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APPLYING CLOUD COMPUTING FOR A MORE EFFICIENT EVALUATION OF PRACTICAL PROJECTS

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Abstract. Significant competitive advantage both for businesses and for the other entities are the well prepared, adaptive, and constantly improving staff. One approach of the education system for the creation and development of adequate to the needs staff, is the development of projects with topics from real economy. Important preconditions for successful realization of the project are the close collaboration between the trainer (teacher, lecturer, mentor, supervisor/consultant, etc.) and the learner and the motivation of the latter to create a product of high quality. The accurate and objective evaluation, set and announced on time, could play a significant role for the positive motivation and respectively for the successful outcome of the project and the acquisition and consolidation of knowledge. This paper considers some features of Cloud Computing used to increase the efficiency in the evaluation of projects with topics from real economy.

Keywords: Cloud Computing; Cloud Computing in education; usage of Cloud technologies in education; project work; evaluation of project work; road map of practical projects; Cloud Computing for evaluation

Significant competitive advantage both for the businesses and for the central and local administration is well-prepared, adaptable and continuously improving staff. In today's dynamic stage of human existence, seeking and finding appropriate experts is a difficult and vital process that does not always end successfully. This often leads to direct losses or missed opportunities. Ernst & Young conclude in one of their surveys that "German SMEs have difficulties finding qualified staff, which causes them missed opportunities of € 33 billion a year"[1]. According to an IBM report (IBM's 2012 Tech Trends), only one of 10 organizations has professionals with the skills needed for effective implementation of technologies such as "business intelligence", "mobile computing", "Cloud Computing" and "social business"[2].

The minimization of time from the occurrence of the need till knowledge acquisition and application in practice becomes more and more significant for all industries, services, management, etc. One approach of the education system for the creation and

development of adequate staff needs is developing projects with themes from the real economy. So the learners (students, graduates, employees in companies, etc.) acquire practical knowledge and skills.

It is well known that the occurrence of the project method is closely related to the acquisition of practical knowledge and skills. Project work was used even back in 1763 in the architectural school "San Luca" in Rome - according to a study by M. Knoll (Knoll, 1997). Significant development and justification of this method is made by the U.S. educator and psychologist John Dewey and his student William Kilpatrick (Nikolaeva, 2004). Institutionalization of the term "project" is done in 1911, when the Bureau of Education of the United States legalized it.

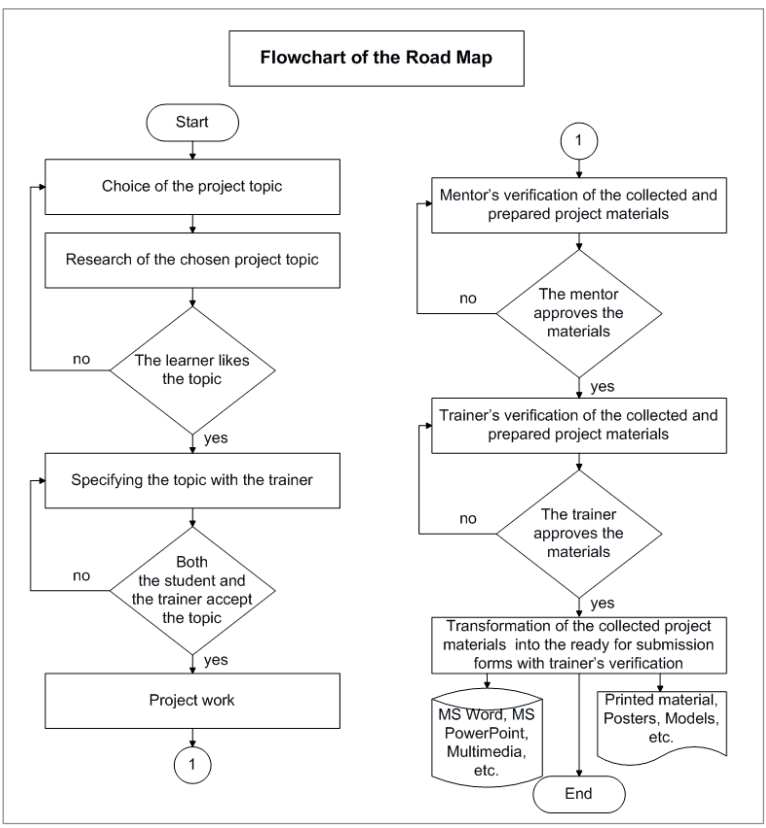


Fig. 1. *Road Map for developing practical projects*

Nowadays the project method is being reassessed and developed. Over the past 20 years a number of authors, including Bulgarian ones, actively explored the main issues of the project-based learning. Plovdiv teams (A. Rahnev, E. Angelova, K. Gurov, S. Aneva, etc.) have worked hard on issues related to the project activity and its improvement. A number of scholars and teachers in different subjects (B. Toshev, A. Gendzhova, B. Yordanova, I. Marasheva) has studied and implemented project-based learning (Marasheva-Delinova, 2012). In the past few years, in terms of evaluation in our country, there has also been solid theoretical and practical experience (Bankov, 2012), (Stoimenova, 2000), (Lazarov, 2009), etc.

The development of practical (on topics from the real economy) projects in mathematics, computer science, information technology, etc. is an iterative process, consisting of seven phases (Delinov & Marasheva, 2013), whose block diagram is shown on Fig. 1. Important preconditions for the successful end of the process are the close cooperation between the trainer (teacher, lecturer, mentor, scientific supervisor / consultant, etc.) and the learner, on one hand, and the motivation of the latter to create a "top-quality" product out of his efforts and work, on the other (Marasheva, 2011). In this respect, the ability of the trainer, to form positive motivation attitude in students mind (learners), which is one of its most important tasks (Andreev, 1996).

Evaluating the projects: Evaluation, as part of learning, plays an important role for motivation. According to one of the definitions, evaluation is "the process of comparing the measured actual performance with pre-set and required quantitative and qualitative standards, norms, criteria" (Radev, 2005). According to another one, "it is a process of differentiation by comparison aiming regulation and analysis" (Stamm, 1998), and so on. It is clear that there is no uniform and standardized definition of evaluation, but in all cases it is understood that this is a process of comparison, cross-check, analysis, etc. of the achievements against pre-set criteria. But it's not just stating the results of a comparison. The evaluation of one activity and single knowledge cannot be considered outside the development of the learner's overall personality. Therefore the tutor (teacher, trainer, scholar, etc.) should be very well aware of his/her students (Grozdev, 2007). Through the evaluation of acquired knowledge and skills the students form significant parts of self-awareness and self-assessment criteria, compares the social and psychological significance of their achievements with those of others (Andreev, 1996). In (Andreev, 1996) and (Andreev, 1987) Marin Andreev sets the functions of check and evaluation. Three of these are:

– Diagnostic and prognostic - establishing the status of the work done and acquired knowledge to a given date gives feedback and helps to predict future conditions and progress management.

– Stimulating - objective evaluation plays an important stimulating function because it encourages students to work systematically, ensuring fair remuneration for the work.

– Developing skills for self-control - students form their own criteria for evaluation of the nature of their mistakes and find ways to overcome them.

The accurate and objective evaluation, set and announced on time, could play a significant role in the positive motivation and respectively in the successful outcome of the project and the acquisition and consolidation of knowledge. It is therefore a good practice to evaluate the work throughout the whole cycle of development, preparation and presentation of the project. The measurement during the entire project development is also necessary in order to provide operational feedback. In this aspect, in the different phases of the map, the verification by teacher and/or mentor is a sort of evaluation of the activities to date. The process of verification, respectively evaluation, could be significantly improved and optimized by using Information technologies (IT), and more specifically "Cloud Computing" (Grozdev et al., 2013a).. Essential for the learners (especially students) is the final score that they receive for the public defense of the project in front of an audience. The latter usually consists to a greater extent of their peers, often even classmates from their class or school. According to a survey conducted among the students from the "upper classes", developing projects, one of the most important evaluation of their work is the one given by their peers during classroom and school conferences (Marasheva-Delinova, 2012). It turns out that the assessment is not the only important thing for the young people. A survey, conducted among students from 21st Secondary School "Hr. Botev", Sofia, shows that a very important incentive for the development of projects is the dissemination of results among their peers. When asked how they wish to popularize their results, 50% of the students answer: "On the school website", and 41% say: "On the school's board". The massive selection of the first two answers by the students is natural because at this age the defining factors are their environment and the approval of their peers. According to the American psychologist Judith Harris (Stamatov & Minchev, 2010), the socialization of children is done not by their parents, but by their peer groups. Moreover, 20% of students recommend when organizing school conferences to invite younger students. This also serves to build credibility and popularity. The competition for prestige and popularity is powerful incentive for the development of young people, for their expression and accumulation of knowledge (Marasheva-Delinova, 2013). The researches conducted among students from economic specialties, confirm the conclusion that for the majority of the students developing projects it is of practical importance that their work is presented to an audience of their peers. When asked "How would you like to popularize the results of your projects?" more than 66%

indicate a response "Using a poster in front of the group/course/Institute". Over 50% chose the answer "On the web site of the Institute". This choice was probably made as it is supposed that the web site of the Institute is most often visited by students and/or future students (i.e. peers).

To achieve a greater objectivity of the project evaluation for the development of practical knowledge it is necessary to set up evaluation criteria and that the students (learners) get acquainted with them. Such criteria are for example, designed to evaluate projects in mathematics using IT (Marasheva-Delinova, 2009). Part of the criteria for evaluation of mathematical projects is the basis of the developed evaluation criteria for projects, forming practical knowledge (Delinov & Marasheva-Delinova, 2014). These are unified, coherent and to a greater extend fixed (unchangeable) through the years of students education. They are developed by taking into consideration the comments, opinions and recommendations of the learners. Project evaluation is conducted with the help of evaluation cards, based on the criteria. They are used by the jury of the conference and by the participants and/or guests entitled to the right of voting. This mechanism for evaluation and self-evaluation of projects is described in (Marasheva-Delinova, 2012). Its effectiveness has been demonstrated by analyzing more than 650 completed evaluation cards and given over 1,500 assessments on developed projects (Marasheva-Delinova, 2012).

From the above it is clear that the timely, accurate and targeted evaluation is one of the main levers for successful project development, in particular with topics from real economy, forming practical knowledge. Among the destinations in which one may be looking for effectiveness of evaluation are:

– Recruitment and creation of a suitable audience for the evaluation of the projects.

– Development and implementation of appropriate instruments enabling objective evaluation of the projects.

– Search and implementation of appropriate tools for timely evaluation of the projects both during the development process, and of the final version.

Cloud technologies and the possibilities for their application in the process of project evaluation: We think that one good tool to make the process of project evaluation more effective, both throughout the whole development cycle, and in the final phase (the presentation of the finished project) is "Cloud Computing" due to the possibilities it provides for sharing of large amount of data, for mutual work, for creation and processing of forms. These features are platform and geographically independent.

It is believed that the initial idea of "Cloud Computing" dates back to the 60s of the 20th century, when John McCarthy[3,4] states the theory that "If computers of the kind I

have advocated become the computers of the future, then computing may someday be organized as a public utility just as the telephone system is a public utility..."[5], "… The computer utility could become the basis of a new and important industry." (McCarthy, 1961). Several decades later, in 1997 Ramnath Chellappa uses the term "Cloud Computing"[6]. Serious contribution to the rapid development and application of technologies that are identified with this term is given by the competition between tech giants and industry leaders: Google, Amazon, Microsoft, Oracle, IBM, HP, Dell, Fujitsu and others. According to Gartner "Cloud Computing" is scalable and elastic IT - related resources that are provided as a service, using Internet technologies[7]. Cloud service is a specialized technology that provides customers tools (processing power, memory, disk space, network resources, specialized controllers, software, etc.) by a group of interconnected servers that for the user look like one[8,9] . The term "Cloud" is taken from telecommunication companies[10]. In 2009 Maria Spinola attempted to systematize and clarify the terms and content of "Cloud Computing"[11,12] and the related services, referring to the five defining characteristics of "Cloud Computing" given by the USA National Institute of Standards and Technology (NIST)[13].

The five characteristics that define "Cloud Computing" are:

– On-demand self-service.

– Ubiquitous network access.

– Location independent resource pooling.

– Rapid elasticity.

– Pay per use.

Cloud technologies offer basically three types of services:

– SaaS – Software as a Service – users rent certain software application installed and provided in the "Cloud".

– IaaS – Infrastructure as a Service – users rent "virtual hardware": computing power, memory, network bandwidth, storage space for information flows, etc.

– PaaS – Platform as a Service - users rent both infrastructure and software provided in the "Cloud".

Types of Clouds:

– Private Cloud: The entire infrastructure of a Cloud is owned or rented by one company and is managed by it.

– Community Cloud: The infrastructure is shared by several companies and serves to maintain a specific user community.

– Public Cloud: The infrastructure is owned by the company selling Cloud services. This company provides them to wide range of customers.

– Hybrid Cloud: The infrastructure is a combination of two or more Clouds (private, community, public).

There are a lot of criticisms and unresolved issues, regarding "Cloud Computing". These mainly affect the security of the information, its possession and dependence, as well as its location in some types of "Clouds". When it comes to corporate, confidential, and "sensitive" data such comments and questions are of great importance. For the solution of this problem are focused the efforts of the largest technology companies, as well as a number of governmental, international, regional, etc. organizations. When considering the usage of "Cloud Computing" in the learning process (including project development) (Grozdev et al., 2013b) we must have in mind that some of the criticisms and remarks are not significant. The learning process does not cover "sensitive" data and with the correct selection of a provider of public "Cloud services" can be overcome some of the other threats. Students, however, should be aware of all the advantages, disadvantages and risks.

The advantages of "Cloud Computing", which make them particularly attractive and are dynamic driving force for their development and application, are several. Some of the features and opportunities that "Cloud Computing" provides are quite useful for the learning process and could significantly improve the quality and effectiveness, including that part of the evaluation of projects and the formation of an individual learning path:

– Easy, fast, platform independent access (via WEB and/or via "local client") to the information in any Internet-compatible device (PC, Tablet or Smartphone) with direct access to the "Cloud resources" (Grozdev et al., 2012a).

– Publishing, sharing and processing (including WEB based on "office" documents) of information. Possibilities for organizing co-working on the materials with almost instant notification updates. The participants in the virtual groups work in the same way, as if they are in a local area network and even as they are in a the same room, although located in different geographical locations (including cities and countries).

Popular "Cloud resources" are: iCloud, OneDrive (old name - SkyDrive), Google Drive, Dropbox, Amazon Cloud Drive, Open Drive, Mega, Box, etc.

As for the evaluation in the development process, we have already noted that the application of "Cloud Structures" for verification of material by the teacher (and/or mentor) significantly optimizes the performance and thus represents a kind and timely assessment of the activities at the precise moment at which the project is located. For the evaluation of the final drafts by a wider audience (at conferences and/or conference connections enabled by digital technologies) we chose the less popular functionality of Google Drive for form processing.

This choice was made despite the large range of specialized capabilities (Survey Monkey, Poll Everywhere, etc.). One of the main advantages of the "Google forms" is the fact that this technology, although poor in features, is integrated with other widely used and well-known and popular Google resources. "Cloud structures" are used more frequently by trainees and trainers in the process of project development and other educational and extra-curricular activities. This makes Google Drive (along with Dropbox, OneDrive etc.) somewhat familiar or easier to explore and use. Another advantage is platform independence. It is especially important in the process of completion and submission of the evaluation maps. It allows the usage of any technical device with any operating system and any connection to the Internet. These are personal and mobile computers (running under Windows, Mac OS, Linux, etc.), Tablets (running under iOS, Android, Windows, etc.), and Smartphones (running under iOS, Android, Windows, etc.). The Internet connection may go via local area network, wireless access point or mobile network. Useful feature is the option to arrange each project evaluation in a separate table. This opens the way for the formation and organization of a data set with grades for all projects evaluated with "Google Drive forms". Last but not least is the fact that the resources that are provided free by "Google Drive" are sufficient for the purposes of the paper work, including the evaluation of projects.

Stages of the evaluation process, using "Cloud" and others online technologies:

1. Preparation of the form

It is prepared based on an evaluation card. Each of the criteria is formed as a question and the possible answers are his performance indexes. For the sake of simplicity it is possible to form several separate pages with criteria sets. A copy (model) of the form is prepared for each project by changing only the names (of the project and form) - Fig. 2.

2. Referral of the Form

The model with the evaluation card of the project is directed at the right moment (classroom, school, etc. conferences, seminars, workshops, e-conference connection, etc.) to the people with voting rights. An individual group (audience) of evaluators (jury, classmates, colleagues, teachers, etc.) can be set up for each of the projects. A period of time can be defined for the project evaluation.

3. Evaluation

The evaluators give their assessments in the time given. For each of the criteria (in the given form) they point their choice – which index suits best which project. At the moment they have terminated answering all criteria (this is an option for each of the „questions" on the form), the evaluator may submit his/her card (evaluation of the given project) if the time for filing has not expired - Fig. 3.

4. Processing

The set by the evaluation cards estimates are processed in a timely manner and the results are presented to the developer of the project and the audience (if there is any, and if the results should be declared before it). Using the selected technology makes possible the formation of the final results of the evaluation with cards within the nearly complete presentation of the project and completion of the appointed time for evaluation. Possible are variants of summarizing and displaying the final score, criteria, and

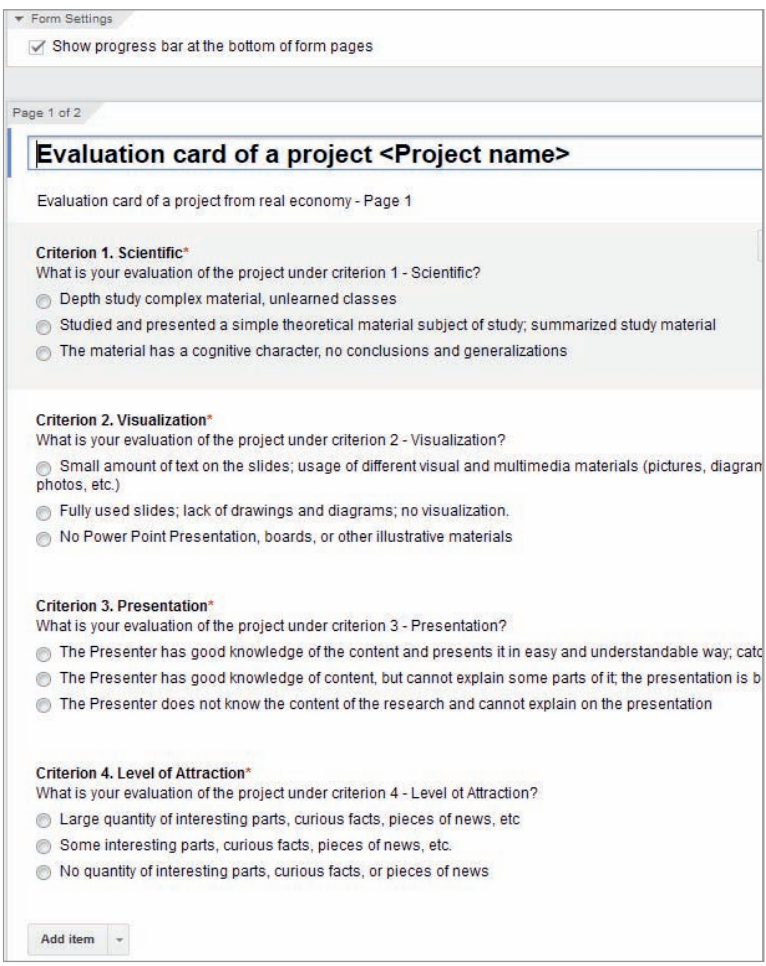
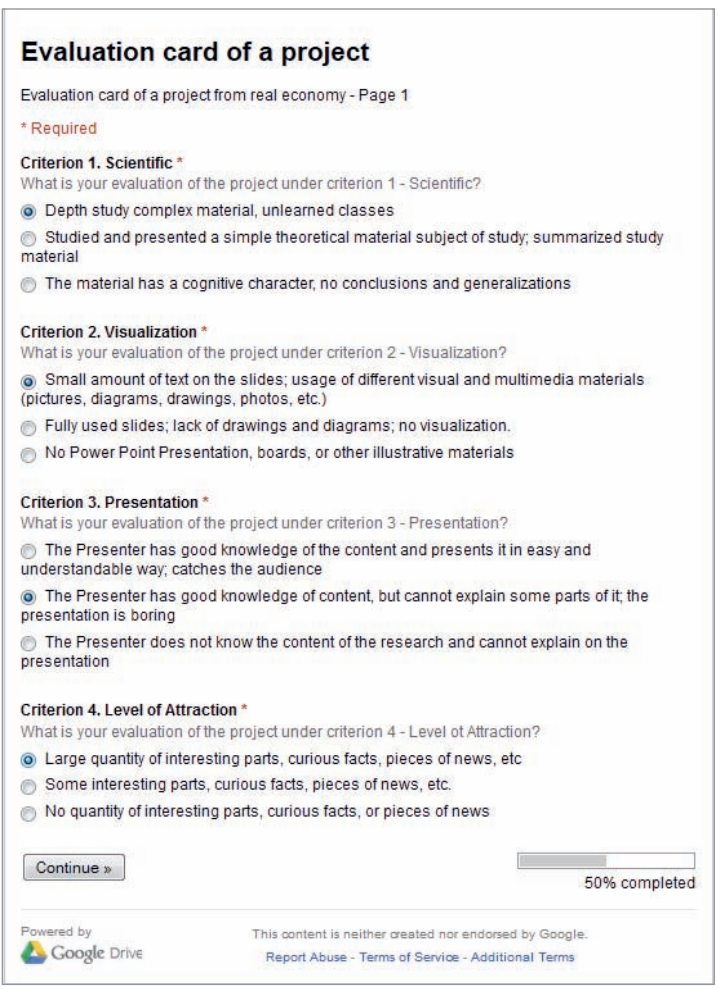


Fig. 2. *Preparation of the form*

indicators – Fig. 4. Technology provides good conditions for quantitative measures of the evaluation and options for export to a spreadsheets (MS Excel, OpenDocument) and compatible ones (csv, text file), pdf and HTML. The latter makes it possible for further processing, by means of which can be obtained high quality, averaging, weighted formal evaluations, rapid processing, publishing, etc. There are preconditions for the application of nonlinear methods and evaluation, as well as contributing to the management of the processes by changing some of the conditions.



Evaluation card of a project

Evaluation card of a project from real economy - Page 1

* Required

Criterion 1. Scientific *

What is your evaluation of the project under criterion 1 - Scientific?

- (•) Depth study complex material, unlearned classes
- ( ) Studied and presented a simple theoretical material subject of study; summarized study material
- ( ) The material has a cognitive character, no conclusions and generalizations

Criterion 2. Visualization *

What is your evaluation of the project under criterion 2 - Visualization?

- (•) Small amount of text on the slides; usage of different visual and multimedia materials (pictures, diagrams, drawings, photos, etc.)
- ( ) Fully used slides; lack of drawings and diagrams; no visualization.
- ( ) No Power Point Presentation, boards, or other illustrative materials

Criterion 3. Presentation *

What is your evaluation of the project under criterion 3 - Presentation?

- ( ) The Presenter has good knowledge of the content and presents it in easy and understandable way; catches the audience
- (•) The Presenter has good knowledge of content, but cannot explain some parts of it; the presentation is boring
- ( ) The Presenter does not know the content of the research and cannot explain on the presentation

Criterion 4. Level of Attraction *

What is your evaluation of the project under criterion 4 - Level ot Attraction?

- (•) Large quantity of interesting parts, curious facts, pieces of news, etc
- ( ) Some interesting parts, curious facts, pieces of news, etc.
- ( ) No quantity of interesting parts, curious facts, or pieces of news

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Fig. 3. *Evaluation of a practical projects*

An individual „officer“ („questor“) can be „assigned“ for the greater efficiency of each project. He directs the evaluation cards to the group; monitors the time window in which one can vote (evaluate); processes and provides the results to the authorized person for their announcement. „Cloud“ technology provides each participant the opportunity to review the evaluation results online after submitting the evaluation. This would be particularly useful in cases of different geographical locations involved.

The described in the stages activities are valid and enforceable for similar online technologies (almost with no differences or with very small adjustments).

The described technology for project evaluation using the "Google Form" has been piloted with students from 21st Secondary School "Hristo Botev", Sofia. It was explained preliminary, and "tried" with test cards, then 4 real projects were evaluated by 9 students

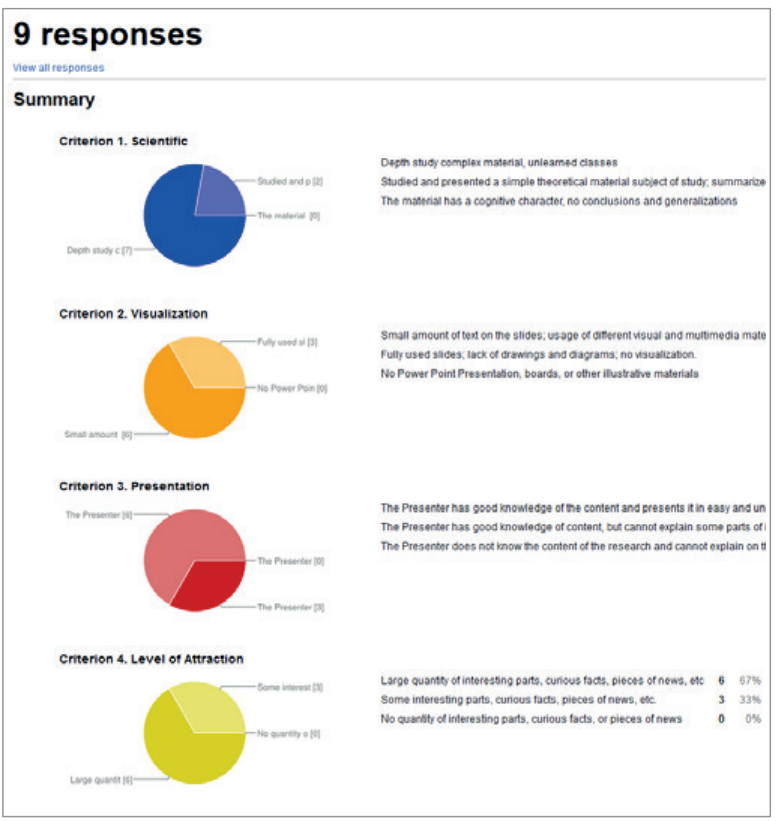

Fig. 4. *One of possible variants of summarizing and displaying the final score*

(who are not prominent in the fields of mathematics and IT). The experiment showed that students very quickly managed with their tasks. They accepted and got used with the activities they had to perform:

– Acceptance of the evaluation cards using mobile devices (tablets and phones).

– Filling in the cards by marking these indicators for each of the criteria that most closely match their judgment for each of the projects.

– Timely submission of the evaluation card in the "open" timeframe.

– Waiting patiently their classmates to give and their evaluation.

The Form for each project is prepared in advance and sent to the evaluators at the time of the conclusion of the presentation and its discussion. The evaluation procedure and processing of the results for each project takes about 5 minutes. This is the time required for changing of the presenters. Meanwhile, the "questor" processes the results. The final results for all projects are announced within 10 minutes after the last performance. It is planned that the projects for the next conferences at school will be evaluated based on the described technology.

Conclusion: The possibility to form a set of data for project evaluation would be very useful if organized as part of the database for the electronic library of projects (Grozdev et al., 2012b). In this way, the students (developers) would have access not only to the projects developed by their „predecessors", but also to their evaluation. This is very helpful in order to "see how the land lies", avoid errors, omit mistakes, apply positive experience, minimize the negative aspects, and pre-form conditions to maximize the individual performance evaluation. In the process of evaluating the young people (students, learners, etc.) are usually on the side of being evaluated. The evaluation of others is crucial for them because it places them on the other side – this of the people who evaluate. Gaining experience in evaluation leads to the commensurability between the grades of others and one's own. The evaluated can control the results of their developments in advance and to reach their own true assessment. The more evaluations given, the more experience gained. This experience, in return is a prerequisite for the greater approximation of the final result against its preliminary set criteria. The use of „Cloud Computing" shortens the time from the evaluation till the presentation of the overall results, and the resulting evaluation is timely.

This method of evaluation leads to the adoption of new technologies. The competences formed during this process may become a serious competitive advantage to those who gained them, as business has, and will have growing need for professionals with knowledge and skills in IT.

NOTES

1. http://banks.dir.bg/2013/08/08/news14671900.html
2. http://public.dhe.ibm.com/common/ssi/ecm/en/xie12346usen/XIE12346USEN.PDF
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ПРИЛОЖЕНИЕ НА „ОБЛАЧНИ ТЕХНОЛОГИИ“ ЗА ПО-ЕФЕКТИВНО ОЦЕНЯВАНЕ НА ПРАКТИЧЕСКИ ПРОЕКТИ

Емил Делинов

Резюме. Съществено конкурентно предимство за стопанските и за други субекти са подготвените, адаптивни и постоянно усъвършенстващи се кадри. Един от подходите на образователната система за създаването и развитието на адекватни на нуждите кадри е разработката на проекти с теми от реалната икономика. Важни условия за успешна реализация на проект са близкото сътрудничество между обучаващия (учител, преподавател, наставник, научен ръководител/консултант и др.) и обучаемия и мотивацията на последния за създаване на качествен продукт. Точната и обективна оценка, поставена и оповестена навреме, би могла да изиграе значителна роля за положителна мотивация и респективно за успешни резултати от работата по проект, придобиване и затвърждаване на знания. В настоящия материал се разглеждат някои възможности на „Облачните технологии“ (Cloud Computing) за повишаване на ефективността при оценяване на проекти с теми от реалната икономика.

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