



Co-funded by the
Erasmus+ Programme
of the European Union



Project Index
Project Acronym
Project Full Title

575660-EPP-1-2016-1-FI-EPPKA2-KA
HEIBus
Smart HEI-Business collaboration for skills and competitiveness

HEIBus Project

WORK PACKAGE 2: Best practices of HEI- company cooperation

Deliverable 2.4

Analysis of company involvement in HEI education

May 2017



| | |
|---------------------------|--|
| WP2 | D2.4. Analysis of company involvement in HEI education |
| Authors | P5 UJA |
| Short Description | The goal of this documents is searching for methods or models where companies are directly involved with education at the HEIs. Different levels of involvement are searched and analysed. The analysis forms a background for the work of WP5 Flexible Student Mentoring by Companies. The involvement actions of companies are categorized by how intensive their involvement is. The more intensive involvement for example is a company acting as a godparent to one study group throughout the studies. Less intensive involvement could be e.g. giving expert lectures or info sessions to the students. |
| Status | Final |
| Distribution level | Public |
| Date of delivery | 27/05/2017 |
| Contributions by: | |
| Project web site | www.heibus.eu |

Document History

| Version | Date | Author/Reviewer | Description |
|---------|------------|------------------|---------------|
| 0.1 | 08.05.2017 | Jesus de la Casa | First Draft |
| Final | 27.05.2017 | Jesus de la Casa | Final Version |



Table of Contents

| | |
|--|----|
| Table of Contents | 3 |
| 1. Introduction..... | 4 |
| 2. Definitions and previous concepts | 4 |
| 3. Good models | 5 |
| 3.1. Collaborations focused on the development of new educational programmes models..... | 6 |
| 3.2. Collaborations focused on teaching and learning processes model..... | 8 |
| 3.3. Collaborations focused on the transfer between studies and work life | 10 |
| 3.4. Collaborations focused on the sponsors' initiatives by companies models | 12 |
| 4. Models for deeper analysis | 13 |
| 4.1. Selection of Models..... | 13 |
| 4.2. Deeper analysis | 14 |
| 4.3. Assessment..... | 18 |
| 5. Conclusions..... | 19 |
| References..... | 19 |



1. Introduction

The goal of this document is to present an analysis of methods or models where companies are directly involved with education at the HEIs. Different levels of involvement are searched and analysed. The involvement actions of companies are categorized accordingly to their intensity, differentiating between low (L), middle (M) and high (H) level of involvement.

All methods found throughout the world are listed and reported hereafter. Finally, five models are selected for deeper analysis, where a detailed description and assessment of the selected ones is shown.

2. Definitions and previous concepts

Universities and industry have been collaborating for over a century, but the rise of a global knowledge economy has intensified the need for strategic partnerships that go beyond the traditional funding of discrete research projects [1]. So, more emphasis is needed on a collective approach from higher education and industry to provide structured programmes to enhance the employability and effectiveness of students when they enter the workforce providing a higher skill level and capability requirements [2].

As a consequence, a rigorous searching has been made as a bibliographic review on internet and specialized literature that has let us analyse and compare different practices in order to establish the best models.

For companies, as providers of training, there are very important concepts such as Early Organizational Involvement (EOI), Recognition of Prior Learning (RPL), Work Related Learning (WRL) and collaboration schemes. All of them are frequently mentioned in the literature found and there will be thoroughly described as follows.

The concept of EOI [2] comes from literature specialized in supply chain theory through the concept of 'early supply integration' (ESI) which focuses on both suppliers and buyers



working together to better contribute to product development. In the same manner, EOI encourages higher education and industry to collaborate and become involved in the early stages of the student's professional development, to best prepare students for the transition from classroom to the work environment, it is similar to the term Recognition of Prior Learning (RPL) [3,4].

It is well-recognized that embedding WRL programmes into higher education will better prepare students and manage their expectations for the workplace, leading to greater retention and improved outcomes of graduates entering the workplace, benefiting the student, higher education and employers. Several studies show that learning needs to be analysed in employment sectors [5] particularly in these two aspects: work placements and continuing professional development [6].

This document takes, as starting point, these concepts to design a framework in which ways of cooperation, between companies and HEIs and on a worldwide level, are classified. Next section enumerates 10 ways of cooperation models between companies and HEIs which fall into four categories.

3. Good models

If we consider all the previous items it is possible to do this classification depending on the type of collaboration and its main objective:

1. Collaborations focused on the development of new educational programmes or the revision of existing ones: typical examples involve focusing on course structure, numbers of places, curriculum, forms of examinations, etc. Collaborations can exist at different geographical levels, for instance through industry associations, or locally with particular companies. In addition, programmes based in Dual Vocational Education Training (Dual VET) can incorporate a real point of view in students' training.



2. Collaborations focused on teaching and learning processes: typical examples are the involvement of companies in teaching, i.e., visiting professors VPs or also known as short-term secondments for company staff within HEI (part-time professor). Companies providing definitions for students' research projects in PhD programmes. On the other hand, summer schools are other possibilities in order to increase the international/national/local's outreach for companies.

3. Collaborations focused on the transfer between studies and work life: typical examples include Career Fairs and trainee or other recruitment programmes, industrial mentoring and other career advice activities, short delimited contracts for specific projects, competition and awards. Such collaborations are carried out locally, nationally or internationally depend on the companies.

4. Collaborations focused on sponsorship initiatives by companies: Collaborations such as students' grants/scholarship and those others as joint labs at HEIs, technological parks, etc. are other proposals.

Consequently, it showed the main features of each group as well as the definition of all the proposed models. For that purpose, some examples have been included of several universities around the world as representative's cases owing to the similarities among all of them.

3.1. Collaborations focused on the development of new educational programmes models

Models, within this category, share the main common features detailed in Table 1.

Table 1: Main features of Collaborations focused on the development of new educational programmes models

| Feature | Description |
|---------------------------|--|
| Main educational purposes | Curriculum development and strategies to promote industrial engagement; rational goals and open system; human relations; internal processes; accreditation; integration of theory and practice in a current workplacement; progressive skill acquisition |



| | |
|----------------------|---|
| Accreditation | Internal/External/Both |
| Role of company | <u>Advisor</u> (new courses proposed; master thesis advice; companies provide definitions for students' research projects) <u>Supervisor</u> in work placements; board membership consisting of a strong base of experienced, senior executives with a wide range of backgrounds and with demonstrated commitment to the school and the profession; trade committee used to approve the programmes To offer an apprenticeship contract for students |
| Role of HEIs | To set learning objectives and approve host site; assist with student selection; monitoring and assessment |
| Role of student | Inclusive mindset; collaborative tasks; participative initiatives, active enrolling |
| Company's incentives | Opportunity for companies to access expertise in the HEIs |
| HEI's incentive | Strong leadership by Heads who believed in the advisory board process; |
| Students' incentives | Career development; progressive skill acquisition; professional socialization; workplace literacy; workforce readiness |
| Duration | Full-time; part-time employee engaged in productive work; only one time; several times; into only one or more company |
| Optional/Mandatory | IAB optional; Dual VET training is mandatory for students |
| Paid /no Paid | Companies paid student a salary or scholarship; explicit and well-focused fund raising initiatives |
| Territorial scope | International; national; regional; local level |
| Supporter | Government; company; HEIs; social partners |
| Public/private HEIs | Both |

There are a large number of universities following this way of cooperation. Under this category, two models can be identified and described:

- Model 1 (M1). **Industrial advisory boards (IAB)**. The use of voluntary IAB to give aid and advice is almost universal in engineering education programmes. This model is usually followed by universities all around the world [7,8,9] and we proposed the University of Oklahoma's case [7] as an example of typical cases in USA clearly exposed in this report [10]. In addition, it was reported in document D2.1 the necessity of some mechanism in order to guarantee the quality of cooperation agreements or accreditation of degrees offered by universities. So, we included some of those organizations, agencies or associations that are doing these programmes can be certified. In the case of USA, the Accreditation Board for



Engineering and Technology (ABET) [11] has caused many schools to initiate or revitalize new industrial advisory boards in their campuses.

- Model 2 (M2). **Dual Vocational Education Training** (Dual VET). It is based on alternating periods of school education and practical training in a company [12,13]. In general, vocational training does not take any longer than four years. The proposed Danish model could be interesting for other countries, as it proves its adoption by USA [14]. In general, social partners are able to influence the system to a large extent as they are represented at the national and individual HEIs level and to ensure continuous innovation of the system. The national and local procedures ensure consensus-building among the protagonists. At the same time, the structure is extremely dynamic. The Danish vocational education and training system [15] is more than 450 years old and can be described as a cultural bridgehead between the European (German) dual apprenticeship systems and the school-based models of the Nordic countries.

3.2. Collaborations focused on teaching and learning processes model

Models included within this type are defined by the features shown in Table 2:

Table 2: Main features of Collaborations focused on teaching and learning processes models

| Feature | Description |
|---------------------------|---|
| Main educational purposes | Integration of theory and practice; personal development; career exploration and development; professional socialization |
| Common sectors | Business; marketing; social sciences; engineering |
| Role of company | Supervision, evaluation |
| Role of HEI | Set learning objectives and approve host site; assist with student selection; monitoring and assessment |
| Role of student | Full-time or part-time student engaged or not in productive work; students may be observer or can participate in activities |
| Company's incentives | To access to a highly-skilled workforce and cutting-edge academic research |
| HEIs' incentives | To establish long-term sustainable collaborations with business; to |



| | |
|----------------------|---|
| | help build awareness of the added-value that university research can bring to industry and society at large; to help to improve recognition of the PhD qualification; to make sure doctoral students are well informed about all career opportunities |
| Students' incentives | To expose to non-university environments; to improve young researchers' ability to relate abstract thinking to practical applications |
| Duration | Short-term(1 day, 2-3 days); medium-term (1 term-or 2nd term), large term (whole year, more than one year) |
| Optional/Mandatory | Optional |
| Paid /no Paid | Both |
| Territorial scope | International; national; regional; local level |
| Supporter | Industrial association ; companies; social partners; professional associations |
| Public/private HEIs | Both |

Three models have been considered under this categorisation:

- **Model 3 (M3). Visiting professors (VPs)** or short-term delimited contracts for specific project secondments or guest lectures. It is a part-time professor that usually acts as short term secondments for company staff within HEIs. This industry-into-academia initiative aims to utilise the experience of the VPs to enhance student learning as well as the employability and skills. VPs are likely to be engaged mainly with undergraduate students studying for a BEng (3-year programme) or a MEng (4-year programme), but may also be involved in MSc programmes and modules. The proposed model is defined by the UK's Royal Academy of Engineering (RAEng) [16].
- **Model 4 (M4). Summer schools.** The target of this cooperation model is to foster the students' competences and offer them a space out of their traditional classroom environments where they can acquire other multidisciplinary skills and also to complement their academic training. In order to differentiate with summer courses that many Universities organise, just for academic purposes (lifelong-learning activities), this model mostly falls into a Project Based Learning (PBL) philosophy which lies between research or industrial activities [17]. Nowadays it is a very extended and consolidated cooperation model and there is a wide and vast course offering [18] within the European Union. At certain aspects, this model is very close to internships in companies and also workshops tech-talks. The proposed model for a deeper analysis was developed by the Engineering College of Aarhus (Denmark) [19].



- **Model 5 (M5). PhD programmes.** It is well-known that many students want to continue their research work after their education. That's why every year some companies hire many PhD students into an Industrial PhD Program. The proposed model will be the Danish Industrial PhD Programme [20]. The report about doctoral education [21] underlines that collaborative doctoral (PhD) programmes, established between universities and industry, are becoming increasingly important across Europe. It highlights that both universities and business consider collaborative doctoral programmes as important channels for supporting both innovation and recruitment efforts.

3.3. Collaborations focused on the transfer between studies and work life

Models included within this type are defined by the features shown in Table 3.

Table 3: Main features of Collaborations focused on the transfer between studies and work life models

| Feature | Description |
|---------------------------|---|
| Main educational purposes | To develop cross-cutting skills such as drawing-up CVs, one-to-one interview, good team-working skills and flexibility; to increase social skills; to increase capabilities to transfer know-how on practical knowledge to local partners |
| Common sectors | Business; marketing; social sciences; engineering |
| Role of company | Mentoring; supervision; evaluation |
| Role of HEI | Set host site; assist with student selection; monitoring and assessment |
| Role of student | Full-time or part-time student engaged or not in productive work; may be observer or can participate in activities |
| Company's incentives | To access to a skilled workforce |
| HEIs' incentives | To establish short and medium-term sustainable collaborations with business; to help build awareness of the added-value that university research can bring to industry and society at large |
| Students' incentives | To expose to non-university environments; to improve students' ability to relate abstract thinking to practical applications |
| Duration | Short-medium-large term (1 day, 2-3 days) (1 term-2nd term, whole year, more than one year) |
| Optional/Mandatory | Optional |
| Paid /no Paid | Both |
| Territorial scope | International; national; regional; local level |
| Supporter | Industrial association ; companies; professional associations |
| Public/private HEIs | Both |



Three models have been considered:

- **Model 6 (M6). Career fairs.** It is well-known that some universities used to arrange annual university career fair days as a unique event that provides an opportunity for students to meet with companies interested in hiring. Usually, career fairs have an average duration between 1 and 3 days and a wide variety of employers attend with the aim of increase their campus' visibility, to illustrate the benefits of employment in their company and to provide information to students about entry-level jobs, co-op opportunities, and internships. Many of these companies also participate through On-Campus Recruiting (OCR) programs, and use the career fair as a kick-off for their recruiting season. Sometimes, the aim is only to introduce students to their organization and to collect resumes for future openings [22]. Participation in careers fairs allows companies to meet face-to-face with students interested in their organisation. At the same time, it raises the company's profile and they also gain excellent exposure for the employment brand [23]. This model is followed by universities from all over the world. Furthermore, there are universities, like the University of Malaga, that it is offering the same activity but inside a virtual environment [24].
- **Model 7 (M7). Industrial mentoring programmes** are based on the concept of mentor as those who are often experienced persons who go out of their way to help a mentee reach important life goals. Concretely, this guide [25] shows some definitions about informal or formal mentors: an informal mentor provides coaching, listening, advice, sounding board reactions, or other help in an unstructured, casual manner. On the other hand, a formal mentor agrees to an ongoing, planned partnership that focuses on helping the mentee reach specific goals over a specified period of time. In other cases, it used to be offered directly by companies as a core value [26,27,28,29] so they provide many professional development opportunities to grow students career skills providing them a mentor. But, in this study it is not included the model followed by the King's College London [30] which advise that the mentor only can be alumni or PhD students. So, the proposed mentoring programme is similar to the case of the University of Manchester [31] and it is a formal mentoring programme.
- **Model 8 (M8). Competitions and awards** is a cooperation model in which companies either directly promote with prizes or indirectly fund a contest in which HEI teams compete for the development of a certain product following certain rules. This sort of model proves to enhance motivation of the students



involved [32]. Moreover, the economic incentive also plays a great role in the learning process of the HEI participants. Due to the fact that teams work for solving certain problem, this model has some similarities with the concept of Project-Based Learning (PBL). As a consequence, some authors propose this cooperation model to be denominated as Competition-Based Learning methodology [33]. This cooperation model is firmly established in the field of robotics [34], but latest trends shows that this model has a great acceptance in the energy sector [35] together with the automotive field [36].

3.4. Collaborations focused on the sponsors' initiatives by companies models

Models included within this type are defined by the features shown in Table 4.

Table 4: Main features of Collaborations focused on the sponsors' initiatives by companies' models

| Feature | Description |
|----------------------------------|---|
| Main educational purposes | Foster student's skills under the strategic lines of the companies and proximity approach between R&D lines of the HEI and companies |
| Common sectors | Business; marketing; social sciences; engineering |
| Duration | Medium term (12-24 months) for Student's grant and longer-term (several years agreement) for sponsorship of laboratories |
| Compulsory/Optional | Optional |
| Role of student | Career development; professional socialization; workforce readiness; |
| Role of company | Funders |
| Role of HEI | Assessment and manager of the facilities |
| Company's incentives | Access to a skilled workforce and collaboration with companies alike |
| HEIs' incentives | Availability of funding resources |
| Students' incentives | Possibility to continue studies in a high-level environment and proximity to companies interests, therefore, enhance their labour insertion |

- Model 9 (M9). **Students' grants/scholarships** are usually awarded based on student's performance and achievement during their studies, together with the level of financial needs. Certain university's studies are not available to everyone; therefore, many students are not able to apply as a lack of financial resources. In this scenario, there are companies that provide financial aid to



student in order to be eligible for certain HEI courses through grants, scholarships which do not require repayment. Other examples are focus on certain group of students such as students engaged in science, technology, engineering and mathematics education (STEM) [37] or minorities (ethnic heritage, gender, disabled people, etc.) [38] in order to get some specific scholarships. Additionally, some companies also provide scholarships to their employees' relatives [39,40].

- **Model 10 (M10). Sponsorship of Joint Laboratories at HEIs.** This model is focused on the sponsorship of R&D laboratories at the HEI campus. This patronage is either done by building a complete R&D facility, financing equipment, hiring researchers for these laboratories or just by devoting a regular economic contribution [41]. Normally, this cooperation model is focused on R&D lines linked to the company's strategy and products portfolio or just as a mere marketing purpose [42,43]. A variation of this model is through the funding or sponsorship of certain R&D projects which may lie within the area of interest of the company. Although it does not directly imply the sponsorship of a physical location, it may contribute to enhance the potentialities of already established HEI laboratories [44]. The proposed model for a deeper analysis is the Tech Lane Ghent Science Park, in Belgium.

4. Models for deeper analysis

From the former 10 good models, five of them have been chosen for a deeper analysis. In the following subsections the selection criteria of the chosen models are presented, after which a deeper analysis of them is undertaken. Finally, an assessment of each one has been elaborated.

4.1. Selection of Models

In order to select five good models we have given importance to this main feature: the level involvement of companies in HEIs, classifying it in low level (L), middle (M) and high level (H).

- Students are engaged in productive work rather than just observing.



- Students receive some form of remuneration for their work.
- Student progress is monitored by the institution (university or company).
- Performance is evaluated by an employer.

Table 5 shows how the former ten good models satisfy, or not, the mentioned features. In this table, the selected five models are highlighted.

Table 5: Selection of Models

| Models | Features | | | | |
|------------|--|----------------|----------------------|-------------------------|---------------------------------|
| | Model Type | Location | Internationalization | Accreditation | Involvement level for companies |
| M1 | Industrial advisory boards | USA | YES | ABET | H |
| M2 | Dual VET | Denmark | YES | Trade Union /Government | H |
| M3 | Visiting professors | UK | NO | YES | M |
| M4 | Summer schools | Denmark | YES | - | L-M |
| M5 | PhD programmes | Denmark | YES | YES | M-H |
| M6 | Career Fairs | USA | NO | - | M |
| M7 | Industrial mentoring programmes | UK | NO | - | H |
| M8 | Competition and awards | Spain | YES | - | M-H |
| M9 | Students' grants | USA/SPAIN | YES | NO | L-M |
| M10 | Sponsorship (Joint Laboratories at HEIs...) | BELGIUM | YES | - | M-H |

4.2. Deeper analysis

Tables 6 to 10 show the deeper analysis for the previous selected models.

Table 6: Assessment of M1- Industrial advisory boards

| Model ID | M1 |
|---------------------------------|---|
| Public/Private University | Public or private Universities |
| Location | Into HEI's Campuses |
| Voluntary/Mandatory | Voluntary models followed by HEIs; mandatory character if they are boards such as Professional Associations |
| Territorial scope | International; national; regional or local Committees |
| HEI proposal / Company proposal | Both |
| Company's incentives | To apprise the institution of changing skills sought for in |



| | |
|---|---|
| | new hires, exercise a civic and educational role within the community; to forge collaborations on projects that can benefit the company's product line or service; to increase the level of professional credibility; to advise on curriculum development |
| HEIs' incentives | Opportunity to new graduates seeking full-time employment and current students seeking internships; enhancement of an educational institution's stature in the community, and the steering of corporate contributions towards a program 's infrastructure development |
| Who pays the IABs? | Companies/HEIs |
| Does the HEI provide a work place for IABs? | Yes |
| Does the university have a contract with the IABs for hosting them? | Yes |
| Is the IAB involved throughout the whole formative period? | Yes |

Table 7: Assessment of M3- Visiting professors

| Model ID | M3 |
|---|---|
| Public/Private University | Public or private |
| Location | HEI's Campuses into departments |
| Compulsory/Optional | Optional |
| Territorial scope | International /National/Regional or Local |
| HEI proposal / Company proposal | HEI proposal |
| Role of VPs | Deliver face to face teaching and mentoring at the host university; contribute to postgraduate teaching, curriculum development (such as the development of new modules/programmes) and strategy development; tutoring students; running activities such as an industrial visits; proposing and/or supervising undergraduate projects |
| Role of HEI | Providers of senior industry practitioners or company's expert worker |
| Role of HEI | To provide VPs a letter of appointment and a formal contract of employment. |
| | |
| Does the HEI provide a work place for VPss? | Yes |
| Does the university has a contract with the VPs for hosting them? | Yes |
| Are the VPs involved throughout the whole | No necessarily |



| | |
|-------------------|---------------|
| formative period? | |
| Paid /no Paid | Award/no paid |

Table 8: Assessment of M4- Summer Schools

| Model ID | M4 |
|--|---|
| Public/Private University | Public Universities |
| Location | Company Facilities |
| Compulsory/Optional | Optional |
| Territorial scope | International |
| Duration | Three weeks |
| HEI proposal / Company proposal | Both |
| Role of Companies | Exposition of company's principles and mission, design process, portfolio of products, professional careers, research activities, and sales strategy. Guide students in modelling their projects and give feedback on their work |
| Role of HEI/tutor | Selection of students for the model. Responsible for defining the programme and the pedagogical approach. Supervision of the students. Lectures on a relevant topic |
| Role of Students | Resolution of a Problem-based learning project in a multidisciplinary international team |
| Paid /no Paid | Not paid |
| Company's incentives | The new ideas that can come up from students, the recruitment potential and the inspiration from young people |
| Does the company provide a work place for the student? | YES |
| Does the company have a contract with the students, or an agreement to hire the students when they complete their studies? | NO |
| Is the company involved throughout the whole formative period? | NO |

Table 9: Assessment of M7 Industrial mentoring programmes

| Model ID | M7 |
|---------------------------|--|
| Public/Private University | Public |
| Location | HEI; company |
| Compulsory/Optional | Optional |
| Territorial scope | International; national; regional or local |
| HEI proposal/Company | Both |



| | |
|--|--|
| proposal | |
| Role of company | To discuss their own personal experiences as an industrial expert in industry; to give careers advice and help in preparing for job applications and the recruitment process; to describe the toolsets in use in their own and other organisations; mentors can provide technical help by suggesting how they might go about looking for a solution if they were working in a real team, rather than by giving answers directly ; mentors interact with a student or team to work mainly face-to-face (or by mail or online platforms); supervision; evaluation; for post graduates mentoring is an unique opportunity to kick-start their career; to help students to make the most of their personal talents |
| Role of HEI | To establish agreements with relevant industrial sector companies; Faculty centre provide the general info -course booklet or on-line equivalent- in order to enrol students in a lecture, lab classes etc.; to arrange the mentoring relationship and suggest meetings along the whole course in a flexible way; to provide a site an infrastructure into their campus; to contribute to the industrial relevance of the course unit for students by giving them access to an industry professional; recruit students through talents programmes, competitions |
| Role of student | To take the initiative in asking questions and posing topics for discussion; to participate in their own group; to participate in competitions and hand in their final work can provide personal skills information to their mentors for a possible recruitment process. |
| Company's incentives | To advertise their company; to build relationships with students; to improve the quality of the entire cohort by helping to embed good practices early on |
| Does the HEI provide a work place for Mentoring's programmes? | Yes |
| Is the Company involved throughout the whole formative period? | No necessarily |
| Paid /no Paid | No paid |

Table 10: Assessment of M10 Sponsorship - Joint Laboratories at HEIs

| | |
|---------------------------|-------------------|
| Model ID | M10 |
| Public/Private University | Public University |
| Location | HEI campus |
| Voluntary/Mandatory | Voluntary |
| Territorial scope | International |



| | |
|--|---|
| Duration | Long-term agreements |
| HEI proposal / Company proposal | HEI proposal |
| Role of Companies | Integration and equipping in one of the HEI facilities. Collaboration with the University labs, research institutes and other companies |
| Role of HEI | It manages the Science Park and is the incubator for the creation of start-ups. It offers accommodation for labs and companies |
| Role of Students | The use the laboratories for their academic or research necessities. |
| Company's incentives | Easiness of access to human resources available (Students and researcher from the University) and collaboration with companies alike |
| Does the company provide a work place for the student/researcher? | NO (The facilities belongs to the host HEI) |
| Does the company have a contract with the students, or an agreement to hire the students when they complete their studies? | not necessarily |
| Is the company involved throughout the whole formative period? | NO |

4.3. Assessment

Collaboration between companies and HEIs has traditionally taken place through informal agreements with individual academics or departments, often with some more formal agreements running in parallel such as lifelong learning tailored courses made to companies. The variations in the traditions for interaction across different sectors have often been based on national and/or regional industrial specializations and nowadays it is more usually the implementation of internationalization models. In addition, different degrees of reciprocity and involvement between partners- companies and HEIs- are been reported. Some of the proposed models share similar features among them, therefore they can be classified in more than one category among the selected cooperation models between companies and HEIs proposed in this document



5. Conclusions

It is important to remark that this study has been focused on those regions where the productive fabric includes SMEs and multinationals with cooperation willing and interested in the potential benefits that offer cooperation activities with HEI. Nevertheless, it is necessary to remark that the most important feature is the geographical location of some universities, particularly those located more or less close to an industrial area or technological hub as they can better contribute to improve the cooperation between companies and HEIs.

To sum up, the main objective of all the collaborations' models proposed is to increase the students' work-relevant competencies and skills, make them more employable, and foster entrepreneurial attitudes and mind-sets among them.

References

-
- [1] Gail E et al. Making industry-university partnerships work. Lessons from successful collaborations. 2012 Science-Business Innovation Board AISBL.
 - [2] Bonnie C., Clements MD. Early organizational involvement (EOI): creating successful transitions from higher education to the work place. Emerald Group Publishing Limited Vol. 24 No. 3 2010, pp. 5-7.
 - [3] National Principles and Operational Guidelines for Recognition of Prior Learning (RPL). AQFAB. 2004.
 - [4] Blom K, Berwyn C, Bateman A, Bedggood M, Hughes E. What's in it for me? Recognition of prior learning in enterprise-based registered training organisations: Australian National training Authority. 2004.
 - [5] Sheridan I, Linehan M. Work placement in third-level programmes. Roadmap for employment-academic partnerships. 2011.
 - [6] Success factors in higher education–industry collaboration: A case study of collaboration in the engineering field. Journal Tertiary Education and Management. Vol. 17,1, 2011.
 - [7] The University of Oklahoma [online] <http://www.ou.edu/coe/ise.html>. Last access in May 2017.
 - [8] The University of Manchester [online] <http://www.cs.manchester.ac.uk/industry/club/>. Last access in May 2017.
 - [9] The University of Sydney [online] <http://sydney.edu.au/engineering/it/about/industry-advisory-boards.html>. Last access in May 2017.



- [10] Stephen R. Genheimer, Shehab R, The effective industry advisory board in engineering education - A model and case study. University of Oklahoma, School of Industrial Engineering, USA. Published in: Frontiers In 37th ASEE/IEEE Frontiers in Education Conference. 2007 IEEE October 10 – 13, 2007, Milwaukee, WI
- [11] The Accreditation Board for Engineering and Technology (ABET) [online] <http://www.abet.org/about-abet/>. Last access in May 2017.
- [12] Dual Vocational Education Training [online] www.dualvet.edu. Last access in May 2017.
- [13] German office for international cooperation in vocational education and training (GOVET) Presentations on the German VET system [online] <https://www.bibb.de/govet/en/54879.php>. Last access in May 2017.
- [14] U.S. Denmark Partnership for Vocational Education [online] <https://www2.ed.gov/about/offices/list/ovae/pi/usdnmrk/dksys.html>. Last access in May 2017.
- [15] Ministry of Danish Education [online] <http://eng.uvm.dk/>. Last access in May 2017.
- [16] Royal academy of engineering [online] <http://epc.ac.uk/raeng-visiting-professors-2017-award/>. Last access in May 2017.
- [17] Larsen, P. G., Fernandes, J. M., Habel, J., Lehrskov, H., Vos, R. J. C., Wallington, O., & Zidek, J. (2009). A multidisciplinary engineering summer school in an industrial setting. *European Journal of Engineering Education*, 34(6), 511–526.
- [18] Summer Schools in Europe. [online] <http://www.summerschoolsineurope.eu/>. Last access in May 2017
- [19] Aarhus University [online] <http://www.au.dk/en/>. Last access in May 2017.
- [20] Technical university of Denmark [online] http://www.cee.elektro.dtu.dk/education/phd_programme. Last access in May 2017.
- [21] Collaborative doctoral education: University-industry partnerships for enhancing knowledge exchange [online] <http://www.eua.be/activities-services/projects/past-projects/research-and-innovation/doc-careers.aspx>. Last access in May 2017.
- [22] Cornell university: career services [online] http://www.career.cornell.edu/events/university_fair/ Last access in April 2017.
- [23] The university of Sidney [online] http://sydney.edu.au/careers/employers/career_fairs/. Last access in April 2017.
- [24] Universidad de Málaga. Entorno virtual de la tercera Feria de Empleo Málaga [online] <http://www.feriaonline.uma.es/>. Last access in April 2017.
- [25] Taken from the mentor's Guide, Phillips-Jones, Ph.D., Linda. Coalition of Counseling Centers (CCC/The Mentoring Group), Grass Valley, CA, 2000.
- [26] Hub:raum [online] <https://www.hubraum.com/mentors>. Last access in May 2017.
- [27] GTEC Berlin Startup Academy [online] <http://berlinstartupacademy.com/mentoren-gallery>. Last access in May 2017.
- [28] Microsoft coop. [online] <https://careers.microsoft.com/students#programs>. Last access in May 2017.
- [29] Cambridge wireless [online] <http://www.cambridgewireless.co.uk/iotboost/mentors/>. Last access in May 2017.



- [30] King College [online] <https://alumni.kcl.ac.uk/alumni-benefits/mentoring/mentoring-role-descriptions>. Last access in May 2017.
- [31] The university of Manchester [online] <http://www.cs.manchester.ac.uk/industry/mentoring>. Last access in May 2017.
- [32] Skjodt Worm, B. & Vihh Buch, S., 2014. Does competition work as a motivating factor in e-learning? a randomized controlled trial. PLoS ONE, 9(1).
- [33] Sukiman, S.A. et al., 2016. Competition-Based Learning: Determining the Strongest Skill that Can Be Achieved Among Higher Education Learners. In M. A. Abdullah et al., eds. Regional Conference on Science, Technology and Social Sciences (RCSTSS 2014): Business and Social Sciences. Singapore: Springer Singapore, pp. 505–516.
- [34] Tan, N. et al., 2016. IDC Robocon: A Transnational Teaming Competition for Project-Based Design Education in Undergraduate Robotics. Robotics, 5(3), p.12. Available at: <http://www.mdpi.com/2218-6581/5/3/12>. Last access in May 2017.
- [35] Navarro, I. et al., 2014. Experiences and methodology in a multidisciplinary energy and architecture competition: Solar Decathlon Europe 2012. Energy and Buildings, 83, pp.3–9.
- [36] Moto Engineering Foundation [online] <http://www.motostudent.com/>. Last access in May 2017.
- [37] The Siemens Foundation [online] <http://www.siemens-foundation.org/>. Last access in May 2017.
- [38] Banco Santander. Fundación Universia [online] <http://www.fundacionuniversia.net/seccion/becas/doctorado/>. Last access in May 2017.
- [39] Siemens Foundation [online]. <https://www.siemens-foundation.org/programs/other-initiatives/merit-scholarship/>. Last access in May 2017.
- [40] Group Intel. The Andy Grove Scholarship for Intel Employees' and Retirees' Children [online] <http://www.intel.com/content/www/us/en/employee/scholarship.html?wapkw=scholarship>. Last access in May 2017
- [41] Yang, P. & Tao, L., 2012. Perspective: Ranking of the World's Top Innovation Management Scholars and Universities. Journal of Product Innovation Management, 29(2), pp.319–331. May 4, 2017.
- [42] The Haifa facility of the IBM R&D Labs in Israel [online] https://www.research.ibm.com/haifa/haifa_facility.shtml. Last access in May 2017.
- [43] Tech Lane Ghent Science Park [online] <http://www.techlane.be/our-story/>. Last access in May 2017.
- [44] InnoEnergy [online] <http://www.innoenergy.com/>. Last access in May 2017.