CO-CREATION OF INNOVATION IN HIGHER EDUCATION - THE PORTUGUESE CASE

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ABSTRACT

Demola model aims to apply a methodology of co-creation processes, based on cooperation systems, having as objective applying science, technology and innovation policies in personal, educational and business contexts. Considering that the co-creation method is based on a joint initiative, in which providers and beneficiaries create value together, it is intended to demonstrate the impact this methodology brings to educational quality, namely its application to the Portuguese polytechnic higher education system. From the insights and ideas that emerged from the content analysis, this description is enriched and an integrated definition of co-creation of value is developed.

Firstly, a theoretical contextualization of the definition of co-creation and its processes is proposed, giving emphasis to the model developed by Demola Global. Then, the impacts of its application on students, teachers and organizations, evaluated through surveys carried out after a first batch of co-creation projects, are presented and discussed. With this study, it is meant to identify the main changes that co-creation confers when applied in the learning context and which significant developments result from its use.

Keywords: co-creation; innovation; higher education system; Portugal

RESUMEN

Co-creación de la innovación en la educación superior - el caso portugués. El modelo Demola pretende aplicar una metodología de procesos de co-creación, basada en sistemas de cooperación, teniendo como objetivo aplicar políticas de ciencia, tecnología e innovación en contextos personales, educativos y empresariales. Teniendo en cuenta que el método de cocreación se basa en una iniciativa conjunta, en la que provee-

dores y beneficiarios crean valor juntos, se pretende demostrar el impacto que esta metodología trae a la calidad educativa, es decir, su aplicación al sistema de educación superior politécnica portugués. A partir de los insights e ideas que surgieron del análisis de contenido, se enriquece esta descripción y se desarrolla una definición integrada de co-creación de valor.

En primer lugar, se propone una contextualización teórica de la definición de co-creación y sus procesos, haciendo hincapié en el modelo desarrollado por Demola Global. Luego, se presentan y discuten los impactos de su aplicación en estudiantes, docentes y organizaciones, evaluados a través de encuestas realizadas a lo largo de una primera fase de los proyectos de co-creación. Con este estudio se pretende identificar los principales cambios que confiere la co-creación cuando se aplica en el contexto de aprendizaje y qué desarrollos significativos resultan de su uso.

Palabras clave: co-creación; innovación; sistema de educación superior; Portugal.

INTRODUCTION

Countries are increasingly looking for new tools in order to satisfy the demand for innovation in economy. Currently, policies are evolving towards more agile processes of knowledge transfer in order to face global competition, economic instability and rapid technological advancements (Polese *et al*., 2021). In this context, co-creation methodology appears as an alternative to more traditional solutions focused in science based projects led by a few relevant organizations and research centers (Raunio *et al*., 2018).

Co-creation methodology was first introduced by Prahalad and Ramaswamy (2004) and has its roots on a Scandinavian approach defined as participatory or cooperative design in which workers have an active participation in the development of services or products (Ind and Coates, 2012). The former authors defined co-creation as joint creation of value by companies and consumers, or, in a wider sense, by each actor (individuals, organizations, academia, etc.) that engage itself by interacting and exchanging their resources to develop, most likely, new resources throughout the process (Leclerq *et al*., 2016). This idea is highlighted by Oertzen *et al*. (2018), who state that co-creation is composed by the verb *create*, which means making something to happen or to exist, and prefix *co*, which means together with others. While co-creation was initially applied to various marketing and management fields (Sarasvuo *et al*. 2022), today this design thinking methodology is transversally applied in different sectors of society, namely in public-private partnership or in collaborations between industry and academia (Catalá-Pérez *et al*., 2020). In conclusion, co-creation refers to a shared design of new value, idea, model by several partners through a joint effort.

Nowadays, in a society that tends towards the adoption of the sustainable development goals proposed by the United Nations, the collaboration between higher education institutions and the business environment is increasingly fundamental (Osorno-Hinojosa *et al*., 2022). Not only to develop new skills in students (Pocol *et al*., 2022), but also to act as a driver of knowledge and innovation for regional stakeholders (Mathisen and Jørgensen, 2021). Knowledge by itself may be worthless, being only useful if, as stated by Waluszewski and Håkansson (2007), it increases the value of an already existing product or service or when it is combined to create something new. According to Pocol *et al*. (2022), by cooperating together, academic partners may boost education opportunities and insertion on the labor market for their students as well as increase the impact of applied research carried out by academic staff or researchers. On the other hand, public or private organizations have access both to leading innovation or research and to a particularly creative fringe of society, students. By collaborating together, the barriers resulting from preconceived ideas that academia and organizations have of each other are overcome, reducing the gap between these two stakeholders (Marijan and Gotlieb, 2020). For students, participation in co-creation projects brings several benefits. Not only do they participate with greater motivation in their educational process (Pocol *et al*., 2022), benefiting from direct gains, but they also develop the skills commonly described as the 4 C's of the 21st century: critical thinking, creativity, collaboration and communication.

Co-creation process is characterized by four intrinsic features (Prahalad and Ramaswamy, 2004):

dialog, which leads to engagement, interaction and willingness to participate among all the stakeholders;

equal access and transparency to all information, without which dialogue is not possible;

clear assessment of risk-benefits of a course of action and decision of all the stakeholders.

When these four features are present, an atmosphere of thrust is created that conducts all co-creation practitioners to concentrate and produce ideas without fear of how they are perceived by the other team members (Ind and Coates, 2012). Also, according to these authors, the engagement of each practitioner depends on their motivation. This motivation derives from altruistic motives, such the desire of helping, or from non-altruistic motives (Leclercq *et al*., 2016). The latter can be divided in extrinsic motives (monetary rewards or social recognition) or intrinsic motives, which, in turn, result from social (social integrative) or personal (hedonic motives) orientation. The motivation, or engagement, as well as the knowledge of every co-creation practitioner can be considered as more relevant to the creative process than the inherente creativity of individuals (Ind and Coates, 2012). According to these authors, in addition to the above features, the gamification of the process is also a powerful way in the co-creation process. When serious play is present, all the members of the team have the opportunity to experiment ideas just for the fun of doing so, not worrying about possible outcomes (Ind and Coates, 2012). By playing or fantasizing, co-creation practitioners have freedom to do or think in different ways on each occasion, which will allow the exploitation of endless alternatives. During this process the facilitator or the facilitation organization can not be ignored. The facilitator acts as a neutral connector between all the co-creation parties, providing them all the conditions needed to interact and share their experiences, expertise and knowledge (European Commission, 2021). Between the basic function of a facilitator, he or she should enable the creation of trust.

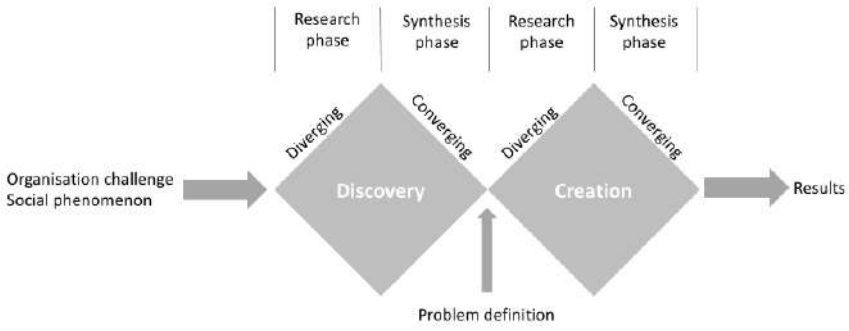
Co-creation process can be divided in three major steps (European Commission, 2021):

The first step is to gather all the team members. The team is built around the industry-relevant challenge or the social phenomenon that is intended to study. From the application received, the facilitator should choose the members according to their motivation, goals and interest. The team should be composed of four to six members, one facilitator and the representative of the organization.

The second step is teamwork, a period that lasts from 6 to 9 weeks, during which the group develops intense work. The process develops around weekly tasks, guided by the facilitator. In a double diamond process (Figure 1), the first half of teamwork is dedicated to the discovery stage, whose aim is the understanding of the phenomenon. The second half of step two is the creation stage, when the team comes up with new ideas and perspectives, ending by choosing one and creating a solution, model or concept for the phenomenon or challenge. Several tools are available for this stage, namely PESTLE analysis, stakeholder mapping, megatrend selection, among others.

The last step is the valorisation of step 2 findings, sharing them with different stakeholders and taking advantage of all the received inputs.

Figure 1 - Co-creation process stages in a double diamond process (adapted from Banathy, 1996)



Co-creation methodology can be applied based on two distinct approaches (European Commission, 2021): i) demand-driven approach, or ii) exploratory approach. While the latter aims to seek alternative solutions that goes beyond the current technological and knowledge boundaries, the former is intended for organizations needs, at the same time that research and education receive feedback and input from industry. Currently, as a consequence of Covid-19 pandemic, multicultural, multidisciplinary and international teams are more frequent and are accelerating the development of sinergies (European Commission, 2021).

OBJECTIVES AND METHODOLOGY

The present study aims to present the first outputs resulting from the Link me up project - support system for the co-creation of innovation, creativity and entrepreneurship, which brings together 13 Portuguese polytechnic higher education institutions and their partner profissional schools from north to south of Portugal. This national consortium intended to implement co-creation projects in order to boost innovation and knowledge transfer between academia and private and public organizations. According to the data from the first batch of co-creation challenges, 145 challenges were developed, involving 127 organizations, 749 students and about 150 teachers. The sample for the evaluation of the results focused on the responses to the surveys carried out by students (376), organizations (75) and facilitators (16), at the end of the first edition of this program. Co-creation challenges followed the methodology developed by Demola Global. Demola co-creation process involving higher education institutions and organizations follows the main features presented in the previous section, being divided in five stages (Science2Society, 2016):

Stage 1: each facilitator proposes a challenge based on an organization's need and defines a challenge card. After publication of the challenge card on the Demola portal, students apply to the challenge and the facilitator should define the team members according to their motivation and information provided on the portal.

Stage 2: the initial meeting is the first time all the team members, facilitator and the representative of the organization meet. During this meeting, each member introduces him or herself, aiming for the creation of an atmosphere of thrust, and basic information about the challenge and Demola contracts, namely the IPR issues.

Stage 3: For 8 to 10 weeks, supervised meetings are held on a weekly basis, during which team members receive guidance, share experience with the representative of the organization and weekly tasks are discussed. During the first four weeks, students were asked to realize a PESTLE analysis and a mid report was delivered. The speculative design took place during the second half of the process and students had to look for weak signals of changes and, based on them, they developed future scenarios asking "What if…" and "How might we…" questions.

Stage 4: Facilitators, trainers and organizations gathered, in person, twice during the process in an all-day event to work on challenges and to reinforce network bonds between polytechnics, facilitators and organizations.

Stage 5: The process ended with a final meeting. During the final meeting, team members presented their solution to the organizations.

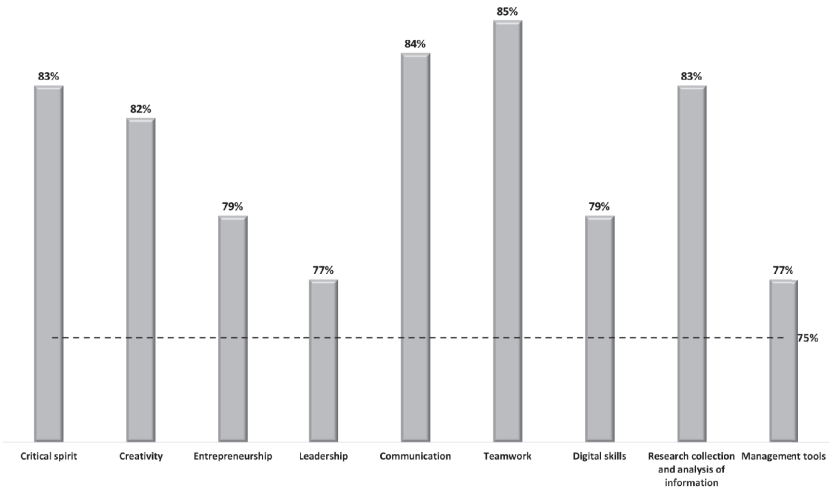
By the end of the first batch of challenges, surveys were proposed to all the parties involved in the process: students, organizations and facilitators, whose answers were compiled. In this study we present the quantitative, comparative and statistical analysis of the results of data collected from the aforementioned surveys. By carrying on this data review, authors aim to conclude about several indicators, namely skills developed by students and organizations, satisfaction perception in all the parties involved and practical outcomes of the co-creation challenges.

RESULTS AND DISCUSSION

The results show the participation of 749 students, who integrated co-creation teams in ambivalent and multidisciplinary projects. Regarding the challenges, the initial objective was 100 projects, but the result was 145 challenges developed. With these results, we observe that students' interest in participating in articulation with companies and with new learning methods is higher than expected by the consortium.

Analyzing the survey results, with regard to the students' assessment of their participation in the project, a degree of satisfaction of 82% was reached. Regarding the development of soft skills, the survey reveals that the students, at the end of this experience, evaluated themselves as more capable in (Figure 2): critical thinking (83%), creativity (82%), entrepreneurship (79%), leadership; 77%), communication (84%), teamwork (85%), digital skills (79%), research, collection and analysis of information (83%) and management tools (77%). The skills that students most highlighted as a result of this participation were: critical thinking, creativity, communication, teamwork and research, collection and analysis of information. Those with percentages below 80% were: entrepreneurship, leadership, digital skills, and management tools. It is curious to observe that technical competences have a lower percentage than the competences of personal and social empowerment. Regarding the analysis of the students' answers about the training that this experience gave them for the possibility of creating their own job or company, the percentage was 67%.

Figure 2 - Evaluation of students' skills improvement after their participation in co-creation challenges

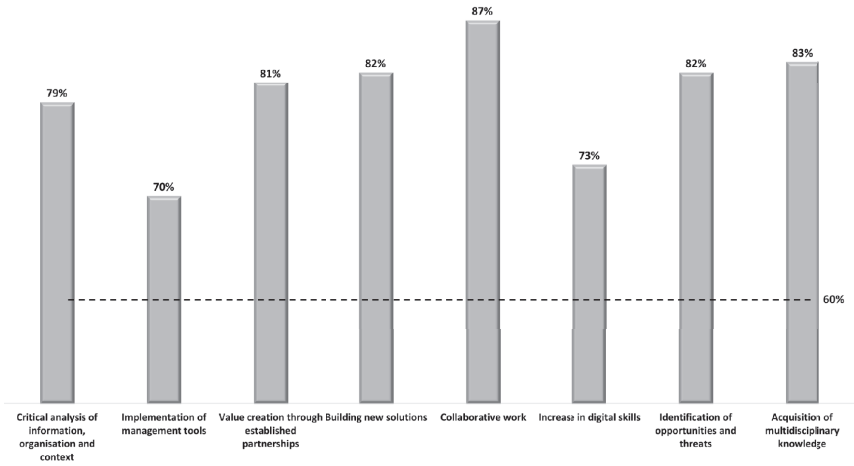


According to the data from the first batch of co-creation challenges, 145 challenges were developed, involving 127 organizations. We can conclude from these data that companies are very interested in participating in new challenges and especially incorporating young people, still in training as a form of business enrichment. The evaluation obtained from the companies indicates that the degree of satisfaction with the project was 89%, which means that companies perceive an effective benefit from participating in this type of program.

According to the results shown in Figure 3, the evaluation carried out on the different companies that participated in the project showed that the training of competences had a development of 80%. These results indicate that companies benefited from this participation, in the development of competences proposed by the methodology. Thus, we observed that companies showed an increase in the following skills: critical analysis of information, organization and context (79%), implementation of management tools (70%), value creation through established partnerships (81%), construction of new solutions (82%), collaborative work (87%), increases in digital skills (73%), identification of opportunities and threats (82%) and acquisition of multidisciplinary knowledge (83%). It is important to evidence that corporate work competence benefited from a higher recognition, which may have helped companies to recognize the importance of collaboration both within a business group and with external entities. On the other hand, we have skills such as creating value through this partnership, building new solutions,

identifying opportunities and threats and acquiring multidisciplinary knowledge with a percentage above 80%. This indicates that the methodology turns out to be quite effective when implemented in a business context, and companies can benefit from more effective responses to the daily challenges that arise at different levels of intervention.

Figure 3 - Evaluation of organizations' skills improvement after their participation in co-creation challenges.



Regarding the teachers who participated as facilitators of the co-creation process until the date of publication of this article, the results at the national level were still not available. However, having access to the results concerning the survey results of the Polytechnic Institute of Coimbra, the authors decided to use Coimbra teachers as indicator for the conclusions obtained by this group in the implementation of this methodology. 16 facilitators from the Polytechnic of Coimbra responded to the survey, from multidisciplinary areas such as: agriculture, engineering, social sciences, science and health.

Regarding the degree of satisfaction with the training program and on a scale from 0 to 7, with 0 being completely dissatisfied and 7 being completely satisfied, 37.5% had a degree of satisfaction of 6, 37.5% with a degree of satisfaction of 5, 18.8% with a degree of satisfaction of 4 and 6.3% with a degree of satisfaction of 3. With these results, it is possible to conclude that 75% of the facilitators considered the training program quite satisfactory, scoring it with a 5 or a 6 (7 beint the maximum rating). When asked about the possibility of implementing co-creation projects in their educational institution, facilitators indicated 68.8% could do so within 12 months and 31.3% between 12 and 24 months. These results indicate, on the one hand, the ease with which the methodology can be applied in the short term and the interest that the facilitators have in migrating this experience to the academic context.

Asked about the degree of pedagogical innovation that this model presents, 75% answered that it is an incremental pedagogical innovation, indicating that it has some new features, but that they already knew some of the tools. 18.8% of the facilitators considered that it was a radical pedagogical innovation, in the sense that it was a totally new methodology and different from what they knew. Finally, 6.3% considered that this methodology is not innovative. These results indicate that most facilitators already had access to some of the tools used, so the methodology did not result from totally new knowledge.

Asked about the possibility of co-creation projects offering solutions with added value to the organizations involved and on a scale of 0 to 7, with 0 totally disagreeing and 7 totally agreeing, 37.5% of the facilitators scored

7, 31.3% indicated 6 , 18.8% scored 5 and 12.5% scored 4. These results show that almost 70% of facilitators consider that these projects add value to the different stakeholders and participants of this methodology. This conclusion is reinforced when 100% of the facilitators responded that they would recommend this program to other colleagues.

CONCLUSIONS

Trying to respond to the needs of current and constantly developing societies, policies seek to evolve towards more effective processes in the creation and transfer of knowledge, especially sustained by rapid technological development. In this context, the co-creation methodology results as an alternative to the development and interaction between the academic and business levels. In this partnership between public and private organizations, the opportunity is created to produce a value proposition, increase opportunities for training and insertion in the job market for students and increase companies' access to ideas and innovations.

In this study, an example of implementation of the co-creation methodology in Portugal polytechnics institutions is shown. The study presents the first outputs resulting from the Link me up project - support system for the co-creation of innovation, creativity and entrepreneurship, which brings together 13 Portuguese polytechnic higher education institutions and their partner profissional schools.

The results point to a very high degree of satisfaction, with the competences related to technical competence having a lower percentage than the competences of personal and social empowerment. This indicates that the methodology, from the students' perspective, allows the development of more relevant skills related to critical thinking, creativity, communication, teamwork and research, collection and analysis of information. The degree of evaluation carried out by the participating companies indicated a higher level of satisfaction than the evaluation of satisfaction by the students. Regarding the results of the competitions in the companies, they recognized that their participation and implementation of the methodology allowed them to develop competences. Evidencing that the corporate work component stood out in terms of percentage compared to the others, which indicates the recognition and importance that this methodology allowed for internal collaborative work or with external entities.

Following the results obtained by the students and companies, the degree of satisfaction of the facilitators in the implementation of the methodology is also quite satisfactory. It should also be noted that teachers who participated have indicated the interest in applying the co-creation process in their teaching activities, in the short and medium term. On the other hand, they indicate the validation of the methodology, suggesting and advising it to other colleagues who have not implemented this kind of pedagogical solution.

This paper highlights the fact that all the participants who collaborated presented high levels of satisfaction, pointing out that it is a useful practice about the possibility of creating new value projects for companies. Students have access to the business context, while still at school, being this collaboration considered by the organizations as something beneficial for them. Regarding facilitators, it increases the possibility of breaking with traditional teaching models and implementing practical and innovative dynamics in an academic context.

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