# Proposals for improvement in the education received in Information and Communication Technologies (ICTs)

The report entitled *The opinion of employers regarding the education received by graduates in ICTs* sets out the results of a survey conducted on organisations that have recruited individuals who recently graduated in ICT Bachelor's degrees. It relates to the education received and the skills acquired. Furthermore, this information is complemented by data from other surveys (on access to the labour market and satisfaction) and information from the UNEIX university system.

The key results of this report are as follows:

- Bachelor's degrees in the field of ICTs account for 40% of all registrations on Bachelor's degrees in the engineering sphere. By and large, availability of places offered meets demand. Even so, it should be pointed out that 8 in every 10 students on ICT Bachelor's degrees are male.

- Student satisfaction with the Bachelor's degree is high, exceeding the average for study programmes in the Catalan university system (SUC) in many cases.

- Access to the labour market experienced by individuals who graduate in ICTs is also excellent. They benefit from high salaries and job stability.

- 8 in every 10 organisations report that they have encountered difficulty in recruiting individuals with suitable profiles (this sector exhibits the greatest difficulties). The foremost reasons include lack of skills needed for the position on the part of candidates and a shortage of qualified individuals in the field of ICTs.

- Employers are happy (at 7.1 out of 10) with the skills of graduates in ICTs. However, they point out the need for improvements when it comes to problem solving and decision-making and in relation to practical training, which is also the case with the remaining study programmes in the Catalan university system.

- When it comes to specific skills in the field of ICTs, 67% of employers report a need for improvements in the education received in terms of project management and planning. Also, around 30% call for improvements in the education received in cybersecurity, data analysis and adaptability, and critical testing and assessment, skills that are more closely linked to implementation of solutions. On the other hand, employers are happy with other skills related to the design of solutions.

- Lastly, employers do highlight the importance of benefitting from professionals with skills in programming, artificial intelligence, big data, cloud computing and project management.

Taking these results into consideration – and with the participation of representatives from the faculties of the Catalan universities where Bachelor's degrees in the field of ICTs are delivered – a host of proposals has been drawn up for the improvement of these study programmes:

**INCREASING DEMAND FOR ADMISSION TO BACHELOR'S DEGREES IN ICTs**

- It is important to reinforce technological vocations among students of pre-university education, particularly among girls. Many actions have been and are being taken along these lines, in particular with visits during the upper secondary school, although their impact is low; it may be because they take place once the students have chosen their vocations (a procedure that takes place in earlier stages of the education process).

- It is necessary to showcase ICT jobs: society is unaware of the career opportunities arising from ICT study programmes and, as a result, boys and girls are also unaware. Society needs to become acquainted with the social impact of computing and telecommunications professions (not so much in terms of the technical aspects but rather in relation to their applications).

- It is vital to strengthen cooperation with the media, both in order to better emphasise the usefulness of technologies and in order to enhance the presence of female role models in the STEM field.

- For this reason, it is important to properly define the usefulness of ICT study programmes and to be able to convey this to society. The means of showcasing the usefulness of the study programme could start with its name. Study programmes with specific names – such as Biomedical Engineering or Data Engineering – have a higher proportion of female graduates.

- In order to strengthen vocations throughout the early childhood and primary education stage it is essential to train teachers in ICTs and technologies. Teachers must be familiar with what engineers do and what purpose technology serves; only then can vocations be encouraged.

- It would be interesting for students of compulsory secondary education and upper secondary education to be educated in computational thinking to provide them with the option of discovering the world of ICTs before they get to university and therefore of choosing these Bachelor's degrees.

- To do this, it is necessary to benefit from the cooperation of the authorities.

**IMPROVING CROSS-DISCIPLINARY SKILLS**

It is far more effective to broaden the presence of employers within the syllabus rather than simply relying on surveys as this allows for swifter adaptation in terms of the timeframe. In this regard, the following is proposed:

- To strengthen dual training: to enhance the achievement of those skills that are valued most highly by employers. It is necessary to ensure that companies take part in the training of future ICT professionals.

- To ensure that all Bachelor's degrees offer a suitable volume of mandatory external training placements.

- To promote the preparation of the Bachelor's degree final-year project at companies: to increase the level of practical training among students.

- To improve project management skills through participation in interdisciplinary Bachelor's degree final-year projects or other projects.

In addition, further proposals such as the following arose:

- To encourage problem-based learning.

- Languages: although it is presumed that it is not incumbent on universities to improve their students' level of English, activities to enhance communication skills on the Bachelor's degree could be related to undertaking the degree in English. Taking tuition in English and promoting mobility are actions that increase the language skills of graduates.