

## NEW DEVELOPMENTS IN FONTYS IPD-PROJECTS

Ir. Dick van Schenk Brill, Ir. Krijn Kater

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### 1 Introduction

Since 1995 IPD-projects have been carried out at the Fontys University of Higher Education. IPD stands for Integrated Product Development. In general the structure of those projects does not differ so much from traditional educational projects. However in this case projects are involved in which the goals are (partly) supplied by companies. Also the projects are carried out by students from different departments giving a first rise to problems of scheduling and communication. Nowadays students can better cope with those problems as in most of the departments working in projects already starts in an early stage. An example of how the E&E department improves project working by defining different project roles for every student is given in a separate paper (Bakker *et al*, 2004), which will be presented at the IPD Workshop 2004 in Magdeburg as well. In general an IPD-project is as follows: a group of six to eight students, preferably from different departments, gets an assignment from an (industrial) company. The assignment often consists of an investigation for a new product, including a market survey or the development of a prototype. It has to be carried out within one semester. This could be any semester, but given the complexity of most problems and the necessary theoretical background we prefer to choose the 7<sup>th</sup> semester for this. Also there is the advantage that a project like this is a good preparation for the student's graduation project which takes place in the 8<sup>th</sup> semester. There is a limited amount of time available, as during this semester also other educational activities take place. In 1998 the concept of our local Integrated Product Development projects was already presented by our colleague Peter van Kollenburg on the TMCE conference in Manchester (Kollenburg *et al*, 1998). There it was decided to start international IPD-projects with the Otto-von-Guericke University and the University of Lehigh. The Dutch students have been working together with groups from those universities and with students from Finland (Oulu Institute of Technology). In the autumn of 2003 groups also collaborated with students from the UK (University of Bath) and from Hungary (Budapest Technical University). Tools have been developed and evaluated to improve the communication of those dislocated groups (Kollenburg *et al*, 2000). At the end of each semester all groups present their results in an official symposium for an audience of fellow students, tutors, company representatives and other interested partners.

As from 1998 our IPD-projects have evolved rapidly: as stated before international partners became involved but simultaneously we started to carry out more real projects for real companies. Both actions were not always successful. Some of the problems with international projects (also called IPD-CE, CE for Collaborative Engineering) appeared to be: differences in educational schedules, lack of common goals, lack of integrated assessments,

and poor mutual communication. Problems in working with companies are related to the differences in project goals (commercial goals for the company versus our educational goals). In order to be able to give full support to the projects and conclude them with a nice, formal symposium financial funds are needed. Therefore companies were asked for additional sponsoring, which introduced new problems. How we dealt with these problems will be explained in this paper.

Other ways of co-operating with different partners in the IPD-projects is also considered. A recent development is to create combinations with students from secondary technical education that already work in practice. First experiments have started in February 2004. We will give the first results and further plans on these combinations.

Before the new developments are explained the results of a survey of Fontys IPD-projects since 1999 is shown in order to discover some trends and to give a base for the problems mentioned above. The paper will be concluded with our vision on future developments.

## 2 Survey of projects since 1999

After a period of preparation the first international projects started in autumn 1999. There was a suitable assignment from Philips on which we created two projects. In one project we worked together with Lehigh, in the other with both Lehigh and Magdeburg. This resulted in a number of communicational problems, which are described in (Kollenburg *et al*, 2000). Main problems can be summarized as time differences, cultural differences (how to understand each others perception on project work and the technical development) and different working locations. All three problems were less important between the Dutch and the German groups. In that case there were no time differences and although English was used as the communication language (a foreign language for both groups) the mutual understanding appeared to be better. Of course the groups had to work on different locations and communicate in the same way as with the US-group (e-mail, Internet, telephone) but the distance allowed mutual visits (restricted to the presentations).

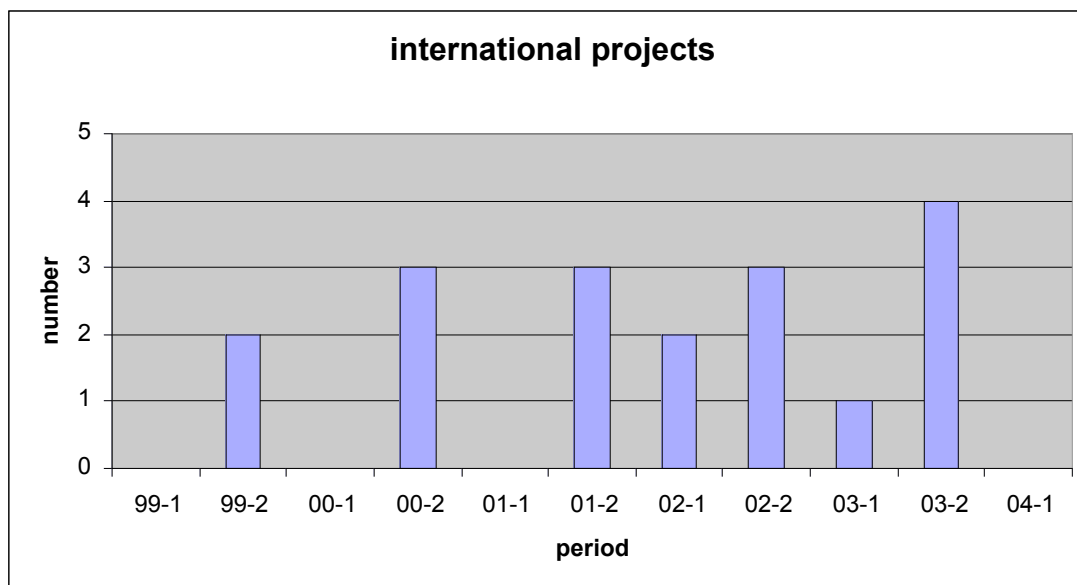


Figure 1. Overview of IPD-CE projects since 1999

An overview of the international IPD-projects from 1999 to 2004 is depicted in Figure 1. First thing that draws the attention is the fact that in the earlier periods no international projects have been carried out in the spring semesters. A reason for that is, that our number of IPD-projects in spring is traditionally lower than in autumn. Education starts in autumn and as the IPD-projects are scheduled in the 7<sup>th</sup> semester there is a lower number of students available for that in autumn. For some reasons the situation in most of the collaborating international institutes seems to be the same. The students that participate in spring have either a delay of half a year in their studies or could (e.g. because of elsewhere obtained experiences) skip one semester. However; since spring 2003 some departments allowed their students from the 6<sup>th</sup> semester already to participate in the IPD-projects. For those reasons the figure is best analysed by only looking to the autumn semesters. Then it appears that the number of international projects has doubled since 1999.

In autumn 2000 the OIT (Oulu Institute of Technology) joined the IPD-projects with one group of students (mechanical engineering), two groups in 2001 and again one small group in the fall of 2002. Besides the usual communication problems the main problem in this co-operation was the fact that the Finnish student got considerably less time for the participation in the projects than the Dutch. At the time we had two Finnish projects there were no possibilities of participation from Lehigh.

In the spring of 2002 a polytechnic in another part of the Netherlands (Hogeschool Zeeland) joined us in a competition project in which intelligent maze robots were created. In this polytechnic students from polytechnics in Lyon (France) and Mosbach (Germany) followed a year of studies. They were assigned to the projects, so in that way we had our first international projects in spring!

During the IPD2002 Workshop in Magdeburg there were discussions on co-operation with the UK. This resulted in an interesting construction in spring 2003. Two of our students did their internship then at the University of Bath. They intermediated between one of our groups and students of this University. This experiment was carried out only once.

In autumn 2003 new contacts from IPD workshops resulted in co-operation with the University of Mexico and the University of Budapest (Hungary). So, as we still had the co-operation with Magdeburg and Lehigh there were even four international projects now. Mexico participated in two projects, one together with Lehigh. It appeared that the Mexicans were very good designers but again the communication was a major problem. In the co-operation with Budapest it was very difficult to conclude to a project suitable to join. Finally it was decided to contribute to an intelligent robot project. Because of the late start it did not come to a real working-together situation. The Hungarian students delivered quite a number of interesting design drawings for a better look of the robots, but as we did not have any production or prototyping facilities then, it stayed with that.

Concluding on international co-operation it can be stated that projects can be successful if both parties have comparable schedules and cultures, no major time differences, possibilities to discuss problems while seeing each other etc. If there is a lack of those facilities strict protocols should be made to ease working and then discipline becomes a major issue. Most of all willingness to co-operate and motivation can overcome a lot of problems.

Projects together with industry have been carried out already for a longer period. An overview of the number of projects, in which industry was involved (most of the time as a financing principal) is given in Figure 2.

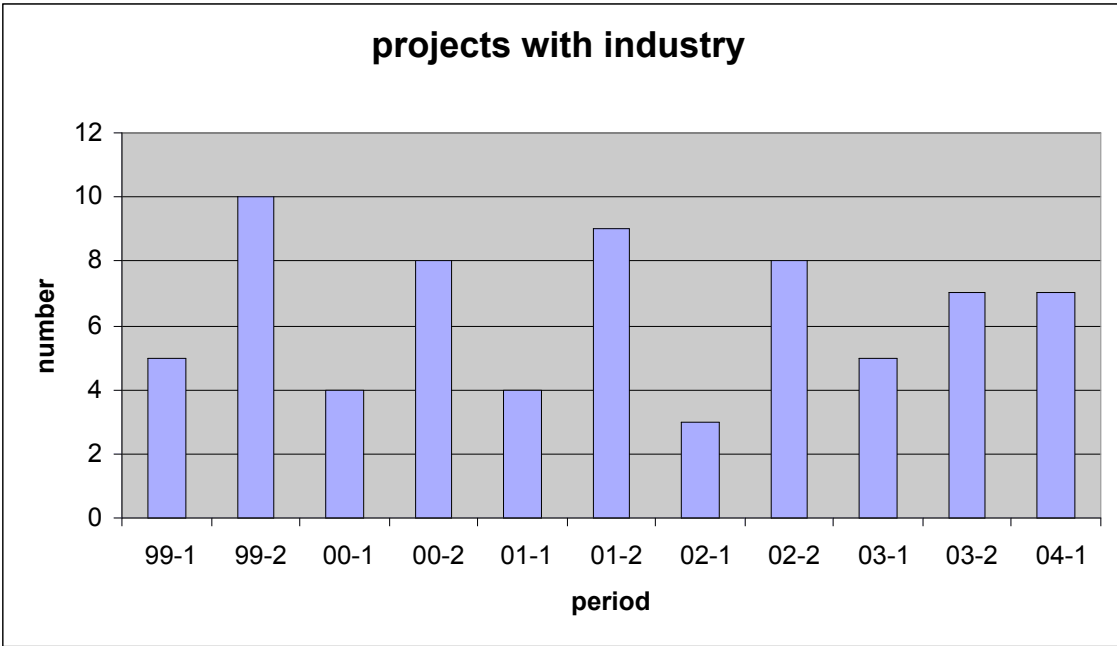


Figure 2. Overview of number of projects with industry.

In Figure 2 the same trend concerning the difference in autumn and spring semester as in Figure 1 can be seen. As the reasons of a company for co-operation in IPD-projects is assumed not to be dependent of the semester a better view can be obtained when the number of industrial projects is given as a percentage of the total number of projects. This is depicted in Figure 3.

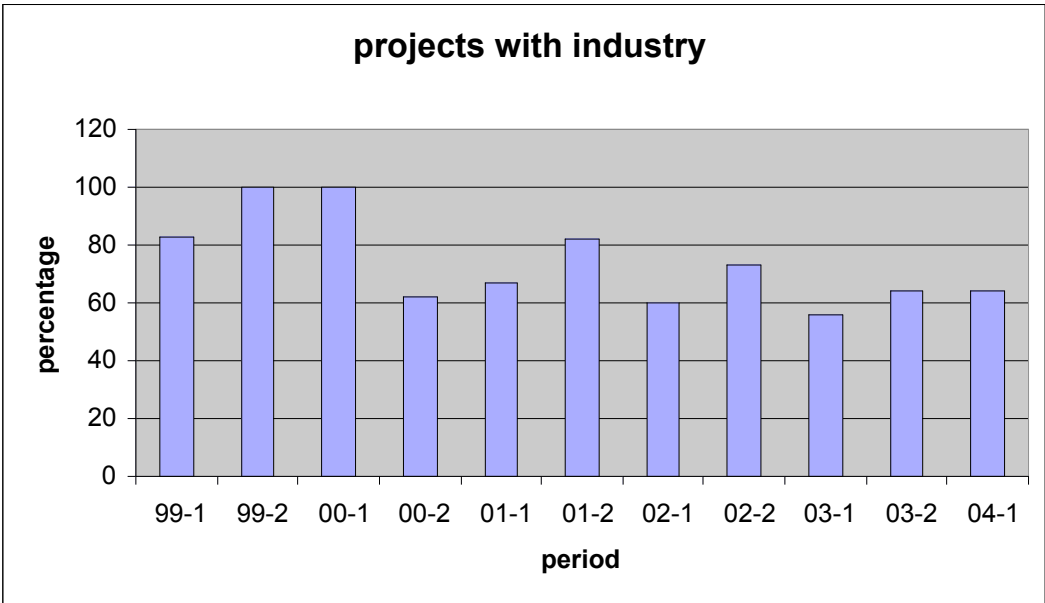


Figure 3. Overview of percentage of projects with industry.

In the late nineties and at the beginning of the new millennium practically all projects were carried out for industry. Since the second half of 2000 this decreased to around sixty percent. As no essential changes were made then the most logic explanation for this decrease is the general recession in technical companies. Around 1997 the projects with industry could start thanks to a stimulation project funded by the Eindhoven Chamber of Commerce; details can be found in (Bakker *et al*, 1999). This made it attractive for companies (especially SME's) to have their (additional) projects carried out by knowledge institutes. When the subsidies stopped a reasonable financial compensation was asked from the companies. In the beginning this was no problem, but from the year 2000 acquisition became more difficult and companies became more critical on the results. Even some projects failed because companies withdrew themselves during the project. To compensate a lack of industrial projects we made it a general rule that some projects should be available at our own institute. But as we all agreed that working in a real project for a real company is far more challenging for students and gives a better preparation for their future jobs, additional ways of funding have been investigated.

This was found in an education renewal subsidy from the Dutch Ministry of Education, described in (van Schenk Brill *et al*, 2001). Also thanks to this fund better structures for the projects could be developed. With some companies (e.g. Philips Electronics and Océ Technology) we tried to create longer lasting relationships. This could allow us to carry out projects with social relevance with no charge, which seemed to be acceptable for paying companies. Nevertheless acquiring each half year enough funded projects to fulfil the need gives a lot of additional work for the lecturers and stays an insecure fact when e.g. the economical situation changes. Since the beginning of this year a new subsidy was found; the Ministry of Economic Affairs, together with the intermediating organisation "Senter" started the so-called Know-how sharing project. In this project, knowledge institutes of different levels (e.g. Universities and Polytechnics) should help SME's that have no research facilities to innovate products. As the goal of the project is to improve "innovation power" of small companies, the knowledge institutes can be paid by the funding that companies receive for their co-operation.

Another way of looking to the IPD-projects of the last five years is to consider the subjects. In this period we had 82 projects with quite varying subjects. Anyway almost all projects (80) had technical aspects. In 20 projects the developments had something to do with Internet or in the earlier stages sometimes other means of remote control or remote monitoring. Fourteen projects were intended to improve the environment. In twelve projects medical applications were involved. In seven projects industrial design played an important role and finally four projects had an agricultural background. In the fall of the year 1999 there was a peak in environmental projects, after that in each semester one or two projects were in this field. This means that we will certainly maintain the knowledge gathered in those projects and try to do more projects in this field. In the medical oriented projects we see a slight increase in the last few years. In this category we did not really count the projects which e.g. were intended to improve quality of living of elderly people. In this broad sense we should certainly concentrate on this item. The involvement of Internet is rather constant over a longer period, although it shifted a little from remote applications, not necessarily using Internet to Internet it self. As knowledge about Internet is a regular subject for Information Technology students, who always participate in the projects, this item will certainly not be neglected. In this category we did not count the involvement of Internet as a means of communication between project groups, but only the projects where the use of Internet was part of the application. It

seems that industrial design aspects became more important in the past semesters. Therefore we will carefully watch the developments in this field.

### 3 Know-how sharing project

In the beginning of this year there was the start of a new project, funded by the Ministry of Economic Affairs, together with the intermediating organisation "Senter". This project, called Know-how sharing, aims to improve "innovation power" of small companies. In this project, knowledge institutes of different levels (e.g. universities and polytechnics) should help SME's that have no research facilities to innovate products and can be paid by the subsidies that companies receive for their co-operation. The preparation phase of this project started in February 2004; combined projects (institutes and SME's) should start in September this year. As we already had the infrastructure to co-operate with different institutes and industry and also had good contacts with the "ROC" (is a regional educational centre, a Dutch institute for secondary technical education) in Eindhoven we decided to help the preparation phase by already starting two pilot projects. In both projects two ROC-students (mechanical engineering) did their internship in a co-operating SME. They participated in and intermediated for a group of Fontys IPD students. One project was intended to automate the operation of a perforator machine, in the other a tool was developed for precise assembling of a Stirling engine. In both cases the mechanical knowledge was extended to physics, electronics and software by Fontys students from the department of Applied Physics. The positive results of both projects were presented by the students at our bi-annual IPD symposium. All parties were very satisfied with the results and the way this was achieved. So in September we will continue with ten IPD-projects in the framework of know-how sharing. We now carried out two pilots and we will certainly use the lessons learned from that.

### 4 Conclusion

International oriented IPD-projects can be successful if all parties have comparable educational and time schedules as well as comparable cultures, no major time differences, possibilities to discuss problems while seeing each other etc. If there is a lack of those facilities strict protocols should be made to ease working and then discipline becomes a major issue. State of the art communication tools should be used to ease mutual understanding. Most of all willingness to co-operate and motivation can overcome a lot of problems.

Projects with industry are very valuable for all parties, but the funding is an on-going problem. Governmental subsidies (e.g. to improve the educational system or to improve innovation of regional industries) form a more solid base for projects with industry than paid projects. The recently started know-how sharing projects seem to be a challenging way to co-operate with other institutes and industry.

The region of Eindhoven is strong technically oriented, which can be seen in the subjects of IPD-projects. Main issue will stay technical solution for problems, but other issues may not be neglected. Important applications of technology can be found in environmental and medical engineering. We will keep our focus on those fields. Internet technology and applications will play a continuous role in our projects.

Finally it was noticed that in the spring semesters there is a lack of international groups. We hope to find new partners and/or extend our relations with existing partners to compensate this at the IPD 2004 workshop!

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Dick van Schenk Brill,

Fontys University of Professional Education

E&E Department, IPD

Postbus 347

5600 AH Eindhoven

The Netherlands

Phone: +31-877-870927

E-mail: [D.vanSchenkBrill@fontys.nl](mailto:D.vanSchenkBrill@fontys.nl)

Krijn Kater

Fontys University of Professional Education

IT Department, IPD

Postbus 347

5600 AH Eindhoven

The Netherlands

Phone: +31-877-871213

E-mail: [K.Kater@fontys.nl](mailto:K.Kater@fontys.nl)