

Work Placements and the Final Year Project: A Joint Experience in the Industrial Engineering Degree*

MARIA DOLORES BOVEA and ANTONIO GALLARDO

Department of Mechanical Engineering and Construction, Universitat Jaume I, Av. Sos Baynat s/n, E-12071 Castellón, Spain. E-mail: bovea@emc.uji.es

Since the academic year 1998/1999, industrial engineering students at the Universitat Jaume I in Castellón (Spain) have been encouraged to do their final year project as part of a work placement. This paper presents the findings from this experience. Once students have successfully completed more than 90% of the credits in core and compulsory subjects in their programme of studies, they then have a work placement in a public or private company in the industrial sector in the province of Castellón. During this period they receive the support and guidance of a supervisor in the company and a tutor at the University, both of whom are thoroughly familiar with the topic being dealt with in the placement. Students' final year projects are derived from the work they carried out during their stay at the company. Both students and members of the teaching staff rate this experience as being extremely positive, as can be seen from the results of the evaluation surveys.

Keywords: final year project; work placement; industrial engineering

INTRODUCTION

OVER the last few years there has been a tendency to include work placements (WP) in the programmes of study of many university degree and diploma courses, either as a compulsory or optional subject [1–4]. By WP, we are referring to the periods when students perform some kind of work in a real professional setting (which may be either a public or private company). The main objective of doing this is to provide the opportunity for students to put into practice all the theoretical concepts they have learnt during their studies at university, at the same time enabling them to become more familiar with the labour market before they actually enter it.

Generally speaking, students view this work placement favourably, as it makes a change from the routine of theoretical classes and laboratory practical sessions, they acquire new practical knowledge that they could not easily obtain in the classroom, and they come into contact with business in nearby areas, which helps them to plan their future careers. At the same time as students are gaining benefits from the work placement, the companies involved can also benefit a great deal from the experience, as they can use it as a test for selecting staff, giving them access to labour that is far cheaper than the standard market rate, because the students very often work without remuneration.

This paper reports on the project begun in the academic year 1998/1999 that involves the fusion

of this period of practical training with the final year project (FYP) in the Industrial Engineering degree course at the Universitat Jaume I in Castellón (Spain). Both students and companies clearly benefit from this experience [5–6]. Students do not have to carry out routine, repetitive tasks, and the company always gains some kind of productivity. This is because the technical quality of the duties carried out by the students is ensured, as they are assessed by lecturers from the university and the quality of their work is a factor that plays an essential role in whether or not they obtain their degree in Industrial Engineering. Moreover, coordinating the WP with the FYP allows students to produce high quality academic work with a high practical content that is adapted to the needs of the industrial sector in Castellón (because the work is based on real problems that arise in the business).

DESCRIPTION OF WP AND FYP

According to the programme of study for the degree in Industrial Engineering at the Universitat Jaume I, in order to graduate as an industrial engineer, students must undertake a final year project. Given the specific nature of this degree course, which is in touch with the essential realities of industry and, bearing in mind the Universitat Jaume I's commitment to encouraging students to carry out work placements in companies, all the necessary steps were taken to enable students to carry out this FYP within the context of WP.

According to the Universitat Jaume I's regulations governing work placements [7–8], WP is a

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Table 1. Distribution of credits in the programme of studies for the degree in Industrial Engineering at the UJI*

	First cycle			Second cycle	
	1st year	2nd year	3rd year	4th year	5th year
Core	51	52.5	34.5	49.5	—
Compulsory	13.5	12	30	15	—
Optional	—	—	—	—	67.5
Free choice	9	7.5	9	7.5	4.5
FYP	—	—	—	—	12**
Totals	73.5	72	73.5	72	84

*One credit is equal to 10 hours' face-to-face teaching time.

** Each FYP credit is equal to 30 hours' practical work in the business.

term that covers (academically supervised) disciplines that consist of undergoing practical training by means of a system of regulated placements in administrative, economic or professional organizations in the public or private sector.

Table 1 shows how credits from the programme of studies are distributed over the first four academic years. The core and compulsory subjects are distributed throughout the first four academic years, leaving all the optional subjects for the fifth, and final, year.

The subject under study here is called the 'Final year project', which is done in the last year of the degree course, with a teaching weight of 12 credits (each credit being equivalent to 30 hours' teaching time). The project therefore requires students to carry out a total of 360 hours' practical work in a company, and they are advised to link the work done during the WP with their FYP.

As a prior requirement for beginning the WP and the FYP, the programme of study states that students must have passed at least 90% of the core and compulsory subject credits. The reasoning behind this is that it ensures that students have acquired a minimum amount of knowledge before starting these practical training periods, allowing them to obtain maximum benefit from the tasks performed during their stay at the organization. Apart from the students themselves, the main agents who play a role in the WP and FYP are:

- the WP and FYP Coordinator (the person responsible for coordinating all activities related to the WP and the FYP);

- the supervisor (the person from the company who takes the student under his or her wing, so as to speak) who is responsible for supervising the student's work, in cooperation with the tutor;
- the tutor (a member of the university teaching staff who is directly related to the degree or diploma course and to the subject matter to be dealt with during the WP).

The duties carried out by each of these agents are shown in Table 2.

The methodology followed in carrying out the WP and the FYP will now be described. Once students have successfully completed 90% of the credits for their core and compulsory subjects, they submit a 'WP Application Form' to the Coordinator, stating their preferred subject matters/industrial sectors. With this information, the Coordinator selects the companies that best meet the students' preferences and then assigns the applicants to them. Should several students want the same position, the number of core and compulsory subject credits and students' average grades are taken into account as selection criteria.

When the students have been assigned to companies, their supervisor from the company and their tutor at the university both help the student to draw up a work plan, which is finally decided on jointly by the three of them. When the 360 hours have been completed, the supervisor fills in a questionnaire in which he or she assesses the work done by the student during the placement and the student writes a report on the work carried out. These two documents are sent to the tutor, who assesses both of them and awards the student a grade of 'Satisfactory' or 'Unsatisfactory' for the Work Placement. The grade awarded for the WP does not appear on the student's academic record.

From then on, students can decide whether to carry on with the work done during the placement as the subject matter for their FYP or to change to another topic. Whatever they decide to do (over 95% of students choose to take advantage of the work done during the WP and develop it further in their FYP), the students, together with their FYP director, propose a title and an abstract for the FYP, which is then assessed by the WP and FYP Committee. This Committee is made up of the

Table 2. Duties to be carried out by each of the main agents involved in the WP and the FYP

Agent	Tasks
WP and FYP Coordinator	Looking for companies and assigning a company and tutor to each student.
Tutor	Managing the process of doing the WP and assessing the FYP. Drawing up a work plan for each WP with the supervisor at each company and writing out the document specifying the duties and jobs to be carried out by each student during the time they are at the company. Controlling and monitoring the conditions under which the WP is carried out. Collaborating with the person responsible for supervising the WP. Writing the report on the student's WP in the company.
Supervisor	Collaborating in the student's practical training, helping him or her to become integrated within the company. Drawing up a work plan for the student, in collaboration with the tutor. Counselling and providing technical aid for the student. Keeping track of the practical training sessions. Keeping in touch with the tutor. Assessing the student at the end of the placement.

Course Director, the WP Coordinator, two members of the teaching staff related to the subject matter dealt with in the FYP to be authorized, and a student.

The proposed title should be concise and clearly represent the content of the project. The content of the FYP should be summarized in a maximum of 500 words in the proposed abstract. All subjects involved in the profession of industrial engineer are allowed as FYP subjects:

- Projects on all kinds of facilities and operations included in the branches of industrial chemical, mechanical and electrical techniques; industrial economy, energy and metalworking.
- The development of a specific part of a project that, because of its difficulty, is as substantial and important as an entire project.
- Research and development projects.

Whatever the content of the FYP, it must be possible to apply it to a practical case. Purely theoretical studies will not be allowed.

If the proposed title and abstract are approved, the student can present the FYP in one of the ordinary exam periods (February, June, September) or in the extraordinary period (December). To be allowed to submit the FYP and attend the oral examination, students must have passed all the credits set out in the programme of study.

The FYP documents must show a report and budget and, depending on the nature of the project, specifications and plans. Finally, the FYP is assessed before a board made up of experts in the subject matter, according to the following criteria:

- Paper documentation, with a weight of 80% of the final mark. The board assesses the paper documents presented (report, budget, specifications and plans) in accordance with the quality of the documents, quality of the content and feasibility of the project.
- Oral examination, with a weight of 20% of the overall mark, where students present the most

important aspects of the project and their conclusions in a maximum of 20 minutes. After the presentation, the board has an hour (maximum) to ask the questions it considers appropriate, which must be answered by the student.

ANALYSIS OF THE JOINT WP-FYP EXPERIENCE

In this section, some of the results obtained from the experience of coordinating WP and FYP during the academic years 1998/99 and 2004/05 are presented in graphic form.

As the degree in Industrial Engineering has only recently been introduced at the Universitat Jaume I, it has not yet been possible to achieve a steady number of students beginning their WP each year. Figure 1 shows the development of the number of students who started the WP and finished their FYP over the seven academic years since the degree was set up at the university.

There is a slight imbalance in the number of students who start the WP and those finishing the FYP. This is due to the fact that the duration of the WP and work on the FYP extend over an average of six months, so there is a percentage of pupils who start the WP during one academic year and finish the FYP the next academic year. The subject matters dealt with during the WP, and later in the FYP, coincide with the three specialty streams that are currently available on the Industrial Engineering degree course:

1. Town planning and services.
2. Electromechanical engineering.
3. Industrial processes and management.

Distribution according to industrial sector was as shown in Fig. 2, which reproduces the industrial distribution of the province of Castellón.

The two sectors that most students preferred are technical offices and the ceramics sector. In the former, students mainly carry out classical engineering projects typical of the town planning and

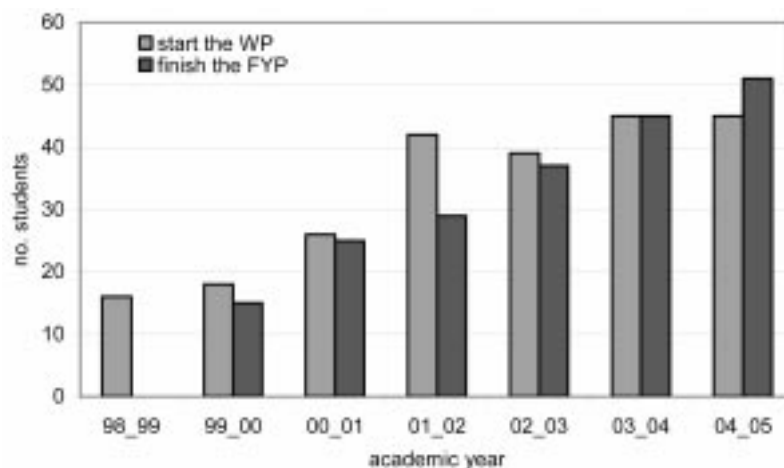


Fig. 1. Number of students who have done the WP and the FYP, distributed by academic years.

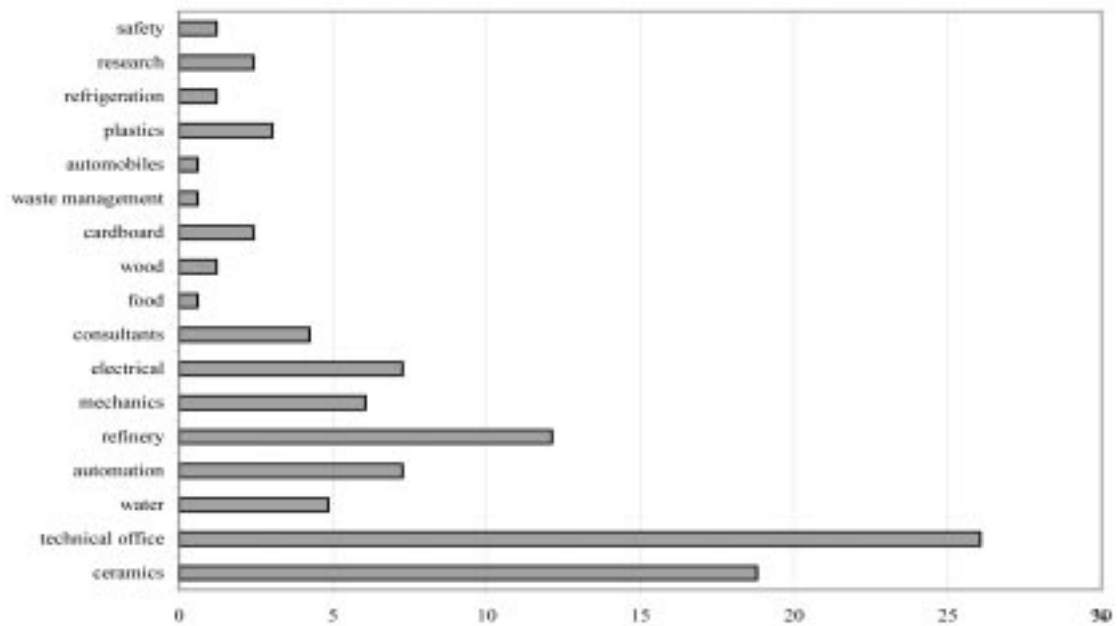


Fig. 2. Industrial sectors of the businesses where the WP and the FYP were carried out.

services specialty stream: calculations for facilities, development projects, and so on. In the remaining industrial sectors, the subject matter of the projects varies enormously, although most of them fit into

the other two specialty streams of electromechanical engineering and industrial processes and management. Some examples of projects that have been carried out include: improvements to

Table 3. Summary of students' ratings of the placements

		Mean	Standard deviation
Supervisor	Follow-up carried out	4.10	1.22
	Knowledge of the degree course	3.95	1.24
Tutor	Time spent	3.71	1.15
	Follow-up carried out	4.29	0.72
Supervisor-tutor	Accessibility and willingness to help	4.67	0.73
	Coordination	3.62	0.97
Organization of the placement	Information about enrolment	4.10	0.70
	Information about organizations/duties	3.52	1.12
	How the organization matches the degree	3.19	1.17
	Placements abroad	2.48	1.25
	Combining placements/classes	3.33	1.02
	Academic evaluation of the placement	3.62	0.86
	Suitability of the length of the placement	3.90	0.83
	Duties/project carried out	3.86	1.24
	Initial planning of the duties to be carried out	3.57	1.12
	Extent to which the work plan was fulfilled	3.71	1.10
Contribution of the placement to students' career development	Variation in the duties	3.57	1.03
	Extent to which the duties match the training received	3.81	1.21
	How students cope and their self-confidence in the workplace	4.19	0.75
	Knowledge of how the organization works	4.43	0.75
	Expanding career options	4.14	0.96
	Work experience	4.43	0.68
	Development of diverse skills	4.00	0.77
	Narrowing the gap between career and studies	4.24	0.83
	Incorporation of new knowledge	4.24	0.77
	Application of theoretical knowledge	3.76	1.09
Learning	Understanding/Resolution of practical problems	3.86	1.01
	Work methodologies	4.05	0.92
	Practice languages	2.30	1.49
	Remunerated placements	2.21	1.51
	Access to material required to perform duties	4.05	1.28
Conditions at the organization	Time available to carry out the project	4.00	1.14
	Flexible conditions	4.48	0.68
	The work was useful and valued by the organization	4.00	0.65
Attitude at the organization	Pleasant, motivating work environment	4.71	0.56

production processes, automation of processes, maintenance plans, implementation of quality, and environmental or risk prevention management systems.

EVALUATION OF THE WP AND THE FYP

On finishing the WP, students anonymously fill in a survey about their WP, where several aspects of their placement are evaluated. The evaluation is carried out using a qualitative rating scale of 1 to 5: 1 (not at all satisfied), 2 (not very satisfied), 3 (not sure), 4 (satisfied) and 5 (very satisfied).

The findings from the evaluation are shown as a summary in Table 3, which reports the mean and standard deviation of the responses in each of the aspects analysed.

From these results it becomes possible to identify, from the students' point of view, the weak points, and therefore the aspects that need improving, both at the organization and in actually carrying out the placements. In general terms, carrying out their placement/project in an organization outside the University is rated very positively by students, as they see it as a way of bringing new knowledge and new experiences to their professional development. The overall rating of the degree of satisfaction concerning the carrying out of the placements and projects was 4.33 (on a scale from 1 to 5), and 90.5% of the participants recommended the organization where they had done their placement in to other students in subsequent academic years.

Although generally speaking students' ratings were high, a number of points to be improved were also identified:

- The number of places for doing placements abroad should be increased, as this improves the students' chances of becoming more fluent in a foreign language as, to date, less than 3% of the placements have been carried out in foreign companies.
- Organizations should be provided with incentives to offer remunerated placements. Less than

20% of the places offered to students are paid. Although the collaboration agreement between the UJI and the organization does not specify the obligation to pay those taking part in placements, some enterprises do give students *grants* or they pay some kind of benefit in the form of a *travel allowance*.

- Try to get organizations to specify the subject matter of the project to be carried out during the placement. In this way, both students and the organization are fully aware of the duties to be carried out when the students choose to which organization they prefer to go.
- An effort should be made to achieve the maximum degree of coordination between tutor, supervisor and student, which enables a clear work plan and objectives to be drawn up at the beginning of the placement. This, in turn, allows greater benefits to be attained from the placement.

CONCLUSIONS

Coordinating the WP and the FYP within the Industrial Engineering degree was a very positive experience.

From the academic point of view, the fact that Industrial Engineering students have the chance to familiarize themselves to some extent with the professional world and gain some experience of the labour market by means of placements in private or public organizations is seen to be extremely beneficial. Furthermore, coordinating these hours of practical training with the FYP enables students to produce high quality academic work with a high practical content that is adapted to the needs of the industrial sector in Castellón (because the work is based on real problems that must be dealt with in the company).

From the students' point of view, on a scale from 1 (not at all satisfied) to 5 (very satisfied), this experience was rated with an overall score of 4.33. The organization where students carried out their placement was recommended to those in subsequent academic years in 90% of all cases.

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M. D. Bovea is an Associate Professor of Project Engineering at the Jaume I University (Castellón, Spain). She received her BS in Industrial Engineering from the Polytechnic University (Valencia, Spain) and her PhD in Industrial Engineering from Jaume I University (Castellón, Spain). She has coordinated the work placements and the final year project experiences in the industrial engineering degree since 1997.

A. Gallardo is an Associate Professor of Project Engineering at the Jaume I University (Castellón, Spain). He received his BS and PhD in Industrial Engineering from the Polytechnic University (Valencia, Spain). He coordinates the work placements and the final year project experiences in the industrial technical engineering degree since 2002.