THE KNOWLEDGE ADAPTABILITY OF PRODUCT LIFECYCLE MANAGEMENT IN VIRTUAL FACTORY

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Abstract: It is well known in all the world that between industrial companies has been a strong competition in order to ensure market success.

In the actual economic situation, companies have realized that the way they are implemented innovative processes and technologies influence the response time to market requirements.

Consumer claims have increased, requiring companies which want to develop, to be engaged in more extensive search processes for finding out innovative - constructive solutions, technologies, strategies and techniques for product development, documentation management optimization, so that products be of quality, have a short development cycle and as low as possible production costs.

The main challenges encountered in product development consist of reducing development time and the time to market of products, which depend on the ability of firms to turn in as soon as an idea into finished product, fast adaptation to customer needs by modifying existing solutions, product documentation management.

1. INTRODUCTION

Under current conditions it was imposed an integrated approach to constructive aspects, technological, organizational and management development stages of the products due to the interdependence of these products by the economic factor, in order to ensure market success.

This method allows a fast and efficient communication and a collaborative concept of the product, by a parallel connection of specialists in different development sectors and management of product life cycle (PLM).

The concept of PLM integrates people, data, processes, combines solutions which optimize the entire product life cycle starting by the design phase, manufacturing, until leaving the household.

This concept should be reflected in the training of future engineers so that they might understand and can apply these knowledge in practice, in order to support the transformation of ideas into successful products, increase competitive advantages for companies, making smart decisions, increasing the business rate of the companies that will be part.

The business success of a firm often requires, in addition of developing new products and manufacturing technologies also a complex reorganization, that must be sustained by innovative instruments to the human resources, logistics, services accompanying the product even after selling it.

One way that can be used to reorganize a business in order to improve its efficiency is a virtual enterprise, which represents collaboration between different departments which contribute to the achievement of certain activities to obtain a particular product.

Virtual enterprise appeared and has developed by the evolution of information technology, that created software applications with opportunities to virtualize objects (CAD applications), manufacturing processes (CAM) resistance analysis (FEM) motion analysis, robots programming, manufacturing programming, data management, etc.

Departments within virtual enterprise, each with well-defined role and activities (design, analysis and simulation, manufacturing, management, etc..) can access and share in between virtualized information on the product that must be realised.

Using digital information assumes a PDM computerized system for data synchronization and managing the flow of information between different departments of the company, the aim being to integrate CAD, CAE, FEM, ERP applications.

2 STUDIES OF FIRMS NECESSITIES

In order to find out the necessities of industrial companies from Romania, in January 2010 was done a study to determine how graduates of technical faculties have been integrated in the labor market and to determine the profile of the ideal graduate as well.

The study was based on a questionnaire that was distributed to companies, which had the target to identify the criteria used by companies from industry to select their employees, knowledge that would have graduate, major deficiencies in preparing graduates from the point of view of the companies in the industry.

Regarding future employee selection criteria, most companies considered that graduate education and the obtained grade at faculty are the most important (Fig.1).

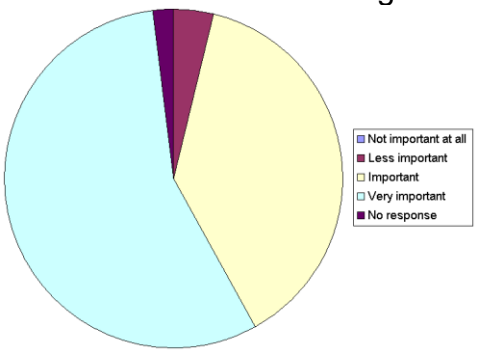

Fig.1. Education

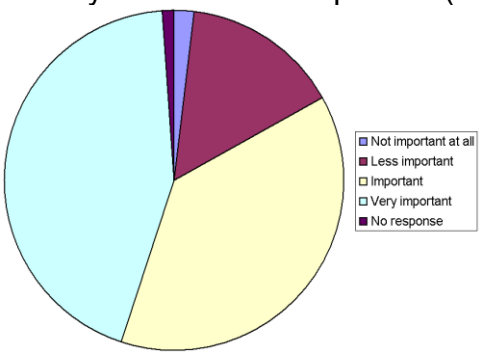

Fig. 2 Practical experience.

The majority of companies surveyed considered as very important practical experience of future employee, in this way being able to give a good yield in a short time after engagement (Fig.2).

In terms of skills and competencies that need to have a future employee, most companies focus on solid technical knowledge, design, analysis and simulation on computer being considered the most important (Fig.3), while the degree of satisfaction is low (Fig.4)

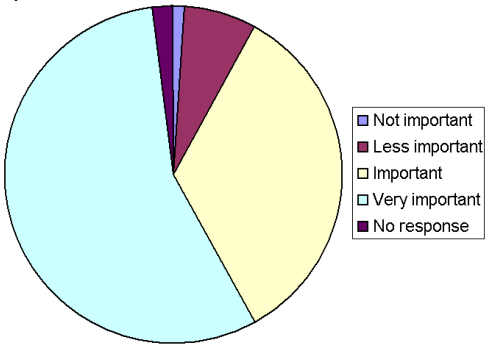

Fig.3 Needed within the companies

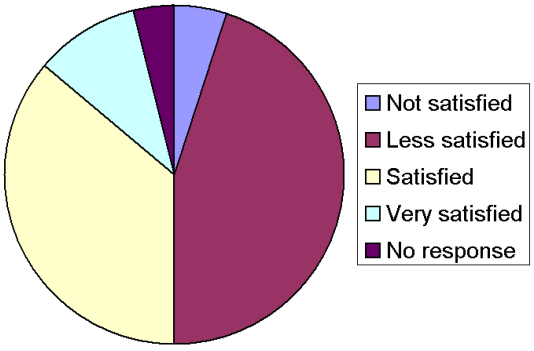

Fig.4 Satisfaction within the companies.

Two-thirds of the surveyed companies consider knowledge of technological processes and skills to achieve digital manufacturing as important, while only a small fraction are satisfied about the knowledge and skills of students.

The study shows that 74% of companies believe as essential the knowledge on integration the development steps, while only 24% said they were satisfied with the knowledge and skills of the students.

Conclusions of the study

The study showed that there are some differences between what companies expect and the actual training of future graduates, which can be attributed to the fact that

companies were forced to adopt new technology to withstand the market, while universities have not always had access to financial resources in order to keep up with the companies.

Firms expectations regarding theoretical and practical basic knowledge of future graduate cover both practical experience and theoretical aspects.

The perfect candidate:

- has good general technical knowledge and a developed technical common sense.
- knows to use computer
- has knowledge about design, simulation, analysis, digital manufacturing, integration stages of product development, about working in a virtual enterprise and the management of technical documentation of products and processes.

3. PLM ADAPTOR – THE VIRTUAL FACTORY

Starting from the premise that on long-term, companies need well-trained graduates, PLM Adaptor project supports human resource development with an investment of 2.4 million Euro co-financed by the European Social Fund through the Sectorial Operational Programme Human Resources Development 2007-2013. The project was implemented by the firm ADA Computers from Bucharest together with seven technical universities located in different regions of Romania and has had a development period of 31 months.

The main objective of the project was to prepare students in the development of products and processes in the virtual enterprise using PLM knowledge ("Product Lifecycle Management") in order to increase the adaptability to the labor market of a number of 700 students from partner universities by adapting the knowledge to the needs of business field.

Another objective of the project was to promote partnerships between educational units and industrial companies in order to match students' knowledge with employers' requirements.

To eliminate bureaucratic barriers and to provide equal opportunities to everyone, students were able to register online. After selection, taking into account the Recruitment Guide, students were notified by e-mail and sms about the admission results.

Within the virtual enterprise, were conducted courses according to four modules, covering the product life cycle stages.

Module 1 - Concept and design of products using CAD software application, when, based on the main technical parameters was approached the detailed design and complete product shape.

Module 2 - Simulation and analysis using virtual prototype aims to analyze previously the virtual product in terms of its behavior in real working conditions (movements, stresses, displacements, vibrations) using software called CAE (Computer Aided Engineering).

Module 3 - Virtual manufacturing products performs the programming CNC machine tools, in the meantime being optimized the available production resources, by using CAM (Computer Aided Machining) solutions.

Module 4 - Integrating the development stages, collaboration in the virtual enterprise and the management of technical documentation for the products, which highlighted the efficiency of the collaborative work, project management, implementation of quality standards, knowledge reuse by addressing the first three modules as an integrated whole, using type PDM (Product Data Management) software solutions.

Within the free courses students were able to simulate in the virtual enterprise the concepts of digital development products and processes by using high performance software applications.

In addition, students received at each module free printed and electronic textbooks and exercise files.

Upon completion of each module, students received diplomas, on the basis of acquired skills assessment tests.

On the site of the project was created an information platform and event presentation of the project and also a forum through which students from the target group could get in touch with their colleagues from other universities.

Besides the four course modules, in the project were held two activities "Job Fair" in each partner university and a competition with consistent prizes.

The events "Job Fair" were dedicated exclusively to students who attented at least one module of the PLM Adaptor project and had as main purpose to establish a connection between the academic field, the labor market and the business field.

On the platform of the project were posted information about participating companies from all the academic centers and was created a career counseling section with useful information for successful professional development and career debut engineer, as career counseling brochure, the wording of CV, template for European CV, submission to interview with employers.

Another activity within the project was a competition in which students had to solve real issues in the industry.

The awards were substantial and consisted of laptops and professional cameras

Enrolled students presented their achievements and competitors tie was made by a joint commission consisting of teachers who conducted classes, managers, representatives of industry and representative of the project coordinator.

4. PROJECT REQUIREMENTS

By its activities, the project had to meet several indicators of which the most important are:

- Number of people assisted in the transition from school to work
- Number of partnerships between schools, universities, businesses and other institutions concluded to support the transition from school to work
- The percentage of persons assisted in the transition from school to work, who have found a stable job

In terms of achievements at the University of Oradea all indicators mentioned were overcome.

In the project was specified as the required number of people assisted in the transition from school to work to be 90, at the end of project the implementation rate exceeded by 54.5% the value indicated in the project. (Fig.5)

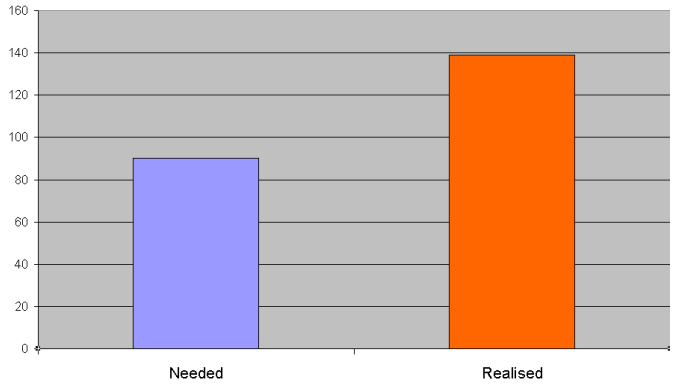

Fig.5 Number of people assisted in the transition from school to work.

Situation of students' repartition on the modules of study within the virtual enterprise is presented in fig. 6

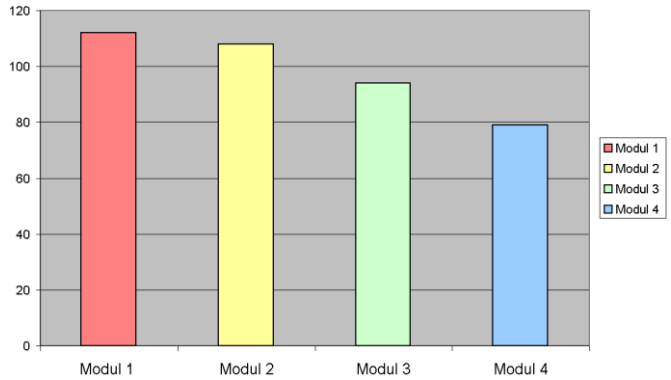

Fig.6 Situation of division students on study modules.

In the „Job Fair" events were concluded partnership agreements between the University of Oradea and companies specialized in industrial engineering from the county, the realised number of partnership agreements to support the transition from school to work in the project exceeded by 100% the estimated number.

After the „Job Fair" events part of participating students were able to find a job in firms that have partnership agreements, such as the share of persons assisted in the transition from school to work, they found stable employment exceeded by 39.6% the value in the project (Fig.7)

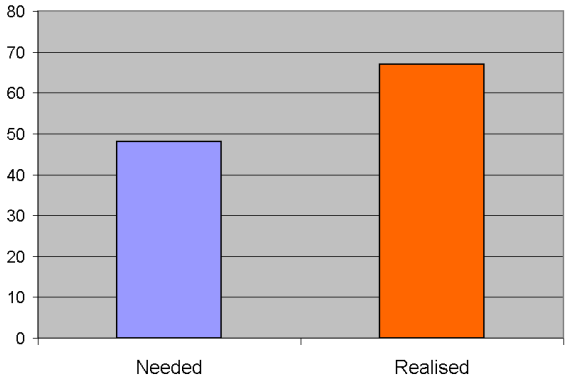

Fig. 7 Number of people assisted in the transition from school to work, who have found a stable job.

5. CONCLUSIONS

It was done a study in Romanian companies which highlights the needed knowledge for a graduate when he intends to employ, the recruitment criteria used by firms to employment, being outlined the ideal employee profile.

The structure of the training modules was built based on survey responses from companies within the study in the beginning of the project.

In the virtual enterprise students had the opportunity to become familiar with all product life cycle processes, had the opportunity to acquire and develop complex concepts to simulate digital products and processes and free to prepare at high standards asked by industry.

The events "Job Fair" provided to students an open dialogue with representatives of private business.

Knowledge and information in the course of the project can be exploited by including in the curricula and from the point of view of relationships with private business, these will be continued and developed and will be done new partnership agreements with other companies, so that students from IMT faculty to have where to do training stages, study visits, to conduct practice or to choose topics for diploma, and finally to be able to engage.

During its work, the project has recorded a high level of responsiveness both from the students, teachers and the representatives of private business.

The main objective of the project: to increase employment skills of the students in partner universities in the situation of transition from university to working life, by adapting to the needs of business knowledge, was achieved.

6. References

[1] www.plmadaptor.ro/