Editorial. European Certification of Informatics Professionals — Niko Schlamberger

Monograph: "EUCIP: A Model for Definition and Measurement of ICT Skills" (published jointly with Nóvatica*)

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A Web-based Computer System as a Main Tool of Certification Processes Automation in EUCIP Poland

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EUCIP Certification Program in Poland was preceded by the research, which showed that all examinations processes, described by the ECDL Foundation, can be highly aided with the Internet Computer System. Polish Information Processing Society (PIPS) decided to implement EUCIP in Poland and base it on such a system, which was named EUCIP Examination System (EES). Now EES may support or automatically execute EUCIP proceedings. It consists of some modules, which are responsible for a different activities like: payments, invoices, examination Core, examination Professional, and User (Candidate) account. The article also describes systems functionality designed for the Candidate, Competence Centre, PIPS accountancy and the Administrator.

Keywords: EUCIP, Internet System, IT Certification, Workflow.

1 Polish EUCIP market: the System Environment

The European Certification of Informatics Professionals (EUCIP) idea is aimed at people who are directly connected with IT, so they can be called IT Professionals. Such a target group gives wide possibilities to automate the certification processes using an Internet system. EUCIP certification procedures may be easily described using Business Process Management (BPM) methods and then used in a workflow, which is supported by the Internet system. As the Advantages of workflow and electronic information flow are obvious and are well described in many articles, that issue will not be mentioned in this article.

The Polish Information Processing Society (PIPS), used the fact described above, to base the EUCIP Programme in Poland, on such an Internet system and named it the EUCIP Examination System (EES). The system was designed, taking into account all the rules described in EUCIP Standards and Procedures documentation, as well as Polish market demands. Considering the amount of paper documentation, produced by Polish ECDL proceedings, since it was implemented in 1997, PIPS decided to base all EUCIP activities, on electronic documentation. Now EES is available for candidates in Poland 24 hours a day, so they can register, pay and plan their examinations, at any time, from any computer connected to the Internet. EUCIP candidates may use two main parts of the system.

The first system element is a regular web page [1], which contains all the information about the programme, such as: EUCIP programme introduction, certification levels, Core modules, Professional specialisations, exams and certificate prices, procedures (available also as an animation show), actual competence centre (CC) data and a detailed EES user guide. Many of them are provided as PDF documents, which may be easily downloaded and printed, so it becomes typical paper documentation, like used i.e. at ECDL.

The second element is a dynamic EUCIP Examination System [2]. It is further divided into separate modules, responsible for specified activities like: payments, exams, user accounts and accountancy. The EES user is automatically switched between the relevant modules, so he/she won't feel any inconvenience. To use this element, candidate must become a certified user, which means he/she must register into the Polish EUCIP candidate's database. This is equal to purchasing the Record of Achievement (ROA) in other EUCIP running countries. After a registration, the user gets his/her individual account for the System. EES gives the candidate a possibility, to begin his/her EUCIP certification path, using his/her personal computer, connected to the Internet, at any place and any time.

2 Systems Architecture

The Polish Information Processing Society, decided to join the EUCIP Program at the second quarter of 2007. Official Polish EUCIP certification started on the first of February, 2008. The time between these two dates was spent on preparation, especially designing and implementing the
system. Due to the lack of time, the EUCIP Examination System takes advantage of some modules, which were developed earlier and already used in other educational and examination units. To meet EUCIP needs, such modules were adopted and partially rebuilt. The main problem was to set proper communication between the modules, because they were produced using different technologies.

All of these issues were successfully solved and now the system contains four general modules, which work together, as a single system. EES modularity is presented on Figure 1.

The most important and complex of the four modules is the Main module. This module acts as a gateway for the information processed in other systems components. The next two modules: Core and Professional examination modules, are used to process the exams on two different levels. The Core module was entirely adapted to the system, as a standalone application and uses other technology, than the rest of the system. It also separates the Question and Test Database (QTB) and taken exams history, from the rest of the system, what gives additional protection against unauthorized access. The last module is an outsourced payments service. This module operates all the money transfers between PIPS and the candidates or competence centres, resulted from the certification and authorization procedures. As mentioned above, the main module manages all the information flow, what means that the passed data must always run through this part of the system. Specified tasks are assigned and passed directly to the relevant module, which takes it into its proceedings and returns the result.

The main module is a kind of manager to assign tasks to the specified resource (module) and wait for the result, to activate the next step of the modelled process. Most of the processes in the system flow automatically, without any administrative activity, but there are also some breakpoints which needs to involve the Competence Centre or a system administrator decision. The whole system is a virtual partner for the candidate, which prepares him/her for the examination, then examines and announces the result. Additionally it helps the candidate, to go through the examina-

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**Figure 1: EUCIP Examination System Structure.**
tion process on each part of it. That's why the candidate doesn't need to contact any EUCIP representative, to get or pass the information, needed to make the process go forward.

Communication between the separate modules is hidden for the user so the switching between different systems is seamless. Candidates have a personal contact with the certification party, only while taking the exam (fulfilling the test in a EUCIP Core or Professional final exam). This is a requirement to prove the candidates identity, before the Core test or to estimate personality for the adequate points assigning in Professional. Candidate’s personal contact, with the board of examiners in professional level, as required by the ECDL Foundation.

The data gained in the specified processes are stored in separate databases, connected directly to the module which got it from the user or proceedings output. Only the Main module gets some information from the other systems components, because it is necessary as an input, for the further proceedings. Such partial data are additionally stored in the main system database. Detailed and complete data which are stored in other databases are accessible only through the specified module.

3 Systems Functionality

EES functionality is very wide and constantly developed to adjust the system for EUCIP certification in Poland. There are three main types of system users. Firstly, and the most important, is a systems administrator. That kind of user account has the widest access which means the biggest impact on the system. Managing the system provides not only the biggest access rights, but also many duties and acceptance of the huge responsibility for taken actions. The Administrator is able to use all the CRUD functions (create, read, update and delete) on the candidates database. He/she can also suspend candidates account if required. This may be used to block candidates which have broken the regulations they accepted in the account creation process. Through the administrators account, he/she can also add, edit, suspend or remove competence centres systems accounts.

On the professional level PIPS uses a board of examiners to prove the candidates skills as a concrete specialist. EES administrator creates the examiners database, which is further used in the Professional examination process. Every single examiner has assigned knowledge areas, on which he/she is able to evaluate someone's achievements and knowledge. In addition, some of the examiners may fulfil a board chairman function and be assigned this right.

The Administrator is also authorised to browse the exams database and even cancel these which were taken and were not passed. That is a specific function which gives a possibility to annul the exam which was failed, owing to circumstances beyond anyone's control i.e. systems or connection failure. After such an operation, candidate gets a second chance to take the exam, without additional costs. The last of the administrator's main functions is partial accountancy management. He/she is able to browse the invoices stored at the database and produced automatically by the system after getting the candidates payment.

The second user type is a competence centre account. It is created and accessible directly at the Core examination module. That kind of account has a right to plan and run exams on the specified (authorised) computers. Exams may be planned, after the user has paid (in Main module), from every computer connected to the Internet, after logging into the CC account. The test may be taken only on the authorized computer, located at the CC location and at the specified (planned earlier) time, with a 15 minutes time offset. The test is loaded and checked automatically, on the main EUCIP Core examination server. The only role of the competence centre in the examination process, is to plan the test time, prove candidates identity before the exam, provide a testing station, secure formal requirements during the exam and then print the exams result, mark it with the individual CC EUCIP stamp and pass it to the candidate. Each of the tasks, mentioned above, is supported by the SEE – competence centre user account. Moreover, the system provides a statement of the exams taken at the specified CC, which is generated at the end of each month. Such a statement is a key document for the CC, to get a reward from PIPS, for the examinations provided to the candidate. The described document is available for the PIPS and CC, using the System. The Examination history for each competence centre is kept in the database for one year and then moved to the offline backup.

The last account type used by the candidate provides him/her with plenty of functionality connected with his/her personal data management, payments and invoices, at last examinations of both levels: Core and Professional. Personal details may be freely changed by the user, with the exception on the personal identity number which is also an account login. Such a number is provided to each citizen in Poland by the government, just after birth and is generally unchangeable. It is used to identify each person which has a Polish nationality. EES also uses that numeration to identify people and to avoid reregistering the user account between two different people, i.e. after passing some of the exams. Using the candidates account type, 'credit' can be loaded which can later be used for exam activation. Candidates can 'top up' their account balance using outsourced payments system. The system provides many different payment methods such as: fast bank transfers, credit or debit cards or just a printed payment form, which can be processed in every bank or at the post office. Using the fastest of the mentioned methods, a candidate can get money on their account in a few minutes after the payment was made. After such an action, candidate gets an invoice which is available at the "invoices" tab on his/her account. The rest of the examination process is also supported by the system, but needs the personal feedback of the competence centre. After the exam is paid and activated, candidate may use the system, to set a time, date and the place, where the test will be taken. Such information is put into the system by the CC
and then accepted (or not) by the candidate. After obtaining that stage of the process, test time and place can be changed only by the administrator and needs the atypical circumstances to do that.

On the professional level EES provides a tool, for uploading an electronic version of the portfolio, which is further evaluated by the board of examiners. The number of points which were given for each of the uploaded documents are also shown to the candidate, so he/she can constantly watch his/her points balance, given for the portfolio. After obtaining a minimum of 32 points he/she may proceed to the next level of the final Pro examination meeting. Using the candidates account he/she can also order a certificate, which will be sent to him/her by standard post. The certificate ordering option is available only when the candidate is licensed to get such a document, i.e. the required exams have been passed.

Depending on the account type, the system can create and provide wide statistical material of the tests which were taken (passed or failed), information on where tests were taken (in which CC) and what is the percentage of positive and negative results in a specified CC. The EUCIP Examination Systems functionality covers many different situations, which may appear in real life, but such detailed descriptions are beyond the scope of this article. All the functions described above represent only a portion of the system, but gives a possibility to imagine the whole EES concept.

4 Access and Security of the System

The whole system architecture has been designed to maximise protection of the data stored in the databases and processed in the modules. The system uses predefined processes, where most of the tasks are automatic. This ensures a minimum human risk factor, which may cause potential errors or a false data input. Additionally, systems protection is based on access control security. This means that every single user is given only the rights that he/she may need to use the system properly. For example, a candidate can’t order a Core Certificate, until the system gets the information that he/she passed all of the three module exams.

The activation of the Professional level will also be unavailable in the user interface, until he/she gets a full Core certificate. Competence centres may not manipulate the Core test because they have no impact on the question configuration, in the specified test session. The test consisting of 45 different questions, taken from different subject areas, and is created automatically on the centrally located server (connected with the Core examination module) and sent to the candidates’ station, located at the CC.

Moreover, the test is fulfilled by the candidate directly on the server, so the questions are not even for a minute, stored on the local computer’s hard drive. After 60 minutes from the session start time, the system automatically closes the connection, sending only the percentage result of correctly checked answers. Such a confirmation is the only printed (or stored) document, which the CC and the candidate can get after the test submission. They don’t have any access to the exam history to find out what were the questions and the correct answers. Such a possibility is assigned only for an administrator account, so he/she can use it in case of a complaint lodged by the candidate. The exam result confirmation, mentioned above, contains the total percentage result, and the percentage results of the specified subject areas used in the test.

The most important value is a testing station authorization, used for the Core examination. To get access into the EES, a competence centre must get through the authorization procedure to ensure the best quality for the EUCIP Core examination purposes. That procedure will be further described in the next section. After the CC becomes an authorised EUCIP Core test centre, they gain access to the system. At this level it may plan the examinations of the candidates using a given login and password. Inside the CC hardware infrastructure, there are only a few computers which may be used to process the exam. PIPS provide an authorization for the computers which are located in the examination friendly environment only. These computers are added into the trusted hardware list, what means that the system may set an examination connection, to such a unit.

To ensure the security for personal data in the EES, the whole communication between the server and the candidates or competence centres computer, is set through the Secure Sockets Layer (SSL) protocol. Each database of the system has an automatic backup procedure, which is activated every 24h and may be recovered in less than 1 hour after a potential database crash.

5 Other Activities in the Polish EUCIP Approach

As it was mentioned above, PIPS maintain a high quality for EUCIP examinations. For this reason it runs a quality assurance program responsible for competence centres selection and authorization. To become an authorized EUCIP test centre (TC) it must fulfil some requirements, from the appearance of the overall location, to the specified computers and Internet connection quality. Such an authorisation certificate is issued for two years and must be further renewed every 2 years. PIPS also limit the quantity of EUCIP TC at any one geographic area. It means that initially, there will be only one TC for each city or province, except main metropolitan areas such as a capital city and similar.

Every authorized TC gets a “welcome pack” which contains some materials used for EUCIP examination proceedings. Every trusted computer used for testing, must be equipped with the provided mouse pad, which was designed to prove computer systems access rights and promote the EUCIP Program. The Competence Centre also gets two framed certificates; one is a EUCIP Core Certificate model, second is a PIPS Authorized Test Centre Certificate. Both of them should be placed in a visible location for potential candidates. PIPS also provides printed documentation, where the procedures are well described and a individual stamp, used to prove the printed documents, which comes
out of the system. Polish Information Processing Society does not earn money from issuing the TC authorisation. The authorisation fee, which is paid by the competence centre, is used to defray the "welcome pack" content and audit cost.

In the Professional level, quality is assured with the board of examiners selection. People which are asked to take part in examination board activity, represent the highest level of knowledge in specified IT areas. Each board is automatically generated just after the candidate activates his/her Professional exam. The board composition is selected based on the elective profile chosen by the candidate and the cognizance of the examiners, stored in the database. Such a selection guarantees the highest quality of the candidates' portfolio evaluation.

To increase the certificate authority, it is issued as a full colour high quality print, proven with the ECDL Foundation hologram, PIPS numbered individual hologram, PIPS round stamp and a original signature. Such a diploma is framed in a wooden frame and provided to the recipient packed in the special carton. The package is delivered directly to the certificates owner, using the postal courier.

EUCIP in Poland try to distinguish itself from ECDL, not only by the different IT skills level, but also as a prestigious certificate. That's why most of the proceedings are covered by the EUCIP Examination System, which is accessible through the Internet. It provides the candidates not only with the best functionality and many facilities, but also a high maintenance level. All of these factors give a candidate the feeling that this program is well prepared and he/she can feel very comfortable using it. He/she is not taking just another exam, which looks like the others, but is taking part in a big certification project, where everything is well designed and works just as it should. Such a strategy was chosen to distinguish the EUCIP on the wide IT certification market and is expected to be successful.

References