Examples of Best Practice of University-Industry Collaboration in the Domain of Electro-CAD Application by using EPLAN P8 and E-learning Systems

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Abstract - Requirements of the industry are reflected into the curricula of the universities oriented to application oriented sciences. Nevertheless, a coordination of the teaching contents to the industrial requirements often does not work efficiently enough because, on the one hand, the dynamism of the changes of the useful teaching contents becomes sluggish at the universities compared with the industry, on the other hand it often does not come to the desired long-term collaboration between universities and industrial companies. In this work different collaboration examples are presented. Also the state of the art of a successful collaboration and the further development of certification program between university and a next-door international enterprise in Cologne, Germany, in the domain of the Electro-CAD application are presented. Special look is given on the technical part of data exchange management. Some examples of such collaboration in the everyday practice at the Cologne University of Applied Sciences by use of the E-learning systems ILIAS and EPLAN Electric P8 software are presented.

I. INTRODUCTION

Who has influenced first whom, one theorist a practical person or vice versa, remains an unanswered philosophical question. However, one thing is sure, theory needs a useful - meant is for the industry useful - practice. This is nothing new; however, till these days this so called university-industry education often does not work in fact. There are many companies which have recognized these problems and out of it, have tailor-made education-oriented continuing education offers for educational institutions. Those especially in regard of different hardware and software solutions like companies as Festo [1], Christiani [2] or Lybold didactics [3] do that. Such systems are surely advantageous for special or university education, but they have a great disadvantage. It is, that without suitable training and permanent continuing education of students and above all of lecturers who have a task to transmit the knowledge to students, such systems becomes very fast outdated provided knowledge. Not out of dated but an up-to date education is asked, which is oriented to the developments of the industry. Consequently the questions arise, how such educational purpose can be reached, and above how this objective can be financed and technically developed in the long-term and which requirements have to be taken into consideration behind the sole readiness to collaborate?

II. BEST PRACTICE EXAMPLES OF UNIVERSITY-INDUSTRY COLLABORATIONS

A. Technical University in Berlin and Deutsche Telekom

There are many examples of collaboration between colleges or universities and industrial companies. One interesting example is collaboration between Technical University in Berlin and Deutsche Telekom in the area of innovations in ITC in form of so-called "Deutsche Telekom Laboratories" [4].

Figure 1. Deutsche Telekom Laboratories

Innovations in the sphere of information and communication change the world and are the base for a sustainable development within the national economy. They can be inspired by customers or by research, to solve problems basically better. To form promising innovations, is a job which must be solved by the science as well as by the enterprises. The connection of both worlds has chosen Deutsche Telekom as a beginning of their promising objective. Together with the Technical University in Berlin it has founded the Deutsche Telekom Laboratories on the campus of the Technical University in Berlin. The
mission is: to set up indicative research of innovative information technologies close to market and telecommunication technologies. Top researchers realize together with experts of Telekom they visions to the creation of the information technology and telecommunications from tomorrow. In Telekom Laboratories the know-how of Deutsche Telekom with the potentials by top researchers from all over the world is bundled up. Telekom Laboratories form the crystallisation point of state-of-the-art knowledge to disruptive, meant is revolutionary, technologies of the future.

B. Technical University and SAP

Another interesting example is the cooperation of the Technical University in Darmstadt and the company SAP, in the form of the so-called "SAP Research Centre" also called “SAP Living Lab" [5].

"SAP Research", the SAP own research department with the head office in small German town Walldorf and scientist of Technical University in Darmstadt co-operate successfully on several research fields since many years as for example "knowledge work in highly dynamic working surroundings", "interaction models for improved use friendliness" and "new methods for the software engineering". These areas are observed in their interlinking potentials and are from special strategical interest for SAP, because they have a strong influence on the use friendliness of the future products. Thus the intelligent software environments are developed for the business application which open varied or new services to the user. According to [6] "The cooperation is another example of the close collaboration between the Technical University in Darmstadt and an extremely innovative enterprise". The cooperation also encloses a common doctoral candidate’s program: Together with SAP scientists research will do each year up to 14 doctoral candidates in subjects like "creation of future working environments". In cooperation with more than 30 leading universities SAP Research investigates worldwide new technologies and examines this for their potential for innovative software solutions or commercial models. With it the pioneering role SAP should become protected by applied technology research and be further developed. Besides, the new location the SAP Research strategy underlines the collaborative research with the aim to strength the European IT-research scene which should be opened even further for new partners. In common projects with customers, technology partners and universities the bases for future commercial uses and their infrastructures are investigated and developed. Besides, German SAP Research pursues two other partners in Brisbane (Australia) and Pretoria (South Africa), in addition also three SAP Research Centers in Palo Alto (USA), Montréal (Canada) and Sophia Antipoli (France).

C. University of Heidelberg and Nikon LLC

Also is to be mentioned the collaboration between University of Heidelberg with the company Nikon LLC in the form of so-called "Nikon Imaging Center (NIC)".

Nikon Imaging centre is a light-microscopic equipment of the university at BioQuant, the Center for “Quantitative Analysis of Molecular and Cellular Biosystems” [12] in cooperation with the Nikon LLC, Nikon Instruments Europe B.V. as well as other internationally operating enterprises. The life sciences and the medicine of the university receive with the NIC access the newest microscopic procedures and instruments [7].

D. University in Passau and Siemens AG

There are not so many examples in the area of the CAD / CAE cooperation between universities and industrial partners. Nevertheless the cooperation between Siemens AG and University in Passau is to be mentioned as one example. Thus company Siemens supports new seminar offer with CAD software.
Students of the informatics courses as well as mobile and embedded systems courses can visit since winter semester in 2013/14 for the first time a seminar to the subject CAD and learn to work with the professional CAD software NX. Cooperation with Siemens makes this offer possibly [8].

E. Rheinische Fachhochschule Köln and EPLAN Software and Services GmbH & Co.KG

Another successful example in the area of CAD/CAE about which already 5 years ago has been reported at the MIPRO conference and which is still successfully functioning, is cooperation between EPLAN Software and Services GmbH & Co.KG and Rheinische Fachhochschule Köln – University of Applied Sciences [9]. To develop and keep functional such wide and successful cooperation, are different success factors determinative. Among the rest, these factors are: functioning data interfaces (in this case based on E-Learning system ILIAS) to the industry tailor-made education offers at schools and colleges, permanent continuing education of the lecturers and development of suitable practice exercises and study course plans for schools and universities [10]. It means, in order to come along with the development of the new versions of the software, it is necessary to continuously develop examination questions, either in English language for international certifications and also in German language for national ECS examinations. Export function of the data exchange file is presented in following figure.

Figure 5. Interface for creation of XML data exchange file

This enormous and complex task can only be efficiently solved, if collaboration partners, Rheinische Fachhochschule and EPLAN Company agree to work simulations and to develop clear interfaces for data exchanges. In the case of definitions of the examinations questions, for data exchange is XML file defined. One example of the XML file is presented in following.

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Figure 6. Example of edited XML file used for data exchange

This file allows definitions of the questions type as e.g. multiple choice with single or multiple answers, free text questions, java applet combined questions and answers. On this way, efficient work is possible and technical fundament for well-organized development of the whole program is achievable. The online-examination portal for EPLAN Certified Student (ECS) exam is presented in following:

Figure 7. Online examination portal based on ILIAS Learning Management System

III. UNIVERSITY-INDUSTRY COLLABORATIONS IN DER AREA OF CAD/CAE

A. Eplan Certified Student – Examples based on platform 2.4

As already mentioned, a successful education oriented to industry at colleges requires a structured and planning oriented education, which takes into consideration the newest technical developments. Thus Rheinische Fachhochschule Köln – University of Applied Sciences uses currently the newest version of the software EPLAN Electric P8, not only to provide the basis knowledge on the new platform, but also new functions from the version 2.4. In the following some of the new functions used in everyday educational practice are presented. So, for
example, the simplistic representation of the PLC structures with one-pole functions under 2.4 makes the documentation and management more clearly and with it much easier. Also the management of the, so called “part projects”, increases the overview of the whole project. From the project, relevant parts can be extracted, worked on individually and bring together again later in the whole project. With it an entire and highly qualitative documentation is generated and users can better concentrate upon his/her area of responsibility. The platform EPLAN supports numerous norms as for example the IEC 81346; now the marking of project sides according to IEC 61355 is possible. With this kind of the marking an object characteristic is used for the definition of the project structure. Besides, with the object sign a document, it means a project sides, is assigned to certain object (function, place or product). This marking can be also used in connection with an interface to PLM/PDM or ERP systems. Now also other devices like converter, engines or valves with bus connections can be a component of a PLC bus system. Devices with several, different bus systems are better supported with it. Also additional PLC manufacturers were taken up for the bidirectional data exchange - for example ABB., Mitsubishi Electric and 3S. [11]

B. Example 1 – Device oriented projecting

The present example concerns so-called device oriented projecting of the motor protection switch contacts -QA7 to- QA10. This means that the so called normally open contacts (NOC) are not to be placed out of symbol library, but there are dependent on company product (article) observable in the device navigator. This functionality becomes clearer to understand if live presented.

C. Example 2 – Enlarged data exchange with Siemens SIMATIC STEP 7

For the new EPLAN version 2.4. the PLC interface was extended for the data exchange between EPLAN Electric P8 and the configuration PLC software ” Siemens SIMATIC STEP 7“. Now for PLC cards different start addresses and addressing ranges can be defined. For this purpose both following properties are available in the PLC boxes in the switch plan:

1. Addressing range 2 (ID 20299)
2. Start address 2 of the PLC card (ID 20255)

![New possibilities for definition of start addresses and addressing ranges for PLCs](image)

Figure 9. New possibilities for definition of start addresses and addressing ranges for PLCs

With it the addressing range 2 and start address 2 of the SPS map are evaluated. The control box “Separate addressing area for inputs and outputs” must be deactivated. In that case for the PLC cards which have inputs as well as outputs with the help of the property “Addressing range 2” one can fix a separate addressing range for the outputs. Every PLC connection must have an unequivocal name, i.e. if the address "A001.0" exists, the address "E001.0" cannot be awarded any more. With the new function a common addressing range is used for PLC in and outputs. In this case the addresses are distinguished, in addition, by the prefix, i.e. within a PLC addresses with the same byte and bit address may seem, e.g., "A001.0" and "E001.0".

IV. Conclusion

Paper gives examples and an overview of best practices collaboration between the university and industrial companies in Germany. Examples of the best practice collaboration in the area of CAD/CAE applications are comparatively seldom in regard of wide use of the CAD/CAE software in developed industrial countries. On the one side the reasons are to be find in the undeveloped trials to start such collaborations, on the other side, long-term collaborations between industrial companies and universities are threatened by slow and inertially development up to date course at universities and the lack of efficient working interfaces, either
technical but also managerial. In this paper an example of functioning technical data exchange is presented as well as examples of day by day examination tasks based on the newest release of EPLAN P8 software. Also one important reason of failure of such collaborations is lack of access to the newest industrial development by universities, and on the other side, lack of financial support to update the equipment and software at universities in order to come along with the industrial development. Industrial companies on the other side, search for same working attitudes which are not always given at universities, because of the different nature of the work. Therefore, industrial companies must make concessions in regard of financial support of universities as a part of their long-term marketing strategy as well as possible acceptance of the different working attitudes, on the other side, universities must offer potential parsons which are able and compliant to sustainable work on the maintenance and further development of the joint educational programs between the mentioned parties.

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