Design of the E-Portfolio System's Model with Artificial Intelligence Traits

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Abstract — **E-portfolio systems become an important part of information systems. In these days lots of universities and other education institutions use e-portfolios to promote lifelong learning, improve the quality of education and training, and motivate learners to achieve the goals. At the same time, there is a need for a number of students to find an appropriate training course or to attend not a whole course or program but only part of it to gain a new academic or professional qualification. Especially it applies on employees who have to shift their positions and unemployed persons. Especially it applies to unemployed persons and employees who have to shift their positions.**

Keywords — **E-portfolio, ePortfolio, Information System, Model, Interactivity, Artificial Intelligence, Data Base, Education, Study Results, Credits, Students, Professional Qualification, Lifelong Learning.**

I. INTRODUCTION

Some of the most important tools available to educational managers and specialists and provide higher levels of efficiency in educational and training area are information systems (IS) and technologies, similarly like it applies to managers and their efficiency and productivity in business operations, especially when coupled with changes in business practices and human behaviour [12].

For their part, e-portfolio systems become an important part of IS. Lots of universities and other education institutions (for example, Queensland University of Technology, University of Melbourne, University of New England, University of Wollongong, Clemson University, University of Minnesota, Indiana University-Purdue University Indianapolis, Portland State University, LaGuardia Community College, and many others) use e-portfolios to promote lifelong learning, improve the quality of education and training, and motivate learners to achieve the goals. Some of them just suggest using of e-portfolios during study period, unlike others stipulate active use of e-portfolios and include them as a part of curriculum [8].

In today world some employers require from manpower to use e-portfolios to provide evidences of their professional growth. For instance, portfolios as evidence of continued professional development are widely used by nurses and midwifes in Australia and other countries, where is an obligation to self-declare competence and fitness to practice when renewing annual practice certificates [7].

However, students and job seekers sometimes have no needs to attend a university or college and complete their studies of a whole course or program. In fact, if a person completes his/her studies, probably there will be some parts of passed before study materials or subjects already included in a new study program which the student is interested in.

Labour market relatively often requires shifting directions of efforts and gaining new qualifications. This is a requirement of lifelong learning which in its turn requires persons' readiness to find appropriate courses and complete them.

Moreover, lifelong learning cannot be compartmentalized into course structures. While lifelong learning is supported by the work done in individual courses, it clearly crosses the boundaries between courses [9].

The problem, which is unsolved yet, is how to organize processing of all data related to person's exiting qualifications and give him/her useful suggestions to obtain an appropriate course or small parts of the courses or subjects.

In the light of it, this paper introduces a draft of the new e-portfolio model with some sorts of artificial intelligence (AI) traits which will be assigned to solve the abovementioned problems by offering people new services.

II. DATA FLOW ASPECTS IN INFORMATION SYSTEMS OF AN EDUCATIONAL ORGANIZATION

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To start considering the role and functions of the educational organization's IS we should bear in mind that IS is a part and parcel of organization. Organizations, as a rule, have more or less similar goals, but different structures.

Namely, ISs have common and different functions depending on organization's goals. With reference to Keneth C. and Jane Price Laudons [12] who have described functions of IS, it is possible to adopt their model to IS of educational organizations by adjusting it as it is represented in Fig. 1.
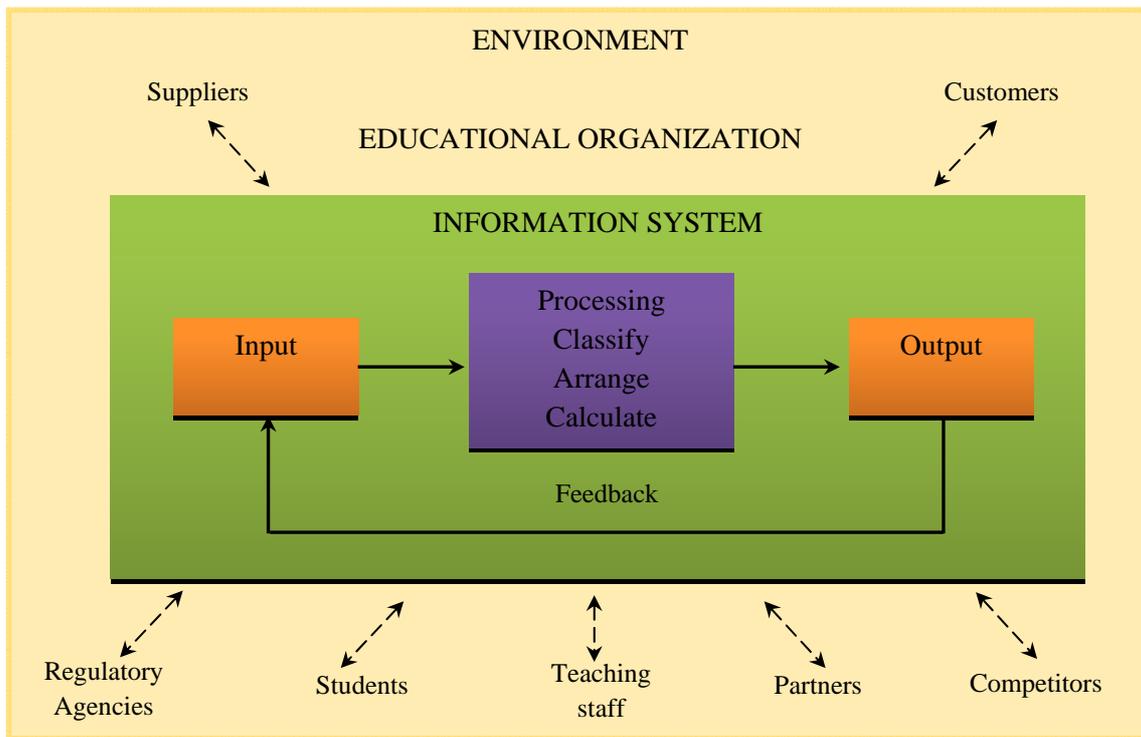
Fig. 1 Functions of Educational Organization's IS

Three basic activities – input, processing, and output – produce the organizations' information need [12]. An important data flow of organization's IS must be marked by the feedback as the output returned to appropriate persons or activities in the organization to evaluate and refine the input. The processing activity collects, analyses, classifies, arranges, and calculates data available from the input activity and interaction with internal and external environmental bodies which in the case of educational organization's IS are:

1) Students. They are the main target audience of IS and teachers' efforts. Undoubtedly, information and data given by them in form of essays, tests passed, evidences of achievements, study and practice results, critical thinking notes and so on play a lead of data flow in organization's IS.

2) Teaching staff, tutors. They serve as the mentoring and advisory board to ensure the educational process. Collaboration within IS between students and tutors, as well as between students in their groups and peers are essential to direct the study process in right way.

3) Partners. They could be recognized as collaboration organizations: both educational and non-educational. Universities can establish consortiums to synergy their efforts, unite separate ISs, whole or part of them, into a common IS, share knowledge, study materials, and study support, organize collaborative data flow in common part of IS through e-collaboration tools and technologies such as TV-videoconferencing, e-mailing, Web 2.0, etc.

4) Competitors. In case of educational organizations' IS there are numbers of evidences showing competitiveness among educational institutions to attract more students.

Governmental schools compete for image, prestige. For private schools this is mainly a question about survival, although image issues remain also actual ones. Curiously, but at the same time it helps them to improve educational results in emulation with each other and finding innovative approaches.

5) Customers. First of all, that is labour market which consists of: employers, business, governmental and nongovernmental organizations (GOs and NGOs) and prioritizes educational directions and proportion of graduates. Secondly, that is business and variety of project activities connected with business and GOs and NGOs goals.

6) Suppliers. They differ as many as their services vary. This list may include such supply services as hardware and software delivery, electricity, water supply, etc.

7) Regulatory agencies. No doubt, all educational institutions should obey appropriate rules established by State Ministry of Education and Science, State laws and regulations (for European Union (EU) countries – also appropriate EU regulations).

In my proposed new design e-portfolio system model with AI features regulatory agencies also should be recognized as the very important IS environmental actors to ensure direct rapid data interaction between regulatory agencies and user's e-portfolio which will be outlined in further chapters.

III. E-PORTFOLIO SYSTEM AS A PART OF INFORMATION SYSTEM

The world and even universe must be considered as the gigantic IS that consists of huge amount of ISs some of which

are joint in bigger or smaller associations. At the same time, these ISs consist of sub-ISs, a number of which depends on organization's goals and needs.

A person's individual e-portfolio should be considered as an integral part of an educational organization's IS. It is aimed to collect and process data of student's achievements and work-based results, prepared in electronic form, which includes evidences of person's professional competencies or learning outcomes, personal reflection, contemplation and action, work or study activities and progress, knowledge development, proof of accomplishment and ability make achievements, collaborate, communicate, think critically, analyse, and invariably improve themselves [8].

In scientific world a battle of the books still continues about purposes of e-portfolios. Whilst there are some opinions that the only purpose of e-portfolios is assessment, others insist on multiple purposes for developing e-portfolios such as assessment, showcasing skills for potential employment, personal development planning (PDP), reflection on learning, etc. [5].

As reflection is the "heart and soul" of an e-portfolio, and is essential to brain-based learning [11], [14], there is a need to develop appropriate strategies that better support reflection in the learning process, supporting different types of reflection to improve learning [4].

Using reflective processes to learn with and from others, students create opportunities to enhance their interpersonal relationships and gain multiple perspectives. Obtaining new knowledge, students learn about others and themselves in ways that enable them to critically reflect on and critique their experiences and examine what shaped their perspectives [2].

From lifelong learning prospective an e-portfolio should be developed as an aggregate system to ensure students' learning and new qualification achieving efforts. Thus, there must be place for PDP, reflection on learning, collaboration with classmates and tutors, assessment, presentation of themselves for employers and teaching staff from other educational organizations.

One thing which we ought to keep in mind building IS and e-portfolios as IS subsystems, is the security of IS. It occurs at four levels to be effective [13], namely:
   a) physical,
   b) human,
   c) operating system, and
   d) network.

The author is especially concerned about level (b) which besides other issues includes social engineering and social networking because social interaction and collaboration between students and teaching staff in e-portfolio systems is of great importance. Also we ought to keep in mind that security certainly is as weak as the weakest chain [13].

Unless some categories of e-portfolio systems do not support and even do not allow interactivity, others have necessary collaboration Web 2.0 tools. In line with Dr.H.Barett's research, there are six categories of e-portfolios tools from which first three belongs to individual and institutional tools and last three – to institutional ones [3]:

1) Authoring Tools (such as Mozilla Composer, Dreamweaver, Front Page, Apple's iWeb, MS Office and Open Office Word, PowerPoint, Adobe Acrobat, iMovie, etc.). They are used for offline portfolios development with further placement onto the Web server or portable memory discs and do not provide interactivity;

2) Static Web Services (such as GeoCities, GooglePages, Tripod, etc.). Organizations and individual persons can use these services to create and publish a presentation portfolio. These web services provide little or no interactivity (Web 1.0);

3) Interactive Web Services (such as WikiSpaces, GoogleDocs, EduSpaces (Elgg), etc.). As dynamic web services they might be used for creating and publishing of organization's or person's presentation portfolio. They allow interactivity;

4) Software – Server Required (such as Blackboard, MS SharePoint, Open Source Content Management Systems (Drupal, Plone), Open Source tools (Elgg, Mahara, OSPI, ePEARL), Embedded in Moodle (Moofolio, MyStaff), etc.). Organizations can install them on their own servers and provide space for persons' e-portfolios. They allow interactivity but do not provide data management;

5) Hosted Services (such as GoogleAps for Education, Digication, Epsilen, My eCoach, etc.). They can be adopted by organizations. Thus, there is no necessity to use organization's server. Services allow interactivity but do not support data management and reporting system;

6) Assessment Systems - Hosted Services (such as Chalk & Wire, College LiveText, FolioTek, mVentive'sTracDat, Richer Picture, and Task Stream). These are systems which, similarly like services in previous category, are hosted. Thus, organizations would adopt them that will allow hosting e-portfolios, ensure interactivity, data management and reporting system for assessment.

In spite of a great number of e-portfolio systems represented in abovementioned categories there is no any e-portfolio system with artificial intelligence features which could be used for creative selective learning based on person's existing competencies to meet lifelong learning requirements.

IV. ARTIFICIAL INTELLIGENCE (AI) TRAITS FOR THE MODEL OF THE NEW DESIGN E-PORTFOLIO SYSTEM

To provide new approach to learning, minimize time necessary to find appropriate study courses and complete them, it is necessary to enrich existing e-portfolio systems by new interactions, links, data bases, data processing, services, regulations, and standards.

The model of the new design e-portfolio system with AI features (Fig. 2) consists of several IS's environmental actors such as individual e-portfolio owners/users (students), teaching staff of an educational organization, classmates, formal and informal educational institutions (e.g. accredited examination centers), ministries, human resources management organizations, business structures, joint data base holder, other key players, which all are tied with links to ensure their interactions.
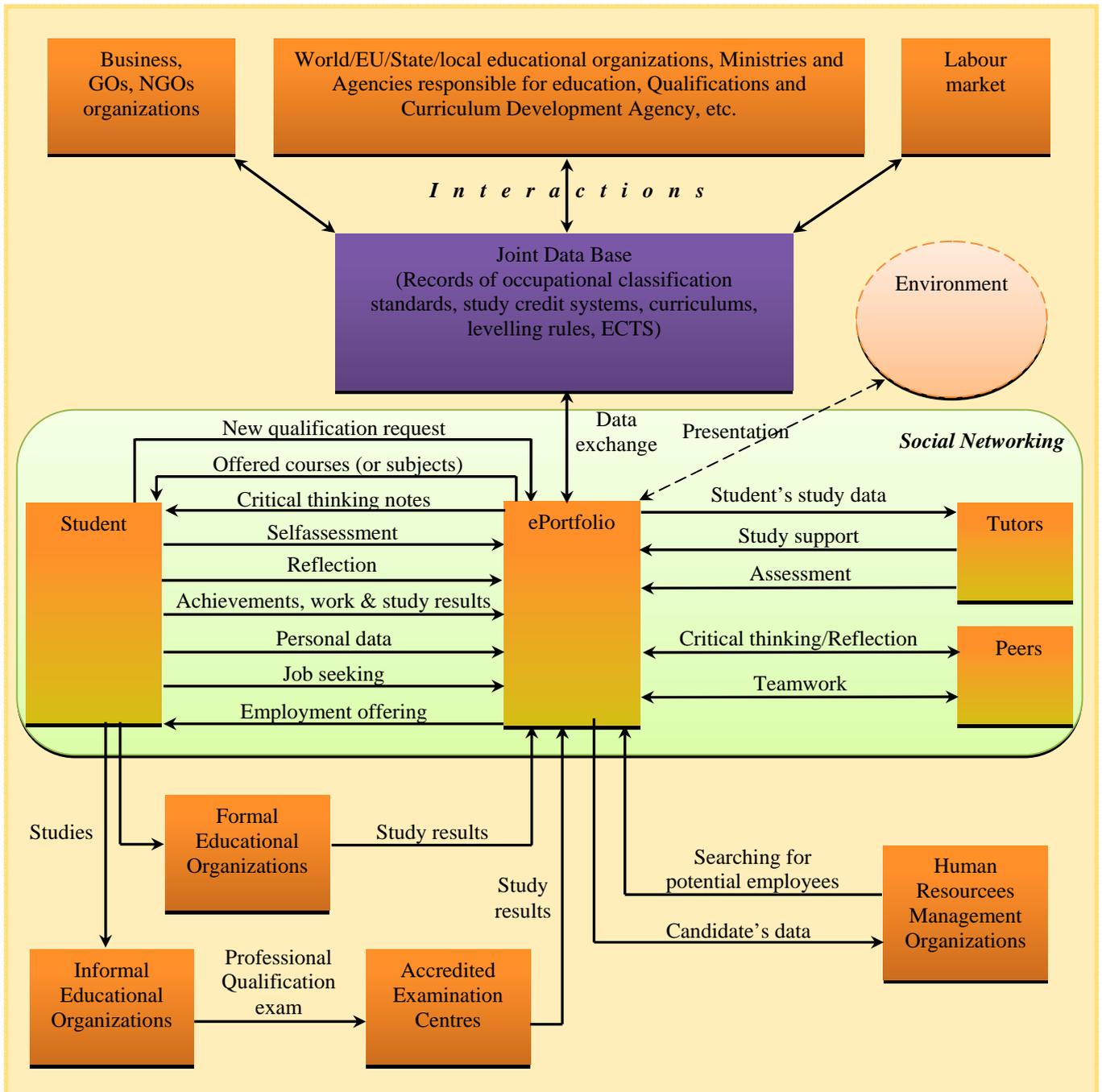
Fig. 2 E-portfolio AI Draft Model

A student displays in his/her individual e-portfolio personal profile, study and practice results, and achievements. This information might be available for business and educational organizations, GOs and NGOs.

Study support, tutors assistance and classmates collaboration, teamwork and critical thinking, as well student's own critical approach to his/her studies and achievements play essential role in student's growth.

Students ought to interact actively with classmates: put forward remarks, notes and proposals to others about their e-portfolios and displayed information, make necessary assessments of peers work as a part of professors' led assessment when it is required.

Students are encouraged not only to think critically but also to make judgments about their own development and performance [6], thus allowing them to identify their own strengths and weaknesses [1]. Reflection and critical thinking are effective tools to develop students' knowledge using e-portfolio [8]. The individual approach to reflection, which is ultimately about personal growth and development, is limited

in its social contextual consideration and also lacks an overt action perspective [10]. Reflection ought to be shown during whole study period instead of students' sometimes short flash activities during examination period or because of requirements of training programme [8]. Moreover, reflection in optimum ought to be appeared both immediate (through Web 2.0 tools, discussion forums, blog entries, as well in form which might not appeared in e-portfolio directly, for instance, via e-mailings and TV/Web-conferencing) and retrospectively when old data are added, corrected and improved all the time.

All this must be rendered in an individual e-portfolio. A new featured e-portfolio should be tied with links to in entirety of data bases which may become a totally new joint data base (JDB).

JDB will include records of rules related to education, occupational standards, obliged and attested equal for everybody credit system, curriculums, and regulations for levelling. JDB will actively interact with e-portfolio users, education organizations, labour market, business organizations, GOs and NGOs, Ministry of Education and Science, other ministries and agencies involved in educational issues. JDB can start as a local, state data base, expanding its capacity at European level and even incorporating all leading countries of the world in sphere of education and training.

JDB will be tailored to an advisory purpose to give students or other individual e-portfolio owners suggestions to choose appropriate educational courses or their parts to get a new qualification. This will be achieved by following activities. Student's personal data and study results (gained qualification), placed in his/her e-portfolio, will be set against data in JDB. Based on a new qualification request, JDB will match available educational or training courses and give immediate response via e-portfolio to the student about necessary educational courses to satisfy his/her needs.

V. Conclusions and Future Work

The proposed e-portfolio model can solve the problems actualized by labour market urgent needs and lifelong learning necessity.

There are many questions to be considered and solved in further research.

First of all, JDB requires a set of common credit system, clear rules, definitions and list of educational and professional standards. They can be based on issues of Bologna Agreement. However, it is questionable to count on a reason that all world countries have the same professional standards, curriculums, credit systems and requirements to gain new qualification. If we wish to promote lifelong learning and mobility of manpower, we should tackle the problem of the interoperability and levelling of national standards. For these purposes the European Credit Transfer and Accumulation System (ECTS), which is a standard for comparing the study

achievements and performance of students in European higher education, should be taken into account.

Secondly, this is a challenge to create such a system. There could be discussions about its programming, developing, further maintenance, and costs.

Next, common system ought to be based on an idea that knowledge is accessible for everybody. It does not mean that universities should offer classes free of charge. Simply, students must have an opportunity to choose the most suitable option offered from JDB through their e-portfolios: if it might be for free or else for a valuable consideration.

Another question relies on security issues. Student's activities using all features of e-portfolio must be safe. Military and some others ISs require additional security awareness. We should like ours multifunctional IS being cheap, fast and secure. Unfortunately, in reality usually there are only two options available simultaneously.

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