European Entrepreneurial Learning in Information and Communication Technologies

The EU-xCEL Experience in Spain

Diego Alonso, Andrés Iborra, Pedro Sánchez
División de Sistemas e Ingeniería Electrónica
Universidad Politécnica de Cartagena (UPCT)
Cartagena, Spain

Francisco Requena
Francisco Requena Alcaraz
SEAT Volkswagen Group
Martorell, Barcelona, Spain

***Abstract*— This paper describes the experience of the Cartagena node in the 2015 edition of the EU-xCEL project, which was funded by the European Union's Horizon 2020 Research and Innovation Programme. EU-xCEL aims at fostering entrepreneurship awareness and training among young graduates, in Information and Communication Technologies as well as to strengthen the European entrepreneurship ecosystem. This paper outlines the development of the training week and the posterior virtual incubation phase, as well as the experience of running the program in Cartagena. Finally, we outline some conclusions drawn from the experience.**

Keywords—entrepreneurship education; entrepreneurship curriculum; European teams

I. INTRODUCTION

Despite the single European market being in existence for quite some time, start-ups and entrepreneurs do not in general think and act at European level, local entrepreneurial ecosystems are fragmented, and business scaling is very difficult. Unemployment levels are very high, with rates of over 50% for under-25s among Mediterranean countries. Entrepreneurship in Europe lags behind the US, in terms of effectiveness, scale and impact [1]. Aware of these limitations, the European community of startups launched two manifestos [2-3] for a better and real European-wide ecosystem, while the European Union launched two Horizon 2020 (H2020) calls: ICT-35-2014 Innovation and Entrepreneurship Support, and ICT-13-2014 Web Entrepreneurship.

In this context, we developed and carried out the EU-xCEL project[1], a Research and Innovation Programme in the context of H2020 ICT-35. The EU-xCEL consortium is integrated by six partners, from six different European countries: two with technological background, and four with a focus on business and entrepreneurship. One of the partners is an incubator from a Technology Park, while the other five are from Academia and have their own, local incubators. As such, it is a very well balanced consortium, with partners with both Business and Information and Communication Technologies (ICT) background, as well as with experience in entrepreneurship and contacts with enterprises.

In order to define the main objectives of EU-xCEL, the consortium circulated a brief survey to enterprises in European incubators associated with the consortium, with a total of 54 responses. The results revealed that (i) there was on average 2-3 founders per enterprise; (ii) almost all enterprise founders are of the same nationality; (iii) only one third of the enterprises are selling at European level; and (iv) on average, it takes 15 months to develop the product technology.

Thus, we define the following main objectives for EU-xCEL: (i) to develop more ICT entrepreneurs and promote entrepreneurship among students and recent graduates, (ii) to develop a network of ICT entrepreneurship creative physical and virtual spaces, and (iii) to coordinate European wide intensive entrepreneurial action training events between consortia members with international teams. EU-xCEL wants to cultivate a European entrepreneurial mind-set, as well as to promote cross-fertilization between countries thanks to student and staff exchange over the program. EU-XCEL specifically targets real deficits in the skillsets of young entrepreneurs, and delivers this impact though an action focused program that closes the gap between mere intentions and actual entrepreneurial activity. Such action focused training has increasingly been recognized in entrepreneurship research as more effective in stimulating business creation [4].

We have engaged with more than 350 students from 25 European countries in the two editions of EU-xCEL. Participants had different backgrounds (mainly Engineering and Business, but also Law, Medicine, Architecture, Biology, etc.), and ages ranging from 22 to 35. Participants represented a range of educational levels from Masters/PhD (28%) to Bachelors degree (46%), Certificate/Diploma/Post-secondary school qualification (12%). Almost a third had three plus years work experience (30%), half had prior virtual team experience (51%) and 43% had prior coding experience, thus providing a diverse group of participants for cross-learning and co-operative inter-disciplinary team formation.

This paper describes the curriculum of the acceleration program in Section II, and the results obtained in the realization of the Spanish program in Section III. Finally, Section IV outlines conclusions and the lessons we learnt from the 2015 edition, since at the time of writing this paper, the 2016 edition is finishing.

[1] EU-xCEL homepage: http://euxcel.eu

II. CURRICULUM DESIGN

For the purposes of the design of EU-XCEL program, entrepreneurship was defined according to Gartner's behavioral approach [5], in which "*the entrepreneur is not a fixed state of existence, rather entrepreneurship is a role that individuals undertake to create organizations*". Hence, the education aspect of the EU-xCEL program and its pedagogy emphasize new venture creation and action-learning, through an experiential real-life practice, supported by mentoring. The curriculum design is based on the conceptual framework for the design and assessment of entrepreneurship education programs described in [6].

The components of the curricular structure, including the planning of instructional sequence for each module, were derived from (i) current research findings and practitioner's experiences in remote work and virtual team management [7-8], and (ii) current entrepreneurial and innovation theories and frameworks, including, but not limited to: Effectuation [9], Customer Development [10], Lean Startup [11], Lead User Design [12], The New Business Road Test [13], Getting to plan B [14], Business Model Generation [15] and Design Thinking [16]. Besides, the combined experiences of the consortium partners in entrepreneurship education and startup incubation provided first-hand insights regarding the practical and operational aspects of the curriculum.

According to the aforementioned, and in order to achieve the objectives of EU-xCEL, we developed an intensive training package over 3 months that comprises 1 training week and 12 weeks of virtual incubation. Each part is focused on achieving concrete objectives, concrete parts of the curricular structure described above, in the allocated time frame. Some can be achieved during the training week, some in the virtual incubation phase. The complete program is supported by an online platform based on Moodle, so that participants can access shared materials (slides, articles, videos, etc.), as well as upload the required reports. This program was repeated six times in 2015, once in each of the partners' facilities, from May to July. The objectives were the same in each case, but each partner was given the freedom to slightly adopt the execution to his/her idiosyncrasy, knowledge, usual practices, available spaces and staff members, etc.

In order to keep the momentum created during the face-to-face training week, and to offer participants an incentive to continue working together remotely for three more months, the program adopted a competition approach. After the virtual incubation phase, a jury would select the best teams formed during the program to connect with and pitch to venture capitalists, angel investors and successful tech entrepreneurs in what we called the "*EU-xCEL Ultimate Challenge Final*".

The design of the training week and the virtual incubation phase is described below.

A. Training Week

The training week, entitled internally "*Start-up Scrum*", has the following main objectives: team formation, introduction to the entrepreneurial process, virtual team training, and problem identification. The week was organized according to the structure shown in Fig. 1. These topics were developed during the first four days of the week, while Friday was left for teams to make their pitches, to review the work done over the week, and to prepare them for the Virtual Incubation phase.

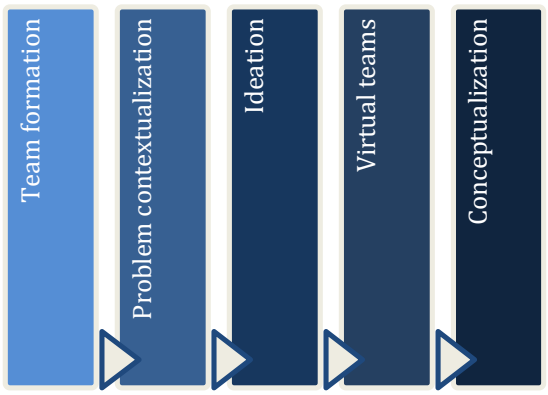

Fig. 1. Curriculum of the training week

Team formation is one of the most critical parts of the program. Since we wanted to have international teams, which could create startups that could start their business in more than one country at the same time, we imposed some restrictions to team composition. We asked participants to make teams of 4 to 6 team members, from at least three different countries, and with not more than two members from the same nationality. In order to help participants to get to know each other and facilitate team formation, we run ice breaking activities (like the Marshmallow Challenge) and workshops (such as World Café), as well as socializing activities outside the venue. We provided them with general guidelines to ease team formation, such as try to make teams whose members share similar personal values, vision (regarding the program and the role entrepreneurship could play in their lives), and commitment level for the program (that is, work a similar number of hours per week). And also try to achieve the most suitable/feasible mix of skills (both business and technical) and team roles to successfully develop their ICT-related business idea. But we advised them that, in the end, team formation is all about human relationships, and that there is no "perfect solution" for everyone. We allowed participants to change team over the week, but not after it.

After team formation, we prepared some lectures regarding the **entrepreneurial process** and its phases, based on the entrepreneurial and innovation theories and frameworks aforementioned. This part was the one that differed the most from partner to partner, but it was mainly organized around Design Thinking and Lean Startup methodologies. **Problem identification** revolved around using self-experience, making interviews, and applying brain storming techniques.

Lastly, we prepared a lecture on **virtual team** management and organization, with advices for them. Advices such as create a hierarchical messaging plan and set expectations for reply; define a fix schedule for EU-xCEL meetings and work, and commit to it; take into account cultural and time zones differences, and be extra-polite in the communications; assign responsibilities with deadlines, considering task dependencies; create a shared-folder or use any of the available online team management tools, etc. The main message for them was to set

up tools and agree on rules to prevent conflicts, given that they will collaborate remotely during the virtual incubation phase. And to be aware of and prepared for conflicts, since they will eventually arise.

Mentors who will support the teams during the virtual incubation phase are also introduced to them at some point. We allocated some time for the teams to get to know their mentor, and to start working with him/her, so that a trust relationship could be forged. We also advise them to set one day per week to have a meeting with their mentor.

We told the teams that they had to deliver three documents for us: a summary of the work performed over the week and, what is more important, the work they will carry out over the virtual incubation phase. These deliverables are the pitching presentation, a team manifesto (where they discuss the team vision, their profiles and roles, levels of expectation and commitment, communication procedures, and intellectual property), and an action plan for the following three months with a Gantt chart.

B. Virtual Incubation

The virtual incubation phase lasts for three months and starts just after the training week. The main objective of the teams is to develop their initial idea, working as a distributed team, and complete this phase by submitting a reduced business plan that summarizes their venture. This is the document the jury will use to select the teams that will go to the Final Challenge. Since the teams have a lot of work to do, and it is easy to get lost in the startup process, we developed the set of milestones shown in Fig. 2 to help them go through the entrepreneurial process, and not get lost in the details. As shown in the figure, the teams have to submit a status report every two weeks, reporting what they have done regarding problem validation, idea development and proof of concept (i.e., development of a minimum viable product to gather feedback from potential customers or stakeholders).

Lean Startup, one of the main methodologies employed in EU-xCEL, advocates for fast iteration cycles and the development of a minimum viable product (MVP) in order to gather customer feedback. This MVP is updated or re-created every iteration cycle, according to the feedback received from potential customers and stakeholders. Given that three months is not enough time to develop a working prototype for a team that is still defining their product, we told our participants to develop low fidelity prototypes, mock-ups or paper prototypes.

Besides, these easy to do prototypes would help them go through the iteration cycles faster. It is also possible that a team discovers, after an iteration cycle, that their initial assumptions were not right and they have to start again (at any point of time) from conceptualization, ideation, or even problem validation. Mentors play of course a central role during the virtual acceleration phase, providing the teams with advice and support to help them continue, even if they have to start again from an early phase.

Inspired by the Lean Startup methodology, the virtual incubation phase comprises two cycles of "idea development" followed by a "proof of concept" step (see Fig. 2). Eight working weeks in total. This design not only stresses the importance of iterative development, but also provides the time frame some teams may need to rethink their ideas or products. The last step of the virtual incubation phase is the development of a (reduced version of a) business plan. The main sections of this business plan, the final milestone, are the following:

1. Industry and Market Analysis.
2. Business Model and Strategy.
3. Sales and Marketing Roadmap.
4. Product Development Roadmap.
5. Operational Strategy.
6. Feasibility Analysis.
7. Management Team.
8. Milestones and Future Prospects.

III. EU-XCEL IN SPAIN

The "Start-up Scrum" took place in Cartagena from July the 6th to the 10th, with a total of 42 participants from 12 European countries. Regarding participants background, 25 had technical background in Engineering (Telecommunication, Electrical, Product Design, etc.) or Computer Science, and 17 were from Business or Law Degrees. Regarding gender balance, we had 29 male and 13 female participants. The age of participants ranged from 21 to 30 in the following groups: 22 participants from 21 to 24 years, 13 participants from 25 to 27 years, and 7 participants from 28 to 30 years. 18 participants were finishing their Degree studies, 24 Graduates, 15 Master students, 4 with Master, and 1 PhD candidate. 6 participants had no previous working experience, 14 had worked from 1 to 18 months, and 22 more than 18 months. Finally, 23 of them had some previous experience on entrepreneurship, whether it was a course or because they are/were entrepreneurs.

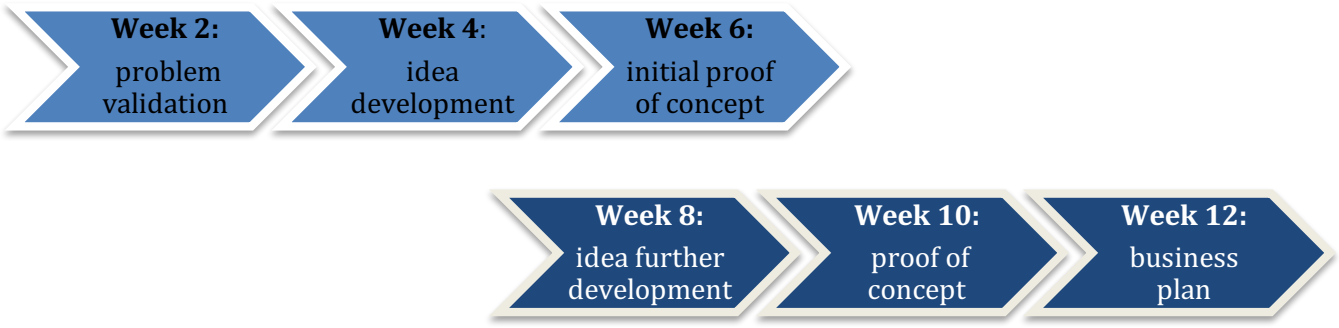

Fig. 2. Milestones of the virtual incubation phase

Participants created 9 teams, with 4-5 team members each. Each team also had a mix of backgrounds, with at least 2 participants with technical and business background, as we suggested. Fig. 3 shows the submission rate of the program milestones during the virtual incubation phase. As can be seen, only one team didn't complete the whole program. When asked for the reasons, they mentioned that they lost momentum at the beginning of summer, and then they simply didn't put in touch with each other and their mentor.

As part of the training in virtual teamwork, we introduced several online tools the teams could use for this phase, but we didn't force them to use any given one. Some participants already had experience in using some tools, so we didn't want to impose any. One of the documents submitted by each team by the end of the 'Start-up Scrum' was the Team Manifesto, where they describe how the team will organize the work and which tools they will use to manage themselves. A brief summary of the recommended third-party tools employed by the teams during the virtual incubation phase is shown in Fig. 4. The tools have been organized in the following categories: video-conference (mainly Skype, but also Google Hangouts), e-mail, document repository (mainly Google Drive, but also Dropbox), chat tools (mainly Whatsapp and Facebook, but also Hipchat), project management tools (mainly Slack, but also Podio, Trello, Asana, and Confluence), and software development tools (mainly Github/Bitbucket, but also Heroku).

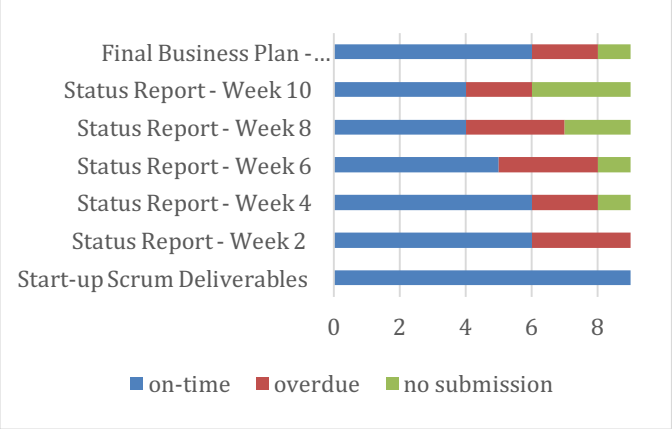

Fig. 3. Submission rate per team

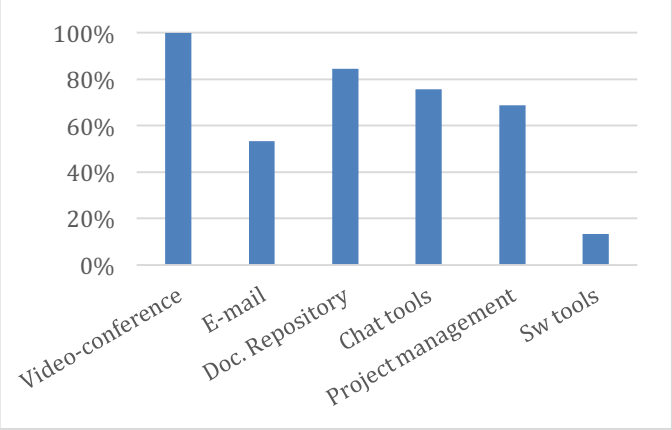

Fig. 4. Tools employed by teams over the virtual incubation phase

IV. Conclusions and Lessons Learnt

EU-xCEL 2015 program delivered real entrepreneurial experiences to its 239 participants across key entrepreneurial competences: identifying good co-founders, ideation and opportunity screening, prototyping and business modelling, market validation, idea pivoting, and investment pitching. The impact of EU-xCEL was specifically targeting real deficits in the skillsets of young entrepreneurs, and delivering this impact though an action focused program that closed the gap between mere intentions and actual entrepreneurial activity. EU-xCEL also increased awareness and perception of ICT entrepreneurship amongst young people in Europe by introducing its participants to trends within the major ICT domains of big data, health informatics, predictive analytics, the internet of things, mobile commerce, and ICT for development. Finally, EU-xCEL impacted upon the European entrepreneurial eco-system by creating international teams consisting of multiple nationalities, and by establishing mentor-participant relationships.

All business ideas developed in the course of the 2015 edition revolved around web and cloud applications. Some examples of the business plans are: a social network for starting musicians and bands to put them in contact with possible event hosts; a website to help organizing weddings; an online interactive videogame to help young students to decide their future career; or wristband and mobile application to help and entertain children in hospitals.

Regarding lessons learnt from the experience, team formation is perhaps the hardest and most critical part of the program. It is even more complex, since we force participants to work with persons they don't know from beforehand, who are from different countries, with different cultures and ways of thinking and acting. But this is also, from our point of view, the strength of Europe: the diversity of its countries. These differences create massive opportunities for new ideas, specially during brainstorming sessions. It is very important to provide a positive message in this first step, that there is room for everyone in the team, that all positive contributions are welcome, and that the team needs all roles and all backgrounds: "*nobody's perfect, but a team can be*" [17].

In a similar way, virtual team management is also a critical part in the virtual incubation phase to keep the teams together and focused. The most successful teams in 2015 were those (i) in which a team member had previous experience or education in team management, and he/she put it into practice, organizing and controlling the work done; and (ii) that manage to create trust among participants during the training week. Personal relationships are of capital importance, since small misunderstandings can (and in our experience, did) dismantle a team that is working perfectly.

Unfortunately, we don't have enough data to conclude whether distributed teams work worse than local ones, which seems the most reasonable option at first. In fact, at the beginning of the project we were worried about the performance of virtual teams. But, in the end, they behave just like normal organizations: it all depends on the individuals that integrate those teams. Their motivation to finish the incubation phase and really develop a good business idea, which made

participants improve their skills or acquire new ones, as well as the attitude and advice of the project staff and mentors, were key factors to the teams' success. Overall, in all six 'Start-up Scrum', only 1 team out of 47 did not complete the programme, which is not worse than the results obtained in many in-person incubators/accelerators.

The "*Final Challenge*" competition also helped sustaining the momentum, and giving teams a clear objective to keep in touch with each other and keep working on their ideas. Besides, it gave the participants the opportunity to experience by themselves how to start a startup, and the feeling that the program was more than an academic program organized by five universities. They felt they had a real opportunity to create and launch their own startup and get access to investors. In 2015, 7 teams continued their venture and entered an incubator to improve their business plan and product. Additionally, the competition also allowed the teams to meet again, and at the same time, meet alike participants from other 'Startup Scrums', thus widening their network of contacts.

As improvements of the programme, based on the aforementioned lessons, the 2016 edition featured (i) a reduced number of participants, from 42 to 34, making it a more manageable group; (ii) use of Facebook as a pre-socialization tool, where we asked participants to record videos and present themselves to the rest of the participants, post news, answer polls, etc.; and (iii) harder requirements for the prototypes, so that participants with and ICT background could participate more and feel more involved on the team. These modifications really impacted the numbers of the second edition.

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REFERENCES

[1] World Economic Forum report, "Enhancing Europe's Competitiveness Fostering Innovation-driven Entrepreneurship in Europe", 2014.

[2] "A manifesto for entrepreneurship & innovation to power growth in the EU", http://startupmanifesto.eu

[3] "From Startup to Scale Up. A Manifesto for Change and Empowerment in the Digital Age", http://scaleupeuropemanifesto.eu

[4] Hull University Business School "Entrepreneurship skills: literature and policy review", Research paper 236, 2015.

[5] Gartner, W.B., "Who is an Entrepreneur? Is the Wrong Question". Entrepreneurship Theory and Practice v.13 (4): p.p. 47-67, 1989.

[6] Vallieri, D., Gedeon, S. A., Wise, S., "A Comprehensive Framework for Entrepreneurship Education". Journal of Business and Entrepreneurship v. 26 (1): p.p. 89-120, 2014.

[7] Gordon, J., "Building Better Teams: Pfeiffer's Classic Activities". Wiley, 2003.

[8] Bjorn, P., And Ngwenyama, O., "Virtual Team Collaboration: Building Shared Meaning, Resolving Breakdowns and Creating Translucence," Information Systems Journal v. 19 (3) p.p. 227-253, 2009.

[9] Sarasvathy, S., "Causation and Effectuation: Towards a theoretical shift from economic inevitability to entrepreneurial contingency". Academy of Management Review v. 26 (2): p.p. 243-263, 2001.

[10] Blank, S., "The Startup Owner's Manual: The Step-By-SteGuide for Building a Great Company". K&S Ranch, 2012.

[11] Ries, E., "The Lean Startup: How Constant Innovation Creates Radically Successful Businesses". Penguin, 2011.

[12] Herstatt, C., von Hippel, E., "From Experience: Developing New Product Concepts Via the Lead User Method: A Case Study in a "Low Tech" Field", Journal of Product Innovation Management, 1992; 9: 213-221.

[13] Mullins, J., "The New Business Road Test:What entrepreneurs and executives should do before launching a lean start-up". Pearson, 2013.

[14] Mullins, J., Komisar, R., "Getting to Plan B: Breaking Through to a Better Business Model". Harvard Business Press, 2009.

[15] Osterwalder, A., Pigneur, Y., "Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers". WILEY, 2010.

[16] Brown, T., "Design Thinking". Harvard Business Review, Ed. June, 2008.

[17] Bakker, R., Bogerd, F., He, Z., Mieras, W., Ssemaganda, V., "Nobody's perfect, but a team can be". A report on team roles for communication skills, Eindhoven University of Technology, 2006.