo (Ball et al., 2008). Spreminjanje slovenskega izobraževalnega sistema je zelo dinamično in je v svoji zgodovini sledilo mnogim idejam, ki so spreminjale pogled na organiziranost sodelujočih elementov. Srednje šolstvo, je npr. v osemdesetih letih prešlo skozi fazo usmerjenega izobraževanja, ki se je leta 1991 tudi uradno končalo. V srednjih šolah je takrat ponovno prišlo do ločitve 3 letnega poklicnega in 4 letnega strokovnega programa. Izginotje gimnazij postane zgodovina. Veliko spremembo smo doživeli v primarnem izobraževanju ob prehodu iz osemletnega na devetletno šolanje. Nekaj podobnega srečamo tudi v terciarnem izobraževanju z uvedbo bolonjskega sistema leta 1999.

Zanimiv premik se je v slovenskem izobraževalnem prostoru zgodil leta 2004, z Zakonom o višjem strokovnem izobraževanju (ZVSI) (UL RS, 2004). Po letu 2004 je bilo v slovenskem prostoru ustanovljenih na desetine višjih šol in npr. leta 2009 je na njih diplomiralo 3.170 študentov (Stat.urad RS, 2009, http://www.stat.si). Konkurenčna prednost posameznih višješolskih ustanov se pokaže le z zagotavljanjem trajnostnega razvoja vseh pedagoških in raziskovalnih elementov (človeški viri, izobraževalni procesi, storitve, raziskovalna dejavnost...).

Sodelovanje z gospodarstvom in podjetniškim okoljem je tako v svetu (Keok in Thong, 2007), kot tudi v Sloveniji postalo pogost imperativ za študijske programe in za vse izvajalce znotraj teh zavodov. Temeljna značilnost danes že prenovljenih višješolskih študijskih programov je učenje na praktičnih problemih, zato so študenti vključeni v praktično in raziskovalno delo tako znotraj šole/zavoda, kakor v podjetjih. Na ta način se ustvarjajo pogoji za prenos znanja iz šole v podjetniško okolje, izboljšujejo pa se tudi zaposlitvene možnosti diplomantov.

Korektno delo in razvoj višjega šolstva seveda zahteva tudi ustrezen pristop h kakovosti. Kakovost je načeloma definirana zelo različno, saj skoraj vsak avtor pojem razume in razlaga nekoliko po svoje. Ena izmed definicij kakovosti je zapisana v standardu ISO 9000 s stopnjo, v kateri skupek svojstvenih karakteristik izpolnjuje zahteve (SIST ISO 9000, 2002). Kakovost storitve je pomembna za uporabnika, saj preko nje spozna kakšno raven kakovosti storitve lahko pričakuje, kot tudi za organizacijo (zavod), ker ji doseganje postavljenih standardov postane cilj in osnova za določitev procesov in z njimi povezanih virov (Marolt in Gomišček, 2005).

V preteklosti je bilo samoocenjevanje nesistematično in zgolj intuitivno. Na ta način so lahko nekatere šole postale znane in »znane«. Mnogokrat je tako šola postala dobra šola zgolj po besednem izročilu.

Da bi se izognili volunterski standardizaciji in intuitivnemu razvrščanju posameznih šol, je k ocenjevanju potrebno pristopiti objektivno. Zato je logična smer raziskave pridobiti objektivne kazalnike in izhodišča pri pripravi strateškega načrta določene višje šole (Lee in Lob, 2003).

Pri doseganju tega cilja izvedemo kritično analizo stanja (SWOT analiza) s poudarjenimi prioritetnimi nalogami. Iz analize izhaja sinteza v obliki akcijskega načrta. Načrtujemo da je akcijski načrt moč pripraviti z uporabo TOWS matrike (Proctor in Ruocco, 1992). Predvidevanje bomo testirali na primeru ocenjevanja kakovosti na višji šoli.

2 Materiali in metode

Primerna analiza za celovito oceno je t.i. SWOT analiza (Strenghts, Weaknesses, Opportunities, Threats) oz. PSPN matrika (prednost, slabost, priložnost, nevarnost) (Wheelen in Hunger, 1996; Dyson, 2004). Pri SWOT analizi se opravi ocenjevanje koristnih in nekoristnih notranjih ter zunanjih dejavnikov, ki vplivajo na funkcioniranje študijskih programov. Analiza prednosti in slabosti odkriva in ocenjuje notranje dejavnike poslovanja, analiza priložnosti in nevarnosti pa zunanje dejavnike poslovanja. SWOT analiza prinaša potrebne informacije, ki šoli zagotavljajo pridobivanje virov in kapacitet potrebnih za konkurenčnost na njenem področju delovanja.

Pri izvedbi analize je bila uporabljena tehnika opazovanja, letni razgovor, anketiranje, racionalna evalvacija, samoevalvacija predavateljev, primerjava podatkov kazalcev učinkovitosti, anketiranje in pogovor.

V metodologijo dela sta bila vključena pregled in analiza šolske dokumentacije, letnega delovnega načrta, izvedbeni kurikuli in pedagoško poročilo. Prav tako so bili v metodologijo posebej vključeni še študenti in predavatelji ter komisija za spremljanje in zagotavljanje kakovosti.

Raziskava je bila izvedena v okviru rednega in v okviru izrednega študija, ob zaključku študijskega leta 2008/2009.

Analiza je bila izvedena na Višji strokovni šoli, Tehniškega šolskega centra Kranj (TŠC, VSŠ), v okviru študijskih programov mehatronika in informatika v okviru rednega in izrednega študija. Raziskava je zajela različna področja, kot so upravljanje in vodenje, izvajanje študijskih programov, študijska dejavnost, statistika študija, praktično izobraževanje študentov, mobilnost študentov in predavateljev, ocene (mnenja) študentov, ocene (mnenja) diplomantov, strokovna dejavnost, zaposleni, sodelovanje z družbenim okoljem, študenti in ocena stanja ter usmeritve.

Raziskava se opira tudi na podatke pridobljene od š.l. 2005/2006 (študijski program mehatronika) naprej in š.l. 2008/2009 (študijski program informatika).

Raziskava je spremljala posamezne elemente, kot so: vizija, poslanstvo, vrednote, cilji, strateške usmeritve, urejenost evidenc, prostori, oprema, knjižnica, spremljanje in zagotavljanje kakovosti študijskega procesa, promocija študijskih programov, vpis v študijska programa mehatronika in informatika, organizacija in izpeljava izobraževalnega procesa na obeh vrstah študija, spremljanje uvajanja prenovljenih višješolskih programov, aktivnosti za povečanje obsega študijske ponudbe spremljanje razvoja učnih dosežkov, prehodnost študentov ter dolžine študija organizacija in izpeljava praktičnega izobraževanja (PRI), realizacija PRI, št. novih sodelovanj s podjetji, št. mentorjev študentom na PRI vključenost študentov in predavateljev v mednarodne programe izobraževanja, kakovosti vsebine in izvajanja programa, povratne informacije diplomantov o relevantnosti pridobljenih znanj na trgu dela, vključevanje študentov in zaposlenih v projekte in tekmovanja, sodelovanje in vključevanje družbenega okolja, struktura zaposlenih in njihov profesionalni razvoj, sodelovanje z gospodarstvom in vključevanje v regionalno in širše okolje, organizacija in vodenje spremljevalnih storitev izobraževalnega procesa, ki omogočajo doseganje učnih ciljev, uresničevanje načrtov in predlogi za izboljšave (akcijski načrt).

Pri dinamični analizi razmer uporabimo TOWS matriko. Na ta način oblikujemo strategijo in taktiko. Strategija se nanaša na prednostna področja ukrepov za doseganje poslanstva in zastavljenih ciljev šole. Na drugi strani se taktika nanaša na akcijski načrt, s katerimi bodo strategije tudi realizirane.

3 Rezultati

Za presojanje kakovosti visokošolskih zavodov se najpogosteje uporabljajo podatki o študentih presojanega visokošolskega zavoda. Tem sledijo podatki o akademskem osebju, administrativnem osebju in nato finančni podatki. Najredkeje pa se uporabljajo statistični podatki, ki se nanašajo na trg dela. Statistični podatki so obstoječi podatki, ki jih visokošolski zavod lahko priskrbi v lastnem informacijskem sistemu (Rodman, 2010).

Samoevalvacija študijskih programov, ki jih izvaja TŠC, VSŠ, je organizirana v skladu s priporočenimi smernicami, ki so jih pripravili člani delovne skupine aktivnosti 9 Kakovost v projektu Impletum (http://www.impletum.zavod-irc.si/, 2011)

Spremljanje kakovosti je v študijskem letu 2008/09 obsegalo naslednja področja:

- upravljanje in vodenje,
- izvajanje študijskih programov,
- statistika študija,
- praktično izobraževanje študentov,
- mobilnost študentov in predavateljev,
- ocene (mnenja) študentov,
- ocene (mnenja) diplomantov,
- strokovna dejavnost,

- zaposleni,
- sodelovanje z družbenim okoljem,
- študenti,
- ocena stanja in usmeritve.

V okviru raziskave smo sledili tudi verificiranim priporočilom iz okolja visokošolskih zavodov. Izhajali smo iz SWOT analize in oblikovali mrežo povezav med prednostmi, pomanjkljivostmi, priložnostmi in nevarnostmi.

SWOT analiza je torej osnova za strukturiranje TOWS matrike. Analiza temelji na tehniki opazovanja, letnem razgovoru, anketiranju, racionalni evalvaciji, samoevalvaciji predavateljev, primerjavi podatkov kazalcev učinkovitosti, anketiranju in pogovoru.

SWOT analiza (tabela 1) je bila opravljena na temelju zbranih podatkov v okviru rednega in izrednega študija. Pri anketiranju je v študijskem letu 2008/09 sodelovalo 92 udeležencev (študenti, predavatelji, delodajalci in mentorji praktičnega izobraževanja).

Iz notranje in zunanje analize in za razvoj strategij, vključenih v rezultate, konstruiramo TOWS matriko (Weihrich, H., 1982). Strategije so naslednje:

- S-O strategije sledijo priložnostim, ki se dobro prilagajajo prednostim,
- W-O strategije bodo premagale slabosti, da se bodo približale priložnostim,
- S-T strategije identificirajo poti, ki jih lahko organizacija izkoristi (prednosti) za zmanjšanje svoje ranljivosti,
- W-T strategije so osnova za obrambni plan, ker organizacija zaradi svojih slabosti podlega eventuelnim nevarnostim.

4 Razprava

Analiza prednosti in slabosti odkriva in ocenjuje notranje dejavnike poslovanja, analiza priložnosti in nevarnosti pa zunanje dejavnike poslovanja.

S-O strategije sledijo priložnostim, ki se dobro prilagajajo prednostim. Raziskava posreduje najboljša pričakovanja, ki izhajajo iz TOWS matrike. Ob dobri opremljenosti, unikatnih učilih in sodobni IKT, lahko izboljšamo sodelovanje med šolo in gospodarstvom tako, da ustanovimo laboratorij za razvoj prototipov (Balantič, Z. in Balantič, B. 2008). Laboratorij bo postal center za združevanje teoretičnih in praktičnih izkušenj. Z možnostjo študija in usposabljanja v tujini (razširjena Erasmus univerzitetna listina) in priložnostjo večje prepoznavnosti šole, izvajamo bilateralna in ostala sodelovanja s tujimi

	Koristno	**Škodljivo**
Notranji vir	**PREDNOSTI**	**POMANJKLJIVOSTI**
	S_1: dobra opremljenost, unikatna učila, sodobna IKT, dostopnost šole in parkirišče **S_2**: predavatelji – strokovnjaki iz gospodarstva **S_3**: možnost študija in usposabljanja v tujini (razširjena Erasmus univerzitetna listina) **S_4**: spremljevalne storitve za študente (strok. ekskurzije za študente …)	**W_1**: slab odziv študentov na anketiranje **W_2**: neizvedeno anketiranje za delavce šole **W_3**: pasivnost študentov v procesih odločanja **W_4**: nizka prehodnost študentov iz 1. v 2. letnik **W_5**: premajhna vključenost predavateljev in študentov v projekte in tekmovanja
Zunanji vir	**PRILOŽNOSTI**	**NEVARNOSTI**
	O_1: izboljšanje sodelovanja med šolo in gospodarstvom **O_2**: vpeljava tutorstva za študente **O_3**: večja prepoznavnost šole	**T_1**: fiktivni vpis **T_2**: majhno število diplomantov rednega študija **T_3**: nepripravljenost podjetij za izvajanje praktičnega izobraževanja študentov **T_4**: slabo sledenje trendom na področju stroke **T_5**: financiranje (pomanjkanje sredstev za vzdrževanje infrastrukture)

Tabela 1: SWOT analiza Višje strokovne šole v Tehniškem šolskem centru Kranj.

	PREDNOSTI:	**POMANJKLJIVOSTI:**
	S_1: dobra opremljenost, unikatna učila, sodobna IKT, dostopnost šole in parkirišče **S_2:** predavatelji – strokovnjaki iz gospodarstva **S_3:** možnost študija in usposabljanja v tujini (razširjena Erasmus univerzitetna listina) **S_4:** spremljevalne storitve za študente (strok. ekskurzije za študente …)	**W_1:** slab odziv študentov na anketiranje **W_2:** neizvedeno anketiranje za delavce šole **W_3:** pasivnost študentov v procesih odločanja **W_4:** nizka prehodnost študentov iz 1. v 2. letnik **W_5:** premajhna vključenost predavateljev in študentov v projekte in tekmovanja
PRILOŽNOSTI: **O_1:** izboljšanje sodelovanja med šolo in gospodarstvom **O_2:** vpeljava tutorstva za študente **O_3:** večja prepoznavnost šole	**S_1/O_1:** laboratorij za razvoj prototipov **S_3/O_3:** napotitve na izobraževanje v tujini **S_2/O_2:** neposredno uvajanje v realno okolje **S_1/O_1:** priprava in izvedba različnih krajših programov usposabljanj za zaposlene v podjetjih; **S_2/O_3:** skupni razvojno-aplikativni projekti (raziskovalne in diplomske naloge)	**W_4/O_1:** pomoč s strani študentov – tutorjev in predavateljev – tutorjev za doseganje boljših rezultatov **W_4/O_1:** karierni center (s štipendijo in namero o zaposlitvi motivirati študente, da diplomirajo v dveh letih) **W_5/O_3:** animiranje in obveščanje predavateljev in študentov o sodelovanjih v projektih
NEVARNOSTI: **T_1:** fiktivni vpis **T_2:** majhno število diplomantov rednega študija **T_3:** nepripravljenost podjetij za izvajanje praktičnega izobraževanja študentov **T_4:** slabo sledenje trendom na področju stroke **T_5:** financiranje (pomanjkanje sredstev za vzdrževanje infrastrukture)	**S_1/T_5:** vključevanje delovanja laboratorijev v sistem povezave z gospodarstvom **S_2/T_3:** organizacija srečanj z delodajalci in mentorji študentov na praktičnem izobraževanju **S_2/T_3:** usposabljanje predavateljev iz gospodarstva za mentorje študentov na praktičnem izobraževanju	**W_5/T_5:** aktivno vključevanje v projekte **W_5/T_4:** vključevanje v bazične projekte **W_3/T_2:** študente motivirati za vključevanje v soodločanje

Tabela 2: TOWS matrika Višje strokovne šole v Tehniškem šolskem centru Kranj.

partnerji na področju teoretičnega in praktičnega izobraževanja. Strokovnjaki iz gospodarstva, ki so tudi predavatelji, lahko s pomočjo tutorjev neposredno uvajajo študente v realno okolje in s tem poskrbijo za močno povezanost šole z industrijo. Sodelovanje se lahko nadgradi tudi s pripravo in izvedbo krajših programov usposabljanja za zaposlene v podjetjih ter skupnih razvojno-raziskovalnih projektih. Slednji se v največji meri lahko izrazijo skozi raziskovalne ter diplomske naloge, ki segajo od aplikativnih raziskav, rešitev konkretnih problemov do racionalizacije proizvodnih procesov. Tak način partnerskega sodelovanja med šolo in podjetji je primerljiv z evropsko uspešno prakso in posebej primeren za področje strokovnega izobraževanja, ki naj usposablja za potrebe konkretnih delovnih okolij.

Srednji nivo pričakovanj lahko pripišemo W-O in S-T strategiji. SWOT analiza nam odkriva dve največji pomanjkljivosti notranjega vira, ki sta nizka prehodnost študentov iz 1. v 2. letnik in premajhna vključenost predavateljev in študentov v projekte in tekmovanja. Ob priložnostih O1 do O3 (Tabela 2), si lahko oblikujemo W-O strategije, ki nam bodo pomagale premagovati slabosti. Pri tem stremimo k temu, da se bomo približali priložnostim. Raziskava in analiza TOWS nas je vodila do tega, da bi pomoč s strani študentov – tutorjev in predavateljev – tutorjev, vodila do boljših rezultatov. S tem bi lahko našo pomanjkljivost približali priložnosti. S postavitvijo

kariernega centra v katerem bi poleg šole, zbornic in podjetij pomembno vlogo imel tudi Zavod RS za zaposlovanje, bi z ustrezno štipendijsko shemo, motivirali študente k vestnejšemu predvsem pa sprotnemu opravljanju študijskih obveznosti, ki bi rezultiralo v zaključku študija v dveh letih. Število diplomantov bi se povečalo, podjetja pa bi dobila ustrezno usposobljen kader. Podobno bi bili lahko uspešni z animiranjem in obveščanjem predavateljev in študentov o sodelovanjih v projektih. Na ta način bi pridobili na prepoznavnosti šole. Osnovno priložnost smo povezali z ugotovljenimi pomanjkljivostmi in tako smo dobili ključni element povezave med notranjim in zunanjim virom.

S-T strategije pokažejo na prednosti, ki jih imamo za zmanjšanje svoje ranljivosti. Laboratoriji s katerimi upravljamo, imajo življenjsko dobo. To pomeni, da vse večja postaja nevarnost okvar merilnih in eksperimentalnih naprav. Obstaja potencialna nevarnost, da financiranje infrastrukture izostane. Za zagotavljanje kontinuitete, potrebujemo stalni priliv sredstev. Izpostavimo dobro opremljenost, unikatna učila, sodobno IKT (informacijsko komunikacijska tehnologija) ter dostopnost do šole. Da bi se podjetja lažje odločala za vključitev v mrežo podjetij, ki izvajajo praktično izobraževanje študentov in ne imela »strahu« pred prevzemanjem dodatnih nalog, bo potrebno organizirati srečanja z delodajalci in mentorji praktičnega izobraževanja ter jih podrobno seznaniti s cilji in nalogami praktičnega izobraževanja študentov. Hkrati velja povabiti strokovnjake iz gospodarstva na pedagoško-andragoško usposabljanje za mentorje študentov na praktičnem izobraževanju. Pedagoško-andragoška znanja bodo mentorje obogatila s sodobnimi spoznanji o delu s študenti. Za mentorja namreč ni dovolj, da je strokovnjak na svojem področju, ampak mora ta znanje znati tudi pravilno prenašati.

Najmanjša pričakovanja prihajajo iz področja W-T strategije, ki pa so osnova za obrambni plan, saj organizacija zaradi svojih slabosti podlega morebitnim nevarnostim. Ubadamo se s problemom premajhne vključenosti predavateljev in študentov v projekte in tekmovanja, pri tem pa nam nevarnost predstavlja pomanjkanje sredstev za vzdrževanje infrastrukture. Če hočemo tesno povezavo optimirati, potem sledi aktivno vključevanje v projekte, saj bomo tako pridobili programski vir financiranja, ki bo skrbel za kondicijo infrastrukture. Vključevanje v bazične projekte bo skrbelo za izboljšanje spremljanja razvoja stroke. Ko bodo študenti bolj aktivno sodelovali v procesih odločanja, bomo bolje reševali problematiko nepripravljenosti podjetij za izvajanje izobraževanja študentov, posebno če ti prihajajo iz njihovega delovnega okolja.

Vsa pričakovanja, ki so zajeta v TOWS matriki, izvirajo iz SWOT analize. Naše rešitve smo z nazorno analizo in sintezo uskladili s smernicami iz literature (Williamson, et al., 2008, Weihrich, 1982). Rezultati raziskave potrjujejo tudi izbrane smernice projekta IMPLETUM, ki ga v okviru Ministrstva za šolstvo izvaja konzorcij šol v letih 2008 – 2011 (RS,MŠŠ, 2008). Projekt izpostavlja pričakovane rezultate v smeri kakovosti izvajanja izobraževalnega procesa.

Izhajajoč iz realizacije zastavljenih kratkoročnih ciljev za študijsko leto 2008/2009 lahko povzamemo, da je šola uspešno delovala na vseh prioritetnih področjih (razširitev obsega ponudbe, razvijanje in izboljševanje pogojev delovanja šole, povečanje kakovosti študijskih programov, povezovanje šole z okoljem) v okviru katerih je realizirala praktično vse zastavljene cilje. Deloma sta bila uresničena le cilja na področju pridobivanje dodatnih višješolskih študijskih programov v okviru tehniških strok in na področju vključevanja šole v postopke za pridobitev visoke strokovne šole. Tema dvema področjema bo v prihodnjih študijskih letih v skladu s strategijo šole potrebno posvetiti dodatno pozornost.

Na osnovi izvedene SWOT analize moramo v prihodnosti, kot dolgoročni cilj definirati potrebne korake za pripravo strateškega načrta.

Proces strateškega managementa pri tem vključuje štiri osnovne faze:

- motrenje okolja,
- opredelitev,
- uresničevanje ter
- vrednotenje in kontrola strategije.

Notranje okolje je organizacija sama, kjer je potrebno pridobiti informacije o poslovni uspešnosti organizacije, njenem poslovnem procesu in na splošno o prednostih organizacije. Zunanje okolje je okolje, ki organizacijo obdaja in kateremu se mora organizacija konstantno prilagajati. Prilagajati se mora tržnim razmeram in politiki ter slediti konkurentom (David, 1986). Tukaj je potrebno stalno pridobivati podatke iz širšega okolja in izboljševati privlačnost samih programov. Teh informacij ni težko pridobiti, saj mora vsaka višja šola slediti konkurenci in razvoju, da obstane na trgu, te informacije pa neposredno posreduje zainteresirani javnosti. Na podlagi tega organizacija tudi sledi izboljšavam in razvoju v višjem šolstvu.

Kot kratkoročni cilj, v okviru samoevalvacije smo se odločili obravnavati štiri ključne kazalnike kakovosti, ki izhajajo iz analize, in sicer:

- zadovoljstvo študentov,
- zadovoljstvo strokovnih delavcev,
- zadovoljstvo delodajalcev in
- število diplomantov.

Vsi štirje kazalniki so ozko povezani s kakovostjo izvajanja študijskih programov, ki jih izvaja šola. Zadovoljstvo študentov, zlasti strokovnih delavcev je povezano tudi z delovanjem VSŠ (večji vpliv), medtem, ko je zadovoljstvo delodajalcev odvisno od vrste zunanjih dejavnikov (manjši vpliv).

Na višjih šolah se z njihovim delovanjem vzpostavlja tudi organ za spremljanje in zagotavljanje kakovosti, kar je v domeni istoimenske komisije. Ustanovitev in delo komisije je opredeljeno v 15. členu Zakona o višjem strokovnem izobraževanju (UL RS, 2004). Komisija ustvarja razmere za uveljavljanje in razvijanje kakovosti izobraževalnega dela na šoli, vzpostavlja mehanizme za sprotno spremljanje in ocenjevanje kakovosti ter učinkovitosti dela na šoli z določitvijo metod vrednotenja, subjektov evalvacije, z izbiro inštrumentov in meril evalvacije in določitvijo vsebin evalvacije. Komisija načrtuje, organizira in usklajuje spremljanje in zagotavljanje kakovosti na šoli, sodeluje s Svetom za evalvacijo visokega šolstva in opravi primerjanje z drugimi šolami doma in v tujini, spremlja zaposlitvene možnosti diplomantov. Na podlagi odziva delodajalcev, Komisija za spremljanje in zagotavljanje kakovosti oblikuje predloge izboljšav ter pripravlja poročila o evalvaciji za obravnavo na Svetu za evalvacijo visokega

šolstva in Komisiji za akreditacijo višješolskih študijskih programov.

Komisija za spremljanje in zagotavljanje kakovosti študentom posveča veliko pozornosti, ki se izkazuje v dobri pripravi in izvajanju študijskega procesa, demokratičnih odnosih, spoštovanju osebnosti in odprtosti za kritično presojo načrtovanega ali preteklega dogajanja. Na področju sodelovanja z drugimi izobraževalnimi ustanovami je načrtovano aktivno sodelovanje s podjetji in fakultetami.

5 Zaključki

Zaradi rasti števila višjih šol je dokaj hitro postalo jasno, da se konkurenčna prednost pokaže le s skrbjo za kakovost. Sodelovanje z gospodarstvom in podjetniškim okoljem je del neizogibnega procesa rasti kakovosti študijskih programov in vključenih izvajalcev znotraj teh zavodov in v poslovnih sistemih, ki z zavodi sodelujejo. Kakovost je potrebno meriti, zato si tu lahko pomagamo s t.i. objektivno samoevalvacijo s pridobivanjem objektivnih kazalnikov in izhodišč pri pripravi strateškega načrta določene višje šole.

Izvedli smo kritično analizo stanja (SWOT analiza) s poudarjenimi prioritetnimi nalogami. Strategije smo oblikovali z uporabo TOWS matrike.

Največ možnosti za realizacijo ima izhodišče, ki temelji na sodelovanju med šolo in gospodarstvom. Zavedamo se, da dobri kadri ne pridejo v podjetje, ampak nastanejo v podjetju. Pri tej povezavi izstopa možnost ustanovitve laboratorija za razvoj prototipov. Laboratorij bo postal center za združevanje teoretičnih in praktičnih izkušenj, ki bo svoje ugotovitve lahko širil preko naših meja. Strategija se mora spoprijeti tudi z manjšim nivojem pričakovanj, kjer ima kljub slabim izhodiščem dobre možnosti. S povečevanjem vključevanja v projekte bo moč vzbuditi mehanizme prepoznavnosti in tako povečati interes v gospodarstvu in pri bodočih študentih. Vključevanje v projekte lahko odpre vir sredstev, ki nam pomaga pri najbolj kritičnih poteh strateških usmeritev, ki so vezane na vzdrževanje infrastrukture.

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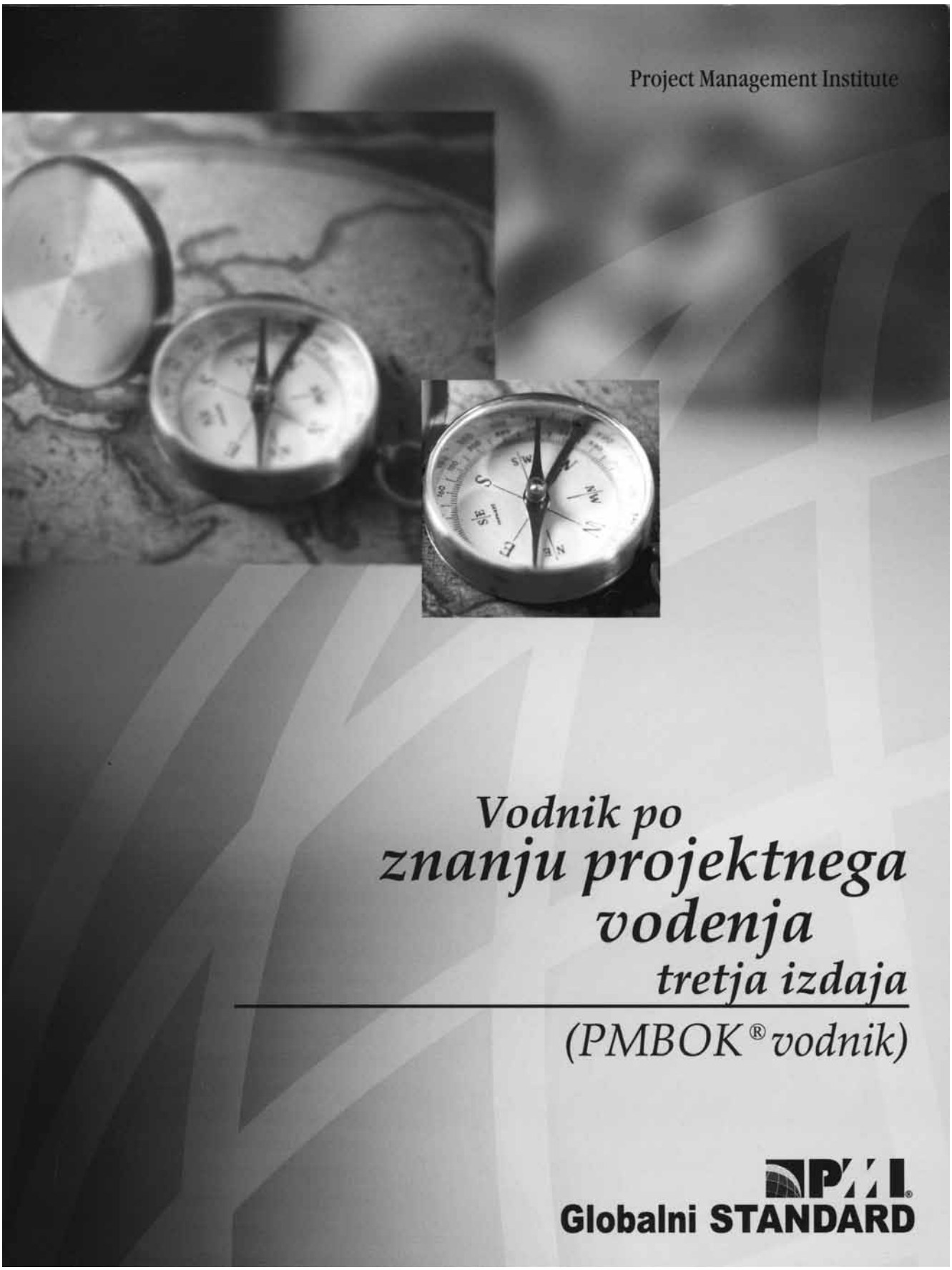
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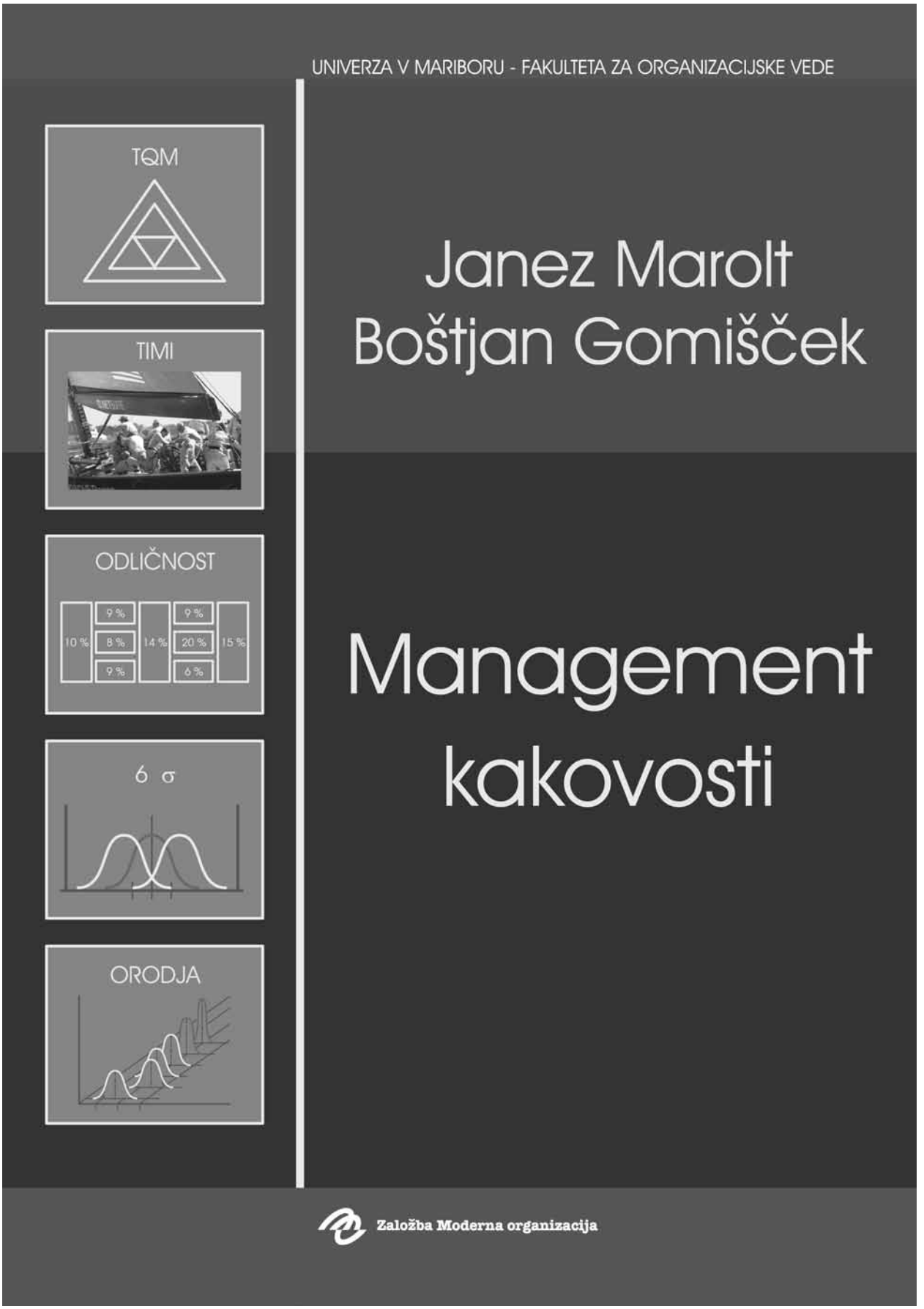
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Management
kakovosti
Založba Moderna organizacija

Model ocenjevanja institucij za izobraževanje odraslih

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V zadnjem času se izpostavlja proces vseživljenjskega učenja kot proces permanentnega izobraževanja posameznikov. V tem procesu izobraževanja se posameznik velikokrat srečuje z dilemo, katero izobraževalno institucijo izbrati, da bo dobil optimalno znanje glede na svoje zahteve. V Sloveniji se je število izobraževalnih institucij v zadnjem času močno povečalo in posameznik tako zlahka zgubi pregled nad njihovo vsebino in kakovostjo. Zato smo v prispevku oblikovali model ocenjevanja institucij za izobraževanje odraslih s pomočjo večparametrske odločitvene metode. Na osnovi pravil, ki predstavljajo kombinacije zahtevanih vrednosti različnih parametrov, smo definirali bazo znanja znotraj ekspertnega sistema Dex-i, ter tako analizirali posamezne izobraževalne institucije glede na njihovo ponudbo. V prispevku je prikazana uporaba odločitvenega modela na izbranih štirih izobraževalnih institucijah.

Ključne besede: vseživljenjsko učenje, izobraževanje odraslih, večparametrsko odločanje, ekspertni sistem

1 Uvod

Izobraževanje kot proces predstavlja permanenten razvoj vsakega posameznika v različnih obdobjih njegovega ustvarjanja. Visoka tehnološka razvitost, močna konkurenca ter nenehni boji za ohranitev položaja posameznih organizacij na trgu so pripeljali do tega, da se tako organizacije kot posameznik zavedajo ne samo prednosti temveč tudi moči, ki jo nudi znanje na določenem področju. Način dela se radikalno spreminja, saj tradicionalne industrijske družbe, za katero je bila značilna priramidalna struktura (Kranjc, 2010) in je definirala razvoj in obstoj organizacij skozi industrijo in težko fizično delo, ni več. Nasledila jo je tako imenovana »družba znanja«, znotraj katere so informacije in znanje tisto, ki pogojujejo razvoj ne samo posameznika in organizacije, temveč celotne družbe. Nahajamo se torej v postmoderni informacijski dobi, kjer se posameznik vsakodnevno srečuje s kontinuiranostjo znanega z neznanim. Posledično mora posameznik slediti potrebam, ki jih od njega zahteva delo, to pa pomeni, da mora konstantno razvijati nove kompetence in se prilagajati trenutnim situacijam. To lahko doseže le s ciljno usmerjenim vseživljenskim učenjem. S tega vidika je zato pomembno, da posameznik izbere ustrezno izobraževalno ustanovo.

2 Izobraževanje odraslih

Razlogi, da danes tudi v naši družbi že namenjamo več pozornosti izobraževanju odraslih, so zelo preprosti in očitni; krizne razmere so dosegle stopnjo, ko nam je povsem jasno, da se iz krize lahko izvlečemo le s temeljito preobrazbo. Ta se seveda ne more omejiti le na gospodarstvo, temveč mora zajeti kar družbo v celoti.

V tem kontekstu predstavlja izobraževanje temelj osebnostnega in strokovnega razvoja tako družbe kot posameznika. Izobraževanje je sestavljeno iz pripravljenih, strukturiranih in bolj ali manj organiziranih situacij, znotraj katerih se posameznik uči oziroma sprejema informacije. Vseživljensko izobraževanje je dejansko kontinuiran proces evalvacije izkušenj (Hočevar Ciuha, 2010). Zato ga imenujemo tudi izkustveno izobraževanje (experiential education). Oziroma kot pravi France Strmčnik (2010):

»Izobraževanje je zavestna in sistematična racionalna in vrednotna interakcija oziroma polimorfna komunikacija med spoznavajočim subjektom in objektom spoznanja. V tej komunikaciji človek, ki angažira vse svoje psihofizične moči, internalizira (ponotranji) dogajanja v objektivni ali subjektivni stvarnosti. Tedaj izobraževanje ne pomeni le informiranje, marveč zlasti formativno razvijanje kognitivnih, emocionalnih in psihomotoričnih moči, torej procesno spreminjanje celotne osebnosti.«

Zgledi razvitih držav in tudi dobri primeri pri nas nam kažejo, da za obvladovanje razmer današnjega sveta ni dovolj, da skrbimo le za izobraževanje otrok in mladine, temveč je enako pomembno tudi izobraževanje odraslih. (Jelenc,1989).

Zakon o izobraževanju odraslih (2006) definira izobraževanje odraslih kot: »izobraževanje, izpopolnjevanje, usposabljanje in učenje oseb, ki so izpolnile osnovnošolsko obveznost in si želijo pridobiti, posodobiti, razširiti in poglobiti znanje, pa pri tem izobraževanju nimajo statusa učenca,

dijaka ali študenta.« Zakon o izobraževanju odraslih predstavlja podlago za razvoj tega področja in ureja tudi organizacijo izobraževalnih institucij, izobraževalne programe in specifike udeležencev izobraževalnih programov

Kakšne so razmere na področju izobraževanja odraslih v Sloveniji in kako naprej? Takšna vprašanja si zastavljamo, ko želimo ugotoviti razvojno pot strokovnega izobraževanja na slovenskem. Slovenija po podatkih analize OECD (Mohorčič Špolar, 2010) namreč zaostaja v deležu populacije (24-65 let) z univerzitetni izobrazbo. Tu je na zadnjem mestu držav (Schleiher, 2008), ki jih je primerjala OECD (37 držav). Izkoriščenost človeškega kapitala je v srednje in vzhodno evropskih držav kot tudi v Sloveniji bistveno manjša od povprečja EU-15. To pomeni, da bi morala Slovenija bistveno več vlagati v izobraževanje in usposabljanje prebivalstva.

V letu 2009/2010 med ponudniki izobraževanja odraslih prevladujejo specializirane organizacije za izobraževanje odraslih, ki so v zasebni lasti, vendar v Andragoškem centru (2010) opažajo, da število teh izvajalcev v zadnjih letih rahlo upada. V zadnjih letih se zmanjšuje tudi število ljudskih univerz ter srednjih šol, ki poleg mladine izobražujejo odrasle. Domnevajo, da se bo ta negativni trend tudi v obdobju gospodarske krize in recesije v naslednjih letih še nadaljeval. Pozitivni trend pa se kaže pri ponudbi višjih strokovnih šol, kjer se zaradi velikega povpraševanja povečuje število višjih strokovnih šol, ki ponujajo dveletne višješolske programe. Velik delež višješolskega izobraževanja se izvede v okviru ljudskih univerz ter znotraj šolskih centrov. Število ponudnikov zlasti splošnega neformalnega izobraževanja ne odstopa veliko od lanskega leta. V to skupino uvrščajo društva in zveze društev, splošne knjižnice, muzeje in galerije, univerze za tretje življenjsko obdobje.

Velik del izobraževalne ponudbe zasebnih organizacij in zasebnih šol, ki so specializirane za izobraževanje odraslih, predstavljajo izobraževalni programi splošnega neformalnega izobraževanja za splošne potrebe in prosti čas (94%). Veliko manjša je ponudba izobraževalnih programov za zvišanje izobrazbene ravni ter programov za pridobitev nacionalnih poklicnih kvalifikacij. Pestra, vendar skromnejša, je ponudba neformalnega izobraževanja, največ jo je s področja poklicnega usposabljanja in izpopolnjevanja.(Andragoški center, 2010). Čelebič (2010) skozi raziskavo ugotavlja, da so v letu 2007 največji delež neformalnega izobraževanja izvajale ustanove za neformalno izobraževanje (44,6%). S tem Slovenija odstopa od povprečja EU – 27, kjer je ta delež precej manjši (16,4%) in se uvršča med države EU – 27 z največjim deležem teh ustanov. V večini drugih držav EU – 27 največji delež neformalnega izobraževanja izvaja delodajalec.

Zaradi pestre izbire izobraževalnih institucij v Sloveniji, med katerimi se posamezniki, ki nimajo dovolj informacij o posameznih izobraževalnih programih in drugih značilnosti glede izobraževanja, težko odločijo, je v nadaljevanju izdelan večparametrski hierarhični model, ki na podlagi vnaprej definiranih kriterijev poda najboljšo izobraževalno institucijo za potrebe izobraževanja posameznika. Tako je moč izmed velikega števila institucij, ki jih ponuja trg, izbrati najprimernejšo glede na trenutne potrebe po znanju.

3 Definiranje faz odločitvenega modela

Pri sprejemanju odločitev za izbor izobraževalne institucije, ki bo izobraževala zaposlene, moramo biti pozorni na več kriterijev, ki določajo kvaliteto izbora. Pred oblikovanjem modela je potrebno opredeliti problem in identificirati kriterije. Pri tem velikokrat nastopi težava, da strokovnjaki (eksperti) ne zmorejo formulirati oziroma identificirati problema (Ayed et al., 2010; Rajkovič et al., 2010). Zato je potrebno poiskati dodatne informacije, s katerimi problem osvetlimo. Šele na podlagi navedenega lahko določimo funkcijo koristnosti, opišemo variante, jih ovrednotimo, analiziramo in sprejmemo odločitev. V praksi so odločitveni procesi največkrat podprti z izbranimi računalniškimi sistemi, ki so specializirani za določeno področje (Shi in Lyons – Weiler, 2007).

V našem primeru smo opredelili problem, kjer smo zajeli štiri hipotetične institucije, ki so primerne za izobraževanje zaposlenih. Predmet odločanja je bila najprimernejša izobraževalna institucija, ki bo izbrana za izobraževanje zaposlenih. Model je bil strukturiran v več fazah in sicer:

- V prvi fazi je bilo potrebno strukturirati problem. Institucija mora zajemati zahteve po ponudbi izobraževanja, ugledu institucije in ostali ponudbi.
- V drugi fazi odločitvenega procesa je sledila identifikacija kriterijev. Prvi korak v identifikaciji kriterijev je bil spisek kriterijev. Ko so bili spisani vsi kriteriji, so bili strukturirani v drevo kriterijev. Kriteriji so bili združeni v skupine in obrazloženi. Določene so bile zaloge vrednosti in njihove merske lestvice.
- V tretji fazi odločitvenega procesa so se definirala odločitvena pravila (funkcije koristnosti). Funkcije koristnosti opredeljujejo vpliv posameznih kriterijev na celotno odločitev in izraža odločitveno moč posameznega kriterija (Odločitveni proces, 2010). Tako je bil določen vpliv podrejenih kriterijev na nadrejene. Definirani so bili v obliki tabel za vsak izpeljan kriterij (drevesna struktura), po principu če-potem.
- Četrta faza odločitvenega procesa je bil opis variant. Variante so bile opisane z vrednostmi po kriterijih (po natančni preučitvi posamezne variante). Pri tem smo bilii pozorni na zanesljivost virov informacij o posamezni varianti in na popolnost podatkov.
- Peta faza odločitvenega procesa je vrednotenje variant. Variante se vrednotijo od listov do korena drevesa kriterijev v skladu s strukturo drevesa in z definiranimi funkcijami koristnosti. Vrednost, ki je bila na ta način pridobljena v korenu drevesa, predstavlja končno oceno variante. Vrednotenje lahko poteka tudi ob nenatančnih, nepopolnih podatkih o variantah. Rezultat je kvalitativna ocena vsake variante. Varianta z najvišjo oceno je praviloma najboljša. Pri fazi vrednotenje variant so bili opisani rezultati vrednotenja. Definirati je bilo potrebno, kako so bile ocenjene variante, katera je najboljša in potem primerjati najboljšo varianto z nekaj najbolje ocenjenimi preostalimi variantami.
- Šesta faza odločitvenega procesa je bila analiza variant. V tej fazi se je bilo potrebno osredotočiti na ugotavljanje razlogov za dobljene rezultate vrednotenja. Opraviti je bilo potrebno analizo KAJ-ČE, narediti aktivno razlago

variant (dobre in slabe strani) in analizo občutljivosti, tako da nekemu parametru določimo utež. Pri analizi variant je bilo potrebno preveriti ali so vrednosti kriterijev in uporabljene funkcije koristnosti ustrezne. Pregledati je bilo potrebno, ali je ocena v skladu s pričakovanji ali odstopa in zakaj ter kakšne so prednosti in pomanjkljivosti posameznih variant. Potrebno je bilo ugotoviti, kakšna je občutljivost odločitve oziroma kako spremembe vrednosti kriterijev vplivajo na končno oceno.

- Sedma faza odločitvenega procesa je sprejetje odločitve. Ugotoviti je bilo potrebno, kaj je končni rezultat odločitve in ali so cilji odločitvenega procesa doseženi.

Zato smo v nadaljevanju na osnovi dobljenih rezultatov izbrali tisto izobraževalno institucijo, ki je najprimernejša za izobraževanje zaposlenih. Odločitev, katero institucijo izbrati, je pomembna iz dolgoročnega vidika izobraženosti in usposobljenosti zaposlenih.

4 Model ocenjevanja izbranih institucij za izobraževanje zaposlenih

Odločitev za izbiro institucije za izobraževanje zaposlenih je bila sprejeta s pomočjo modela, ki je bil oblikovan v programu DEX-i (Jereb et al., 2003). Za način izbora najprimernejše izobraževalne institucije za izobraževanje zaposlenih s pomočjo ekspertnega sistema DEX–i smo se odločili zato, ker ima DEX-i dve posebnosti. Uporablja kvalitativne kriterije, katerih vrednosti so v splošnem besede in le izjemoma številke oz. numerični intervali. Funkcije koristnosti niso podane analitično, ampak s preprostimi odločitvenimi pravili tipa če-potem. Postopek izbora izobraževalne institucije je bil izveden po korakih. Kriteriji, ki vplivajo na izbor najprimernejše izobraževalne institucije, so deloma razvidni že iz identifikacije problema. Pri izboru je bila upoštevna ponudba izobraževanj, izvedba izobraževanj, uglednost institucije in ostalo ponudba. Pod ponudbo izobraževanj so opredeljeni podkriteriji, ki določajo program (koliko programov nudijo zaposlenim, vrsta izobraževalnega programa) in izvedba izobraževanj (uporaba izobraževalnih pripomočkov in opredelitev predavatelja glede na število predavateljev, ki so na voljo, koliko lastnih izkušenj ima ter karakteristike predavatelja). Ugled institucije določajo sodelovanje s podjetji, reference in promocije. Pri ostali ponudbi so bili opredeljeni faktorji, ki so prav tako pomembni pri odločitvi za posamezno institucijo in ne vplivajo neposredno na odločitev. Pod navedeni kriterij so bili navedeni prostor, catering in dostopnost do mesta izobraževanja.

Izobraževalne institucije, ki smo jih zajeli v modelu, so bile zelo različne:

- Izobraževalna institucija 1 predstavlja majhno podjetje, ki izvaja praktična izobraževanja. Kader ima malo znanj in lastnih izkušenj. Institucija je sodelovala s podjetji, čeprav je med novejšimi na tržišču. Prostor je dober in catering zadovoljiv, prav tako je dobra dostopnost. Nekaj promocij institucije opazimo v medijih, vendar ne veliko.
- Druga izobraževalna institucija, izobraževalna institucija 2 je samostojni podjetnik. Ponuja dva izobraževalna programa. Svoja izobraževalna programa predstavi zgolj teoretično. Podjetje kljub majhnosti deluje že nekaj let. Institucija je sodelovala večinoma s stalnimi strankami. Referenc nima. V promocije ne vlaga, saj lastnik meni, da se promocija izvaja sama od sebe z dobrim izobraževanjem.
- Tretja izobraževalna institucija na trgu je veliko podjetje, saj premore preko 11 predavateljev. Nudijo do 10 različnih izobraževalnih programov in imajo veliko znanja in izkušenj. Referenc in sodelovanja s podjetji imajo veliko, saj že dolgo vrsto let kljubujejo trgu. Prostor za izobraževanja imajo zadovoljiv, dober catering in odlično dostopnost.
- Četrta izobraževalna institucija, institucija 4, je prav tako veliko podjetje. Imajo malo znanj in izkušenj, prostor

Drevo kriterijev

Kriterij	Opis
Izobraževalna institucija	Institucija za izobraževanje zaposlenih
Ponudba izobraževanj	Celostna ponudba programov pri izobraževanju zaposlenih
Programi	Programi, ki so na voljo za zaposlene
Število	Koliko programov nudijo zapolenim
Vrsta	Vrsta izobraževalnega programa
Izvedba izobraževanj	Izvajanje izobraževanj za zaposlene
Način	Uporaba izobraževalnih pripomočkov
Predavatelji	Predavatelji, ki izobražujejo zaposlene
Število	Število predavateljev, ki izobražujejo zaposlene
Lastne izkušnje	Splošne predavalske izkušnje predavatelja
Karakteristike	Karekteristike predavatelja
Znanje	Znanje s katerim predavatelj razpolaga
Izkušnje	Izkušnje na podlagi izobraževanj dotičnih programov izobraževanja zaposlenih
Ugled institucije	Ugled institucije
Sodelovanje	Sodelovanje institucije s podjetji
Referenca	Dobro ime institucije s strani podjetij, ki so imele navedeno izobraževanje za zaposlene
Promocije	Kako se izobraževalna institucija promovira v medijih
Ostala ponudba	Ponudba,ki pripomore k zadovoljstvu zaposlenih
Prostor	Prostor, kjer se izvajajo izobraževanja
Catering	Catering pri izobraževanju zaposlenih
Dostopnost	Dostopnost do mesta izobraževanja

Slika 1: Drevo kriterijev

zadovoljiv in odlično dostopnost ter dober catering. Na izobraževanjih podajajo teoretično znanje.

Vse navedene izobraževalne institucije, ki so zajete v modelu, so primerne v smislu ponujenih izobraževalnih programov glede na Zakon o izobraževanju odraslih. Na podlagi zapisanih dejstev je bilo izdelano drevo kriterijev, ki je prikazano na sliki 1.

Kriteriji so bili strukturirani na osnovi njihove medsebojne odvisnosti in vsebinskih povezav. Tako smo dobili poddrevo kriterijev. Pod kriterije so bile navedene vse postavke, ki vplivajo na izbor najprimerneje izobraževalne institucije za izobraževanje zaposlenih. V opisu so kriteriji tudi opisani in podrobneje opredeljeni (slika 1).

Pri metodi DEX so zaloge vrednosti kriterijev sestavljene iz besed ali numeričnih intervalov. V navedenem primeru je bila izobraževalna institucija ocenjevana s petstopenjsko lestvico: nesprejemljiva, slaba, zadovoljiva, dobra in odlična. Merske lestvice so večinoma urejene od slabih (manj zaželenih) proti boljšim vrednostim. Pri metodi DEX to sicer ni nujno, je pa dobrodošlo, saj se uporablja v naslednji fazi pri kontroli konsistentnosti odločitvenih pravil in lahko bistveno pohitri postopek zajemanja funkcij koristnosti.

Na sliki 2 so prikazane zaloge vrednosti. Iz slike je razvidno, da je lahko ponudba izobraževanj ocenjena kot slaba, zadovoljiva, dobra in odlična. Programi so lahko slabi, zadovoljivi in dobri. Število izobraževalnih programov, ki jih organizacija nudi, se giblje od 1-2, kar pomeni slab izbor izobraževalnih programov, 3-5 in 6-10 dober izbor izobraževalnih programov in 11-več odličen izbor izobraževalnih programov za sprejem izobraževalne institucije v ožji izbor. Prav tako so definirani vsi ostali kriteriji v programu DEX-i.

V nadaljevanju so bila definirana odločitvena pravila v programu DEX-i. Model v programu DEX-i omogoča pripravo tabele z že vpisanimi vsemi kombinacijami vrednosti odvisnih spremenljivk. Potrebno je le izpolniti zadnjo kolono. Pri tem program sproti opozarja na morebitne nekonsistentnosti in na nekaterih mestih v tabeli sam predlaga ustrezne vrednosti, ki jih izpelje iz do takrat definiranih pravil.

V primeru, da izobraževalna institucija ponuja 1-2 izobraževalna programa in je program za institucijo nesprejemljiv, potem smatramo, da gre za slab izobraževalni program, ki ga izobraževalna institucija nudi. Tako so vezane vse funkcije koristnosti, da podajo končno odločitev ali je program slab, zadovoljiv, dober ali odličen. Variante so opisane z vrednostmi po parametrih. Do vrednosti pridemo po natančni preučitvi posamezne variante. Pri tem moramo biti pozorni na zanesljivost virov informacij o posamezni varianti ter seveda na čim večjo popolnost podatkov. Definiran bo odločitveni model za zbrane vse podatke o variantah. Model v programu DEX-i jih ovrednoti v skladu s strukturo kriterijev in odločitvenimi pravili.

Kriteriji v modelu so podani z opisom in zalogo vrednosti. Na primer, v zvezi s predavatelji število opisuje število predavateljev, ki izobražujejo zaposlene. Zaloga vrednosti določa mersko lestvico od 1-2 predavatelja, 3-5 predavateljev, 6-10 predavateljev in 11-več (slika 2). Tako so podani tudi ostali kriteriji; Lastne izkušnje opisujejo splošne predavateljske izkušnje predavatelja ovrednotene z zalogo vrednosti nič, malo, veliko. Karakteristike opisujejo karakteristike predavatelja, znanje opiše znanje predavatelja s katerim predavatelj razpolaga in ostalo. Tako so definirane vse zaloge vrednosti in vsi kriteriji, ki so pomembni za izbor najprimernejše izobraževalne institucije

Na podlagi definiranih kriterijev, zalog vrednosti, funkcij koristnosti, opisa, vrednotenja in analize variant je bila ugotovljena najugodnejša rešitev. Potrebno je bilo izbrati najprimernejšo izobraževalno institucijo, ki bo izobraževala zaposlene. Izbirati je bilo potrebno med štirimi institucijami; institucijo 1, institucijo 2, institucijo 3 in institucijo 4. Najprej je bila izbrana izobraževalna institucija na podlagi programa, ki ga institucija nudi. Program določa kvaliteta programa,

Zaloge vrednosti

Kriterij	Zaloga vrednosti
Izobraževalna institucija	neprimerna; slaba; zadovoljiva; dobra; *odlična*
Ponudba izobraževanj	slabi; zadovoljivi; dobri; *odlični*
Programi	1-2; 3-5; 6-10; *11-več*
Število	1-2; 3-5; 6-10; *11-več*
Vrsta	nesprejemljivo; sprejemljivo; *dobro*
Izvedba izobraževanj	neprimerna; slaba; zadovoljiva; dobra; *odlična*
Način	teoretično; *praktično*
Predavatelji	neprimeren; slab; zadovoljiv; dober; *odličen*
Število	1-2; 3-5; 6-10; *11-več*
Lastne izkušnje	nič; malo; *veliko*
Karakteristike	slabi; zadovoljivi; *dobri*
Znanje	nima znanj; malo znanj; *veliko znanj*
Izkušnje	nič izkušenj; malo izkušenj; *veliko izkušenj*
Ugled institucije	slab ugled; nepoznana; *ugledna*
Sodelovanje	ni ; malo; *veliko*
Referenca	nima referenc; malo referenc; *veliko referenc*
Promocije	nima; malo; srednje; *veliko*
Ostala ponudba	slaba; zadovoljiva; dobra; *odlična*
Prostor	slab; zadovoljiv; *dober*
Catering	neprimerna; slaba; zadovoljiva; dobra; *odlična*
Dostopnost	slaba; dobra; *odlična*

Slika 2: Zaloge vrednosti kriterijev

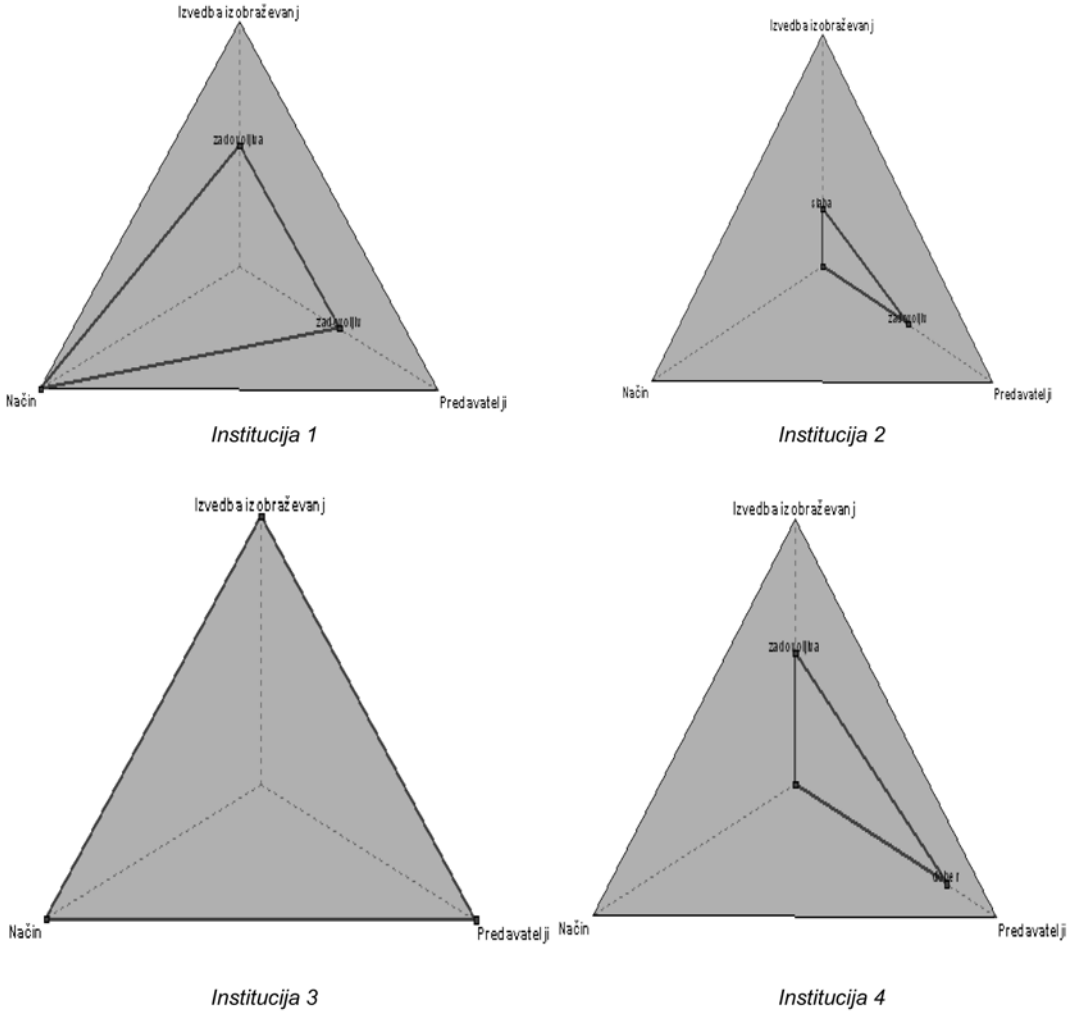
število programov, ki jih institucija nudi in vrsto programa. Izbor programa pri instituciji 1, instituciji 2, instituciji 3 kot pri instituciji 4 prikazujejo grafikoni spodaj. Institucija 3 nudi enajst in več dobrih programov, snov pa podaja praktično, z izobraževalnimi pripomočki. Institucija 2 predstavlja enega do dva izobraževalna programa in nesprejemljivo vrsto programa. Institucija 1 ponuja 3-5 dobrih programov. Institucija 4 nudi 3-5 izobraževalnih programov in razpolaga z 6-10 predavatelji, ki ponujajo izobraževalne programe. Program, ki ga nudi izobraževalna institucija 4 je sprejemljiv.

Ugotovljeno je bilo, da izobraževanja potekajo glede na način izvajanja (koliko pri izvajanju izobraževanja uporabljajo učne pripomočke) in glede na oceno predavatelja, ki izobražuje zaposlene. Institucija 1 nudi poleg izobraževanja z učnimi pripomočki, dobro izvedbo izobraževanj z zadovoljivimi predavatelji. Institucija 3 pri svojem delu uporablja učne pripomočke. Predavatelji, ki izobražujejo zaposlene so odlični in odlična je tudi izvedba izobraževanj. Institucija 2 ponuja praktičen način izobraževanja, z učnimi pripomočki, predavatelji so zadovoljivi imajo pa slabo izvedbo izobraževanj. Institucija 4 nudi zadovoljivo izvedbo izobraževanj.

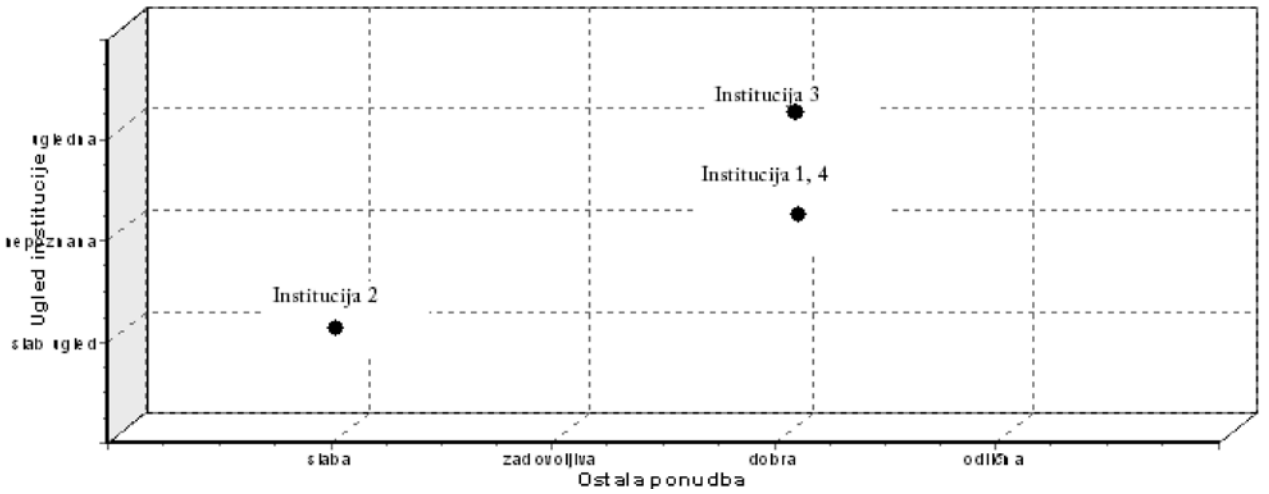
Slika 3 prikazuje primernost izobraževalnih institucij glede na izvedbo izobraževanj (teoretično oziroma praktično izobraževanje), način izvajanja izobraževanja in ocena predavatelja navedene institucije.

Iz rezultatov je razvidno, da sta institucija 1 in institucija 3 najustreznejši. Na izbor najprimernejše izobraževalne institucije vplivajo tudi ostali dejavniki, ki so prikazani v sliki 4. Slika prikazuje institucije opredeljene po ugledu in ostali ponudbi. Institucija 1, institucija 3 in institucija 4 ponujajo ob svojem izobraževanju dobro ostalo ponudbo, medtem ko institucija 2 ponuja slabo ostalo ponudbo ob izvajanju izobraževanj za zaposlene. Pri ugledu izstopa institucija 3, katera velja za ugledno, medtem ko sta institucija 1 in institucija 4, ocenjeni kot nepoznani. Institucija 2 pa ima slab ugled.

V nadaljevanju je bil model iz programa DEX-i prenešen v program Vredana. Slika 5 prikazuje izobraževane institucije, ki so opredeljene z izobraževanji, ponudbo izobraževanj, ugledom institucije in ostalo ponudbo. Izstopa institucija 3. Institucija 3 predstavlja veliko podjetje, katera razpolaga z več kot enajstimi predavatelji. Izobraževalcem nudi dobre izobraževalne programe, ki jih podaja praktično z najrazlič-



Slika 3: Institucije glede na kriterije

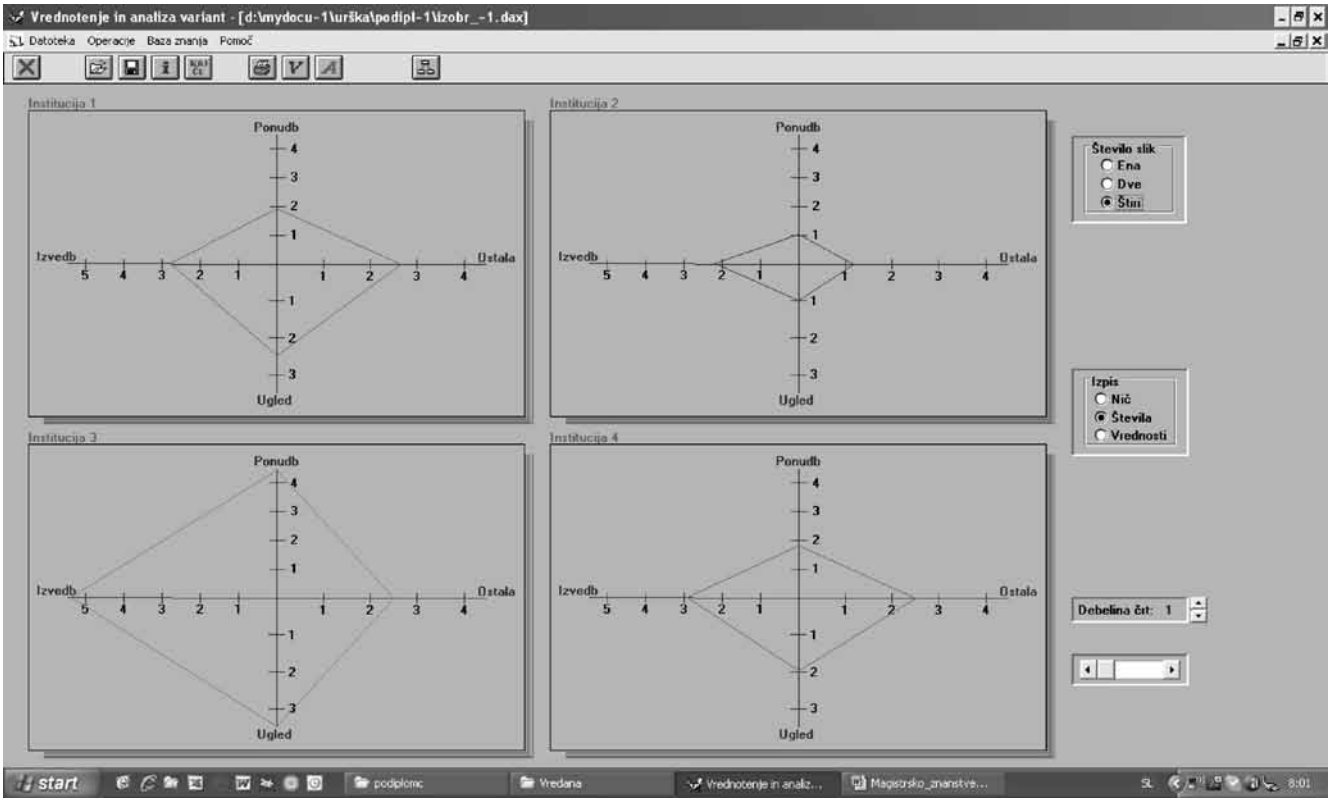


Slika 4: Ostala ponudba in Ugled institucije

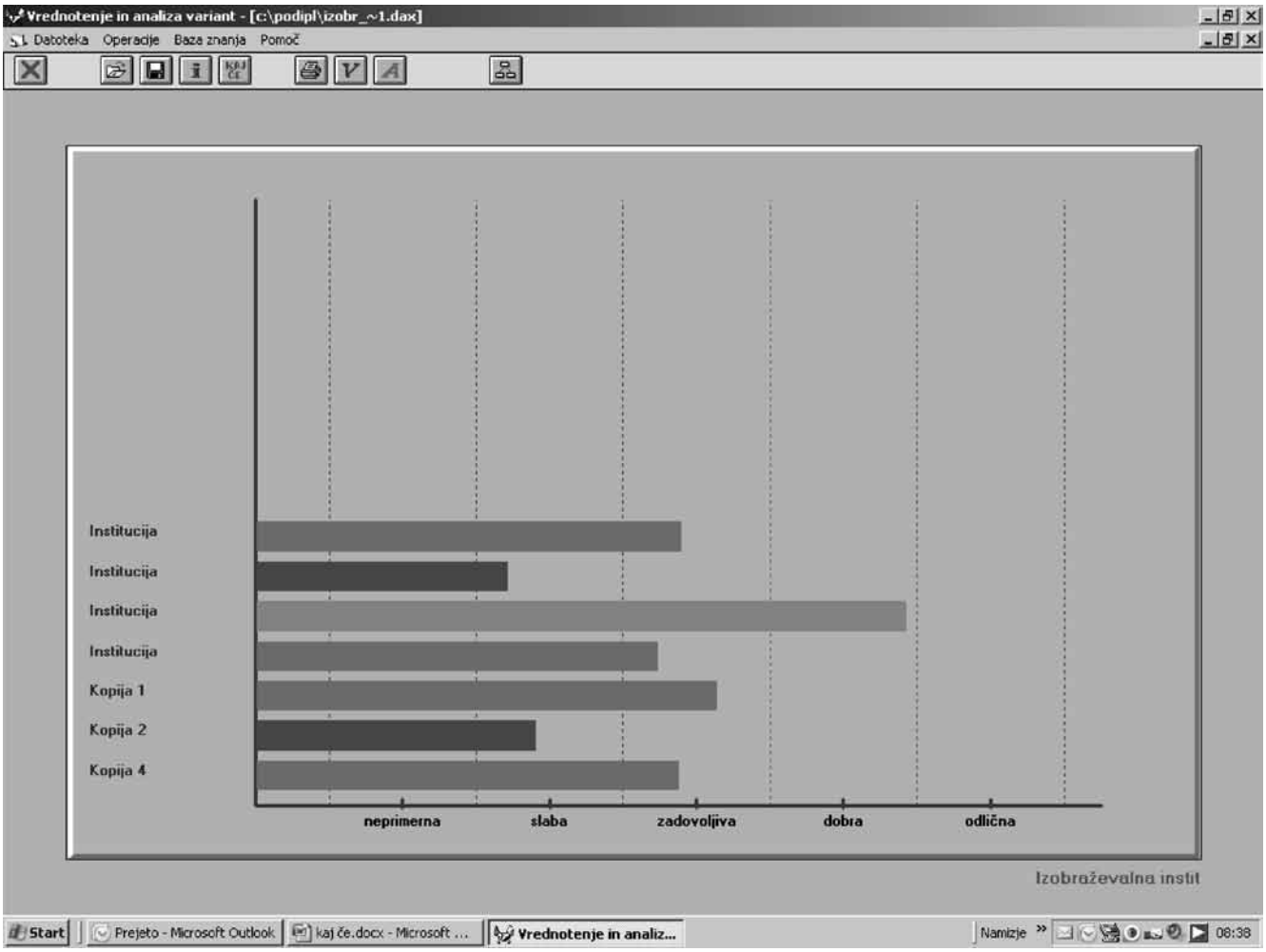
nejšimi učnimi pripomočki. Izobražuje in predava do 10 učnih programov. Ima veliko znanj in izkušenj, prav tako sodelovanj s podjetji, ki so izobraževali njihove zaposlene. Institucija se malo promovira. Dostopnost do mesta izobraževanja je odlična. Prostor je dostopen, saj imajo organiziran prevoz do mesta izobraževanja. Ob izobraževanju nudijo dober catering in zadovoljiv prostor za izobraževanje.

Institucija 3 je podala najboljše rezultate ocenjenih kriterijev za izbor najprimernejše izobraževalne institucije. Ker pa se spreminjajo razmere na trgu in s tem definirani kriteriji, smo s pomočjo programa Vredana skušali ugotoviti, kako bi navedene spremembe vplivale na izbor izobraževalne institucije ob spremenjenih kriterijih.

S pomočjo programa Vredana je bila narejena analiza Kaj - če na več kriterijih. Sprememba je bila narejena pri številu predavateljev, na lastnih izkušnjah in znanjih, ter prostoru in cateringu. Na instituciji 3 ni bilo sprememb na kriterijih. Spremembe so se vršile na ostalih institucijah. Spremembe so



Slika 5: Izobraževalne institucije glede na kriterije



Slika 6: Kaj če analiza

bile zavedene in preimenovane v Kopija 1, Kopija 2 in Kopija 4.

Spremenili so se kriteriji pri ostali ponudbi; cateringu in prostoru. Spremembe so bile naslednje; za institucije (Institucija 1, Institucija 2 in Institucija 4) je bilo zavedeno, da je prostor dober in catering odličen. Institucija 1 je imela dober prostor in zadovoljiv catering. Institucija 2, slab prostor in dober catering. Institucija 4 pa je razpolagala zadovoljivim prostorom in dobrim cateringom. Kljub spremenjenim kriterijem je za najprimernejšo izobraževalno institucijo, ki izobražuje zaposlene še vedno veljala izobraževalna institucija 3, kot prikazuje slika 6.

Na podlagi postavitve modela v programu DEX-i in analize v programu Vredana smo dobili najprimernejšo izobraževalno institucijo, ki bo izobraževala zaposlene. Tako v programu Dex – i kot tudi v Vredani izstopa institucija 3, ki je glede definiranih kriterijev najoptimalnejša izbira za izobraževanje posameznika.

5 Zaključek

Ker živimo v času poplave informacij, je velikokrat težko sprejeti pravočasne in ustrezne odločitve. Kljub temu je uspešnost našega delovanja pogojena s sprejemanjem optimalnih odločitev. Pri tem nam je lahko v pomoč uporaba informacijske tehnologije, ki podpira večparametrske odločitvene procese. Z njeno pomočjo zmanjšamo možnosti spregledovanja pomembnih stvari, ki lahko vplivajo na sprejetje napačne odločitve.

Vseživljensko učenje, ki smo mu priča danes in najverjetneje tudi v prihodnje, zahteva tehten razmislek posameznika, katero znanje potrebuje in kje ga dobil. Dejstvo je, da se izobraževalne institucije v Sloveniji in tudi drugod po svetu med seboj močno razlikujejo po kvaliteti kot tudi načinu prenosa znanja, kar onemogoča posamezniku sprejetje enostavne odločitve. Prametrov, ki vplivajo na izbor posamezne izobraževalne institucije, je lahko preveč. Posameznik je pri tem nemočen in nima jasne predstave o posameznih vsebinah znanj kot tudi ne o njihovi uporabi v praksi. Zato je pomembno, da ima možnost in da hkrati tudi zna izkoristiti sodobno računalniško tehnologijo, ki mu olajša sprejetje najboljše odločitve v danem času. Spremeniti mora svoje razumevanje, kaj lahko z informacijsko tehnologijo pridobi in kaj ne. Predvsem je pomembno, da s podporo informacijske tehnologije lahko sprejme odločitev, ki doprinese k večji kvaliteti dobljenega znanja.

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Model ocenjevanja stopnje informatizacije šole

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Informacijsko-komunikacijska tehnologija je pri procesu modernizacije pouka in učinkovitosti administrativnih procesov na šoli eden izmed bistvenih pripomočkov. Šole potrebujejo jasne usmeritve, kako doseči e-kompetentnost na vseh področjih. Razvili smo večparametrski hierarhični model evalvacije informatizacije posamezne šole na osnovi metodologije Dex. Ta model omogoča, da si posamezna šola predoči obstoječi nivo informatizacije šole, kar ji lahko bistveno pomaga pri nadaljnjem razvoju. Tri glavne skupine ocenjevanja informatizacije: šola in okolje, učitelji in skupnosti, učenci in polje bivanja.

Ključne besede: šola, IKT, stopnja informatizacije, evalvacija, samoevalvacija, vodenje

1 Uvod

Sleherna šola (v širšem smislu mislimo na vsak vzgojno izobraževalni zavod) postaja z vsako kurikularno prenovo in z novimi administrativnimi zahtevami ter nasploh z razvojem in spremembami družbe vse bolj avtonomna. Zaradi zahtevane transparentnosti delovanja šol se dogajajo upravičeni in neupravičeni posegi različnih institucij in posameznikov v prvinske dejavnosti šole, kjer se kažejo tudi ranljivosti šol. Zato morajo šole zagotoviti višji novo delovanja in večjo odgovornost na vseh področjih delovanja. Natančno poznavanje in kakovostno načrtovanje procesov na šoli postaja še bolj ključnega pomena. Prav tako morajo biti šole bolj odprte za sodelovanje z lokalnim in globalnim okoljem. Saj le medsebojno sodelovanje šol, skupno reševanje temeljnih problemov in upoštevanje globalnih usmeritev zagotavlja pravo smer razvoja. Vse bolj je potrebno vključevati upoštevati in zagotavljati osebnostni razvoj vseh izvajalcev in udeležencev vzgojno-izobraževalnega procesa, kar je en izmed temeljev dejanskega vseživljenjskega učenja in smotrnosti življenja (Ščuka, 2009). Vsi našteti pogoji lahko pripomorejo k višji kakovosti izvajanja vzgojno-izobraževalnega procesa (Hopkins, 2007) ter zagotavljajo dodano vrednost za večjo konkurenčnost naših otrok v prihodnosti v EU in svetu.

Informacijsko-komunikacijska tehnologija (IKT) so današnje dejansko okolje mladih in ponuja bistvene pogoje za kakovostnejši pouk, celovitejše in hitrejše učenje, individualizacijo, širšo paleto socialnega življenja (ne sicer fizičnih kontaktov), prav tako z IKT lahko tudi kompenziramo marsikatere »hendikepe« učencev. Zato so šole prisiljene spremljati, sprotni presojati ter smiselno vključevati novosti in priložnosti, ki jih ta prinaša in ponuja. Poleg tega pa IKT učinkoviteje razgalja vse negativne strani življenja: premalo kakovostnega skupnega preživljanja staršev in otrok, nezanimanje učiteljev in staršev za potrebe otrok itd. Če dobro poznamo prednosti in slabosti IKT, lahko trdimo, da je vključevanje IKT v pedagoški in administrativni proces postalo v tem obdobju ena izmed temeljnih nalog sodobne šole, ki resnično želi nekaj spremeniti (Balanskat et al., 2006).

Da bodo (slovenske) šole konkurenčne in v korak s časom jih je treba opolnomočiti s sodobnimi priporočili, smernicami razvoja, zagotoviti učinkovito vodenje šole (Becta, 2008; Davies, 2005), predvsem pa ponuditi razvoj in uvajanje novih kompetenc, vse skupaj z uporabo konkretnih sodobnih e-vsebin, aplikacij in storitev (Rajkovič, 2006).

Eden izmed temeljnih pogojev za napredek in prave spremembe je zagotovo natančno in celovito poznavanje obstoječega stanja. Delno ga lahko ugotovimo z »normirano« zunanjo evalvacijo, celostno pa le poglobljeno samoevalvacijo (Blanchard, 2002). Slednja šoli natančno opredeliti stanje (praviloma na podlagi splošnih oz. zunanjih indikatorjev, katerim se dodajo lastni indikatorji) ter jo usmeri k potrebnim spremembam in nadgradnji obstoječih dejavnosti. Na področju uporabe IKT je tako smiselno za slovenske šole razviti in uvesti sistem samoevalvacije informatizacije šole ter na podlagi le-tega predlagati nadgradnjo in organizacijo nadaljnjih dejavnosti (Čampelj in Rajkovič, 2007). Pri tem je treba smotrno uporabljati in združevati vse ostale dosedanje rezultate (ne le s področja IKT).

V tujini je že nekaj praktičnih primerov modelov, vendar je posamezne kriterije (oz. kazalnike) moč opisati ali samo z »da/ne«, kar nam ne da dovolj kakovostne ocene stanja, ali pa so kriteriji preveč kompleksni, zato posamezna šola ali posameznik ne more konkretno opredeliti eno izmed ponujenih

vrednosti kriterija (DfES, 2004). V našem prispevku predlagamo kombinacijo obojega, tj. model, kjer kriteriji ne bodo le »da/ne« in hkrati ne prekompleksni in naj bi model samoevalvacije podrobneje predlagal posamezni šoli, kje je smiselno, da se dejavnosti drugače izvajajo oz. katere dejavnosti bi bilo potrebno uvesti v šolski vsakdan.

Pri razvoju modela smo se naslonili na teoriji večparametričnega modeliranja in ekspertnih sistemov. Prikazali bomo možnost za večparametrski hierarhični model ocene stopnje informatizacije posamezne šole.

2 Večparametrsko hierarhično modeliranje in metodologija Dex

Za oceno stopnje informatizacije šole smo se odločili izgraditi odločitveni model na podlagi metode hiearhičnega večparametrskega (večkriterijskega) odločanja, angl. HMADM – Hierarhical Multi-Attribute Decision Making (Triantaphyllou, 2000; Turban, et al., 2004). Model lahko uporabljamo tako za analizo obstoječega stanja, kot tudi razlago dobljenih rezultatov ter s tem kot pripomoček za nadgradnjo procesa informatizacije šole.

Osnovna ideja večparametrskega odločanja je razgradnja odločitvenega problema na manjše in lažje obvladljive podprobleme. Variante razčlenimo na posamezne kriterije (parametre, lastnosti, kriterije) in jih ločeno ocenimo glede na vsak kriterij. Končno oceno variante dobimo s postopkom združevanja ocen kriterijev (Bohanec in Rajkovič, 1995).

HMADM je bil razvit predvsem za oceno (oz. evalvacijo) posameznih variant. Za oceno posamezne variante A, B, C itd. (v našem primeru šola A, šola B itd.) se določijo vrednosti osnovnih kriterijev, končna ocena pa je dobljena glede na model. Končni rezultat je celovita ocena posamezne variante (šolo). Poleg te ocene pa z obdelavo dobljenih rezultatov za posamezno varianto lahko raziščemo vzroke za obstoječe stanje. Saj ugotovimo, katere specifične lastnosti lahko vplivajo na izboljšanje rezultatov. S tem pa dobimo tudi usmeritve, kako izboljšati oziroma nadgraditi obstoječe stanje informatizacije posamezne šole (Keeney in Raiffa,1993; Tsoukias, 2008).

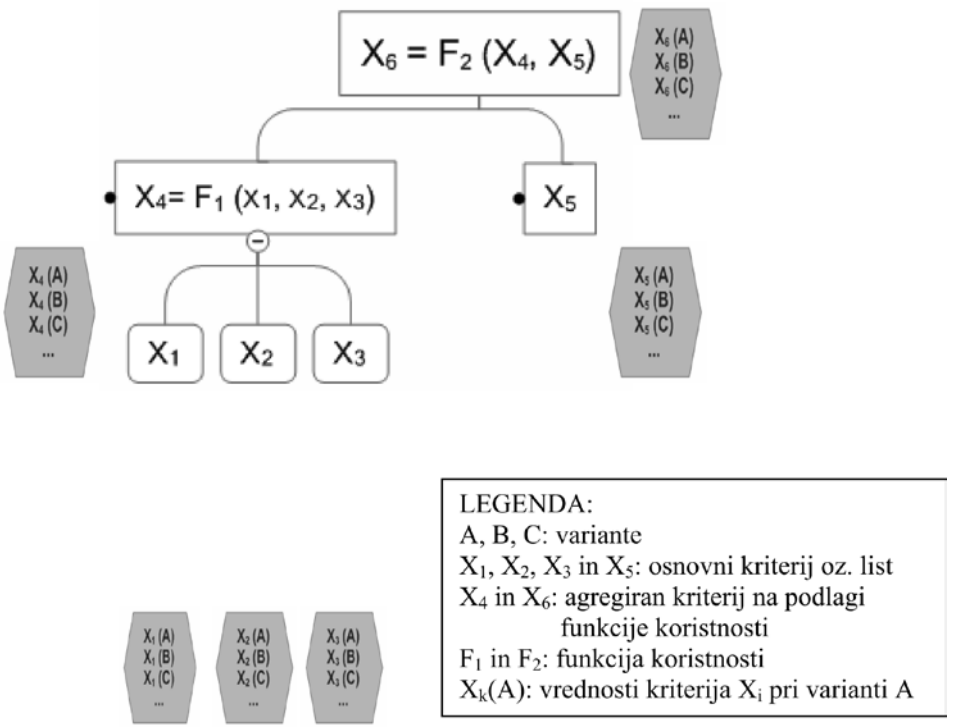
Slika 1 prikazuje primer abstrakcije HMADM modela. Sestavljen je iz kriterijev X_n in funkcij koristnosti F_i (oz. agregacijskih funkcij ali funkcij združevanja) kriterijev iz nižjih podpodročij. Model torej temelji na izbranem spisku kriterijev, lastnosti, parametrov, spremenljivk, dejavnikov, ki jim v procesu informatizacije šolstva sledimo. V odločitvenem modelu je vzpostavljena hierarhija zaradi zmanjšanja kompleksnosti modela glede na veliko število posameznih kriterijev in morebitnih povezav med njimi. Kriteriji na višjih nivojih so tako odvisni od kriterijev na nižjih nivojih.

V teoriji hierarhijo predstavljamo kot usmerjeni neciklični graf, v praksi pa to ponavadi izvedemo v obliki drevesa. Glede na položaj posameznega kriterija v drevesu tako razlikujemo:

- med osnovnimi kriteriji (listi drevesa oz. zunanja vozlišča) in
- agregiranimi - združenimi kriteriji (notranja vozlišča vključno s korenom – vrhom drevesa).

Na sliki 1 so v drevesu štirje osnovni kriteriji – listi (X_1 - X_3 in X_5) in dva agregirana kriterija (X_4, X_6). Za vsak agregiran kriterij obstaja ustrezna funkcija koristnosti, na sliki sta to F_1 in F_2, ki vsaka določa njeno odvisnost od vseh kriterijev na nižjem nivoju, npr.:

$X_4 = F_1 (X_1, X_2, X_3)$.



Slika 1: Abstrakcija modela HMADM

Uporabnik modela stopnjo informatizacije svoje šole npr. šola A s pomočjo modela dobi tako, da izbere vrednosti kriterijev na listih drevesa $X_k(A)$, model pa mu glede na to na višjih nivojih določa vrednosti kriterijev informatizacije šole. Stopnja informatizacije posamezne šole A se torej določi glede na funkcijo koristnosti F_i in sicer od spodaj navzgor glede na hierarhično strukturo drevesa (tj. od listov do korena). Stopnja informatizacije šole (oz. v teoriji ocena variante) je prikazana z vrednostjo kriterija v korenu drevesa (kriterij X_6 na sliki 1).

Večina obstoječih večparametričnih odločitvenih metod temelji na teoriji kvantitativnih odločitvenih modelov (Triantaphyllou, 2000). V takem modelu so kriteriji zvezni, funkcije koristnosti pa so praviloma definirane kot uteži kriterijev, npr. utežena vsota vrednosti nižje ležečih kriterijev. V praksi pa prihaja do težav pri razumevanju opisovanja podatkov s številkami oz. numeričnimi vrednostmi. Povezave med kriteriji v drevesu so linearne, čeprav narava posameznih kriterijev velikokrat zahteva nelinearne odvisnosti. To pomeni, da je pri posameznih kriterijih potrebno upoštevati različne uteži glede na njeno relativno pomembnost. V nasprotju s prejšnjim pa smo mi uporabili metodologijo DEX (Bohanec in Rajkovič, 1995), s katero smo diskretne kriterije predstavili raje z opisom kot s številkami. Ustrezna funkcija koristnosti je tako predstavljena z odločitvenim pravilom, torej ni formula ali utežena vsota, ampak kot tabela zalog vrednosti (Rajkovič et. al., 1988). Na ta način smo HMADM zgradili na nelinearni diskretni funkciji koristnosti. Primerjamo jo lahko s pristopom relativnih uteži, kjer so uteži odvisne od vrednosti kriterijev. Če se vrednost kriterija spremeni, se lahko njegova relativna pomembnost (utež) tudi spremeni.

Pri razvoju modela ocenjevanja stopnje informatizacije šole smo izhajali iz obstoječih analiz stanja informatizacije šole v svetu (npr. DfES, 2004). Obstoječi modeli praviloma nimajo celovite hierarhične strukture, ali pa so ti modeli razdeljeni tudi na do 8 podpodročij (podproblemov) in to zopet na do 8 podporočij, vse skupaj pa ni več kot 3 nivojev razčlenjevanja. V našem primeru smo na podlagi HMADM na vsakem nivoju naredili praviloma do 3 podpodročja. Poleg tega smo izgradili drevo z v večjo globino, zato smo po potrebi posamezni kriterij razčlenili tudi do 10 nivoja. Tako smo proces odločanja oz. odločitveno drevo bolj prilagodili kognitivnim sposobnostim človeka, oziroma upoštevali zmožnosti celovitega procesiranja informacij (Lindsay, 1977). Ker so osnovni kriteriji na področju informatizacije šol kompleksni, pa smo se odločili za »3 plus minus 1«. Odločitveno drevo je s tem sicer večje, ni pa posamezni kriterij razdrobljen na preveč podpodročij, saj bi bila v tem primeru funkcija koristnosti lahko preveč kompleksna in nepregledna. Poleg tega pa smo na tak način posamezni kriterij veliko lažje in bolj natančno opredelili. Uporabniki naj bi z predlaganim modelom posamezni šoli enostavneje in natančneje dodelili stanje ter našli nadaljnje usmeritve in ugotovili možnosti za nadgradnjo procesa informatizacije šole.

The magical number seven, plus or minus two: Some limits to our capacity for processing information.

Če povzamemo in zaključimo poglavje: kot orodje za postopen razvoj in preizkus večparametrskih odločitvenih modelov smo izbrali računalniški program DEXi, lupino ekspertnega sistema za večparametrsko odločanje. Program sloni na opisani metodologiji DEX, ki se od ostalih metodologij večparametrskega odločanja razlikuje predvsem po kvalitativnem pristopu in neposrednem določanju funkcij koristnosti več spremenljivk, kar poveča transparentnost izgradnje in uporabe odločitvenih modelov (Jereb et.al., 2003).

3 Večparametrski hierarhični model evalvacije informatizacije posamezne šole

V Sloveniji in svetu se na področju spremljanja informatizacije šole pojavljajo predvsem naslednji kazalniki (osnovni kriteriji): proces timskega vodenja informatizirane šole, poučevanje in učenje z IKT, IKT v administraciji, usposabljanje in nadaljnje formalno izobraževanje učiteljev, človeški in materialni viri (e-gradiva, računalniška oprema in omrežje ipd.), razvoj in raziskovanje, odprtost šole v lokalni in širši prostor, vključevanje učencev in staršev v načrtovanje, učinki uporabe IKT itd. (Čampelj in Rajkovič, 2008).

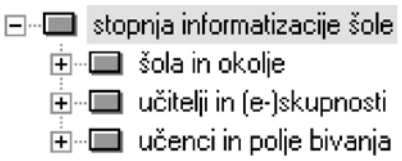
Proces (samo)evalvacije v slovenskih in drugih šolah na področju informatizacije šolstva je slabo razširjen, praviloma se izvaja na posameznih področjih informatizacije šole in običajno s klasičnimi metodami. Pri tem je treba poudariti nekatera dejstva:

- vsebinsko ne gre za strateški pristop, kar je praviloma osnova za dolgoročno načrtovanje in nadgradnjo uporabe IKT na šolah, prav tako je pomanjkanje sistemsko celovitih evalvacij (praviloma obstajajo parcialne raziskave in analize obstoječega stanja predvsem na področju usposabljanja zaposlenih, stanja uporabe računalnikov in druge opreme ipd.),
- organizacijsko evalvacije ne zajemajo udeležencev (učencev) in vseh izvajalcev izobraževalnega procesa (učitelji), še manj pa staršev in drugih,
- sodobna informacijska tehnologija praviloma pri evalvaciji ni uporabljena, razen za beleženje in uporabo statističnih metod obdelave zbranih podatkov. Dokumentacija je običajno vodena največkrat v nepovezanih datotekah različnih formatov, skratka niso celovito in učinkovito izkoriščene možnosti IKT.

V našem modelu smo skušali zajeti čim širše področje informatizacije posamezne šole in sicer ima odločitveno drevo čim več nivojev, vendar toliko da bo drevo še operativno uporabno, hkrati pa s čimveč listi v odločitvenem drevesu skušamo poenostaviti ocenjevanje posameznih kriterijev. Na natančnejše določitev stanja na šoli je potrebno sicer iti v vse večje podrobnosti. Ker je listov (osnovnih kriterijev) v drevesu precej, posameznemu listu pripada ožje področje merjenja ter s tem lažja določitev posamezne vrednosti. Praviloma to pomeni tudi natančnejšo oceno obstoječega stanja, čeprav bomo v našem modelu na vsakem listu in višjem nivoju zaenkrat predlagali tri do največ štiri stopenjsko lestvico. Za opredelitev kriterijev na višjih nivojih smo smiselno uporabili funkcijo koristnosti vključno z utežmi, kar omogoča program Dexi, seveda z ustrezno modifikacijo nekaterih dobljenih vrednosti v tabelah, ki jo določi ta funkcija. Da pa začetek za posamezno šolo ne bo preglomazen, pa sam Dexi omogoča, da

lahko začnemo kriterije vrednotiti tudi že na višjih nivojih (pri tem je potrebno predhodno odstraniti spodnje nivoje oz. liste).

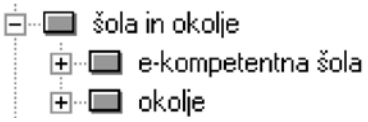
Večparametrski hierarhični model je razdeljen na tri glavne skupine (kriterije): šola in okolje, učitelji in skupnosti, učenci in polje bivanja (slika 2).



Slika 2: Glavne skupine informatizacije šole

3.1 Šola in okolje

Za določitev stopnje informatizacije, predvsem pa za uvedbo ustreznih sprememb na vseh področjih življenja in dela šole, ki bodo povečale nivo e-kompetentnosti posamezne šole, je potrebno določiti in spremljati dejavnosti tako na sami šoli (e-kompetentna šola) kot njeno vključenost v okolje.

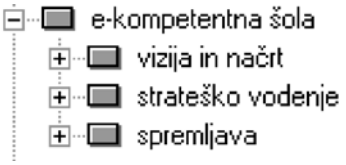


Slika 3: Kriterij Šola in okolje

3.1.1 Šola

Na šolskem nivoju je potrebno zagotoviti vse dejavnosti, da se šola lahko prepozna kot e-kompetentna, zato naj ima (slika 4):

- vizijo in zna strateško načrtovati vse v povezavi z IKT
- strateški tim, ki načrtuje, izvaja ter vodi proces informatizacije šole
- zagotovljeno redno in dovolj široko spremljavo in evalvacijo uvajanja in uporabe IKT.



Slika 4: Kriterij E-kompetentna šola

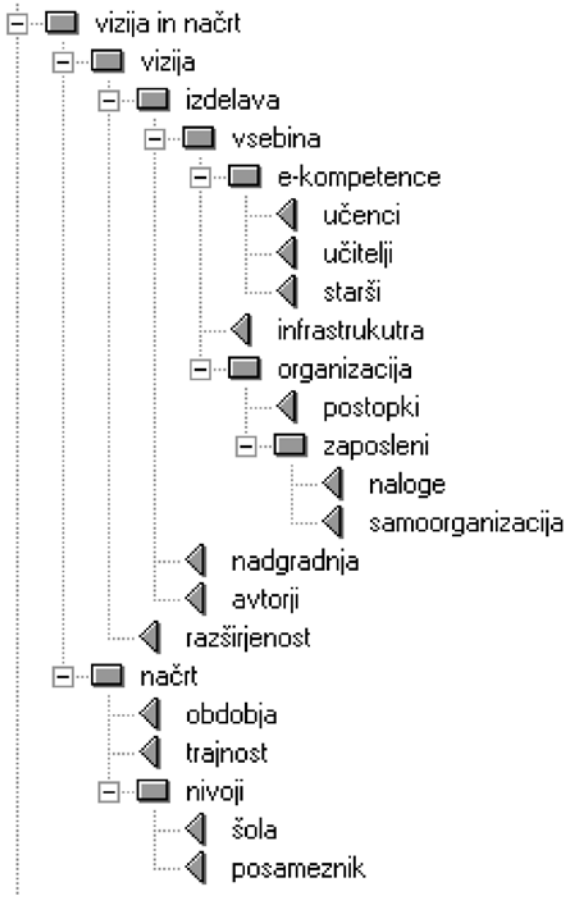
a) Vizija

Vizijo je vsekakor potrebno izdelati, zagotoviti njeno nadgradnjo in trajnost uporabe, pri tem pa naj aktivno sodelujejo vsi potencialni uporabniki. Le tako bo imela šola na vseh področjih dejavnosti zagotovljeno:

- e-kompetentnost učencev, učiteljev in drugih zaposlenih,
- ustrezno informacijsko okolje (računalniki, interaktivne naprave, … ter omrežja in dostop do interneta) ter
- dobro organizacijo dela (vključno s predpisi) in kadrov.

Brez prave promocije in razširjenosti vizije lahko le-ta ostane le na papirju in nekaterih »glavah« posameznikov. Hkrati pa je potrebno evalvirati njeno uporabnost, privzetost in kakovost.

Pri načrtovanju vizije pa je potrebno upoštevati vsa obdobja (kratkoročna, daljnoročna), zagotavljati neprestano spremljanje novosti in trajnost, še posebej pa upoštevati zakonodajo, standarde in priporočila. Pravi napredek pa potrebuje tudi jasno opredeljene prioritete na vseh nivojih delovanja.



Slika 5: Odločitveno poddrevo kriterija Vizija in načrt

b) Strateško vodenje

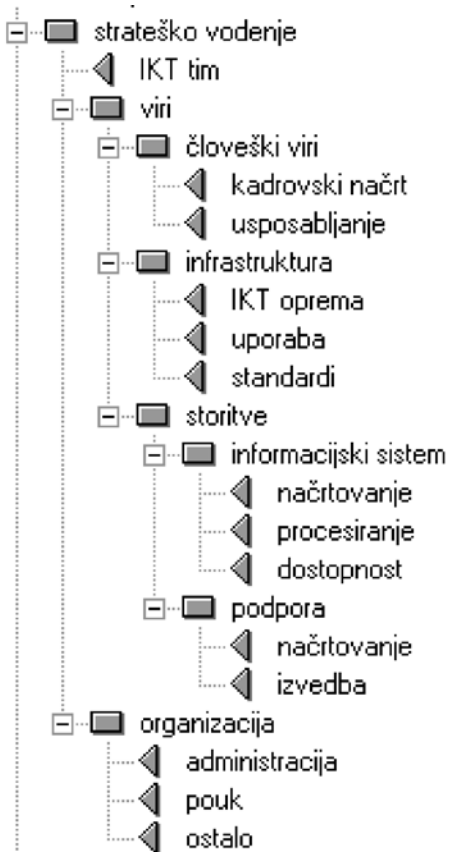
Drugo pomembno področje e-kompetentnosti šole je strateško vodenje (Slika 6).

Strateško vodenje informatizirane šole zahteva timsko delo visoko motiviranih in usposobljenih sodelavcev (vodstveni IKT tim – ravnatelj, računalnikar, dejavni učitelji, …), ki naj upoštevajo tako:

- vse razpoložljive vire in ustrezno organizacijo kot tudi
- zajeti vsa področja življenja in dela šole.

E-kompetentna šola razpolaga z vsemi potrebnimi viri, tako človeškimi kot materialnimi, z obojim pa je povezana organizacija. Pri človeških virih je treba imeti predvsem kadrovski načrt z vsemi potrebnimi spremembami in načrt usposabljanja vključno z učinki le-tega, predvsem pa, kaj je lahko na šoli drugače. Pri materialnih virih je potrebno skrbeti za vsa področja: strojna oprema in internet ter e-gradiva, zagotoviti pa je potrebno uporabo in varnost pri tem ter upoštevanje vseh standardov in priporočil (tako domačih kot tujih). Posebno mesto naj imajo e-gradiva, saj obsegajo tako

gradiva na internetu, intranetu, CD-je, DVD-je, didaktično programsko opremo.



Slika 6: Odločitveno poddrevo kriterija Strateško vodenje

Organizacija zajema predvsem:

- informacijski sistem
- koordinacijo dela
- izvajanje storitev za zaposlene, učence, starše in druge.

Osnova za informacijski sistem je strateško načrtovanje človeških virov za njegovo izgradnjo in nadgradnjo, vključevanje vseh področij dejavnosti šole in konkretno načrtovanje informatizacije procesov, ki še niso računalniško podprti. Glavna odlika informacijskega sistema naj bo procesiranje podatkov o učencih in učiteljih, in sicer o prvih predvsem načrtovanje in beleženje napredka, za učitelja pa mora zagotoviti predvsem manj birokracije (da IKT »odigra« svojo vlogo) ter možnosti koriščenja IKT kot medija, ki zagotavlja »presonalizacijo« posameznega učenca. Poleg tega pa seveda poenostavitev in transparentnost vseh administrativnih dejavnosti in dokumentov. Vsekakor pa naj bo informacijski sistem dostopen in naj zagotavlja in vzpodbuja večsmerno komunikacijo, kar pomeni da mora biti: enostaven za uporabo za uporabo in omogočiti varen dostop do informacij, ki jih posameznih (lahko) potrebuje ter učinkovit. Posebno pozornost je potrebno nameniti pri tem tudi varni rabi, tj. poleg varovanja podatkov je treba širiti zavedanje in izvajati usposabljanje vseh potencialnih uporabnikov ter nenazadnje je predvideti in izvajati ukrepe v primeru kršitev.

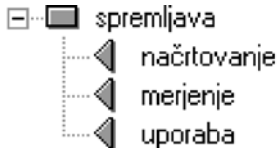
Koordinacija informatizacije šole na nanaša na pregled in vzpostavitev celotnega procesa oz. izvajanje informatizacije šole, torej je velik pomen na samem koordinatorju in vzpostavljanju novih povezav med vsemi. Še posebej je pomembna kakovost vseh spremenjenih oz. nadgrajenih dejavnosti in učinkovitost uporabe novosti.

Za vse dejavnosti informatizacije šole pa je nujno zagotavljanje vseh potrebnih spremljajočih storitev in podpore, od vsebinske do tehnične.

Strateško vodenje bo imelo učinek, če se bodo dejavnosti informatizacije odražale na vseh področjih administrativnih dejavnosti šole (vodenje šole, zagotavljanje celovitega proračuna in pri tem sodelovanje npr. lokalne skupnosti…) in pedagoškega procesa ter drugi dejavnosti.

c) Spremljava

Tretje pomembno področje kompetentne šole pa je spremljava procesa informatizacije šole (slika 7), in sicer od njenega načrtovanja do merjenja učinkov pri vseh udeleženih (učenci, učitelji, starši) ter prepoznavanje odstopanj od načrtovanega.



Slika 7: Kriterij Spremljava

3.1.2 Okolje šole

Informatizacija posamezne šole in s tem pozitivne spremembe tako pri pedagoškem kot tudi administrativnem procesu pa so odvisne tudi od vključenosti šole v okolje (tako lokalno kot globalno), predlog odločitvenega drevesa v tem delu prikazuje Slika 8.

Slika 8: Kriterij Okolje

Tako šola kot okolje (partnerske organizacije) morajo v skupnih dejavnostih prepoznati svoje in partnerjeve lastnosti in zmožnosti (pozitivne in negativne). Npr. lokalna skupnost: skupna rast, sofinanciranje, promocija itd. Oboji morajo poznati tudi prednosti sodelovanja. Predvsem pa je pomembna reorganizacija obeh strani, kar pomeni da se morajo spremeniti tako ljudje, vsebine kot tudi procesi. Za načrtovanje sprememb pa mora tudi na tem področju potekati stalna spremljava in evalvacija.

3.2 Učitelj in skupnosti učiteljev

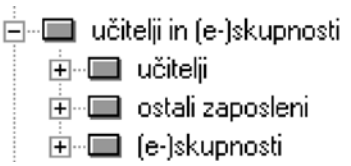
»Poslaniki« pri razvijanju, širjenju oz. uvajanju sprememb so učitelji, zato njim drugo področje informatizacije posamezne

šole. Pri tem imamo v mislih tudi vse ostale zaposlene na šoli ter vse strokovnjake, s katerimi učitelji sodelujejo in vzpostavljajo nove mreže ter seveda obratno.

Tri področja so tako:

- učitelji in njihove dejavnosti na področju pouka in administracije ter njihovo usposabljanje
- drugi zaposleni: administracija, svetovalna služba, kuhinja, njihovo načrtovanje, izvedba in evalvacija uporabe IKT ter usposabljanje
- (e-)skupnosti,

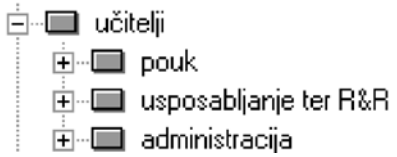
oziroma v drevesu (slika 9):



Slika 9: Kriterij Učitelji in e-skupnosti

3.2.1 Učitelji

Podrejeno drevo učiteljev ima tri področja (slika 10):



Slika 10: Kriterij Učitelji

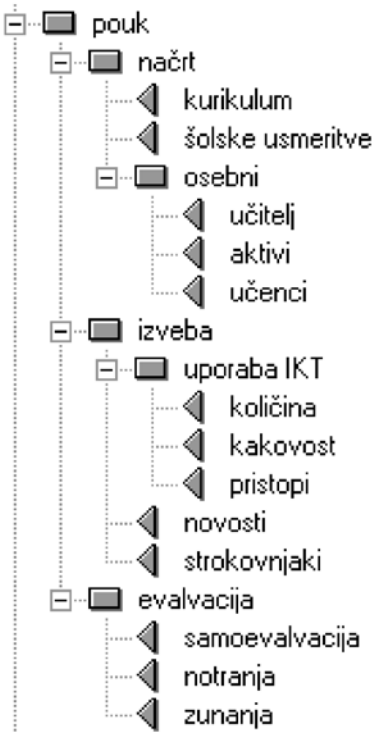
a) Pouk

Najpomembneje za učinkovitost smiselne uporabe IKT in kar tudi lahko opraviči velik finančni vložek v tehnologijo na posamezni šoli je načrtovanje in uporaba IKT pri pouku. Predlagano drevo (slika 11):

Pri načrtovanju je najprej potrebno poznati in upoštevati »nacionalne« usmeritve, tj. v »operativni« kurikulum vključiti čimveč novosti na podlagi preverjenih programov in projektov ter standarde, predvsem vključiti nove učinkovite didaktične pristope. Poleg tega naj učitelj pri načrtovanju upošteva šolske usmeritve (od vizije do načrtov) in še posebej svoje preverjene načrte in ideje ter ideje svojih strokovnih kolegov. Izmed teh pa je treba največ sprememb (»v glavah«) narediti na področju resničnih potreb učencev, tako individualnih kot tudi tistih, ki upoštevajo njegovo okolje bivanja (socialni vidi, ruralni vidik, razvojni vidik) in dejavnosti doma, hobije itd. Le z dobrim načrtovanjem se zgodijo še boljše in učinkovite spremembe in nadgradnja pouka.

Ni posebej pomembna količina uporabe IKT pri pouku, ampak predvsem kakovost uporabe ter učinkoviti pristopi in vključevanje ustreznih novosti poučevanja in učenja. Učitelj z uporabo IKT lahko zelo personalizira pouk, se iz »vseznalca« prelevi v motivatorja, koordinatorja, vzpodbujevalca in tistega, ki pomaga, vzgaja in usmerja pri vrednotenju novih informacij, ki jih učenec prejema v šoli in še posebej izven, pri tem pa ohrani socialni vidik pouka in še kaj drugega, kar je pomembno za celovit razvoj posameznika. Glede same tehnologije mora uporabiti različne možnosti v pravem času, kar pomeni znati tudi opustiti uporabo IKT. Med IKT štejemo tako računalniško opremo (računalniki, interaktivne naprave, kamere, videokonference…), predvsem pa didaktična e-gradiva, kar so v zadnjem času predvsem gradiva na internetu, v zadnjem času pa vse manj nameščene didaktične programske opreme, gradiv na CD-jih in DVD-jih. Vse novosti pa potrebujejo prilagajanje, pri tem pa poleg prispevka učitelja potrebno upoštevati tudi širok spekter, ki ga prispeva sam učenec. Pouk je potrebno popestriti tudi z vključevanjem oz. gostovanjem bolj in tudi manj znanih strokovnjakov (v živo, še posebej pa jih vključevati na daljavo).

Da je uporaba IKT res smiselna in učinkovita, lahko to pokaže predvsem evalvacija, v katero spada vsaj (samo) evalvacija učiteljevega dela, njegova evalvacija (predvsem o spremenjeni vlogi) in evalvacija opravljena pri učencih (učenci ocenjujejo pouk in svojo spremenjeno vlogo, zunanja evalvacija naj evalvira predvsem spremembe vloge in učinke pri učencu).



Slika 11: Odločitveno poddrevo kriterija Pouk

b) usposabljanje ter razvoj in raziskovanje

Za vse zgoraj omenjene dejavnosti in pričakovanja pa seveda potrebujemo resnično »e-kompetentnega učitelja«, odločitveno drevo (slika 12):

Prvi del »e-kompetentni« pomeni, da obvlada in pozna prednosti, slabosti in pasti uporabe same tehnologije, »učitelj« pa pomeni, da ima vse didaktične in še posebej specialno-didaktične zmožnosti (kompetence) uporabe pri načrtovanju, izvedbi in vrednotenju pouka. Enako kot sicer je potrebno strateško in dolgoročno načrtovanje usposabljanja učitelja, kjer so zastopani tako nacionalni, šolski in lastni interesi in

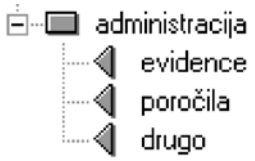
potrebe. Pri načrtovanju je potrebno upoštevati tudi potreben vložek (čas in sredstva) glede na pričakovan rezultat. Sama izvedba naj bo kakovostna (resnično možnost pridobivanja novih kompetenc; en del usposabljanja pa naj bo namenjen tudi sami resnični uporabi novosti ter na koncu tudi refleksijo) in personalizirana, saj bo kasneje učitelj le tako resnično spremenil pouk in vključeval možnost individualizacije pri poučevanju in učenju (v razredu). Čas, ki ga učitelj potrebuje za usposabljanje in samoizobraževanje, mora biti izven pouka in v taki meri, da učinkuje. Vsekakor je potrebno vsakih nekaj let usposabljanje (ali celo formalno izobraževanje, sodelovanje v projektih, …) v tujini, da se »v glavah« razblinijo postavljene meje in nepotrebni vzorci. Evalvacija usposabljanja naj zajema, kako je bil načrt realiziran, učinek glede na načrt, kaj je potrebno v načrtu spremeniti in dopolniti. In najpomembneje, kako nove e-kompetence učitelj resnično uporablja, kako so na šoli zagotovljeni pogoji za njihovo uporabo ter kako jih širi med kolege.

Raziskovanje in razvoj praktično vsebuje tudi usposabljanje. Če bi se učitelji v prihodnje več vključevali v to, bi veliko lažje, hitreje in suvereno vključevali vse novosti v pouk. Zato je raziskovanje in razvoj potrebno bolj strateško načrtovati, pri sami izvedbi pa se usmeriti v vsebinsko koristne projekte. Potrebno pa je pri tem sodelovanje na vseh nivojih razvoja in raziskovanja: na šoli vključno z učenci, z učitelji sodelavci in učitelji iz drugih šol ter sodelovati s strokovnjaki drugih domačih in tujih ustanov (raziskovalci na fakultetah, podjetjih, neprofitnih ustanovah, raznih združenj itd.).

Slika 12: Odločitveno poddrevo kriterija usposabljanje ter razvoj in raziskovanje

c) Administracija

Da bi dodatno učitelje vzpodbudili k uporabi IKT, naj uporaba IKT učiteljem drastično zmanjša potreben čas in dejavnosti na področju administrativnega in birokratskega dela, tako bodo veliko hitreje usmerili več časa v didaktično in vsebinsko prenovo svojega dela (priprave na pouk, izvedba pouka, razvojno-raziskovalno delo, sodelovanje, odpiranje navzven ipd.). Odločitveno drevo tu ni obsežno (slika 13):



Slika 13: Kriterij administracija

Pomembnejše dejavnosti, kjer IKT kot orodje lahko vpliva na učinkovitost procesov so: evidentiranje (ocenjevanje, prisotnost pri pouku), poročanje (če pouk poteka z uporabo z IKT npr. s spletnimi učilnicami, potem npr. v dnevnik pouka ni potrebno ponovno vpisovati povzetkov posamezne ure) in druge dejavnosti povezane s poukom, sodelovanjem s starši in administrativnimi postopki.

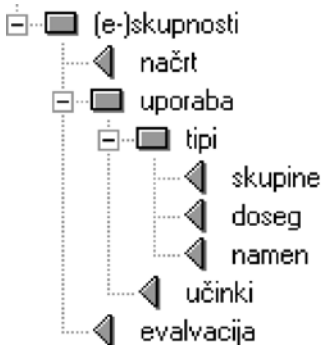
3.2.2 Drugi zaposleni

Poleg učiteljev je za uporabo IKT potrebno izvajati podobne dejavnosti za ostale zaposlene (ravnatelj, administracija, kuhinja, svetovalna služba …) in sicer: načrtovanje sistematične uporabe IKT, izvedba načrtovanih dejavnosti, evalvacija in usposabljanje (tudi na tem področju načrtovanje in izvedba). Odločitveno drevo (slika 14):

Slika 14: Kriterij ostali zaposleni

3.2.3 Skupnosti učiteljev

Zadnji člen pri oblikovanju e-kompetentnega učitelja pa so e-skupnosti, odločitveno drevo (slika 15):



Slika 15: Kriterij e-skupnosti

Več dejavnosti je potrebno pri tem nameniti načrtovanju, kjer se zopet upošteva vizija in priporočila šole, prav tako je pomembno zavedanje, da so e-skupnosti (oz. socialna omrežja) del današnjega vseživljenskega učenja in nasploh življenja,

zato je pomembno poznati in poudariti tako prednosti in slabosti. Načrtuje naj se sodelovanje tako po predmetih (stroki) kot tudi način, kako naj učitelji sodelujejo.

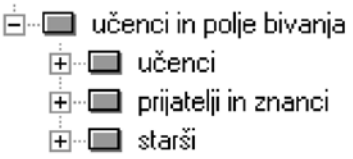
Pri izvajanju in uporabi je prav, da e-skupnosti razdelimo glede na: ciljne skupine, doseg in namen. Ciljne skupine v e-skupnostih so usmerjene predvsem v stroko in didaktiko, lahko so to predvsem partnerji v projektih (tudi novi) in pa iskanje novih učiteljev, strokovnjakov oz. sodelavcev. Lahko so to bolj ljubiteljsko usmerjene skupnosti učiteljev, ki prav tako prispevajo k zadovoljevanju potreb in osebnostni rasti učitelja. Doseg je mišljen glede na širino (šolski, nacionalni, mednarodni) in glede uporabo orodij oz. tehnologije. Namen e-skupnost je lahko marsikaj, npr.: boljši pouk, partnerstva v projektih (on-lin projekti, institucionalni projekti – npr. EU…), prav tako pa je večja korist sodelovanje v e-skupnostih, ki so namenjena širšemu spektru bolj ali manj znanih strokovnjakov, učiteljev, tudi učencev ipd.

Pri evalvaciji e-skupnosti je potrebno upoštevati in vključevati ali pa celo sodelovati pri evalvacijah, ki potekajo tako na mednarodnem področju kot tudi posameznih državah. Vsekakor naj se tudi negativni izsledki evalvacij vključijo v nadaljnje načrtovanje in dejavnosti.

3.3 Učenci in polje bivanja

Najpomembnejše področje so vsekakor učenci in njihove dejavnosti med poukom in izven, vključno z okoljem (prijatelji, starši, stroka,…). Pri učencih končno lahko tudi izmerimo učinke, ki smo jih želeli doseči predvsem s spremembami na obeh dosedanjih področjih (to sta: »Šola in okolje« ter »Učitelj in skupnosti«).

Zgornji nivo odločitvenega drevesa pri učencu bi lahko izgledalo takole (globina drevesa je zopet odvisna od uporabnika, njegovih potreb in izkušenj) – slika 16:

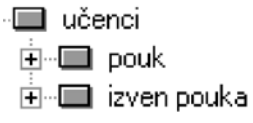


Slika 16: Kriterij učenci in polje bivanja

Torej je razdeljeno na same učence, njihove prijatelje in znance ter starše in druge.

3.3.1 Učenci

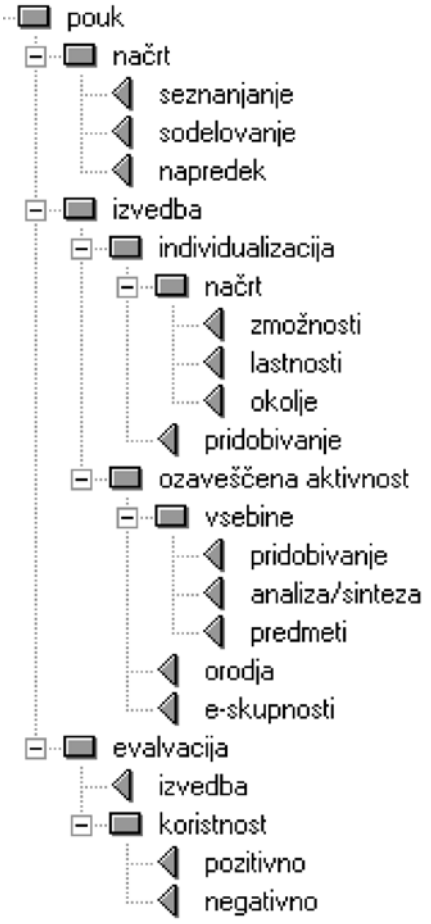
Zaenkrat bomo največji poudarek dali učencem. Dejavnosti, kjer ima lahko IKT vlogo pri večji kakovosti učenja in njegovega razvoja, razdelimo lahko na pouk in izven pouka, čeprav so vse te dejavnosti vse bolj povezane (slika 17):



Slika 17: Kriterij Učenci

a) Pouk in interesne dejavnosti

Predlagano odločitveno drevo v tem delu (slika 18):



Slika 18: Odločitveno poddrevo kriterija Pouk

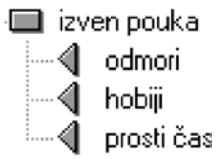
Za smiseln in učinkovit pouk z IKT je potrebno sistematično načrtovanje, kar zajema tudi seznanjanje učencev z načrti (kje je smiselno vključiti IKT, kje bo pri pouku vsebovan IKT, katere kompetence se bodo razvijale in kako so vključene usmeritve in vizija šole, nacionalni/mednarodni projekti in priporočila, …). Pri tem naj bodo učenci čimprej vključeni v načrtovanje, kar posledično pomeni prilagajanje načrtov učencem, učenci sami lahko prispevajo svoja interesna področja, katera orodja bo uporabljal, pa tudi podrobnosti, kateri strokovnjaki so lahko v procesu učenja vključeni. Končno je potrebno pri načrtovanju opredeliti pričakovan napredek učenca v ožjem in širšem smislu.

Sama izvedba poučevanja naj upošteva čimvečjo, če ne kar celovito individualizacijo posameznega učenca, in sicer je IKT lahko učinkovito orodje za načrtovanje in spremljavo njegovega napredka (kompetence, komunikacija in osebnostno rast), za kar je potrebno upoštevati učenčeve lastnosti: obstoječe kompetence (zmožnosti od psiholoških, fizičnih in mentalnih), domače okolje (socialno, urbano, kulturno), inteligenco sprejemanja informacij (bralna, vizualna, avditivna). Poleg tega naj pouk odraža resnično spremenjeno vlogo učenca – tj. ozaveščena miselno aktivna vloga v čim več dejavnostih tako z vsebinskega kot tehnološkega vidika. Pri vsebinskem vidiku gre predvsem za aktivne procese pred (tudi

z morebitnimi drugimi strokovnjaki) in med poukom (različni pristopi, oblike in metode dela) ter pri resnični uporabi, sintezi in analizi. Predmetov, kjer delo poteka na tak način naj bo čimveč, med seboj naj bodo vsebine povezane oz. naj se nadgrajujejo. Uporabljene naj bodo različne vrste orodij, še posebej pa naj bodo uporabljena v različne namene. Evalvacija pouka naj meri, kako se načrt resnično izvaja ter katere so resnične koristi.

b) Izven pouka

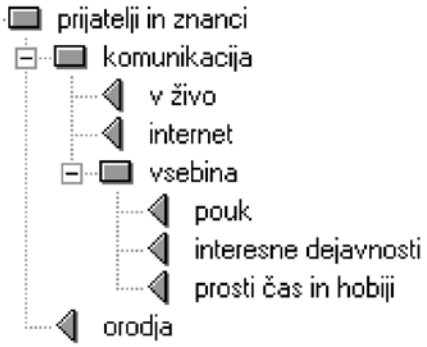
V šoli je za ustrezno uporabo IKT potrebno skrbeti tudi v času, ko ni pouka (odmori – knjižnica, hodniki, …), ter izven šole (doma, pri prijateljih, pri hobijih …). Pomembna pa je intuitivna uporaba tudi v drugih situacijah, krajih, skupinah ljudi itd. Vsekakor se na tem področju premalo izkoriščajo potenciali, zato bo potrebno to področje še razširiti. Odločitveno drevo zaenkrat (slika 19):



Slika 19: Kriterij Izven pouka

3.3.2 Prijatelji in znanci

Polje bivanja učenca poleg pouka pomeni tudi njegove vrstnike, sošolce, prijatelje in znance (slika 20):

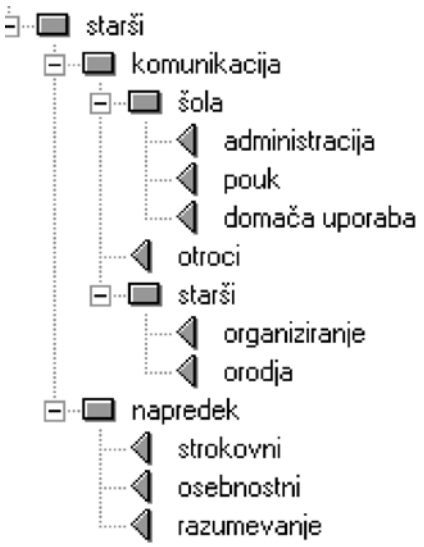


Slika 20: Kriterij Prijatelji in znanci

Smiselna in potrebna uporaba IKT se kaže predvsem pri komunikaciji z njimi, tako v živo kot na daljavo (npr. preko interneta, telefonov, …). Še posebej naj bo vsebina komunikacije različna in pravilno uravnotežena, kar pomeni da ni vse namenjeno zabavi, ampak naj bo vključena tudi šolska snov (predvsem raziskovalni del ali medsebojna pomoč) ali interesne dejavnosti. Pomembno pa je tudi ustrezno poznavanje in smiselna uporaba ustreznih orodij za komunikacijo (v živo in off-line), ustvarjalna orodja (delo s slikami, arhitektura itd.).

3.3.3 Starši

Tretji bistveni element okolja učencev pa so starši – predlagano drevo (slika 21):



Slika 21: Odločitveno poddrevo kriterija Starši

Le-ti naj imajo ustrezno komunikacijo s šolo, kjer naj ima IKT svojo vlogo predvsem pri informacijah, kjer ni potreben socialni stik tako pri pedagoškem procesu kot tudi administraciji šole, sicer pa naj bo komunikacija z učiteljem v živo ali če drugače ni možno, z uporabo on-line orodij, saj je pri razreševanju npr. vzgojnih problemov kontakt v živo (fizično ali na daljavo) edini primeren. Starši naj bodo več vključeni v načrtovanje učenčevih novih kompetenc, hkrati pa bi morali starši posredovati povratne informacije o učenčevih dejavnosti in njegove IKT opreme doma. Poleg komunikacije šolo pa je pomembna tudi komunikacija staršev s svojimi otroci, od medsebojnega informiranja, skupnih dejavnosti, vzgoje oz. celovitega osebnostnega razvoja (svetovanje, vrednotenje, samostojnost, motivacija, spreminjanje obstoječih vzorcev pogleda na svet, …). Komunikacija med starši, pa naj poteka z ustrezno organizacijsko podpora šole ali pa tudi s samoorganizacijo staršev.

Končno naj starši prav tako skrbijo za svoj potreben napredek (od strokovnega do osebnostne rasti, prilagajanje lastnih ciljev z družinskimi) in še posebej naj razumejo, kako lahko IKT prispeva kot pripomoček ter seveda, da digitalna ločnica ne bo več tako velika. Zato naj bodo starši informirani in sodelujoči pri pripravi in upoštevanju šolske vizije in načrtov za uporabo IKT pri poučevanju in učenju.

4 Zaključek

Model prispeva k zmanjšanju možnosti, da bi spregledali kaj pomembnega, saj temelji na celovitem procesu informatizacije šolstva. Izognemo se izolaciji in nestrateškemu delu posameznikov, ki pomembno prispeva k povečanju sodelovanja in timskega dela. Z uporabo sodobne IKT je možno doseči novo kvaliteto v pogledu celovite obravnave šole, sam aktiven model pa je v podporo delu vodstvenega tima, obenem pa zmanjšuje možnost necelovitih ali napačnih rešitev. Kar pa nas predvsem zanima je, ali bodo posredno šole razvijale kreativno poučevanje in učenje. Za model želimo, da omogoča uporabnikom, da si postavijo ogledalo in jih vzpodbuja k iskanju

novih rešitev in pristopov. Tak pristop naj zajema vključevanje ključnih kompetenc in indikatorjev kakovosti šol, usklajenih v evropskem ali širšem merilu ter predlaganih drugih standardov na področju informatizacije šolstva.

V praktičnem oziru model torej služi predvsem vodstvenemu timu procesa informatizacije na šoli pri upravljanju razvoja šole in posameznikov. Na osnovi samoocenitve bodo vodstveni timi lažje in bolj zanesljivo sprejemali svoje odločitve, se bolje zavedali možnosti učinkovitega procesa samoevalvacije in bili sposobni identificirati želene rezultate in cilje. Model bo prispeval k poenotenemu pristopu v praksi in omogočal večjo razumljivost procesov vodstvenim delavcem, učiteljem, učencem, staršem in drugim. Poenotenje bo pripomoglo k primerljivosti in nadaljnji obravnavi procesov informatizacije šolstva in tako tudi nov korak napoti raziskav s področja informatizacije šolstva, s poudarkom na spremembah pri pouku, administraciji itd.

Kakovost modelu zagotavljamo tudi na podlagi uporabljenih standardov v mednarodnem prostoru, s tem bomo slovenske šole lažje primerjali z drugimi. Model smo razvijali več let, vključeno pa je bilo tako teoretično znanje kot praktične potrebe na šolah, ter vsi nivoji od učitelja do zaposlenih na Ministrstvu za šolstvo in šport.

Model je potrebno validirati in verificirati in ga glede na rezultate dopolniti, tudi glede na psihološke in sociološke značilnosti uporabnikov. Verificiral se bo z oceno šol in ta analiza bo dala kritično oceno vsebine in izvedljivosti.

Razvit model torej omogoča evalvacijo sprememb na področju informatizacije posamezne šole, poleg tega pa se šole lahko med seboj tudi primerjajo in tudi na podlagi tega nadgrajujejo procese, torej z model prispevamo k izboljšavi informatizacije šolstva nasploh.

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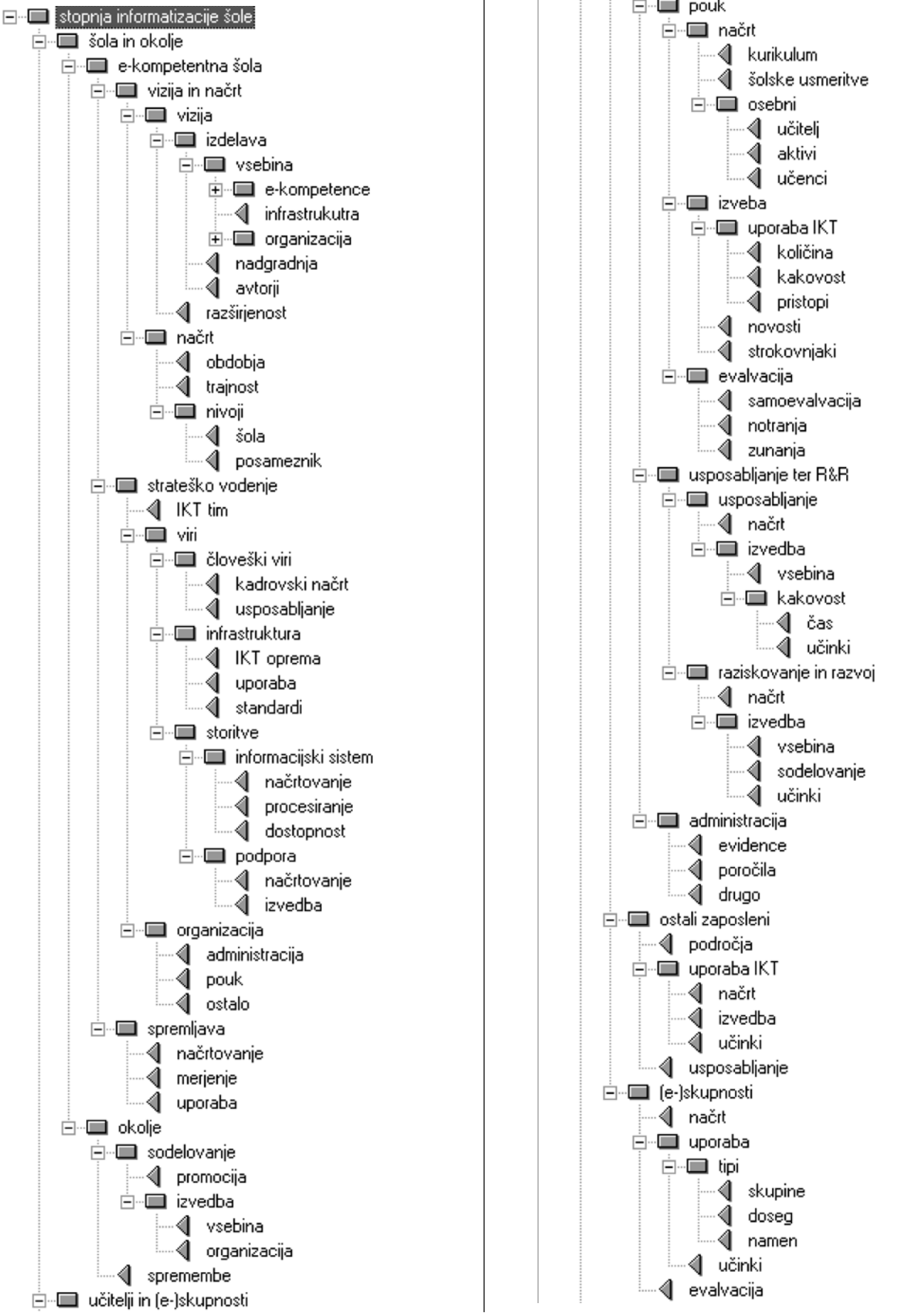
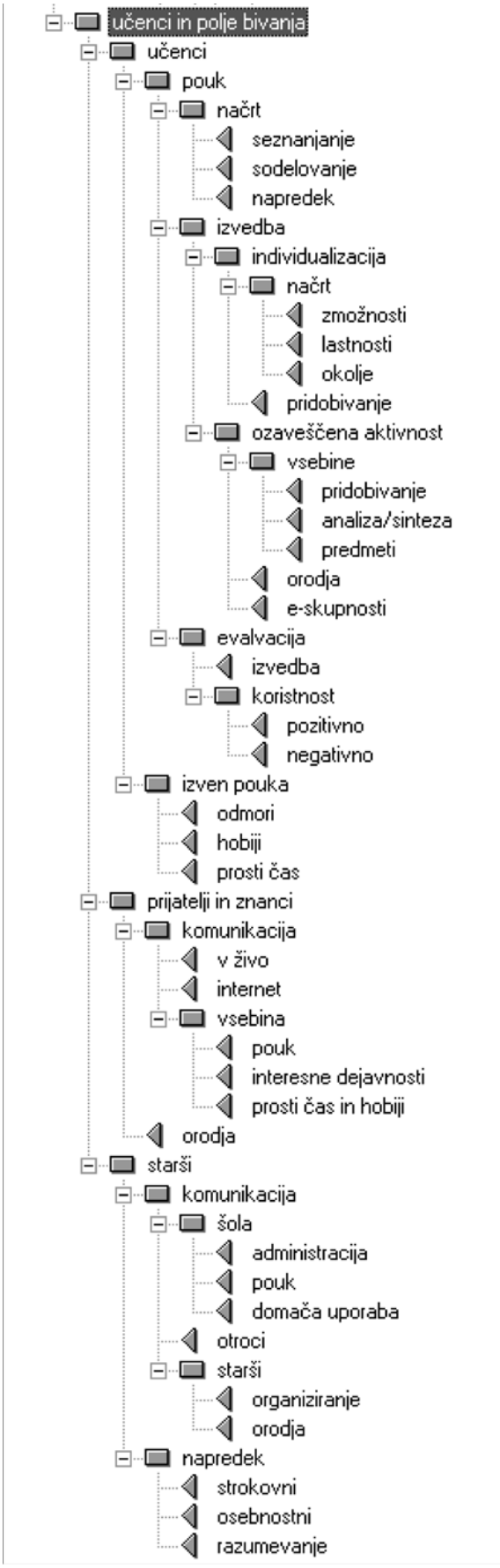
Borut Čampelj je zaposlen na Ministrstvu za šolstvo (sekretar) za področje informatizacije šolstva, kjer sodeluje pri pripravi strategij in načrtov, operativno pa je zadolžen predvsem za področje izobraževanja in svetovanja učiteljem, razvoja novih e-gradiv, sodeluje tudi v mednarodnem prostoru in je član delovnih teles Evropske komisije v Bruslju.

Vladislav Rajkovič je zaslužni profesor in predstojnik Laboratorija za odločitvene procese in ekspertne sisteme na Fakulteti za organizacijske vede, Univerze v Mariboru ter raziskovalni sodelavec Odseka za inteligentne sisteme na Institutu »Jožef Stefan«. Njegovo področje so računalniški informacijski sistemi s posebnim poudarkom na uporabi metod umetne inteligence v procesih odločanja ter vzgoje in izobraževanja.

Eva Jereb je redna profesorica za kadrovsko-informacijsko področje na Fakulteti za organizacijske vede, Univerze v Mariboru. Njeni raziskovalni interesi so predvsem na področju kadrovskih ekspertnih sistemov, e-izobraževanja, avtomatizacije pisarniškega poslovanja, delno pa tudi na področju dela na daljavo. Svoje delo je predstavila na več mednarodnih in domačih strokovnih in raziskovalnih konferencah in posvetovanjih. Je avtorica ali soavtorica znanstvenih in strokovnih člankov, objavljenih v domačih in tujih revijah in soavtorica več knjig.

PRILOGA: odločitveno drevo:




učenci in polje bivanja
učenci
pouk
načrt
seznanjanje
sodelovanje
napredek
izvedba
individualizacija
načrt
zmožnosti
lastnosti
okolje
pridobivanje
ozaveščena aktivnost
vsebine
pridobivanje
analiza/sinteza
predmeti
orodja
e-skupnosti
evalvacija
izvedba
koristnost
pozitivno
negativno
izven pouka
odmori
hobiji
prosti čas
prijatelji in znanci
komunikacija
v živo
internet
vsebina
pouk
interesne dejavnosti
prosti čas in hobiji
orodja
starši
komunikacija
šola
administracija
pouk
domača uporaba
otroci
starši
organiziranje
orodja
napredek
strokovni
osebnostni
razumevanje

Franci Pivec

Codes of Ethics and Codes of Conduct for Using ICT in Education

Codes of conduct and codes of ethics are a way of ensuring that positive impact in the community prevails. Tertiary education environments that have standardised ICT management show higher quality of performance if compared to those that have not yet standardised it. Moreover, characteristic of these environments is their strong willingness for change. University is a place of scientific communication and, thus, ICT and especially the Internet represent the entry point into a new developmental phase to which the best universities are strongly dedicated. In this way, ethics returns to the core of the mission undertaken by higher education institutions. Many countries around the world are adopting National Educational Technology Standards (NETS) that have been developed and are continuously updated within the ISTE Association and at the same time represent a code of conduct for students, faculty teachers, administrators and all others involved in high-quality study. Those standards must be supported by codes of ethics as they depend on the compliance with the relevant moral values.

Keywords: code of conduct, code of ethics, ethical maturity, idea of university, National Educational Technology Standards (NETS), ISTE

Bojan Klemenc, Peter Ciuha, Franc Solina

Educational Possibilities of the Project Colour Visualization of Music

We propose a system of colour visualization of music based on a system of colour signs, which are connected to musical tones. Tones, which are in harmonic relationships, are represented by related colours. First, we outline the foundations on which the system of colour signs is based – the mathematical model of harmony. We discuss several possibilities of visual representation of expressive elements of music – melody, composition, rhythm and harmony. These relationships enabled us to develop a computer program that employs these elements for visualization. The program mimics human perception in which the parts are determined by the perception of the whole. Furthermore, the program enables the development of tools that can enhance music understanding during listening or performing. Music performance can acquire a new quality with the use of interactive coloured musical instruments, which by using colours show the performer different possibilities for forming musical harmonies and thereby change the composing of music into a game and attractive colour-aural journey. Here we stumble upon a challenge for educational science and methodology: how to use such upcoming multimedia tools. These tools would bring the processes of learning and playing a game closer together since playing games is a child's most natural form of functioning. Furthermore, in the area of artistic creation we can once again establish a balance between our logical and intuitive nature.

Keywords: visualization, music, colours, learning, creativity

Matija Lokar, Boris Horvat, Primož Lukšič, Damijan Omerza

Baselines for the Preparation of Electronic Textbooks

TThe NAUK group (Advanced Learning Blocks group; http://www.nauk.si) is engaged in the development of theoretical and practical concepts of ICT use in all levels of education. Recently, the proposed introduction of electronic textbooks (e-textbooks) has become a major topic nationwide in Slovenia. There are multiple dilemmas to be solved, e.g. what a modern e-textbook is, what it should include, in what way should it differ from conventional textbooks, what tools and technologies should be used for its creation, etc. This paper attempts to make recommendations, which we believe should be followed by all the authors of e-textbooks.

Keywords: e-learning, electronic textbooks, e-content, recommendations

Borut Čampelj, Vladislav Rajkovič, Eva Jereb

Assessment Model of the School Informatisation

Information and communication technology is one of the most important tool in the modernization of the school's lessons and efficiency of the school administration. Schools need the guidelines how to reach e-competences at all levels and areas. We developed on the base of DEX methodology the hierarchical multiple attribute decision making model of the evaluation of the school informatization. The model shows to the school the existing situation of informatisation and helps it to recognize the way for further development and necessary changes. Three main areas of school informatisation are: school and environment, teachers and community, pupils and living area.

Key words: school, ICT, level informatisation, evaluation, selfevaluation, leadership

Mojca Bernik, Urška Modrijan

Model for Assessing Adult's Education Institutions

Recently, exposed is the process of lifelong learning as a process of individuals' continuing education. In this process of education, the individual often faces the dilemma of which educational institution should choose to get an optimal knowledge according to his requirements. In Slovenia, the number of educational institutions has recently increased significantly, and the individual can easily lose an overview upon

their content and quality. Therefore, we developed in this article an evaluation model of institutions for adults' education using multi-attribute decision making methods. On the basis of rules that represents a combination of the required values of different parameters, we defined a knowledge base in expert system Dex-i, and we analyzed an individual educational institutions according to their offer. The article represents usage of decision support model in four chosen educational institutions.

Key words: lifelong learning, adult learning, multi-attribute decision making, expert system

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Development Strategies for Quality Implementation of Vocational Education

Correct work in vocational school development demands appropriate quality approach. Quality needs to be assessed by self-evaluation considering quality indicators. As quality needs to be measured self-assessment can be used. In the past self-assessment was non-systematic and only intuitive. The research is focused on determining objective indicators and preparation of vocational school strategic plan.

For comprehensive quality assessment many quality assurance instruments can be used (outside evaluation, inside evaluation, revision, certificating…). In article selected element of inside evaluation (self-evaluation) is discussed. For such evaluation SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis is appropriate. SWOT analysis delivers school basic information which enables it source acquisition and capacity needed for competitiveness on its working field.

TOWS matrix shows individual strategies which follow opportunities, strategies which will overcome weaknesses, strategies for vulnerability reduction and strategies which are basis for protection plan.

Article provides reliable strategy forecast. This strategy is based on comprehensive analysis of advantages and disadvantages of university program realization. Commissions for monitoring and quality assurance are established on vocational schools. Commission establishment and role is defined in article 15 of Vocational education act. Beside known recommendations SWOT analysis and TOWS matrix can recognize mutual relations which can be modeled into suitable, efficient and especially real strategy. Article describes strategy design using presented analysis techniques.

Key words: Vocational school, quality, SWOT, TOWS


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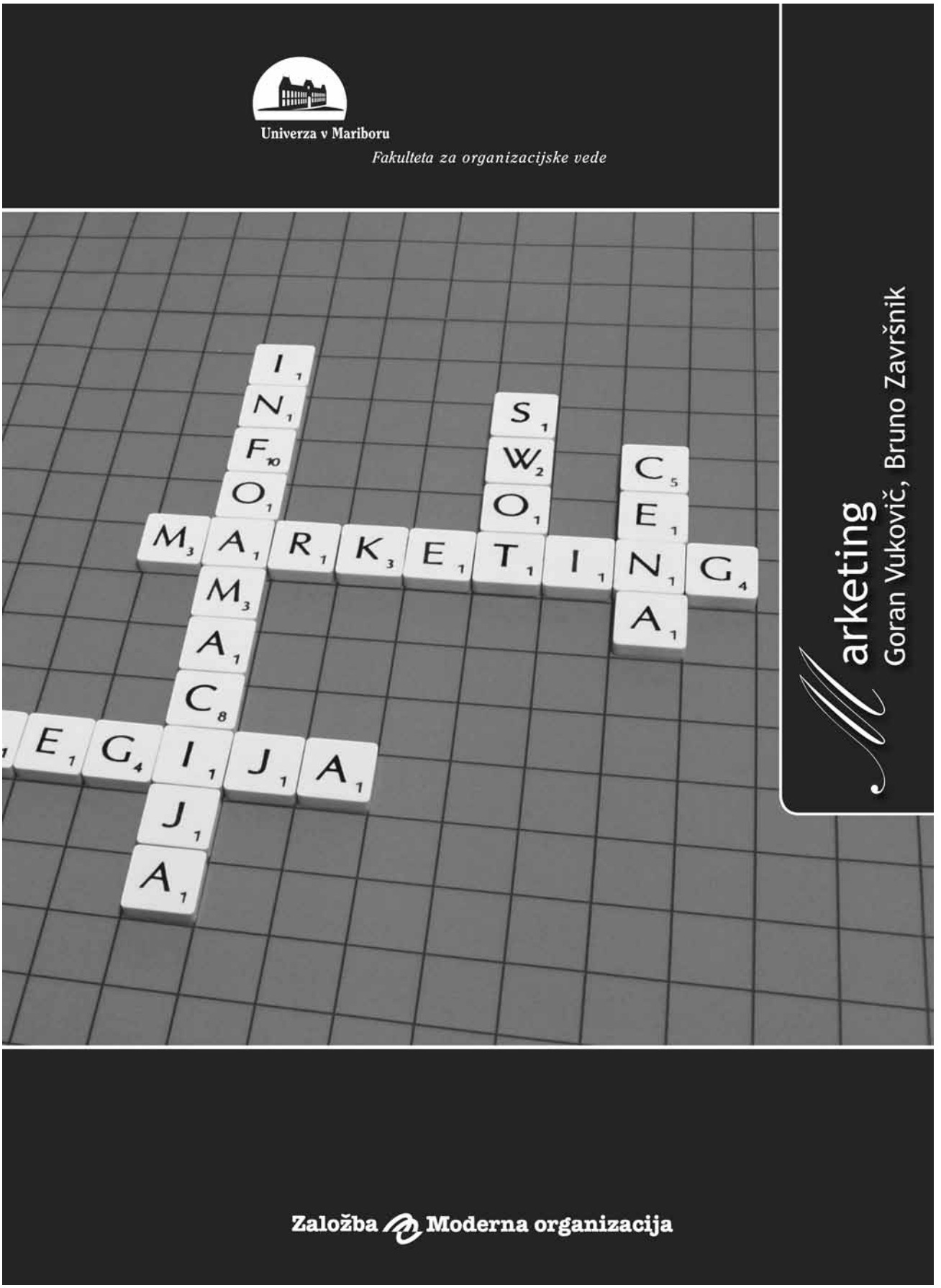
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