

Higher Education according to Industrial Requirements - ECS as a successful Example

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Abstract—Universities' Curricula and especially those of Applied Sciences should be, in the best case, developed in such way, that graduates' knowledge reflects contemporary requirements of the industry, without compromising the assertion of the knowledge universality as the central perspective of the higher education. This awareness is often identified, but in a real case, the organization of the courses and lectures at the university according to the industrial requirements, often does not function efficiently enough. The key reason for this is the dynamic and rapid progression of the industrial and technological development, which can't adequately be followed at the university side. This paper presents one solution for this problem. The collaboration between EPLAN Software and Services GmbH & Co.KG, as one of the worldwide key industrial company working in the domain of development of Electro-CAD software applications and the University of Applied Sciences from Cologne, Germany, is described in this paper. Special attention is given to development of the certification program called EPLAN Certified Student (ECS).

Index Terms—University-industry cooperation, higher education, industrial requirements, EPLAN, ECS

I. INTRODUCTION

IN most cases, scientific achievements are the most important achievements for universities. But beside those scientific, strategic and economic issues should also be highly respected by the universities, as in the case of industrial companies. Therefore, very often universities and institutions of higher education, especially private ones, try to achieve economic, scientific, and strategic advantages by cooperation with industrial companies [1]. Their motivations for partnerships are of didactical, business-political and epistemic nature, with strong orientation to the marketing needs [2]. There are many obstacles that can appear in such cooperation. Some of them are: industrial collaboration restrictions regarding the protection of the intellectual property and rights, adoption of the collaboration to the organisation issues of the university as also organizational cultural differences in the case of international partnerships [3]. Often, industrial companies and universities have disparate time horizons regarding results and achievements of the particular cooperation [4]. On the other hand, there are various

possibilities for strengthening collaborations, as for example to use an authorized framework and mediators. Keeping those issues in mind Rheinische Fachhochschule Köln gGmbH, University of Applied Sciences has started the collaboration with the company EPLAN Software and Services GmbH & Co.KG about nine years ago. Rheinische Fachhochschule Köln is one of the biggest and oldest German private universities, existing since 1958. EPLAN Software and Services GmbH (EPLAN) is a worldwide market leader in the field of development of the electrical CAD software, but also in the domain of mechatronics, fluid, process measuring and control technology and pre-planning. The cooperation with EPLAN implies the realization of the so-called EPLAN Certified Engineer (ECE) assessments for industrial clients, EPLAN Certified Student (ECS) assessments for students and EPLAN Certified Technician (ECT) assessments for apprentices of vocational and technical schools. Rheinische Fachhochschule Köln acts as a third party certifier of the EPLAN Company.

II. BACKGROUND AND MOTIVES FOR COOPERATION

The assessments listed above represent quality standard assessments that aim to evaluate the excellence of the theoretical and practical knowledge of the examinees that are using the EPLAN product Electric P8, which is the standard software application used in most industrial countries worldwide, particularly in the automotive industry and companies like Mercedes, Volkswagen or BMW [5]. As it is well-known, automotive industry in Germany is one of the major national employers, with a workforce of over 850,000 workers, engaged in the industrial segment and trade area, with the largest share of passenger automobile production in Europe [6]. Accordingly, the multi-purpose influence of automotive industry is enormous. The need for creation of the quality standards by examination in the domain of electrical CAD application arrived, for the reason that many subcontractors' companies which are working for automotive industry, did not offer high-grade qualitative electrical wiring diagrams and project engineering plans and pre-planes. These led to, at least, higher costs for every involved part, since the reviewing of defective electrical plans is highly time and money consuming. For that reason an independent institution, Rheinische Fachhochschule Köln, has been integrated in the concept of development of the quality standards for examinations in the field of electrical CAD application with EPLAN P8. As an independent institution, Rheinische Fachhochschule Köln has started the task of the development

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of the guideline and contents leading to sustainable quality CAE standardised exam, as well as the development of the evaluation procedure. It comprises also the distribution of all the resources needed for the realization of the active assessment. One of the requirements was to provide homogeneous quality of the exam, independently from the exam location, since it is internationally recognized.

III. REALIZATION OF THE EPLAN P8 BASED EXAMINATION

In the area of the computer aided engineering the cooperation between universities and industrial partners are rare. Mostly, companies have special offers for universities, mostly low price licences, but direct cooperation and joint development of educational programs are sporadic. In the literature dealing whit this topic, there are not many mentioned cooperation in Germany. One of them is Siemens cooperation with the university in Passau regarding NX application. Siemens supports new seminar at University of Passau, which offers courses with NX software to the students [7].

A. Eplan Certified Student

One successful example of cooperation in the area of computer aided engineering, is a nine years old cooperation between EPLAN and Rheinische Fachhochschule Köln gGmbH, University of Applied Sciences [8]. To improve and keep functional such extensive and internationally successful cooperation, some crucial success factors must be fulfilled. To accomplish these, it is important to emphasize that especially functioning data interfaces based on learning management systems are as significant as the industry tailor-made education offers at schools and colleges. Furthermore, durable on-going education of the lecturers and improvement of suitable practical exercises and study course plans for schools and universities are important, and schools and universities needs support in that area, because of very short timing requirements for development of the courses [9]. One example of the XML regarding Serbian language file is presented in Fig. 1.

```
<presentation label="32.Da li kablovi mogu biti numerisani po izvoru i odredištu?">
- <flow>
- <material>
<mattext texttype="text/plain">32.Da li kablovi mogu biti numerisani
</material>
</material>
- <response_lid ident="MCSR" rcardinality="Single">
- <render_choice shuffle="No">
- <response_label ident="0">
- <material>
<mattext texttype="text/plain">Da. </mattext>
</material>
</response_label>
- <response_label ident="1">
- <material>
<mattext texttype="text/plain">Ne.</mattext>
</material>
</response_label>
</render_choice>
</response_lid>
</flow>
</presentation>
```

Fig. 1. Example of edited XML file used for data exchange in Serbian language

It means that in order to come along with the development of the new software versions, it is required that Rheinische

Fachhochschule Köln uninterruptedly develop examination questions, in all international languages, and not only in the English or German language that are used for national EPLAN Certified examinations. This huge and multidimensional task can be professionally solved, only if collaboration partners, Rheinische Fachhochschule and EPLAN Company agree to give simultaneous efforts and to develop strong interfaces for data-exchanges. Defining the list of examinations questions requires a data exchange that is described as an XML file. This allows also direct definitions of the questions type as e.g. multiple-choice questions with single or multiple answers, free text questions, java applet combined questions and answers. In this way, well-organized work is achievable and technical basis for effective progress of the whole certification program is attainable. Based on the ILIAS learning management systems, the online-examination portal for EPLAN Certified Student (ECS) exam is presented in Fig. 2:



Fig. 2. Online examination portal based on ILIAS Learning Management System

The log-in mask is available in different languages, depending on the language of examination. Based on it, theoretical online examination has been developed. Practical part of the test is, in the case of EPLAN Certified Student examination, done on-site, by our local licenced partners. One example of the exam question in Serbian language is presented in Fig. 3:

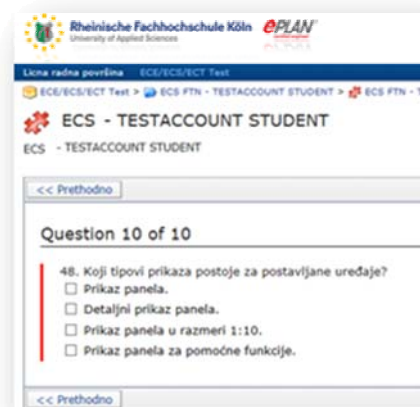


Fig. 3. Example of the exam question in Serbian language

IV. UP-TO-DATE KNOWLEDGE

As already mentioned, a prosperous education oriented to industrial needs requires organized teaching, which takes into consideration the latest industrial developments. This is particularly important in the case of software application. Thus Rheinische Fachhochschule Köln, University of Applied Sciences uses, at this time, the latest version of the EPLAN Electric P8 software, the version 2.5. Each new version is linked with the so called "news book" provided by EPLAN, which, depending of the versions, counts up to 500 pages. New versions of the software are frequently provided to the customer, approximately every 1 year. Therefore, these new functions connected with the latest version of the software, should also be introduced as topics of the lectures at the universities and schools in order to maintain the up-to-date knowledge of the graduates, which they can later exploit with the future employers. Some of new functions used in everyday educational practice are presented next.

A. Description of Function Templates

In parts management, since version 2.3, one can now insert relating texts for the template of a part. Benefit of this function is that the descriptions of templates can now help customers with the placement of complex devices, by knowing the number of device connection points. Based on the stored description text, it is possible to recognize in the navigators more easily which device function is hidden behind which template. For this determination, the Device selection (function templates) table on the Function templates tab was prolonged to include the Description column. The description can be uploaded as a multilingual input. A text entered in this column is not useful to the function during the selection of the part / the insertion of a device. For this, the explanation is displayed at the templates in the tree views of the navigators. In the tree view, the explanation is displayed in square brackets and is right behind the function definition. Fig. 4 shows the descriptions of the templates for an auxiliary contactor and its contacts in the device navigator [10, p.77].

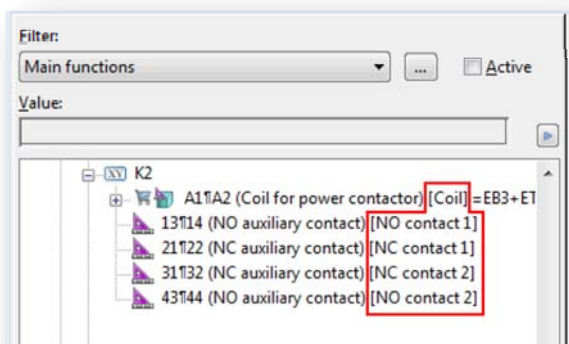


Fig. 4. Example of the description of function templates

B. SQL server database for the dictionary

EPLAN P8 offers possibilities to translate the projects in 17 different languages. So far, an Access database has continuously been used as the dictionary for translations on the EPLAN P8 platform. In the novel version, the dictionary can now also be placed on an SQL server database. In this way, customers can use the dictionary in the 64-bit version of the EPLAN P8 platform, even though the 32-bit versions of Microsoft Office applications (including Microsoft Access) are installed on the computers. Benefit for the customers is that the option of using SQL server databases for the dictionary allows for better applicability for users regarding the software frameworks installed. Storing in an SQL server database accelerates editing and the admission to this data, particularly in the case of huge amounts of data. SQL also provides consistent advantages in the "Administration" and "Multi-user operation" parts of P8 software. One can switch between an Access and SQL server database in the dictionary environment. In the particular dialogs, one can use two options: Access and SQL server. This is presented in Fig. 5.



Fig. 5. SQL server database for the dictionary

With the new version of the EPLAN P8 software, according to the needs of customers, for transferring the entries from an existing Access database to an SQL server database, the best way is first to export the data from the Access dictionary in the XML-ETD format, than to generate a new SQL server database, and then import the data into the new database.

This section of the paper has shown just a few new functionalities from a large pool of new functions that come with the new versions of the software. It is important, that also lecturers and teachers, who need to transfer the knowledge to the students and scholars, are trained to use the latest achievements and knowledge.

V. EPLAN CERTIFIED STUDENT (ECS)

Students and especially graduates need to have as much qualifications as possible, at the end of their studies. Every additional qualification increases the chances to get a better job. Which qualifications are required is determined by the industrial requirements. EPLAN Certified Student is in-between much known certification with German and European employers which provide student work places. Students which own such certificate own the knowledge necessary to determine errors in simple projects, to find them and to eliminate them in the most efficient way. Certification exam consist of practical and theoretical part with total duration of the 90 minutes. The final examination is carried

out by Rheinische Fachhochschule Köln (RFH), University of Applied Sciences, or through the worldwide Certificated Partners of RFH. All ECS participants finish the examination in a worldwide available on-line time constrained assessment (theory) as well as by accomplishing the practical part of the examination which take place on site according to predefined standards. All certification partners are provided with templates for exam and preparation, and with free of charge software. Benefits through EPLAN Certified Student (ECS) certification are various.



Fig. 6. EPLAN Certified Student logo picture

Some of the benefits students and scholars receive by taking part in the certification procedure are listed in the following:

- Students receive recognition from the employer for the skilled knowledge
- The curriculum vitae shows a issue, the recruiters are considering very positively
- Already during the study, students can more easily find adequate job or sideline

By wide acceptance of the EPLAN software in the industry, the points stated above represent, nowadays vital aspect of consideration for every graduate. An EPLAN Certified Student logo is shown in Fig. 6.

VI. CONCLUSION

This article gives an example of the development of higher education courses according to industrial requirements. The cooperation between RFH and EPLAN is a valuable realization example of best practical collaboration between the university and industrial companies in Germany. Such examples of the best practical collaboration in the area of

computer aided engineering applications are highly desired but also very rare in other segments of industry and academia due to a wide use of similar frameworks in developed and developing industrial countries. Possible reasons for this are to be found in the lack of the initiative to start such collaborations by companies and universities, then in slow and inert progress in developing up-to-date courses at universities, and at the end, in the shortage of the efficient working interfaces, either on procedural or at the executive side. In this work an example of functioning technical data-interface is presented in addition to examples of day by day examination tasks, based on the newest release of EPLAN P8 framework. Finally it can be argued, that in the case that industrial oriented education is desirable, universities should give recommendation for talented persons that agree to maintain the upkeep and further expansion work of the joint educational programs and industrial firms. Also, the companies involved in collaboration should make steps with respect to financial support of the universities as a part of their long-term marketing policy.

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