



ENTREPRENEURSHIP AT CAPARICA

Case study of a Portuguese engineering school (FCT-UNL)

ABSTRACT

FCT-UNL is the School of Engineering affiliated to NOVA University of Lisbon. The bonds with the business world are a priority for several decades, having bred a research organisation in 1986 (UNINOVA) and a science park in 1995 (Madan Parque).

This proactive approach to the market was reinforced more recently (since 2012/13 academic year) with the implementation of a revised curricular profile of all master degrees (Engineering and Applied Sciences). It was perceived the need to improve and extend the competencies of undergraduate students, with a focus on the paradigm of learning by doing in close connection to the business world.

The entire alumni population is enrolled within the activities pertaining to the "Entrepreneurship Education Programme" at FCT-UNL (later referred to as EEP-FCT). It all happens along 5 weeks in-between the two terms, with different degrees of complexity: simple tasks and eventual study visits during the 1st year, ending up with the development of business ideas in the middle of 4th year.

After this 4-years pilot and hundreds of business ideas scrutinised by a multidisciplinary jury, there is an emerging trend consisting of an advanced programme, whose primary implementation is foreseen to the forthcoming academic year. This programme targets not only the contingent of senior students (5th year), but also graduate students and PhD students who are keen to follow a new course of entrepreneurial activities.

The goal is to work closely with students and to get the most of their creativity, by means of inspiring the generation of business ideas which can be developed further at Madan Parque under the framework of its pre-incubation programme.

Such ambitious 2-stage programme is being assessed and improved continuously, taking advantage of the gracious support granted by local actors (development agency, city council, companies) and many other partners connected to FCT-UNL extended network.

THE INFRASTRUCTURE

The team responsible for the implementation of EEP-FCT is composed by several professors affiliated either to the Industrial and Mechanical Engineering Department (DEMI) or to the Applied Sciences Department (DCSA) at FCT-UNL, more precisely the Economy, Management and Industrial Sociology Section. This team is completed with the support of external members: PhD students in some cases, but also experienced businessmen coming from corporate companies.

The EEP-FCT comprises a total of 12 ECTS that is 3 ECTS per year of the first 4 years of the revised curricular profile of all 3+2 MSc Engineering Courses. The overall structure and main contents of each module is described along the next sections. A simple overview is depicted within the following diagram:



FCT CURRICULAR PROFILE

ACADEMIC CALENDAR



COMPLEMENTARY COMPETENCES



SOURCE: website of FCT-UNL

Module 1 – TRANSVERSAL COMPETENCES FOR SCIENCE AND TECHNOLOGY (3 ECTS)

This first module is very much targeted to the development of soft skills amongst students, with an emphasis on these topics: 1) Insights about drafting a CV; 2) Preparation for a job interview; 3) Advanced usage of



spreadsheets; 4) How to write reports and search for information within public databases and 5) Basics of ethics and deontology.

Module 2 – SCIENCE, TECHNOLOGY AND SOCIETY (3 ECTS)

This module is intended to acquaint students with generic information about the world from a scientific and technological point of view. Students are stimulated to develop a critical thinking about the impact of science and technology in today's modern society. In addition to the former activities, students are also encouraged to attend eight conferences addressing varied topics, that is:

- Risks, safety and responsibility/ethics;
- Science, technology and gender issues;
- Sustainability networks: environment and society;
- War and peace: Einstein, Bohr and Oppenheimer;
- The future is Bio and Nano;
- And the man has created the cyborg;
- Information Society;
- Science, technology and cinema.

Module 3 – UNDERGRADUATE RESEARCH PROGRAM or PRACTICE PROGRAM (3 ECTS)

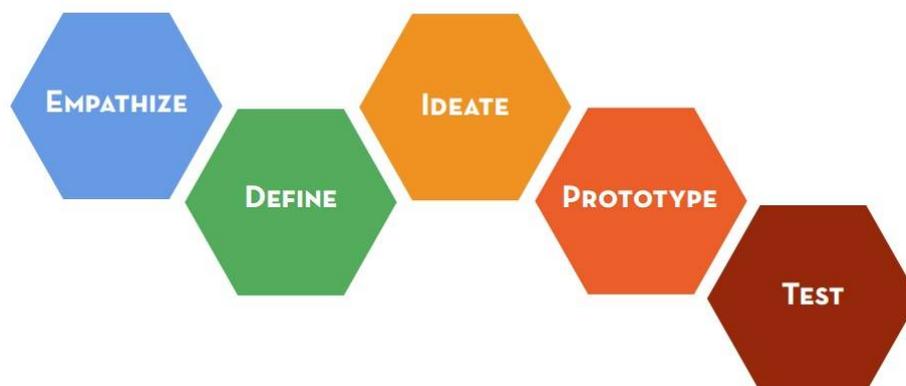
Just in between the last terms leading to the Engineering degree (3rd year), students willing to follow the Undergraduate Research Programme are invited to meet research teams at FCT-UNL who are involved with the development of RTD projects. Otherwise, students can be enrolled within the Undergraduate Practice Program. In such a case, students are placed at companies whose core activities match their scientific background in order to turn such experience meaningful for its recipients.

Module 4 – ENTREPRENEURSHIP (3 ECTS)

The revised curricular profile of FCT-UNL comprises a specific module about entrepreneurship addressing 4th year students only. After the generic training of the first 2 years and the short apprenticeship period during the year after, students have then the opportunity to develop business ideas from scratch.

The learning path follows by short the design thinking process as it was conveyed by Rolf Faste (Institute of Design at Stanford) in the late 80s, who pioneered such disruptive approach to problem-solving which is centred on the perception of needs.

The design thinking process comprises 5 blocks linked in a sequential way, starting by the EMPATHISE mode and finishing with the TEST mode as it is shown below:



SOURCE: course materials developed by the Institute of Design at Stanford



THE CHALLENGES

The reform of the curricular profile was an initiative of the Management Board at FCT-UNL, so there were no major burdens to overcome from an institutional point of view. Nonetheless, the implementation of some activities (module 3 mainly) required the involvement of all Department Units and the nomination of a responsible team for i) Managing the study visits; ii) Identifying suitable host companies and iii) Supervise the learning outcomes of the interns during their 5-week internship.

This process was far more difficult, once not all Departments were genuinely committed to embrace the changes introduced into the curricular profile and hence there was some resistance to adopt such changes. Once the reform followed a top-down approach, the strong commitment of the Management Board was instrumental, having paved the way to a general acceptance of the new model despite the initial constraints as regard to the new orientations and the respective tasks.

Also from the side of the hosting companies it was not always clear the objectives of the short-period internships, being also difficult to identify the necessary resources for running smoothly the activities proposed. Nonetheless, the enthusiasm and persistence of FCT-UNL staff was determinant to ease the process and to find the right whenever approaching the private sector in such a large scale. There were some misconceptions on the early stages and the assumption of a waste of time and other resources. Years later, the liaison between FCT-UNL and neighbourhood companies is being strengthened having led to the identification of other opportunities for cooperation between the counterparts.

Most of the students were quite motivated to be engaged within the activities of module 4. The main challenges to the facilitators/mentors have surfaced whenever students were taken out of their comfort zone. The first situation to emerge was related to the distribution of students per working groups: instead of allowing groups of classmates, each group have had to be formed by 5 students selected randomly. In such a way, the various groups are multidisciplinary and allow different degrees of reasoning and the intersection of different knowledge, once their background is diversified.

HOW THE INITIATIVE WAS RECEIVED BY THE LEARNERS?

The initiative was well received by the learners throughout the years, even though there is not any quantitative evidence so far. The feedback from the learners has been done on an informal way, although it is going to change once the management of FCT-UNL does want to have some concrete data about this topic. The assessment of the new curricular profile by its recipients (the students) is a valuable tool for the contents to be improved, therefore feeding the system with a responsible feedback targeted to increase its overall performance.

THE LEARNING OUTCOMES

This paper attempts to describe the activities embedded within the new curricular profile at FCT-UNL. Due to the limitation of length, some sections will address only one of the four modules. That is the case of the learning outcomes, which will be addressed along the next paragraphs only for module 4 of EEP-FCT.

The main learning outcome associated to module 4 consists of the development of a business idea coupled with a comprehensive business plan. The business plan does include several components, such as: A) market study; B) marketing plan; C) management team and core competencies; D) SWOT analysis, considering opportunities and challenges; E) financial plan, including funding sources and F) final statement, with conclusions.

The reasoning beyond the aforementioned learning outcome flows along the 5-week period, with F2F support and mentoring provided both by the professors and other facilitators (external trainers). The framework is the



one of the design thinking process, as referred to before. The structure of the Entrepreneurship module comprises 5 sequential parts, that is:

PART #1: THE PROBLEM

It starts with an ice-breaking activity, followed by the distribution of students by groups via a random process. As it was said before, each group of 5 elements can have students from 5 different engineering degrees. The goal is to proceed to the identification of the problem / need / opportunity to be worked out. There's a focus on creativity, as well as on the ability to observe / listen /engage.

PART #2: DESIGN A SOLUTION

Students are encouraged to process the information gathered and to refine their ideas, disregarding what is not relevant via a funnelled process. The internal discussions within each group take into consideration the various points-of-view and leads the group into several proto-solutions. The resulting plethora of possible solutions can push forward more questions and variables, leading the groups to convey one final solution (business idea).

PART #3: MARKET STUDY & MARKETING PLAN

Once the business idea is final, students have to start working on the business plan. The first components to be explored are the ones referring to the market study and to the marketing plan. The market study has to identify the sector to be targeted by the new product/service, the customers and also the competitors, with an emphasis on the competitive advantages and the differentiation factors attached to the new product/service. A SWOT analysis is critical at this point. The marketing plan looks at the desired brand positioning and the means to be used for informing potential customers about the company and what is offering.

PART #4: DETAILED FINANCIAL PLAN

Does require an estimation of all costs deemed necessary (operational, financial, etc.) for all phases leading to the release of a new product/service. The intended revenues have to be checked against the investments plan, in order to determine the break-even point and thus infer if the initial projections were feasible or not. It is an iteration process, demanding an intensive mentoring effort by the module's facilitators.

PART #5: ELEVATOR PITCH

Each group is requested to deliver several public presentations of the business idea and the respective business plan, with a time-limit of up to 3 minutes. The evaluation follows a 3-stage process.

The first filter consists of the selection of the most interesting 70 business ideas, out of the initial 180-200 ideas developed by all groups of students. This process is accomplished by the trainers who were present along the various sessions of module 4.

A second iteration takes place 2 days before the final plenary session and besides the participation of the all-time trainers, there is also an extended jury composed by external advisors not affiliated to the Programme on a daily basis. It is then their first contact with the second group of business ideas. There is a discussion period, with a recommended length of up to 10 minutes during which some questions are posed, the financial plan is verified and the interest of the idea is assessed. Each member of the jury fills in a form with a classification of 1-5 granted to several items, that is:



1. Size of potential market;
2. Quality of the team;
3. Quality of the business idea being tested;
4. Innovative potential of the business idea;
5. Ability to quantify the key elements of the business;
6. Quality of the overall strategy;
7. Adequacy of funding assumptions.

Equipa	Dimensão do mercado potencial	Qualidade da equipa	Qualidade da ideia	Carácter inovador da ideia	Capacidade de quantificação dos elementos chave do negócio	Qualidade da estratégia	Adequabilidade da estrutura de financiamento	TOTAL Pontuação 1 a 5	TOTAL Nota Máx. 20 Val.	Obs. (faltas)
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SOURCE: header of the evaluation form developed by **FCT-UNL** for the EEP

There is also a column for observations (missing issues) and another one for the final mark accorded by each member of the jury to the business ideas being evaluated. The trainers group gathers then all this forms and based on the recommendations of the external advisors group as well as their own perceptions, makes a final selection of the 12 best business ideas. The respective groups are notified at this stage and have then to prepared themselves to the final Plenary Session which is due the day after, in the presence of the whole School of Engineering and its stakeholders; invited companies; banks, VCs and other private investors; other universities; local authorities; national agencies; etc.

This is the special moment for the 12 best business ideas to be presented and a final scrutiny takes place. Everyone group of finalists is a winner, but in each academic year there is a need to nominate the 3 best ones, which benefit from the support of Madan Parque, materialised in pre-incubation programme, comprising the valences of counselling and business development.

The winner idea of EEP-FCT 2016 edition was named "Preeclampsia Handy Control". It focuses on the development of a biosensor to monitor preeclampsia in pregnant women. A condition that can affect all pregnant women and that, in the final analysis, can lead to death and the baby.

The winning team consists of students Cátia Figueiredo (Micro and Nanotechnology Engineering), Inês Rosete (Chemistry and bio-organic), José Miguel Cunha (Micro and Nanotechnology Engineering), Vânia Silva (Biotechnology) and Vasco Santos (Micro and Nanotechnology Engineering). As it can be easily understood, the 5 students are affiliated to 3 different MSc degrees, thus forming a multidisciplinary team as it was required in the beginning of the Programme.



SOURCE: website of FCT-UNL

FUTURE PLANS FOR DEVELOPMENT

Such an ambitious programme should not finish in the middle of the 4th year, but proceed beyond. The EEP-FCT is running for 4 years now, so it can be said it is mature enough to require further iterations and an extension to the 5th year, eventually linked to the dissertation thesis whenever possible. In such a case it is compulsory a revision of the curricular profile, so then there will be additional ECTS for supporting the advanced EEP-FCT. Furthermore, such a challenge does require the leverage of specific funds to sustain the subsequent development stages of the existing business ideas, which is the case of pre-seed funds.

Another challenge is the internationalisation and the possibility to intertwine this advanced programme with similar initiatives arising from other countries, should there be suitable financial instruments to support the exchanges and/or the ideas contests.

Some work is being developed already in this sense, namely under the framework of a H2020 project named DIGISTART (Support Ecosystems for Digital Startups. This project has a duration of 30 months, having started in January 2015. The coordination is assured once again by DEMI at FCT-UNL. DIGISTART aims at to support European-Wide digital ecosystems through a set of coordinated activities targeting both Lisbon and Malmö (Sweden, namely the Clusterland incubator). It looks at to harness also the capabilities of the largest European online platform for startups and web entrepreneurs (the platform F6S), in what concerns the delivery of online support to startups.

DIGISTART project is linked to Digital NOVA – University Pre-Accelerator, which consists of a pre-acceleration program for digital entrepreneurship whose implementation is going to be effective in 2016/17 academic year (pilot-testing started last April). 5th year students, recent graduates and even PhD students from the various schools of NOVA University can be enrolled. The programme consists of 3 different modules, that is: 1) Business Design (setting-up the teams, definition of ideas and of the business model); 2) Boost (acceleration period, with multidisciplinary sessions targeted to the development of the business concept) and 3) Start (testing of the business concept within the market, public presentation and final pitch).



The way ahead is thus to secure the sustainability of both initiatives (DIGISTART and Digital NOVA) and to enlarge its focus to other areas of knowledge embedded within the graduation and post-graduation programmes of NOVA University of Lisbon various schools. The aforementioned pilots are one year old at the most, so it is the perfect timing for moving further in an attempt to comply with the framework of Universities' Third Mission as it was discussed by Laredo (2007) and Molas-Gallart (2005).

Last but not the least, the Administration Board of FCT-UNL as well as the responsible structure for the EEP-FCT is looking at delivering some publications about the programme, with the course syllabi and a quotation of some examples of successful business ideas generated along time, so the future generations can better understand and innovate by having a retrospective look into the past.

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