

# Co-creation design thinking process: Learning with demola approach

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**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, to obtain more creative and appropriate processes to respond to current and future scientific, academic and professional challenges. This article presents the participation of a group of professors from Instituto Politécnico de Setúbal (IPS) in the DEMOLA® approach to be trained as facilitators. 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 Background

DEMOLA® is a co-creation approach, created in 2008 within the innovation ecosystem from Tampere, Finland, which involves students and external organizations intending to generate ideas based on challenges. It has in its origin the collaboration of the country, local universities and the private sector [1].

The DEMOLA® platform ([www.demola.net](http://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 [2].

For companies, the co-creation approach helps to explore future impacts and better understand the requirements for their products or services, exploring changes in consumer behaviour. 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 [3]).

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 [4]

Co-creation is broadly defined in the literature [5, 6] 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 [7, 8] allow an individual customer to co-create unique experiences with the company, which may unlock new forms of competitive advantage [9]

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 [10]. 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 [2, 10] 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 [11]). 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 [11]. 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 [4].

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 clarifies 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 competencies and also facilitation methods, identity and cohesion of teamwork [9]).

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 [12, 13]), including self-awareness, self-confidence, concern and respect for others, non-judgmental acceptance, genuineness, empathy, vitality and maturity. Simply, the role of the team facilitator is to create an atmosphere of psychological safety that promotes self-disclosure, feedback and experimentation associated with 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 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 [14]. Participatory decision-making processes emerge from this approach as being based on four fundamental values [15]: 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 strengthening 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 higher-quality ideas, wiser goals and more inclusive solutions [15, 16].

DEMOLA approach is a strong commitment to innovation, multidisciplinary, and internationality. Simultaneously it is also committed to developing a methodology to improve a wide range of skills in students and professors of higher education institutions (HEIs) that will achieve facilitators skills. DEMOLA's approach has the ambition to strengthen 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 between industry and academia. The relevance of these networks will bring new ideas to the class, highlight research niches and, consequently, create opportunities for new research domains. From an Educational and Pedagogical perspective, it improves teaching practices; brings actual and relevant content to teaching and contributes to the development of future skills, increases also professional identity and employability rates at the student's level.

DEMOLA approach is based on co-creation design thinking processes, thus is based on 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.

## 2 Objectives

The main goal of this paper is to share the experience of a group of IPS teachers that are DEMOLA facilitators after performing a 15 week of training according to the DEMOLA® approach. The share of this experience and its application to a classical unit from an IPS Master program as a follow-up of the new skills achieved are also presented. The DEMOLA training of facilitators has the objective of developing new skills in co-creation design thinking processes that could be applied to teaching nowadays.

## 3 Methodology

The DEMOLA approach in Portugal, and specifically at IPS, was actively developed for 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.

The 15 weeks of training span the 1st semester of the academic year of 2021-2022, running between September and February.

In the first six weeks, professors were trained to submerge 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 to attract students, since the student's enrolments occur during this step, and the signature of confidentiality, ethical and legal agreements.

The second stage is composed of eight weeks of teamwork, divided into two phases: the analysis of the challenging context following a PESTLE analysis; and the 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 of 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 leads 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 (e.g. MIRO). These two tools are considered essential: PESTLE analysis allows the users to build knowledge of the reality of the phenomenon under study. It focuses on external forces that the company faces, and the letters stand for Political, Economic, Social, Technological, Environmental and Legal – PESTLE. The 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 the 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 of this DEMOLA approach. This enabled the sharing of knowledge acquired and the best techniques to pursue the objectives of the different projects.

The 10 IPS professors, worked in pairs as team facilitators and developed 5 projects during the 15 weeks of training.

The evaluation of the DEMOLA project is made by considering 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 each team) 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 in the facilitator's feedback to the students.

## **4 Results and Discussion**

A global assessment of the experience in the DEMOLA® approach allows us to analyse the contribution of facilitators and students to develop new skills.

The major contribution of the DEMOLA® approach is based on networking through digital media of facilitators and students.

Major results from the DEMOLA® approach can be indicated as tools for the facilitating process:

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!

From the perspective of the facilitators, also IPS teachers, the use of these results contributes to a shift from education in the classical sense, towards direct support for the practice in real context by allowing to establish new formats such as mentoring, coaching, reflection support, networking or formation of learning communities.

Also relevant as results are the 5 projects developed by the 5 teams with IPS facilitators. The main guidelines for each project are presented in table 1 and were established according to the challenges presented by each team stakeholder.

The share of these challenges, developed by each team, in co-creation with facilitators, students and stakeholders allow us to illustrate how the co-creation design thinking approach can be used in innovative domains far from the professional formation of each facilitator. Co-creation design thinking approach allows the teams to act as proactive global citizens who help design the environment and solve problems.

**Table 1.** Summary of the 5 projects developed by the Teams with IPS facilitators of the 1<sup>st</sup> semester of 2021-2022.

<b><i>DESIGN OF A NEW WORLD... WITH PERMACULTURE</i></b> (Alcina Dourado and Bernardo Ramos)	
<b>Partner</b>	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.
<b>Team</b>	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).
<b>Challenge</b>	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, work 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 responsibly, 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 a 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?

<b><i>GENZ GREENOWER: CIRCULAR ECONOMY</i></b> (Alice Ruivo and Célia Picoito)	
<b>Partner</b>	A technological and innovative company, specialising 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.
<b>Team</b>	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.
<b>Challenge</b>	<p>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.</p> <p>The partner company has waste as a result of a production process - clean plastic from cutting plastic materials - and has not yet found a way to reuse it.</p> <p>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 can 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 has a Greenpower?</p>

<b><i>ROAD MAP TO A CARBON-NEUTRAL CITY</i></b> (Fernando Angelino and João Vinagre)	
<b>Partner</b>	Regional Energy Agency of the municipalities of the Lisbon and Tagus Valley region. A private non-profit association, created with the support of the "Intelligent Energy-Europe" program and the Municipal Councils in its area of intervention.
<b>Team</b>	Two students from ESTBarreiro/IPS (Bachelor in OilTechnologies), one student from ESS/IPS (Master in Physiotherapy), and one Brazilian student (Master in Business Sciences).
<b>Challenge</b>	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 industries should be attracted to the territory?

<b><i>THE PATH OF STONES</i></b> (Nuno Pereira and José Pires)	
<b>Partner</b>	Portuguese cement production company.
<b>Team</b>	Five students from ESTSetúbal/IPS: one from Mechanical Engineering, two from Environmental and Marine Technologies and two from Energy Technologies.
<b>Challenge</b>	Making the social and economic development of a region compatible with the defence 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?

<b><i>SPIRULINA – GREEN FOOD 4 HEALTH</i></b> (Helena Caria and Fátima Serralha)	
<b>Partner</b>	A small company in the area of artisanal food production, from the central region of Portugal
<b>Team</b>	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.
<b>Challenge</b>	<p>Spirulina is a green-coloured cyanobacterium integrated into 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 this business, gives it healthy properties and a great taste, maintaining its green colour. The challenge aimed to identify how it is possible to:</p> <ol style="list-style-type: none"> <li>1. Increase the consumption and acceptance by consumers of green, but very healthy and complete food, and simultaneously, create consciousness of its local and sustainability production;</li> <li>2. Create communication channels with innovative recipes;</li> <li>3. Increase the involvement of the Gourmet/Chefs cuisine in this new and natural cooking practice</li> </ol>

It is intended by the authors, that this methodology could be replicated in some of 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 multi-professional 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 reducing 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 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 did not know 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 co-creation methodology previously trained, thus showing that it is feasible to apply in certain curricular units promoting the shift from classical education to a new approach centred on competencies of the reflective practitioner.

## 5 Conclusions

This paper presents a description of the application of the DEMOLA approach to IPS in Portugal. The DEMOLA® approach enabled the training of a group of IPS professors as facilitators of co-creation processes, having contributed to the acquisition of Design Thinking skills that can be used in new projects and applied to new teaching methods at IPS.

This approach also made it 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 competencies at a national and international level, with companies and other polytechnic institutes, expanding the network of future collaborations.

To act as facilitators we identify the ability of self-management with learning and development based on personal demand, clearly evident during the 15 weeks of the DEMOLA programme.

Further studies cover the application of the co-creation design thinking process to other units from different curricular IPS programmes and develop a questionnaire survey conducted among students to better assess the impact of the used approach.

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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