WPOM

Working Papers on Operations Management.
Vol. 7, Nº2 (127-139)
ISSN: 1989-9068

http://dx.doi.org/10.4995/wpom.v7i2.6549

# Action planning intervention to identify how to improve selection processes for internships

**Juan A. Marin-Garcia[a], Eduardo González[b], Myriam Carrasco[b] y Daniel Ros[b]**
[a] ROGLE-Dept. Organización de Empresas. Universitat Politècnica de València, jamarin@omp.upv.es, [b]Schneider Electric, eduardo.gonzalez@schneider-electric.com, myriam.carrasco@schneider-electric.com, daniel.ros@schneider-electric.com

Received: 2016-08-31 Accepted: 2016-11-18

***Abstract***
*In this research into participatory action research, by a team formed by researchers and people in charge in various areas of several multinational companies, we reflected on the advantages and disadvantages of internships and we proposed a procedure for companies to improve the recruitment and selection of industrial engineers, while strengthening relationships between the university and companies, attracting students' interest, improving their professional competences and providing evidence for their students' real learning to degree managers at the same time.*

***Keywords:*** *Internship; action research; recruitment; industrial engineering; operations management.*

## Introduction

Internships are some of the main recruitment methods used by multinational companies to select new engineers for their companies (Menke, 2006; Ostrowski Martin, Kolomitro, & Lam, 2014). The volume of yearly internships is very high; e.g., some 8,000 internships are organised every year only at the Universitat Politècnica de Valencia (UPV), and this number has continued to increase substantially since 2012 according to the UPV's Employment Service databases.

Among the main advantages of this form of recruitment, increased student employability, developing soft skills in students, and training technical competences tend to be cited (Amorim, Pimentel, & Rosa, 2012; Escudeiro, Escudeiro, Druzovec, & Papadourakis, 2014; Maertz Jr, Stoeberl, & Marks, 2014; Menke, 2006; Ostrowski Martin et al., 2014).

However, internships also have their inconveniences, e.g. time-consuming, lack of cooperation between stakeholders or the scope of diffusion (if students do not know about the internship opportunity, they cannot apply) (Conejero, Garcia-Sabater, Maheut, & Marin-Garcia, 2015; Escudeiro et al., 2014; Maertz Jr et al., 2014; Ostrowski Martin et al., 2014).

In this research work into participatory action research, by a team formed by researchers and people in charge in various areas in two multinational companies, we reflected on advantages and disadvantages of internships and intervened to verify if amending the conditions with which recruitment and selection are carried out can improve companies' experience with internships. The main contribution of our work to the literature of Internships is to analyse the role of "Challenge" as a tool to improve the selection process of internships by companies.

## Theoretical framework

Recruitment is one of the functions performed in managing human resources and deals with the processes related with recruiting candidates for (permanent or of a given duration) job posts in an organisation and to filter those with a better potential to enter a selection process (Gardner, Reithel, Foley, Cogliser, &

Walumbwa, 2009; Marin-Garcia, Garcia-Sabater, Maheut, Valero-Herrero, & Andres-Romano, 2012; Menke, 2006; Raoudha, Mouloudi, Selma, & Abderrahman, 2012; Rowe, 1995). One of the options to carry out recruitment is internships.

Internships can be defined as the real work experiences acquired by students, supervised by a manager, prior to graduation from an academic programme (Alemany-Costa, Tornil, & Panadès-Estruch, 2016; Maertz Jr et al., 2014; Ostrowski Martin et al., 2014). Internships involve several variants according to the way the following characteristics are combined:

> "(1) Paid *vs.* unpaid
> (2) Full-time work *vs.* part-time summer work *vs.* part-time work concurrent with coursework.
> (3) Graduate/professional school internship *vs.* undergraduate internship *vs.* non academic (trade union apprenticeship or other internships for people out of school)
> (4) Academic course credit *vs.* no academic course credit
> (5) High formal academic requirements (e.g. assigned readings, written learning objectives, learning diaries) *vs.* low/no formal academic requirements (i.e. learn by on-the-job experiences/ad hoc instruction/osmosis)
> (6) Internship arranged between intern-employer *vs.* arranged through school (i.e. career services, faculty contacts)
> (7) Clarity and planning in internship duties *vs.* "do whatever is needed or asked"
> (8) Project-based work format *vs.* job-based work format
> (9) Faculty sponsor/mentor *vs.* no faculty sponsor/mentor
> (10) Work sponsor/mentor *vs.* no work sponsor/mentor
> (11) Implied opportunity of future full-time employment *vs.* no implication regarding future full-time employment" (Maertz Jr et al., 2014)

We performed a literature search to answer the three questions below:

1. What process do companies follow to recruit young engineers from the industrial field (university graduates) who will work in operations management functions in manufacturing plants?
2. What advantages and disadvantages do these processes detect?
3. What future research about the recruitment of young university graduates has been requested (specifically for engineers)?

Searching in SCOPUS with this strategy: all years ( TITLE-ABS-KEY ( internship ) AND TITLE-ABS-KEY ( engineer* OR STEM) AND TITLE-ABS-KEY ( student* ) AND TITLE-ABS-KEY ( ( recruitment OR selection ) ) ), we obtained 70 results (18 journal papers, 52 conference proceedings). After filtering by title and abstract, almost none of those references added any information about our three questions.

None of the references found explicitly mentioned the first of our three questions. No specific reference was found for industrial engineers. Three recruiting tactics are generally considered for internships: on-site (campus) recruiting, online recruiting and network marketing (former interns generating new applicants) (Menke, 2006). We found no evidence if any of these tactics could better work than the others.

Most references talked about benefits to students participating in internships in terms of motivation, improving knowledge and skills, reducing shock for post-graduation work transition, and understanding how to apply concepts in real environments and visibility for future employers (Amorim et al., 2012; Dansberry, 2012; Escudeiro et al., 2014; Maertz Jr et al., 2014; Menke, 2006; Pujol-Jover, Riera-Prunera, & Abio, 2015).

Benefits to the university in terms of curricula improvements, increased relationship with organisations, evidence for accreditation process, image or rankings, and attracting students were mentioned (Maertz Jr et al., 2014; Menke, 2006; Trullas & Enache, 2011). In principle, internships could be used as an "autentic assessment" form (Anderson, Potočnik, & Zhou, 2014; Antoncic & Hisrich, 2001; Eylon &

Herman, 1999; Gill, 1979; Lievens & Anseel, 2007; Tett & Jackson, 1990; Waldman & Korbar, 2004), as a way to assess what professional competences students had learned while studying their degree. However, we found no references that were considered an objective to analyse this matter.

Finally, internships present advantages for organisations, such as access to low-cost skilled labour, increased work capacity, low risk recruitment, access to fresh ideas or greater loyalty among hired interns (Dansberry, 2012; Escudeiro et al., 2014; Maertz Jr et al., 2014; Menke, 2006; Ostrowski Martin et al., 2014).

Nonetheless, considerable anecdotal evidence and very little empirical evidence exist to evaluate whether internships offer significant benefits (Maertz Jr et al., 2014). Indeed only a couple of articles that we found explicitly referred to the costs or problems that derive from internships (Maertz Jr et al., 2014; Ostrowski Martin et al., 2014). For instance, students can feel frustrated if they do not understand their role in the organisation, or if they only perform routine tasks or if the company does not provide them with sufficient training or, in some cases, they have to pay internships with their own money. Universities may have excess administrative tasks or tutors may be overworked. In some cases, they must wrestle with legal aspects that restrict or complicate students being present in companies. Finally, organisations can receive a poor return on investments made to train and teach students, especially if internships do not last very long. Moreover, students do not always have the necessary competences for the job post. Finally, the same legal aspects that complicate the work universities may also affect the companies that welcome students.

Once again, very little information was found about future research lines into internship in general as regards our third question, and no information was found about the internships of operations management engineers. The main demands would centre on extending empirical research on the potential costs of internships (Maertz Jr et al., 2014). Above all, it would be necessary to list which characteristics of internships contribute more to the programme's success in a given situation (industry, occupation, size or degree of the organisation's centralisation) as it is foreseeable that each context will demand a specific configuration (Maertz Jr et al., 2014; Ostrowski Martin et al., 2014). It would also be interesting to analyse how the economic conditions (e.g., crises) affect the quantity of internships, or their typology or characteristics, and how these characteristics affect students' perceptions (Maertz Jr et al., 2014).

Bearing in mind the information collected in this section, we decided to start our research to deal with some of these questions in more depth in the specific context of internships of operations management engineers in two large-sized plants of two multinational companies in the electronics sector. More concretely how to improve selection processes for internship, and as secondary goal, to check if the FINCO-DA framework is useful for selecting students when we use the engineering contest situation.

## Method

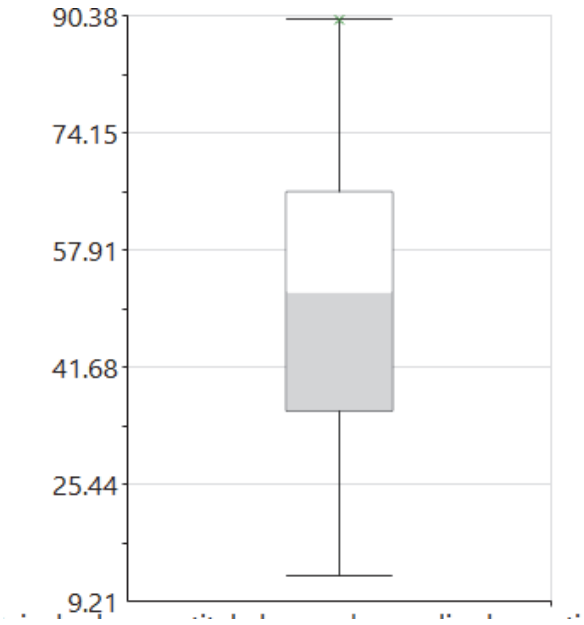
In this research, we followed the general recommendations for scientific protocols (Marin-Garcia, 2015; Miles, Huberman, & Saldana, 2013; Naslund, Kale, & Paulraj, 2010) and a participatory actions research framework where researchers and practitioners participated in all research stages (Alfaro, Avella, & Mejía-Villa, 2016; Dick, 2009; White, 1991):

1. Problem or improvement area in the organisation
2. Identifying the relevance of the subject for academic contribution
3. Action planning
4. Acquiring information
5. Analysis
6. Evaluation
7. Diffusion in the organisation
8. Diffusion in academic channels

In this research, we focus mainly on the first three phases (problem definition, relevance and action planning). The three participating organisations, the UPV (researchers/organisation), Schneider Electric and Celestica (organisations), form part of a European project [554493-EPP-1-2014-1-FI-EPPKA2-KA], and this action research is part of the activities of this project. On the day of the event, a further three organizations were added to those three (such as Lear, Dr Franz Schneider plus AVIA -Automotive Cluster of Valencia Community: http://avia.com.es/-).

The UPV plays two roles during the process as it provides researchers and is an organisation interested in research results to improve the way in which learning opportunities are offered to the students of two of its degrees. The Bachelor's Degree in Industrial Organisation Engineering (GIOI) and the Master's Degree in Industrial Engineering (MII) were selected because one of the UPV researchers is the Academic Director of the GIOI and also a teacher of the MII. The degrees selected to participate in the study were those that generate a greater volume of internships. The ETSII, with its 1,373 internships in 2015, was the university centre that signed the largest number of internships in the whole UPV. The Degree in Organisation Engineering, with its 168 internships, is by far the degree with the highest percentage of students who do internships as, according to the UPV's Employment Service databases, 90.38% of the students with this degree did internships in 2015 (as opposed to the average figure of 52% for the UPV), as did 68% of the next degree with the highest percentage (Figure 1).

**Figure 1-Distribution of percentage of UPV's graduates with internships**




Seventeen students were enrolled voluntarily in the event.

We divided the problem we wished to analyse into two research questions or improvement areas:

- RQA: how to improve selection processes for internships
- RQB: is the FINCODA framework useful for selecting students when we use the engineering contest situation?

Our academic contribution focused on analysing the advantages and disadvantages by comparing it with traditional systems and by using the "Engineering Challenge" as a recruitment tool for the internships of industrial engineers in the operations management area of industrial companies. We also analysed the potential of the FINCODA model (Marin-Garcia et al., 2016; Ramirez Bayarri, Marin-Garcia, & Atares-Huerta, 2016) as an innovation competency performance appraisal tool. Finally, since the participating

students were degree and master's degree students, we were interested in comparing the degree of acquirement that both student groups presented with the innovation competence.

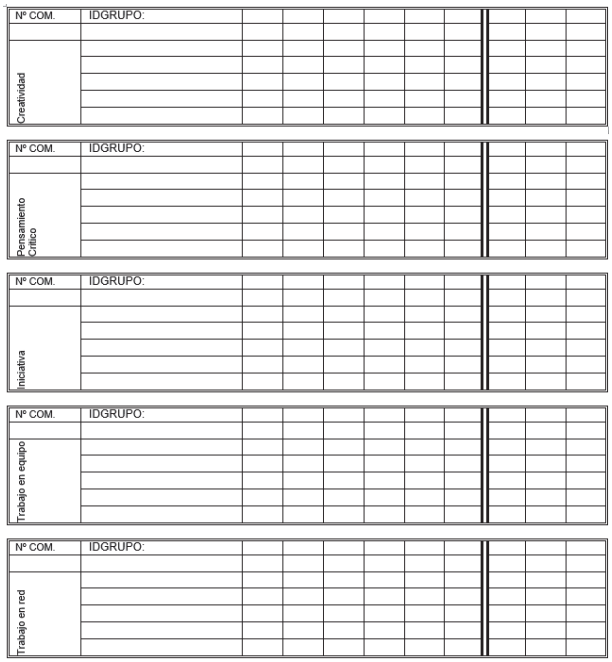
We followed the recommendations from several authors (Miles et al., 2013; Naslund et al., 2010) during the action research process. Table 1 below shows the main tasks performed in the action research project.

**Table 1.- Action plan**

| Agenda | Date | Participants |
|---|---|---|
| Start the idea | September 2015 | 4 UPV, 1 Cel, 3 SchElec |
| Meeting | December 2015 | 1 UPV, 1 Cel, 3 SchElec |
| Case proposal | January 2016 | 1 UPV, 3 SchElec |
| Fincoda joint meeting. Explaining the intervention to all partners | 10 May 2016 | 4 UPV, 1 Cel, 3 SchElec |
| Reviewing the first draft of the case | 4 May 2016 | 1 UPV, 3 SchElec |
| Defining the case | 6 May 2016 | 1 UPV, 2 Cel |
| Last changes made to the case | Week 22-24 June 2016 | 1 UPV, 1 Cel, 3 SchElec |
| FINCODA self-assessment | Week 22-24 June 2016 | 17 students |
| Challenge<br>FINCODA Tutor Assessment | 27 June 2016 | 1 UPV, 3 SchElec, 3 Other companies, 17 students |
| Interview with OM | 27 June 2016 | 1 UPV, 2 SchElec |
| FINCODA self-assessment (old internships) | End of internship | Pre-challenge internships |
| FINCODA self-assessment (new internships) | End of internship | Challenge internships |
| Interview with HR | End of internship | 1 UPV, 2 SchElec, 1 Celestica |
| Interview with OM | End of internship | 1 UPV, 3 SchElec |

The outline for o pre-Challenge interviews and post-Challenge interviews can be found in the Annex. Interviews were recorded and then coded (not transcribed) with the Atlas-Ti programme, version 7 (Contreras, 2014; Friese, 2012; Muñoz Justicia, 2005). The self-assessment of innovation competences was done with the FINCODA Barometer, v.1 (Marin-Garcia et al., 2016). The template provided below was used for tutor assessments, and was developed specifically for this purpose (Figure 2).

**Figure 2.-The template used to note data about the frequency of observing performances**




## Results

The main idea emerged during a lateral thinking session that took place in January 2015 in Turku, Finland. Then the idea was set out during several meetings held in Valencia, Spain. The team started to take action in January 2016, Schneider Electric developed several case proposals to be discussed at the end of March and mid-April. Then UPV and Schneider Electric selected two cases and refined them to be used in the Challenge.

The participating companies have some 20 internships from the ETSII Centre, of which 3-4 are GIOI students.

The conventional way of obtaining candidates for internships is by publishing an offer through the UPV company internships scheme. Then the recruitment departments conduct a selection process, a similar one to the selection process used in standard contracting (personal interviews with those who correspond to the selected curricula). Generally speaking, companies are satisfied with the selected candidates and consider that very few failures occur because candidates show good willingness. Nonetheless, it has been found that not all candidates have the same competences, or it is not always easy to identify suitable profiles with the traditional system.

The internships that the companies offer include the following characteristics: full-time summer work; Paid (roughly 700 euros/month for working 6-8 hours/day); Graduate/undergraduate internship; granting academic course credit; Few/no formal academic requirements; arranged through school (i.e. career services, faculty contacts); Clarity and planning in internship duties; Project-based work format; No faculty sponsor/mentor; Work sponsor/mentor; Implied opportunity of future full-time employment.

For the Challenge event, the internship characteristics were not amended. Indeed only the way in which recruitment was done and the first candidate selection phase were altered. To this end, the companies intended to identify interesting profiles that matched the type of internships that factories may offer, which allowed the best to be made from this experience according to the viewpoints of the factories, students and interns.

Thanks to Challenge activity, they expected to be able to observe how students performed when faced with a real case; how they were able to work as a team and were allocated the different roles needed to do the work. So they expected to identify the students who showed initiative and proactiveness, and whether they played the role of leader/team driver. Besides, the company that facilitated cases could obtain new points of view (by students and the ROGLE group, the organiser of the Challenge event) to deal with the solution to the considered case (which was a real problem and one pending to be solved in the company).

The Challenge was scheduled for the last week of June 2016 and consisted in:

- Students for GIOI (only 3rd and 4rd year students) or MII Degree of UPV enrolled freely in the Challenge
- They worked in groups of 4-5 people
- The case was presented early in the morning
- Students worked on the case for 6-7 hours
- Then they presented the results to a panel of managers of Schneider Electric and other industrial companies, such as Lear, Dr Franz Schneider plus AVIA (Automotive Cluster of Valencia Community: http://avia.com.es/)
- Each participant company should offer at least one paid 2-month company internship as a prize (companies were not forced to offer a prize if students did not meet the job profile). Additionally, one of the companies offered 500 euros as a prize for the best team presentation
- During the challenge, the people from the companies and the teachers who belonged to the ROGLE group observed student behaviour. Moreover, participants should fill in the FINCODA barometer prior to the challenge.

Seventeen students participated in the event. During the morning session, one teacher and three people from the companies' Department of operations/engineering assessed each student in the five FINCODA model dimensions(Marin-Garcia et al., 2016) using a holistic rubric based on the conceptual definition of each dimension and supported by the template (Figure 2). After students had worked for 4 hours, the four observers compared their impressions and identified the students who stood out in some dimension (last column in (Table 2) and those students who they seemed interested in for internships (marked by an asterisk in the second column of (Table 2). Prior to the session, students self-assessed their innovation competences (Marin-Garcia et al., 2016; Marin-Garcia, Aznar-Mas, & González-Ladrón-de-Guevara, 2011; Marin-Garcia, Perez-Peñalver, & Watts, 2013; Martínez-Gómez, Marí-Benlloch, & Marin-Garcia, in press; Watts, Marin-Garcia, Garcia-Carbonell, & Aznar-Mas, 2012). The results set out according to the dimensions are summarised in columns 3-7 in Table 2 and the average of them all is found in column 8. The numbers of these columns (3 to 8) have values that range from 0 (poor) to 100 (excellent).

**Table 2.- Self assessment *vs.* observer assessment. 2nd columns identify students (first digit the team, second digit the student in that team). The 3rd to 5th columns are average indicators in the self-assessment questionnaire (Crea: Creativity; Crit: Critical Thinking; Ini: Initiative; Team: Teamwork; Net: Network; Innov: Average of the previous five dimensions). The 6th column results from the observers template (Figure 2) * denotes students that organisations considered to have a high potential to be selected. n.a. : data not available**

| Category | Student | Crea | Crit | Ini | Team | Net | Innov | Observers highlight |
|---|---|---|---|---|---|---|---|---|
| **Pregraduate (2nd-3rd year)** | 11 | 74 | 71 | 80 | 77 | 82 | 75 | Initiative |
| | 12 | 94 | 93 | 98 | 86 | 91 | 93 | Critical Thinking |
| | 13 | 62 | 73 | 66 | 71 | 78 | 69 | Critical Thinking |
| | 14 | 70 | 69 | 75 | 80 | 76 | 72 | Absent |
| **Average pregraduate (2nd-3rd year)** | | 75 | 77 | 80 | 79 | 82 | 77 | |
| **Pregraduate (4th year)** | 31* | 64 | 65 | 65 | 74 | 91 | 69 | Initiative, critital thinking, teamwork |
| | 32* | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. | Initiative, critital thinking, teamwork |
| | 33 | 80 | 79 | 82 | 86 | 84 | 81 | Nothing special |
| | 34 | 68 | 59 | 65 | 68 | 71 | 65 | Nothing special |
| | 41 | 90 | 85 | 77 | 69 | 67 | 82 | Nothing special |
| | 42 | 50 | 64 | 62 | 78 | 76 | 62 | Nothing special |
| | 43 | 90 | 99 | 92 | 100 | 100 | 95 | Nothing special |
| **Average pregraduate (4th year)** | | 73 | 76 | 75 | 81 | 78 | 75 | |
| **Master** | 21* | 80 | 81 | 78 | 85 | 78 | 80 | Initiative |
| | 22 | 80 | 81 | 83 | 85 | 95 | 83 | Initiative |
| | 23 | 82 | 79 | 85 | 80 | 91 | 82 | Nothing special |
| | 24 | 92 | 93 | 92 | 98 | 95 | 93 | Initiative |
| | 51 | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. | Nothing special |
| | 52 | n.a. | n.a. | n.a. | n.a. | n.a. | n.a. | Initiative |
| | 53 | 66 | 79 | 82 | 92 | 58 | 74 | Initiative |
| **Average Master** | | 84 | 84 | 85 | 87 | 90 | 85 | |
| **Average sample population (647 cases)** | | 70 | 71 | 71 | 71 | 70 | 70 | |

During the afternoon session, solved cases were presented to a panel of six people in charge of operations and human resources in industrial companies and the three observers who accompanied the students during the morning session. The companies thought that the work the students had done was interesting and stressed a good level for the presentations (all with a similar level). However, they highlighted the presentations from group 4 (slightly worse than the others) and those from group 5 (slightly better than the others; this group received the prize for the best presentation).

After the presentations, the professionals made some comments and gave students some feedback. Once the professionals had left, the Academic Director of the GIOI (DAT) remained with the students for 2 more hours to review the day's work, to provide all the students with specific feedback, and to make specific comments on positive aspects and those that could improve.

## Discussion and conclusions

All the companies assessed the event very positively and would like such activities to be repeated (some requested two editions each year).

One of the main conclusions drawn for the DAT is that students have more capacities than those which they demonstrated during the event. The students who stood out when performing degree activities for their creativity or networking, or for their teamwork mastery, were unable to demonstrate these capacities

during the event. They felt that the event was dealt with as if it were an "exam" rather than as a real exercise where there are managers who wished to know possibilities, alternatives and outcomes. More ambition when dealing with a problem as a divergent solution (Bigelow, 1998; Teng, Song, & Yuan, 2004), applying group work techniques, applying the visual management tools from the problem-solving process and better defined steps, stages and tasks, as well as better managing time were also missed. Regarding presentations, some participating students evidently failed to take care of their personal image. During the morning session, and especially during the afternoon presentation, students were seen for the first time by their future employers. Bearing in mind that first impressions mark many of the decisions made during selection processes (Dougherty, Turban, & Callender, 1994; Nordstrom, Hall, & Bartels, 1998; Ren, Sun, Zhang, Chen, & Liu, 2015; Simons, 1995; Wilhelmy, Kleinmann, König, Melchers, & Truxillo, 2016; Zhao & Liden, 2011), several students were evidently not clear about the style to use to outline a professional image (some looked messy and others were too elegant as if they were going to a wedding or another similar social event). The content of the presentations and the way they were defended were also deficient; e.g., filling in slides with too many superfluous details with, for example, all the mathematical operations made to obtain the results in each option and, worse still, reading all these details (which were almost the same for the five groups as they all decided to solve the same case). All this information could have been shown in a much more visual way without having to be read, and by the professional panel being able to understand from a simple glance, while students could have explained only the relevant touches of the process followed, centred on the results and demonstrated their competences as engineers.

Students also positively assessed this activity and some examples of such are provided below:

- "These actions should be organised much more often because the more proximity there is between companies and the academic world, the more opportunities to learn and allow us to enter the world of work"
- "I am grateful for your constructive criticism and recommendations as they allow us to improve when faced with future selection processes"
- "Although I had not received the prize, which is always gratifying, the prize for me was being able to participate in the event"

Two weeks after the event, 12 students who participated in the Challenge visited Dr Franz Schneider plant, which they considered very interesting. One of the students (52) is doing one of the internships and three other companies are waiting to finish their selection process.

Regarding our research questions, it would appear that Challenge is one way of improving selection processes for internships, at least as far as companies' implication and interest and the possibility of students knowing about internships are concerned (Menke, 2006). We cannot presently draw definite conclusions as we have been unable to verify in the long term, nor with a large sample, the results of these internships compared to those conducted by means of conventional selection processes. However, the participating companies have had to previously define the job profile and the decisions to be made in it. The same can be said of the knowledge, skills and attitudes they wish to see in the candidates for the job. They have even modelled a real problem in which students will do their internship. So they are in a better position to offer a focused internship and to make the best of students' talent (Maertz Jr et al., 2014). Moreover, students arrive at companies with a more specific vision of what is expected of them and of the context that surrounds industrial processes. So the Challenge helps them as a pre-socialisation process for the workplace.

We also piloted the FINCODA barometer. During the challenge, the people from the companies and the teachers of the degree observed student behaviour using the FINCODA framework. Moreover, participants should fill in the FINCODA barometer prior to the challenge.

It is still too soon to state whether the FINCODA framework is useful for selecting students for internships. However, this research has provided certain evidence for the positive potential of the FINCODA model. During the morning session, we observed no specific behaviours of a high level of creativity, teamwork or networking. According to the observers (one teacher and people from the

companies), this was not a problem related to the staff or the definition of components, but simply a matter of students performing similarly and also displaying poor performance for these innovation dimensions. The presented case offered the option of allowing these dimensions to come into play, but participants focused more on conventional and rational solutions rather than on developed creative aspects to solve cases. Indeed for the two available cases, all the participants opted for the most "traditional" one and used a convergent solution, achieved by using basic engineering knowledge and formulae.

***Practical implications***

We are unable to provide a definitive answer to our research questions owing to the limitations of this study. Nor can we compare our results with the previous literature as we were unable to find any.

However, our results can help to start building a recruitment model for the specific internships for Industrial Operations Management Engineers. In our experiment, four companies from different sectors (plastics, automotive seating, electronics) and one representative from an industrial cluster participated (at different levels of involvement). All their impressions coincided, in that it is foreseeable that they could be generalised to other medium-/large-sized industrial plants, even though they work in other economic activities or belong to other geographic areas. We cannot ensure whether the same results could be reproduced in companies that offer services or in small or micro-enterprises as these contexts would require conducting specific research.

As a future research line, it would be interesting to create, along with the people from the companies, a typical high/low competence profile in all the FINCODA model dimensions. Thus observers (or the tutors of the companies during internships) could assess candidates using these profiles during the Challenge event. On the one hand, this would allow us to verify if the self-assessment results coincided with external assessments and, on the other hand, would help us to more easily compare the real competence during the internships of the candidates selected traditionally with those elected by the Challenge. This would, in turn, allow us to overcome in the future some of the limitations indicated herein.

## Acknowledgments

This work has been conducted as part of a European project financed by the European Union ["FINCODA" Project 554493-EPP-1-2014-1-FI-EPPKA2-KA] (http://bit.ly/FINCODA-EUsite01). (The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein), and by the Universitat Politécnica de Valencia PIME 2015-2016 A/09 "Evaluación de los indicadores del comportamiento innovador en el alumno universitario".

## Annex

To acquire information about the pre-Challenge interviews, the following outline was used:

> When you think about the student interns of engineering degrees in the industrial field that your company contracts:
>
> 1. What do you wish to learn from the Challenge experiment? What are your expectations?
> 2. How many engineering interns do you currently have on internships from the industrial field (or in the last year) (in your department/in the Valencia plant)? How many are from the GIOI?
> 3. How do you currently select students (engineers from the industrial field) for internships?
>    a. (What process do you follow to select them? Do you submit them to any prior testing? What tests?)

4. What can be improved in the current process and why?
    a. Any failures?
    b. Can better talent be chosen?

This outline was employed for the post-Challenge interviews:

When you think about the interns you have selected in the Challenge:

1. Has the performance of interns improved or become worse compared with those you chose before? In what have you noticed any changes?
    a. If performance has changed, do you think that this change is due to the way you chose them in the Challenge? Why?
2. What extra effort/investment has the Challenge meant for you?
3. Does it pay to make the effort of participating in the Challenge? Why?
4. What have you learnt from the experience?
5. Have your expectations been met? Why?

## References

Alemany-Costa, J., Tornil, X. P., & Panadès-Estruch, L. (2016). The impact of the ehea on the professional internships: Interviews with the academic coordinators. *Intangible Capital, 12*(2), 420-443. doi:10.3926/ic.611

Alfaro, J. A., Avella, L., & Mejía-Villa, A. (2016). *Concerning the increasing relevance of action research methodology in improving collaboration between researchers and industry in the field of operations management.* Paper presented at the 23rd EurOMA conference. TRondheim. Norway.

Amorim, M., Pimentel, C., & Rosa, M. J. (2012). Iem graduates transition to the labour market: The importance of internships. *International Journal of Industrial Engineering and Management, 3*(2), 83-92.

Anderson, N., Potočnik, K., & Zhou, J. (2014). Innovation and creativity in organizations: A state-of-the-science review, prospective commentary, and guiding framework. *Journal of Management, 40*(5), 1297-1333. doi:10.1177/0149206314527128

Antoncic, B., & Hisrich, R. D. (2001). Intrapreneurship: Construct refinement and cross-cultural validation. *Journal of Business Venturing, 16*(5), 495-527. doi:http://dx.doi.org/10.1016/S0883-9026(99)00054-3

Bigelow, J. (1998). *Teaching managerial skills: Moving beyond current practice*.

Conejero, A., Garcia-Sabater, J. P., Maheut, J., & Marin-Garcia, J. A. (2015). The praktikum upv campus: Stretching closer ties between research at the university and students in secondary school. *WPOM-Working Papers on Operations Management, 6*(2), 64-75. doi:http://dx.doi.org/10.4995/wpom.v6i2.4199

Contreras, R. B. (2014). *Utilización del programa de analisis cualitativo atlas.Ti para gestionar y analizar datos.* Paper presented at the https://atlastiblog.wordpress.com/2014/06/12/utilizacion-del-programa-de-analisis-cualitativo-atlas-ti-para-gestionar-y-analizar-datos/.

Dansberry, B. E. (2012). *Examining outcomes data from an undergraduate internship program.* Paper presented at the 119th ASEE Annual Conference and Exposition; Conference proceedings, San Antonio, TX; United States; 10 June 2012 through 13 June 2012.

Dick, B. (2009). Action research literature 2006–2008. *Action Research, 7*(4), 423-441.

Dougherty, T. W., Turban, D. B., & Callender, J. C. (1994). Confirming first impressions in the employment interview: A field study of interviewer behavior. *Journal of Applied Psychology, 79*(5), 659-665.

Escudeiro, N., Escudeiro, P., Druzovec, T., & Papadourakis, G. (2014). *Praxis: Bringing an european dimension to project/internship academic activities*.

Eylon, D., & Herman, S. (1999). Exploring empowerment: One method for the classroom. *Journal of Management Education, 23*(1), 80-94.

Friese, S. (2012). *Qualitative data analysis with atlas.Ti*. London: SAGE Publications Ltd.

Gardner, W. L., Reithel, B. J., Foley, R. T., Cogliser, C. C., & Walumbwa, F. O. (2009). Attraction to organizational culture profiles: Effects of realistic recruitment and vertical and horizontal individualism--collectivism. *Management Communication Quarterly, 22*(3), 437-472.

Gill, R. W. T. (1979). The in-tray (in-basket) exercise as a measure of management potential. *Journal of Occupational Psychology, 52*(3), 185-197. doi:10.1111/j.2044-8325.1979.tb00453.x

Lievens, F., & Anseel, F. (2007). Creating alternate in-basket forms through cloning: Some preliminary results. *International Journal of Selection and Assessment, 15*(4), 428-433.

Maertz Jr, C. P., Stoeberl, P. A., & Marks, J. (2014). Building successful internships: Lessons from the research for interns, schools, and employers. *Career Development International, 19*(1), 123-142. doi:10.1108/CDI-03-2013-0025

Marin-Garcia, J. A. (2015). Publishing in two phases for focused research by means of "research collaborations". *WPOM-Working Papers on Operations Management, 6*(2), 76-80. doi:http://dx.doi.org/10.4995/wpom.v6i2.4459

Marin-Garcia, J. A., Andreu Andres, M. A., Atares-Huerta, L., Aznar-Mas, L. E., Garcia-Carbonell, A., González-Ladrón-de-Guevara, F., . . . Watts, F. (2016). Propossal of framework for innovation competencies development and assessment (fincoda). *Working Papers on Operations Management, 7*(in press), in press.

Marin-Garcia, J. A., Aznar-Mas, L. E., & González-Ladrón-de-Guevara, F. (2011). Innovation types and talent managment for innovation. *Working Papers on Operations Management, 2*(2), 25-31.

Marin-Garcia, J. A., Garcia-Sabater, J. J., Maheut, J., Valero-Herrero, M., & Andres-Romano, C. (2012). *Gestión de recursos humanos para ingenieros de la rama industrial*. Harlow: Pearson Education.

Marin-Garcia, J. A., Perez-Peñalver, M. J., & Watts, F. (2013). How to assess innovation competence in services: The case of university students. *Direccion y Organizacion*(50), 48-62.

Martínez-Gómez, M., Marí-Benlloch, M., & Marin-Garcia, J. A. (in press). Validation of incode framework for assessment of innovation competency of higher education students: A multidimensional technique for affinity diagram to detect the most relevant behaviours and skills *In press*

Menke, S. E. (2006). *Strategies for undergraduate internship recruiting.* Paper presented at the 8th US National Conference on Earthquake Engineering, San Francisco, CA; United States; 18 April 2006 through 22 April 2006.

Miles, M. B., Huberman, A. M., & Saldana, J. (2013). *Qualitative data analysis: A methods sourcebook*: SAGE Publications.

Muñoz Justicia, J. (2005). *Anñalisis cualitativo de datos textuales con atlas.Ti 5*. Creative Commons license: http://www.unizar.es/abarrasa/tea/200910_25906/a9c_.pdf.

Naslund, D., Kale, R., & Paulraj, A. (2010). Action research in supply chain management - a framework for relevant and rigorous research. *Journal of Business Logistics, 31*(2), 331-355.

Nordstrom, C. R., Hall, R. J., & Bartels, L. K. (1998). First impressions versus good impressions: The effect of self-regulation on interview evaluations. *Journal of Psychology: Interdisciplinary and Applied, 132*(5), 477-491.

Ostrowski Martin, B., Kolomitro, K., & Lam, T. C. M. (2014). Training methods: A review and analysis. *Human Resource Development Review, 13*(1), 11-35. doi:10.1177/1534484313497947

Pujol-Jover, M., Riera-Prunera, C., & Abio, G. (2015). Competences acquisition of university students: Do they match job market's needs? *Intangible Capital, 11*(4), 612-626. doi:10.3926/ic.625

Ramirez Bayarri, L., Marin-Garcia, J. A., & Atares-Huerta, L. (2016). How has been assessed the innovation competency in companies and universities? *Working Papers on Operations Management, 7*(in press), in press.

Raoudha, H., Mouloudi, D. E., Selma, H., & Abderrahman, E. M. (2012). A new approach for an efficient human resource appraisal and selection. *Journal of Industrial Engineering and Management, 5*(2), 323-343. doi:10.3926/jiem.452

Ren, R., Sun, J. Y., Zhang, Y., Chen, Y., & Liu, C. (2015). Can good impression and feedback-seeking behavior help chinese graduates get a job?: A mixed-methods study on a recruiting assessment center. *Journal of Chinese Human Resource Management, 6*(1), 14-32. doi:10.1108/JCHRM-03-2015-0003

Rowe, C. (1995). Clarifying the use of competence and competency models in recruitment, assessment and staff development. *Industrial and Commercial Training, 27*(11), 12-17. doi:doi:10.1108/00197859510100257

Simons, T. (1995). Interviewing job applicants-. How to get beyond first impressions. *Cornell Hotel and Restaurant Administration Quarterly, 36*(6), 21-27. doi:10.1016/0010-8804(96)80999-2

Teng, J. G., Song, C. Y., & Yuan, X. F. (2004). Fostering creativity in students in the teaching of structural analysis. *International Journal of Engineering Education, 20*(1), 96-102.

Tett, R. P., & Jackson, D. N. (1990). Organization and personality correlates of participative behaviours using an in-basket exercise. *Journal of Occupational Psychology*(63), 175-188.

Trullas, I., & Enache, M. (2011). Theoretical analysis of the antecedents and the consequences of students' identification with their university and their perception of quality. *Intangible Capital, 7*(1), 170-212. doi:10.3926/ic.2011.v7n1.p170-212

Waldman, D. A., & Korbar, T. (2004). Student assessment center performance in the prediction of early career success. *Academy of Management Learning & Education, 3*(2), 151-167. doi:Article

Watts, F., Marin-Garcia, J. A., Garcia-Carbonell, A., & Aznar-Mas, L. E. (2012). Validation of a rubric to assess innovation competence. *Working Papers on Operations Management, 3*(1), 61-70.

White, W. F. (1991). *Participatory action research*. New York: SAGE publications.

Wilhelmy, A., Kleinmann, M., König, C. J., Melchers, K. G., & Truxillo, D. M. (2016). How and why do interviewers try to make impressions on applicants? A qualitative study. *Journal of Applied Psychology, 101*(3), 313-332. doi:10.1037/apl0000046

Zhao, H., & Liden, R. C. (2011). Internship: A recruitment and selection perspective. *Journal of Applied Psychology, 96*(1), 221-229. doi:10.1037/a0021295