

Building Global Competencies: A Strategic Approach to Internationalization of Engineering Education

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Abstract— International mobility is an essential aspect of undergraduate education that enables students to acquire the necessary competences required by the European Higher Education Area (EHEA). However, small universities such as the Public University of Navarre (UPNA), which has approximately 9,000 bachelor's students, face challenges in providing effective mobility opportunities. The most significant hurdles include offering attractive mobility experiences to students and establishing mobility agreements with other universities. Nonetheless, the reduced size of UPNA provides some potential benefits, such as more personalized advice for students and better knowledge of the available destinations. This article discusses the internationalization strategy implemented by the Faculty of Industrial and ICT Engineering at UPNA, which has enabled over 25% of its students to participate in a mobility experience, resulting in a high satisfaction rate. This contribution provides valuable insights into how smaller universities can successfully offer international mobility programmes to their students.

Keywords— student mobility; international academic curriculum; soft skills; engineering education.

I. INTRODUCTION

In order to improve the quality of their Engineering Degrees, several initiatives are developed in many universities concerning internationalization of their education programmes [1], [2]. The European Union (EU) identifies the students' internationalization as a key factor regarding the European Higher Education Area (EHEA) [3]. Together with the participation in student's associations [4], an international experience has been proven to contribute towards the development of soft skills in technical high education programmes [5]. Moreover, an effective internationalization programme is favourable, firstly, to regions receiving students, due to the attraction of trained talent that could be later incorporated to the work market. Secondly, it is beneficial to regions sending students, given that these students acquire new competences during their mobility experience, bringing them

back to their home region when they return from the mobility. Thirdly, it is also advantageous for the students, given the more comprehensive training achieved by means of an international experience, as well as the wider offer they have for starting their working life. Therefore, this mobility is a key aspect for sending and receiving universities, that can offer a better service for students and for society.

Due to the potential of students' mobility during their bachelor's degree, various universities among Europe offer international engineering curricula for students willing to include an international experience in their degrees [6]. These curricula are designed with the international experience as a key consideration. The courses are normally offered in English in order to facilitate incoming students to take a semester of these curricula as their mobility experience, thereby achieving a higher internationalization and interculturality in the courses [7]. Moreover, the English proficiency gained by local students during these curricula eases their mobility to other Universities in Europe or abroad. These international engineering curricula have usually high satisfaction rate among students, due to the more comprehensive training achieved. They are also valuable for universities and industrial stakeholders, given the talented students that are attracted to these engineering programmes [8].

One of the shortcomings identified in mobility programmes is the low rate of participation among students [9]. The Faculty of Industrial and ICT Engineering (ETSIIT) of the Public University of Navarre (UPNA), has designed a mobility programme that achieves participation rates among bachelor students higher than 25% every year. This achievement has been possible by means of a novel design of the mobility programme, exploiting the benefits of the reduced size of the university (around 9000 students). This ratio of 25% of the students participating in mobility programmes is limited by the offer of destinations, given that the number of students applying for the programme has increased during the last years, after the covid-19 pandemic.

This contribution explains the mobility programme for bachelor students designed at the Faculty of Industrial and ICT Engineering, summarizing the key aspects of the programme that contribute to its success. We analyse quantitative results concerning bachelor student's participation rates during the last years, number of destinations offered, as well as results of satisfaction surveys filled by participants. Based on these quantitative results we analyse the acquisition of soft skills such as analytical capacity, problem-solving capability, self-organizing, teamwork, self-confidence and decision making. Moreover, we analyse the synergies established between the internationalization strategy and the international curricula offered by the faculty.

II. INTERNATIONALIZATION AT PUBLIC UNIVERSITY OF NAVARRRE

In line with the EHEA framework, internationalization is one of the seven aspects highlighted in the 2020-2023 UPNA Strategic Plan. One of the strategic actions included in this aspect is the consolidation of the outgoing mobility. With this aim, the university makes, on the one hand, a constant effort towards the establishment of new international alliances and agreements with various universities. These alliances are established and maintained by part of the faculty staff, which assume specific roles related to the faculty internationalization, as described in Section III. B. This allows a wide annual offer of destinations for students to take part in the mobility programme.

On the other hand, an intense effort has been made for the coordination of the mobility offer for students, such as internships at companies, bachelor theses and solidary training. With this coordination, the students are provided with all the information at once, so they can decide among the available options.

The bureaucracy required for an international experience is quite complex. A well-planned and easy-to-follow process is critical for a high participation rate and high satisfaction results. The process implemented at UPNA, which is used for the internationalization of engineering students, is explained in the following lines.

Let n be the year in which a student carries out their mobility. During year n , the mobility is made during the spring semester (February to June), as shown in Fig. 1. The application calendar designed at UPNA begins in October of year $n-2$. This early beginning of the application process is a positive characteristic that make the students aware of the relevance of their international experience.

- October, $n-2$: Information about available destinations for each bachelor programme is published on the website, coinciding with the publication of other offers mentioned above.
- November, $n-2$: Students submit their online application choosing their preferred destinations.

- December, $n-2$: Publication of the assignment. Each student knows the destination they have been assigned.
- April, $n-1$: An informative meeting is held with all students who have been assigned a placement to inform them about the required paperwork for the mobility programme.
- May, $n-1$: Each student must complete their learning agreement, indicating the courses they will take at the destination and those that will be recognized at UPNA. The signature of the professor in charge of the destination is required.
- June, $n-1$: Regular enrolment of UPNA students. Students who are going to participate in mobility programmes already have the recognized courses to be enrolled.
- November, $n-1$: Official nomination of students, informing the destination university.
- December, $n-1$: Destination universities contact students to provide them with the latest instructions.
- February, n : Mobility begins.
- June, n : Mobility ends.
- July, n : The destination university sends the transcript of records, credits are recognized, and grades are recorded in the student's record.

III. INTERNATIONALIZATION AT THE FACULTY OF INDUSTRIAL AND ICT ENGINEERING

The efficient application of the general methodology presented in Section II is critical for a successful internationalization. With this aim, on the one hand, the Bachelor curricula of the ETSIIIT Faculty have been designed, as detailed in Section III. A, taking the mobility strategy into account. On the other hand, the faculty organizational structure described in Section III. B has been implemented in order to allow a real implementation of this strategy. Moreover, this effective international mobility strategy allows the faculty to offer International Programmes (IP) of some of the bachelor's degrees, as described in Subsection III. C. All in all, these actions allow the participation of 27% of the students in international mobility programmes.

The number of destinations that is offered by the faculty each year is designed based on the expected demand by students, with the aim of keeping the students' internationalization rate higher than 25%. Fig. 2 shows the number of destinations offered in the last 6 calls. Note that year 2021 was significantly affected by the Covid-19 pandemic, leading to a 40% reduction of the offered destinations. The number of students' applications suffered a less significant reduction of 16%. This issue led to many students willing to participate in international programmes during the upcoming years, with a number of applications significantly higher than years 2019 and 2020. Therefore, the

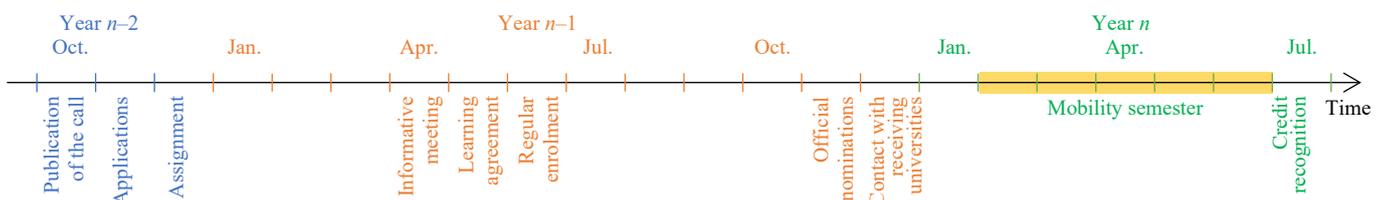


Fig. 1: Calendar for mobility programmes designed at UPNA, being n the year of the mobility experience.



Fig. 2: Offer and participation in the last six mobility calls.

number of offered destinations was also increased in around 40% compared to years 2019 and 2020.

Fig. 3 shows the geographical distribution of the destinations assigned in the last call. This share is similar every year, being Europe the most typical destination. This is due to the easier signature of alliances among European universities, the easier recognition of courses inside the EHEA system, with the European Credit Transfer and Accumulation System (ECTS), and the funding of the European Erasmus+ Programme.

A. BACHELOR CURRICULA

The ETSIIT Faculty offers 11 bachelor programmes. The offer includes degrees in Industrial, Electrical, Mechanical, Communications and Computer Engineering. All the curricula include competences highlighted in the EHEA framework, that are significantly enhanced by an international mobility programme. Therefore, these curricula have been designed considering an internationalization experience. This design is a key stone for the success of the internationalization strategy presented in this contribution.

The 8-semester curricula consist of 240 credit points (ECTS). Each semester, which lasts approximately 20 weeks, is built by courses that add up to 30 ECTS. Each ECTS is designed to require 10 hours of presential class and 15 hours of individual work. Therefore, the overall weekly workload for a student is 37.5 hours. Fig. 4 shows a schematic representation of the curricula designed at the faculty. The core courses are grouped in Semesters 1 to 7, thereby having a Semester 8 consisting in 12 or 18 ECTS of elective courses and the Bachelor Thesis, with 18 or 12 ECTS. Some of the bachelor's degrees have 12 elective ECTS and others 18 ECTS. The Bachelor Thesis have 18 or 12 ECTS, having all the degrees 30 ECTS in Semester 8.

Semester 8 is a very flexible semester, in which students are enrolled in elective courses, that are easy to find in a different university, allowing for the international experience. Moreover, these students live the international experience once they have a solid technical background acquired during Semesters 1 to 7. Given that it is the end of their bachelor's degrees, the mobility during this semester opens a wider offer for Master's degrees and working opportunities after their semester abroad. The

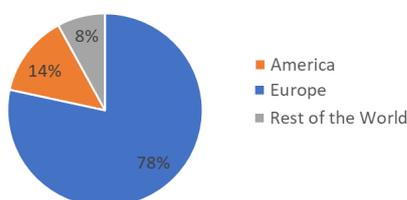


Fig. 3: Geographical distribution of destinations of the mobility semester.

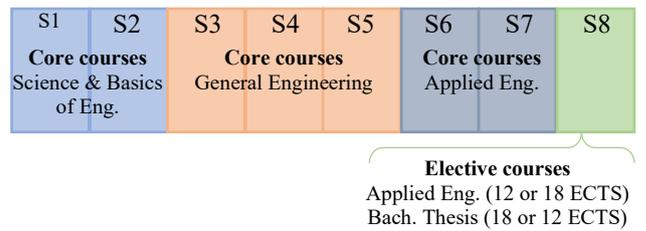


Fig. 4: Structure of Bachelor curricula at the Faculty of Industrial and ICT Engineering, Public University of Navarre.

Bachelor Thesis is also a good opportunity for these students to take part in technical work in collaboration with a company or with a research group at the receiving university.

B. FACULTY STRUCTURE

The Faculty of Industrial and ICT Engineering of the UPNA has assigned specific roles to some of its professors for an effective management of the internationalization strategy. The Vice-dean of Internationalization is the person in charge of this strategy. Besides the coordination of the faculty internationalization, the Vice-dean works on the stabilization of new mobility agreements with strategic partners. This entails funding management, design of bi-lateral international agreements with other universities aiming at a mutual benefit, proposal of new international alliances, etc.

Three faculty professors are the so-called "Mobility Coordinators" (MC). Each of them coordinates the mobility among similar bachelor's degrees offered by the faculty: (i) Industrial, Electrical and Mechanical Engineering, (ii) Communications Engineering, and (iii) Computer Engineering. These coordinators build up the mobility offer for each of the degrees, by adding or deleting destinations based on the expected number of applications, on the results of satisfaction surveys of previous years and looking for a broad offer in terms of locations and types of institutions. Moreover, they homogenise the credits recognition among all destination universities.

Finally, 21 professors are the so-called "Mobility Managers (MM)". Each destination university has an assigned MM at UPNA. The functions of the MM are to be in touch with destination universities, to keep a fluid communication with them, to visit them from time to time, to know the academic offer of each university, to advise the students during the application process if they have specific questions about a destination, to sign the students' Learning Agreement, which relates the courses that will be taken at the destination university and those from UPNA that will be recognized for their curricula, and to transfer the students' grades received from the destination universities to the UPNA Transcript of Records.

C. INTERNATIONAL PROGRAMMES

The Faculty of Industrial and ICT Engineering of UPNA offers international programmes (IP) for some of the bachelor's degrees. The students of these international curricula acquire the same competencies as students in traditional engineering programmes. The main two differences are that in the IPs most of the courses are in English, and an international mobility is mandatory. Given that these international programmes are offered in English, it allows incoming international students to be enrolled in some of the courses, while local students are in

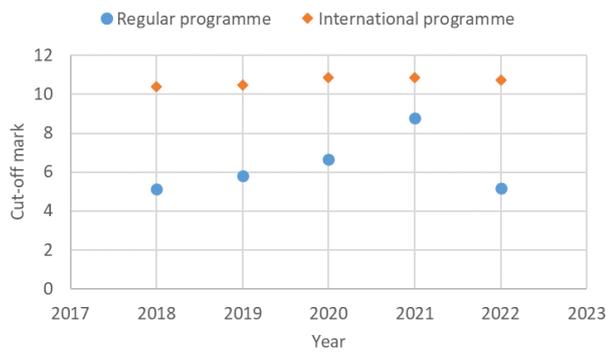


Fig. 5: Cut-off mark for the regular and the international programmes of Industrial Engineering. Maximum admission mark: 14; minimum: 5.

touch with incoming students and improve their technical English proficiency.

On the one hand, these international programmes are allowed by the international strategy described in this contribution, given that local students of international programmes are required to participate in an international experience. Therefore, the efficient offer and management of internationalization is mandatory for the faculty to be able to offer them. On the other hand, these programmes are also a key stone for the good performance of the presented internationalization strategy, given that the students enrolled in these programmes are willing to live an international experience and the courses offered in English attract also international students, balancing the incoming/outgoing balance of the faculty internationalization strategy.

Besides the international talent attracted to the university by means of these IPs, outstanding local students are also attracted to the university. This attraction of local talent can be measured by means of the cut-off mark for admission to these programmes, which is the mark of the last student who gained admission to a degree with limited places. Fig. 5 shows the cut-off mark of the last 5 years in the regular and international programmes of Industrial Engineering. The maximum admission grade in Spain is 14, while the minimum is 5. Note that the cut-off mark for the IP during the five years is between 10.5 and 11, while that of the regular programme is lower than 5.2 in 2018 and 2022. Note that the access marks of years 2020 and 2021 may be affected by the Covid-19 pandemic. The high admission marks of the IP mean that outstanding students are attracted to this curriculum. Given that the only difference between the international and the regular programmes in the internationalization approach detailed in this contribution, this is a key element for the attraction of talented and motivated students to the university.

IV. ASSESSMENT

The internationalization strategy presented in this contribution allows more than 25% of the students of the Faculty of Industrial and ICT Engineering the experience of a semester of their bachelor's degree to be taken in a different international university. All these students are asked to fill a satisfaction survey after their mobility experience. The result of this survey is used for the improvement of the internationalization strategy, as well as for the assessment presented in this contribution. The average response rate of these satisfaction surveys is 52%.

One of the key indicators that explain the success of the internationalization strategy year after year is the high satisfaction rate among participants. 93.5% of the participants are satisfied or very satisfied with the international experience,

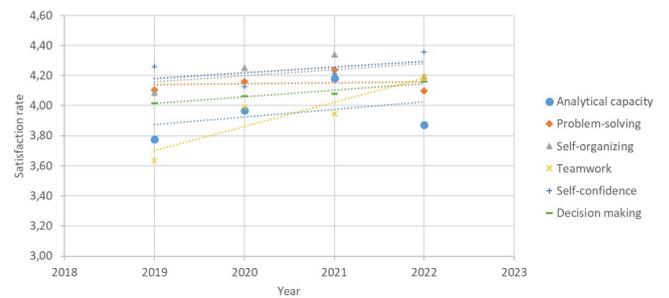


Fig. 6: Satisfaction rate with the acquisition of soft skills after international experience in a scale from 1 (very unsatisfied) to 5 (very satisfied).

and 97% of them would recommend the experience to other students. Concerning the satisfaction with the support provided by the sending institution, the four indicators analysed range from 3 to 4 in a scale of 5, meaning 1 “very unsatisfied” and 5 “very satisfied”. The indicators and their values are:

- Administrative support: 3.5 / 5
- Academic mentoring: 3.2 / 5
- Support from students' associations: 3.1 / 5
- Support with personal needs: 3 / 5

The most relevant indicators concerning the strategy presented in this contribution are the administrative support and the academic mentoring, which achieve the highest satisfaction rates.

The development of the soft skills, one of the most relevant EHEA competences, is a capital objective of the international strategy presented in this contribution. The satisfaction survey filled by the students after their participation in the international programme includes some questions related to the acquisition of soft skills. Fig. 6 shows the result of these questions, in the same scale from 1 to 5 presented above, during the last four calls. The average values provided by participants during these four years concerning the acquisition of soft skills are:

- Analytical capacity: 4.0 / 5
- Problem-solving: 4.2 / 5
- Self-organizing: 4.2 / 5
- Teamwork: 3.9 / 5
- Self-confidence: 4.2 / 5
- Decision making: 4.1 / 5

Fig. 6 also shows a linear fit for the satisfaction rate related to the acquisition of each soft skill. All of the six fitting lines have positive slopes, indicating an increasing satisfaction of the participants with the acquisition of soft skills. It is noteworthy that the overall satisfaction of students with the acquisition of soft skills, which is asked in an independent question of the survey, is 4.4 / 5, higher than the satisfaction with the acquisition of individual skills.

Finally, the participants are also asked about their employment expectations. The average answer to the first question, *can you imagine yourself working abroad in the future?*, is 4.28 / 5, while the second one, *do you think you are more likely to find a better job after your international experience?*, has an average result of 4.06 / 5. Therefore, on the one hand, the participation in an international programme

encourages students to be open to job offers coming from different countries, increasing their willingness to move away from home and live in other countries. On the other hand, the participants feel that an international experience is valued by future employers, given that they expect to be able to find a more suitable job due to their participation in the internationalization programme presented in this contribution.

V. CONCLUSIONS

This contribution shows the students' internationalization strategy designed at the Faculty of Industrial and ICT Engineering of the Public University of Navarre. This strategy has allowed the faculty to reach 27% of students' participation in mobility programmes, as well as a relevant increase in the number of applications after the covid-19 pandemic. This participation in a mobility programme reinforces some of the competences highlighted by the EHEA programme and required for the bachelor curricula at the Public University of Navarre.

This contribution presents the process step by step, requiring a total of 21 months for a mobility of 5 months. This long and established calendar is a key factor for the success of the internationalization strategy, given that students have the international semester in mind for 21 months, thereby enlarging the relevance of the internationalization for the development of important skills. This impression is transferred to younger students, increasing the willingness of taking part in an international experience. The structure of the faculty needs to be designed to keep proper track of this long process. The Vice-dean of Internationalization coordinates the whole process, assisted by 3 Mobility Coordinators and 21 Mobility Managers. The International Office of the University also plays a key role concerning the required paperwork and the implementation of the internationalization strategy.

The design of the bachelors' curricula is also relevant for the success of the internationalization strategy. The bachelors' degrees offered by the faculty are divided into 8 semesters, keeping the elective courses and the bachelor thesis in the 8th semester. This elective semester eases the participation of students in international programmes during their last bachelor semester.

The synergies between the presented internationalization strategy and the bachelor's international programmes offered by the faculty are also shown in this contribution. On the one hand, the internationalization strategy provides these programmes with an essential tool to guarantee all the students the chance to study a semester abroad. On the other hand, the international programmes attract talented local students and increase the internationalization of the university, attracting students from other countries, thereby enriching the learning environment of the faculty.

Finally, the high satisfaction rate of the participants, both with the support received from the sending university, with the acquisition of soft skills and with the employment expectations validate the successful of the presented internationalization strategy. It contributes to the acquisition of soft skills, as demanded by the EHEA programme, and increases the employability of the participants. This strategy allows more than 25% of the faculty students to have an international experience during their bachelor's degree, being 93.5% of them satisfied or very satisfied with this experience.

The strategy presented in this contribution has been proven to be effective, due to the large number of involved students, affordable, given that it has been implemented in a relatively small university (9000 students), and successful, due to the high satisfaction rates registered in the surveys filled by participants. The key elements presented in this contribution can serve as a model for other small universities and faculties seeking to improve their internationalization strategy and promote student development. By implementing such strategies, universities can provide their students with valuable international experiences that enhance their learning and employability.

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