CO-CREATION DESIGN THINKING PROCESS: LEARNING WITH DEMOLA APPROACH

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Summary / Abstract

Nowadays we witness numerous partnerships and projects of national and international scope around active training, using digital tools and based on co-creation processes between different partners, with the aim to obtain more ceative and appropriate processes/pathways to respond to current and future scientific, academic and professional challenges.

This article briefly presents the participation of a group of professors from Instituto Politécnico de Setúbal (IPS) in DEMOLA® approach. We present the objectives, the formation of the teams and the established work methodology, and the application of this methodology adapted to the curricular unit of Process Optimization of the Master of Biological and Chemical Engineering.

We briefly describe the main phases that constitute the development of the project within the scope of IPS and the obtained results from the analysis of all components (student training, professors, challenges with companies/organizations and perceptions of the whole team).

We emphasize the development of instrumental skills (Canva, Miro, PESTLE, Portfolio); scientific/pedagogical skills (Teamwork, Multi-professional Approach, Co-creation Processes, Design Thinking, Research, Facilitation, Disruptive Thinking and Co-construction, among others); and “win-win” situations, or rather “learn-learn” between facilitators and students, innovation, intergenerational, sustainability and freedom of thought.

Keywords: Demola approach, Co-creation, Learning, Design Thinking

1. Contextualization

DEMOLA® is a co-creation approach, created in 2008 within the innovation ecosystem from Tampere, Finland, which involves students and external organizations with the aim to generate ideas based on challenges. It has in its origin the collaboration of the country, local universities and the private sector (Fernandez, n.d.).

The DEMOLA® platform (www.demola.net) facilitates local and international co-creation projects between students, companies, and higher education institutions. DEMOLA® is a co-creation approach focused on solving real challenges. Each project carried out will have a positive result – be it a new concept, a demonstration, or a prototype. If the partner company finds the result useful, it can license or buy the result and promote its further development. Each partner has a clear role, and the work is guided by simple procedures. Contracts, intellectual property rights, licensing models and other legal requirements are in place and compliant with international business standards and practices (EU, 2016).

For companies, co-creation approach helps to explore future impacts and better understand the requirements for their products or services, exploring changes in consumer behavior. For students, it is an enriching experience during their studies, providing close contact with companies, non-governmental organizations (NGOs) and public sector organizations. For professors, the aim is to increase collaboration between academia and industry and establish a joint working platform between the various institutions participating in the DEMOLA® platform at the national level (Demola Global, 2021).

The value of co-creation generated through the DEMOLA® methodology, based on a valid strategic approach to social challenges, has become more widely recognized, which has led to an increased interest in testing it with new multi-sectoral and multi-stakeholder approaches and may even help to overcome some of the university cultural tensions (Catalá-Pérez et al., 2020).

Co-creation is broadly defined in the literature (de Morais & Santos, 2015; Zwass, 2010) as the creation of value by participants in the process and activities of the value chain, through their active participation. In this process, high-quality interactions (Leavy, 2013; Prahalad & Ramaswamy, 2004) allow an individual customer to co-create unique experiences with the company, which may unlock new forms of competitive advantage (Trischler et al., 2017).

The Organization for Economic Co-operation and Development (OECD) considers a co-creation process as the interaction between all actors through the free circulation of knowledge and transformation into products and services, which support the growth of new markets, entrepreneurship, and the promotion of an entrepreneurial culture (OECD, 2013). Citizen participation in co-creation and innovation processes is one of the key issues in terms of European Union policies, which highlights some needs such as: having an objective and a clear method of application; sharing responsibilities; being transparent; having enough time; be open. Sometimes, the most important thing is not the result of the co-creation process, but the social change that begins after this cooperation, which helps to gather information about existing social issues in the community and to identify areas where to develop more innovative practices, making them more inclusive and participatory co-creation process (EU, 2016; OECD, 2013). In search of solutions for a better future, the EU policy agenda for 2030 promotes actions that stimulate the co-creation of innovations, sustainability goals and Sustainable

Development Goals (Mazaj et al., 2018). In this sense, one should seek to understand the most complex challenges through the integration of different approaches in a sustainable development system and interactions between various disciplines, promoting co-creation between the various local actors and actors of the scientific and technological system (Mazaj et al., 2018). The next generation of Science, Technology, and Innovation (STI) policies will have as fundamental principles a clear orientation of their mission and co-creation processes and will be implemented through dynamic public-private partnerships (Catalá-Pérez et al., 2020).

Companies and industry in general, are aware of the relevance of co-creation processes within the Design Thinking approaches for the successful development of new products or services. This clarify the relevance of co-creation methods for the acquisition of the now named future skills applied to teamwork, to master the challenges of the future namely communication, empathy and conflict management, cooperation, ethical and decision competences and also facilitation methods, identity and cohesion of teamwork (Trischler et al., 2017; www.nextskills.org).
We can highlight that the success of a co-creative design-thinking process is directly articulated with the facilitation process. The facilitator has the role of being a coach that guides and stimulates the team participants to evolve their future skills and to promote the best interaction between participants.

There are a variety of personal qualities deemed necessary for team facilitators (Anderson & Robertson, 1985; Luctkar-Flude et al., 2017), including self-awareness, self-confidence, concern and respect for others, non-judgmental acceptance, genuineness, empathy, vitality and maturity. In a simple way, the role of the team facilitator is to create an atmosphere of psychological safety that promotes self-disclosure, feedback and experimentation associated to alternative behaviours, contributing to an attitude of constant curiosity like the one in the basis of scientific research, however not considering the limits of known possibilities in order to *think out of the box*.

There is also a strong link between empowerment and the facilitation processes to support local partners and other stakeholders, first by defining challenges and identifying needs prioritization, and second by developing solutions and making decisions that could be further accepted and integrated into the community (Antuña-Rozado et al., 2018). Participatory decision-making processes emerge from this approach as being based on four fundamental values (Kaner et al., 2007): full participation; mutual understanding; inclusive solutions and, shared responsibility. Also, according to the same authors, meetings conducted according to these participatory values are described to produce significant results, contributing to strength individuals, teams and agreements, as examples of many other benefits.

Individuals and groups empowered in this way will be better equipped for future challenges of the job market, exhibiting more skills and leading to a supportive atmosphere generated within the team. Agreements reached in these conditions, will include more higher-quality ideas, wiser goals and more inclusive solutions (Kaner et al., 2007; Foong et al., 2018).

2. Pedagogical Aspects of DEMOLA methodology

DEMOLA approach is a strong commitment to innovation, multidisciplinary, internationality. Simultaneously it is also committed to develop a methodology to improve a wide range of skills in students and professors of higher education institutions (HEIs) that will achieve

facilitators skills. DEMOLA approach has the ambition to strength collaborative networks of local and global companies and HIEs professors, bringing this collaboration to the learning environment.

DEMOLA methodology equips the teams with a set of tools for co-creation, providing the acquisition of strategic forecasting work and its integration as teaching tools. The remote work methodologies, nowadays a common approach, allow the creation of international and multidisciplinary teams, sharing different visions, cultures and attitudes, which enrich the search for innovative solutions.

The main objective of the DEMOLA approach is to create a culture and operational practices that will enforce collaborative networks between national polytechnic institutions as well as the transfer of between industry and academia. The relevance of these networks will, obviously, bring new ideas to the class, highlight research niches and, consequently, create opportunities to new research domains. From an Educational and Pedagogical perspective, it improves teaching practices; brings actual and relevant contents to teaching and contributes for the development of future skills, increases also professional identity and employability rates at student's level.

DEMOLA approach is based on co-creation design thinking processes, thus is based in teamwork practices enabling the participants to:

- identify real challenges, arising from the day-to-day stakeholder's context, namely industry or companies or public and social institutions;

- work in multidisciplinary teams of students, led by facilitators (professors from HEIs);

- look for innovative solutions to the challenges identified.

3. Methodology

The DEMOLA approach in Portugal, and specifically at IPS, was actively developed during 15 weeks, each one dedicated to different stages of the co-creation process. A previous stage was the selection of HEIs professors to join the project.

In the first six weeks, professors were trained to submerse in the approach and develop skills as facilitators. At this stage, some of the specific tasks undergone were the identification of a company to become the partner entity, the identification of a challenge to be publicized in order to attract students, since the student's enrolments occurs during this step, and the signature of confidentiality, ethical and legal agreements.

Second stage is composed by eight weeks of teamwork, divided into two phases: the analysis of the challenge context following a PESTLE analysis; and identification of future perspectives.

1. The DEMOLA process and the enrolment of companies' partners
2. Definition of a challenge
3. Enrolment, selection and creation of the student team
4. Online tools and Teambuilding
5. The skills of a facilitator
6. Project start-up: Discovery phase
7. Project kick-off the student team (week 1/8)
8. Building trust (week 2/8)

9. Work phase (week 3/8)
10. Facilitation skills with the project partner (week 4/8)
11. Work phase (week 5/8)
12. Decision-making support, solution refinement and finalization (week 6/8)
13. Preparation of the presentation meeting (week 7/8)
14. Final project meeting (week 8/8)
15. Portfolio reflection of the work performed.

Of all these phases, we feel the need to highlight professors training, which lead them to abandon their traditional role of educator-trainer to play the new role of facilitator.

Students were also subjected to a training process, capable of enabling them to carry out PESTLE analysis and to use collaborative work development tools (eg MIRO). These two tools are considered essential: PESTLE analysis allows the users to build knowledge of the reality of the phenomenon under study. It focusses on external forces that company faces, and the letters stand for Political, Economic, Social, Technological, Environmental and Legal – PESTLE. MIRO tool narrows the distance between the participants by allowing them to complement the communication between those involved. It should be noted that, whenever possible, it is desirable to establish a relationship based on physical presence of students and facilitators, which happened in several cases, including activities such as visits to the companies.

It is also important to stress the holding of two bootcamps in which IPS professors socialized and exchanged ideas with professors from other polytechnic institutions in the country, who were also facilitators on this DEMOLA approach. This enabled the sharing of knowledge acquired and the best techniques to pursue the objectives of the different projects.

IPS's professors, who worked in pairs, developed 5 projects. The main guidelines for each project are presented below.

DESIGN OF A NEW WORLD… WITH PERMACULTURE (Alcina Dourado and Bernardo Ramos)	
Partner	Exceptionally, this challenge did not imply a company, but involved a project as an expert. The promoters of the Project work in the field of permaculture and are based in central Portugal.
Team	International Master's student in Psychology (University of Pavia, Italy) and a nutritionist student of Biochemistry and Health, in the field of Clinical and Metabolic Biochemistry (Polytechnic Institute of Porto).
Challenge	With climate change, the future of humanity is at risk. It is essential to understand the contribution of ecologically based movements to a more responsible, sustainable and, above all, regenerative life. How to make it accessible and attractive to the masses? Permaculture is the design methodology for regenerative human lifestyle systems. Human habitats, working with Nature, not against Nature. It works as an anchor that connects the citizen to essential principles, techniques, and methods. It seeks food sovereignty, land management, socio-economic well-being, and ecological regeneration in a responsible way, defending environmental sustainability and leading to a new reality. However, it faces scepticism, various stereotypes, and prejudices. In other words, there is a lack of evidence that permaculture is a viable option for the restructuring of

	conventional agriculture, being accused of proposing a utopian (and therefore) impossible world. How can we strengthen the conditions to create a resilient world by making permaculture mainstream? How would it be?

GENZ GREENOWER: CIRCULAR ECONOMY (Alice Ruivo and Célia Picoito)	
Partner	A technological and innovative company, specialized in intralogistics, that is, in the search for continuous improvement, increasing the competitiveness of its customers through the implementation of specific solutions as an integral part of its performance.
Team	Four students, two from Accounting and Finance (ESCE/IPS), one from Marketing (ESCE/IPS) and one from Sea and Environmental Technology (ESTSetúbal/IPS), all from the Polytechnic Institute of Setúbal.
Challenge	In industry, waste accumulates and involves expenses related to treatment or pollution. Materials for new products must come from old ones – the aim is to reuse as much as possible, reproduce, recycle raw material, or use it as a source of energy. The partner company has waste in result of a production process – clean plastic from cutting plastic materials – and has not yet found a way to reuse it. We challenge Generation Z to understand this phenomenon, think about it and propose a solution. It can be a new product for the company, or to be used by another company, a source of energy... the limit is your imagination. You have the possibility to put into practice what you need to change: stop wasting! Start the circular economy! And you can be an active part of this transformation! Do you accept the challenge of showing how Gen Z really has a Greenpower?

ROAD MAP TO A CARBON NEUTRAL CITY (Fernando Angelino and João Vinagre)	
Partner	Regional Energy Agency of the municipalities of the Lisbon and Tagus Valley region. Private non-profit association, created with the support of the "Intelligent Energy-Europe" program and the Municipal Councils in its area of intervention.
Team	Two students from ESTBarreiro/IPS (Bachelor in Petroleum Technologies), one student from ESS/IPS (Master in Physiotherapy), one Brazilian student (Master in Business Sciences).
Challenge	The transition to a climate-neutral society is both an urgent challenge and an opportunity to build a better future for all. How can these problems be solved when applied to a territory such as the Baía do Tejo Business Park, in Barreiro? What strategy should the territory adopt to combat climate change? What decisions should be taken in the field of energy efficiency and renewable energies? Are there effective ways to accelerate the transition to a sustainable industrial and business park? Are there preventive measures to ensure this objective? What effective guidelines should be taken? How should an industrial park be built to meet the targets for net CO2 Zero emissions by 2050? What typology of companies and industry should be attracted to the territory?

THE PATH OF STONES (Nuno Pereira and José Pires)	
Partner	Portuguese cement production company.
Team	Five students from ESTSetúbal/IPS: one from Mechanical Engineering, two from Environmental and Marine Technologies and two from Energy Technologies.
Challenge	Making the social and economic development of a region compatible with the defense of the landscape and the environment is fundamental for harmony, although it is not always easy to achieve It is essential to invest in a strong technological upgrade of the industrial process to improve operating conditions and preserve the environment, but will it be enough to satisfy all stakeholders? How can we find the balance between the natural park and the cement industry that has existed in that location for a hundred years?

SPIRULINA – GREEN FOOD 4 HEALTH (Helena Caria and Fátima Serralha)	
Partner	A small company in the area of artisanal food production, from the central region of Portugal
Team	One student from Mater in Biological and Chemical Engineering and two students from Biotechnology, all from ESTBarreiro/IPS; one student from Biomedical Technology at ESTSetúbal/IPS.
Challenge	Spirulina is a green coloured cyanobacterium integrated in the microalgae groups. It is currently considered by the world health organization (WHO) as a complete and innovative food being produced in an artisanal and sustainable way in this business, which gives it healthy properties and a great taste, maintaining its green colour. The challenge aimed to identify how you it is possible to: 1. Increase the consumption and acceptance by consumers of a green, but very healthy and complete food, and simultaneously, create consciousness of its locally and sustainability production; 2. Create communication channels with innovative recipes; 3. Increase the involvement of the Gourmet/Chefs cuisine in this new and natural cooking practice

4. Evaluation

The evaluation of this DEMOLA projects was developed in different aspects: one directed towards the students and the other towards the facilitators. There was also a global assessment of the proposed solutions to the problems presented (carried out by the teams) and an overall assessment of the methodology used.

The students prepared two reports:

- one in the middle of the process, with contextualization and deepening of the theme in the light of the present, and materialized in the PESTLE analysis;
- a final report, where the solutions found were presented and justified.

For facilitators, the experience culminated with the elaboration of a personal portfolio, where each one exposed their personal views regarding their participation in the project, the difficulties experienced and the learning achieved, thus enabling a good reflection on the methodology applied.
There were also meetings between each team and the partner organizations/entities, to present the proposed solutions. The discussion and satisfaction of the same with the work developed should be highlighted.
The global assessment of this experience, made by this group of IPS's facilitators, was based on a multifactorial analysis of all available instruments and on the collection of perceptions of all participating teams.

5. Results, implications and recommendations

A global assessment of this experience in the DEMOLA® approach allows us to conclude that it enabled the facilitators and students to develop several aspects:

- Instrumental skills, by using Canva, Miro, PESTLE analysis and Portfolio;
- Scientific/pedagogical skills using: teamwork, multidisciplinary approach, co-creation processes, design thinking, research, facilitation, disruptive thinking and co-construction, among others;
- The ability to analyze a reality and present solutions to real problems, through the development of future skills, the enhancement of students' skills, the contention that facilitators had to train in order not to present solutions to students, a "win-win" situation, or rather "learn-learn" between facilitators and students, innovation, intergenerational relations, sustainability ideas and freedom of thought - different from the usual, with no known solutions –think out of the box!

It is intended this methodology to be replicated in some IPS's Curricular Units, contributing to the implementation of co-creation design-thinking process practices in the training of future graduates. In this way, the aim is to contribute to the training of new professionals who can establish a real connection between emerging themes, in different contexts, and the creation of solutions outside the usual patterns and based on multiprofessional approaches.

With this objective, the Co-creation methodology has already been applied in the curricular unit of process optimization of the master's degree in biological and chemical engineering. A challenge has been proposed on how to contribute to reduce the use of materials and energy. After carrying out an analysis, students proposed an approach that was studied by the PESTLE analysis and presented implementation scenarios.

The following stand out about the students' opinions:

> *" I really liked the methodology, because it was necessary to research several points"*
>
> *" it would be interesting to focus on the solutions"*
>
> *"it was a good work to learn more information on the topics covered, among which several laws that we had no knowledge of their existence"*
>
> *" It also allowed us to know the PESTLE analysis, of which we were also not aware"*

" the work was interesting and good for my learning, because it allowed me to learn how to visualize a particular problem in the various perspectives (by PESTLE analysis)"

The analysed proposals were related to wind energy, desalination of seawater, biofuels production and collection of food oils. With this work it was possible to have a first implementation of the methodology previously trained, thus showing that it is feasible to apply in certain curricular units.

6. Conclusions

The DEMOLA® approach enabled the training of a group of IPS's professors as facilitators of co-creation processes, having contributed to the acquisition of Design Thinking skills that can be used in new projects.

This approach also made possible to strengthen IPS' partnerships with the national business networks which, in terms of internships and acceptance of IPS graduates in the labour market, creates a direct advantage.

The articulation between students and facilitators in the DEMOLA® approach contributed to a reinforcement of competences at national and international level, with companies and other polytechnic institutes, expanding the network of future collaborations.

We hope to apply most of the learnings of this project in daily teaching practice, using active methodologies to respond to real problems.

The future is now!

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