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LIVING LABS UNDER CONSTRUCTION: PARADIGMS, PRACTICES, AND PERSPECTIVES OF PUBLIC SCIENCE COMMUNICATION AND PARTICIPATORY SCIENCE

Co-creativity in Living Labs: fostering creativity in co-creation processes to transform food systems

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Abstract

In this article, the authors aim to reflect on the relationship between collaborative creation and creativity ('co-creativity') within Living Lab (LL) research and innovation in the domain of agri-food systems.While the value of LL is often perceived to be the collaboration among its participants, there is a need to capture and measure the process of co-creation.Co-creativity is indicated by the literature to be a necessary research and collaborative component of social change, as well as for promoting a transformative sustainability agenda.This article uses empirical and primary data collected in the context of the DIVINFOOD project to show the extent to which researchers actively promote, manage and respond to the effects of collaborative creativity within their research. Collaborative creativity is an indispensable component of the co-creation process because it supports collaborative learning. The authors conclude that measuring co-creativity could be an interesting indicator to monitor the development of LLs over time.

Keywords

Citizen science; Environmental communication; Participation and science governance; Living Labs; Co-Creation; Creativity; Food Transformation; Design

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Introduction

There is ample evidence today that one of the greatest challenges ahead for humanity lies in constructing more sustainable food futures. While modern food systems have delivered an efficient system capable of providing food rapidly and smoothly, this has come at the cost of negative externalities in the form of unhealthy diets and environmental degradation [International Panel of Experts on Sustainable Food Systems, 2016; Willett et al., 2019]. This paper aims to understand what new collaborative models are emerging to solve major social and food system challenges. It focuses on Living Labs and their collaborative and co-creation-oriented approaches. Living Labs have emerged as an arena where inspiring, creative and collaborative processes take place, allowing for a systematic

approach to solving the problem, with the flexibility to change the pace and innovate, if the need arises along the way. The importance of Living Labs and their role in co-creation is clear from the increase in the use of this term in EU projects [related to food, see projects such as Food Shift and Fit4Food and cf. Hossain, Leminen & Westerlund, 2019; Gamache et al., 2020].

It is clear that traditional innovation linear processes are not producing the results needed to tackle the above situation [Bouncken, Fredrich, Ritala & Kraus, 2018; Bouncken, Kraus & Roig-Tierno, 2019; Chesbrough, 2003, 2007]. New methods that take into consideration the ever more connected and convergent arena of the food system are needed, and it is for this reason that companies and organisations are becoming increasingly convinced that the most fertile ground for new products, services and solutions will be found at the intersection of business, consumers and other players in the innovation ecosystem [Belitski & Mariani, 2023]. In contrast to traditional approaches that cannot adequately address these challenges, new solutions resort to collaboration, by introducing and engaging new partners in ecosystems that all benefit from working together for a common goal [Zott & Amit, 2009]. "Collaborative creation" (co-creation) is a dynamic way to successfully navigate new business and also to solve the most difficult social challenges [Wiścicka-Fernando, Misiak-Kwit & Fernando, 2019; Zott, Amit & Massa, 2011].

The process of co-creation seems ideal for building projects on complex issues [O'Reilly & Tushman, 2021], as demonstrated in the cases of smart cities (e.g. Copenhagen Zero Emission Smart City by 2025) or EU and other projects that focus on food systems. Here, there are some clear cases where co-creation has had interesting results. One example is the ALCHEMY approach, (a participatory coLlaborative approaCh to mapping the interactions between value cHain, the EnvironMent and societY), used in Holland to help stakeholders develop a common understanding and build joint solutions [Topi, 2022]. The project developed co-creation approaches aimed at capturing and integrating the different points of view on agrifood value chain and allowed stakeholders to interact with each other on common ground [Topi, 2022]. In the EU project FoodTrails, co-creation has been inserted as a key feature of the project for more innovative, but also effective and inclusive food policies in Europe. Co-creation here is intended as "understanding what the needs are together with stakeholders and to define with them what the food policy objectives will be" (FoodTrails design document.[1]) Lastly in the world of food retail environments there is evidence on the benefits of co-creation (between companies and consumers) that rest on participatory processes [Vargas et al., 2022]. In fact the challenges to be addressed require systemic approaches rather than linear perspectives [Amara, Landry, Becheikh & Ouimet, 2008] and collaborative process, such as a series of small projects working in harmony with each other. Multiple perspectives and different capacities [Audretsch & Belitski, 2013] come together to work towards concrete solutions and possibilities to address and solve most of these problems.

Living Labs are places for open innovation where co-creation is a method for addressing real-life issues [Mbatha & Musango, 2022]. They are physical or virtual space where societal challenges, especially in urban areas, are solved by bringing together various stakeholders for collaboration and collective ideation [Hagy,

[1] https://foodtrails.milanurbanfoodpolicypact.org/consortium/.

Morrison & Elfstrand, 2017]. A collaborative real-life environment that engages various types of participants is a key requirement of living labs. However, while inclusivity and co-creation are notions that have received increasing attention from scholars, practitioners and policy makers, their essence remains unclear to many, and there is often a dissonance between the aim of living labs and the existing reality [Almirall & Wareham, 2008; Hossain et al., 2019]. While the benefit or value of living labs is often perceived and very "real" to its participants [Leminen & Westerlund, 2012], there is a need to capture and measure the process of co-creation to better understand and pinpoint the value of Living Labs. Today, the literature remains silent on quantifying the value of living labs in clear, measurable transformational values [Juri, Massari & Reissig, 2022] yet there is a need to better explore how living labs perform creatively in multifaceted situations and what implications this has in terms of public policy and innovation management initiatives [Westerlund & Leminen, 2011; Hagy et al., 2017].

The key questions that this paper will address are: what is the role of creativity and the connection to co-creation in Living Labs? Is creativity encouraged in co-creation processes or is it undervalued and not properly understood? How can collective creativity be monitored and measured in the context of Living Labs? Is co-creativity (collective creativity) an interesting object of study for supporting co-creation processes in Living Labs? This article addresses these questions using primary data collected in three experiments inspired by the project DIVINFOOD EU described in section 3.

The first section of the article focuses on the concept of co-creation: what does it mean, how has it evolved over time and in different sectors, and what are the gaps and difficulties we have today in activating a co-creation process. Section two will clarify how co-creation and co-learning are two sides of the same coin. We draw upon data from the DIVINFOOD project,[2] collected during the first seven months during the development of the guidelines to facilitate the Living Labs, besides the collection of scientific literature on creative processes in LLs and the conduct of additional empirical experiments (workshop sessions) developed during the ENOLL[3] annual conference. Main insights confirm that co-creativity is an essential component of co-creation because it sustains collaborative learning, has transformational power that can generate change. The scenarios and methodologies used for the experiments are explained in the third section. In the fourth section, the results obtained and some critical issues that exist for considering co-creativity as a potential indicator for monitoring and evaluating transformation in LLs are discussed and, in the conclusions, some proposals for continuing research on this topic are highlighted.

Context: co-creation

1.1 Co-creation: definition and outcomes

Co-creation can be defined as "the enactment of creation through interactions" [Ramaswamy & Ozcan, 2018], it provides a direction to innovation processes and allows a wide range of voices that would normally never be heard to collaborate. A

[2]See Divinfood project website https://divinfood.eu/.

[3]Workshop session: "From brainstorming to groupthink, applying trans disciplinarity", Turin, Thursday 22 September https://openlivinglabdays.com/from-brainstorming-to-groupthink/.

review of the vast literature on the theme reveals that co-creation is a multifaceted term [Oertzen, Odekerken-Schröder, Brax & Mager, 2018]. For several authors, co-creation is linked to innovation. It is a fundamental strategy for organisations that want to activate innovation and has the power to transform an organisation's approach to innovation [Ramaswamy, 2009; Frow, Nenonen, Payne & Storbacka, 2015]. Co-creation is also an inclusive process [Franklin, 2022] that, in a complex and changing ecosystem of actors, accelerates everyone's innovation efforts and creates more value for the organisation, end users and society. Companies increasingly opt for co-creation by engaging customers in new product and service development processes. Higher levels of customer role readiness, technologization, and connectivity positively affect different co-creation experience dimensions. According to Verleye [2015], the customer co-creation experience is characterized by six dimensions, which are hedonic experience, cognitive experience, social experience, personal experience, and pragmatic experience and, economic experience. The impact of these dimensions on the overall co-creation experience, however, differs according to customers' expectations in terms of co-creation benefits [Verleye, 2015; Pine & Gilmore, 1999; Prahalad & Ramaswamy, 2003]. Despite its acknowledged importance, empirical work on the outcomes of co-creation is rather limited [Carbonell, Rodríguez-Escudero & Pujari, 2009]. Extant studies — which have largely been limited to conceptual and qualitative studies — associate co-creation with efficiency gains for firms, such as minimization of new product and service development costs [O'Hern & Rindfleisch, 2008], reduced failure risk [Hoyer, Chandy, Dorotic, Krafft & Singh, 2010], and faster speed to market [Alam, 2002].

Co-creation is also based on the principle that if everyone is involved in the process from start to finish, it can provide benefits to everyone involved (without excluding anyone). It is considered by many as a process based on transparency and consensus, one that allows overcoming some obsolete and restrictive practices, and develops closer relationships between the parties, breaking down some boundaries [Fang, Palmatier & Evans, 2008; O'Hern & Rindfleisch, 2008]. Therefore, co-creation involves customer engagement in the creation of offerings through ideation, design and development [Bolton & Saxena-Iyer, 2009; Mustak, Jaakkola & Halinen, 2013; Vargo & Lusch, 2008]. Many have highlighted the results of co-creation, in terms of creation of economic benefits related to the reduction of costs of developing new products and services, enables more successful products and services, improves financial performance, creates new business opportunities, and can help improve the social impact of organisations or companies' activities on communities [Franz, 2015; Roser, DeFillippi & Samson, 2013].

The role of creativity in co-creation research has received far less attention, except for some notable exceptions Carpenter, Horvath and Spencer [see e.g. 2020], Kara [2015] and Pauwels and Mannay [2019]. For example Carpenter et al. [2020] reformulate the concept of 'co-creation', from a term usually associated with citizen involvement in neoliberal contexts, to its 'critical artistic practice' [Mouffe, 2013] in which new ways of imagining the space (city) can be articulated; they examined the practice of collaborative creation as a participatory methodology involving artists, researchers and local stakeholders in developing 'agonistic spaces' by scrutinising a five-day workshop conducted in the Rio de Janeiro favela. During the workshop people with different backgrounds learned to build collaborative knowledge to improve understanding of the identity of the local territory. The

experience suggested that, the use of arts-based methods, collaborative creation and constructive approaches could help to build trust between researchers and non-academic community; the results showed the success of combining verbal methods with creative and embodied ways of knowledge production, how putting different actors in a "special space" where antagonistic views can fight and cab be negotiated without risks and more conflicts. More in depth Kara [2015] examines the four pillars of creative research methods: arts-based research, research using technology, mixed-method research and transformative research frameworks. In a more recent edition of her book Kara [2015] decided for the inclusion of embodied research as a fifth 'pillar'. These are not mutually exclusive; creative research often falls into more than one, but they offer a useful way to help us think and talk about a highly complex interdisciplinary field. Finally, Pauwels and Mannay [2019] argued that the future of visual research will depend on continued efforts to cross disciplinary boundaries and engage in co-constructive dialogue, but more importantly, their interdisciplinary research aimed to encourage researchers from different disciplines to think about how their knowledge could be nurtured using creativity and visual tools. In addition, a geo-humanistic literature exists to embrace critical perspectives through creative practice to address current global injustices [Hawkins, 2019].

Yet, there remains much more to be understood about the relationship between creativity and collaboration in the furthering of transformative sustainability agendas more broadly throughout the sustainability sciences. The essays in Alexz Franklin's book, entitled "Co-Creativity and Engaged Scholarship", [2022], show that research can and should encompass much more than the economic and industrialized production of knowledge. They illustrate that a critical approach can be creative and that, in turn, creative research can promote and evaluate critical thinking; they highlight the realization that co-creation is a powerful practice that can (and should) replace old notions of 'creative genius'.

The relative silence as to the role of creativity in primary research settings could in part reflect a history of LL practices dominated by calls for tangible outcomes, objectivity and replicability.

In this article, the authors argue that although we may know a lot about practices that stimulate new ideas, LLs teams often have trouble in applying them. The same applies in the field of food, where LLs set up to help various actors along the food chain to work together are limited by the divergent views of the different stakeholders and the inability of researchers to "speak" to farmers' unique situation [Toffolini, Capitaine, Hannachi & Cerf, 2021; Lacombe, Couix & Hazard, 2018]. Indeed, people's ingrained biases and prejudices are objective obstacles. By using an example from the world of food (DIVINFOOD project), this article shows how design thinking and creative methods can help people overcome this issue and release their creativities, in a collaborative way. Creative methods also remodel the experiences of innovators, help groups to co-construct based on their different ideas, and to negotiate compromises when differences arise. In this way they decrease fear in change for all stakeholders, and a creative strategy gets people more comfortable in trying new things and processes.

1.2 Is co-creation a new approach? No

Co-creation is often presented as a new generation approach while in fact it has a history of almost half a century. Co-creation is a concept that involves a broad range of stakeholders in a design or problem-solving process as co-designers. It first appeared in the 1960s–70s when Scandinavian trade unions extended the movement for democracy in the workplace to the right of workers to co-design computer systems that impact their work. It was initially called co-operative design (i.e. co-design). The most well-known collaborative design project was UTOPIA [Sundblad, 2011]. UTOPIA gave a lasting contribution to the theoretical understanding of design with users through contributions such as Pelle Ehn's and Susanne Bødker's dissertations [Ehn, 1988; Bødker, 1991, 1999] and several other papers.

In the 1970s, Americans considered the term 'co-operative' as being too collectivistic and therefore renamed it 'participatory design'. John Heron, in 1971 [Heron, 1971, 1996], is credited with inventing the term 'collaborative enquiry' to describe the importance of doing research 'with' rather than 'on' people. The involvement of end-users in research and information gathering is considered fundamental. In the 1980s, the concept of participatory design[Muller & Kuhn, 1993; Schell & O'Brien, 2015] is extended to other fields. Urban planners are the first to adopt it, calling it collaborative place-making or collaborative planning [Muller, 2003]. They study the impact of the approach, citing improvements in efficiency, reduction of obstacles and breadth of objectives achieved.

But it is Don Norman who proposes user-centred design [Norman, 2013] and marks the epochal shift from participatory design as an engineering, information technology mindset focused on requirements and tasks to a design mindset focused on holistic systems and human needs. In 1990 a biennial conference on participatory design was held [Greenbaum & Kyng, 2020; Clement & Van den Besselaar, 1993]. The 1990s confirm an evolution of design from user-centred to interaction-centred [Hartson & Pyla, 2018] and then human experience-centred (experience-centred design, by IDEO '96) and it is here that design thinking fits in more broadly [Rizzo, 2020]. Participatory design remains a more specific and focused strand within these movements and is used to train professional negotiators inspired by the theory of collaborative dispute resolution, characterized by co-creative activities such as joint fact-finding [Susskind, 2020].

Evidence that co-creation could bring benefits on learning and skill acquisition came in the 2000s with the soaring of digital methods and studies conducted on co-creation outcomes. It emerged that participants in co-creative processes experienced an increase in individual competence, support for the outcome, perceived legitimacy of the process, and strengthened social networks. University of Michigan professors CK Prahalad and Venkat Ramaswamy include the term 'co-creation' in the Harvard Business Review article 'Co-Opting Customer Competence' [Ramaswamy, 2009]. Emerging concepts such as open innovation, collaborative innovation, customer-led innovation, but also crowdsourcing focus on co-creation as breaking down barriers between consumers and companies in the interest of co-creation. Ramaswamy and Gouillart with their book 'The Power of Co-Creation' [2010b], reinforce the new business-consumer relationship by explaining how co-creation between stakeholders within an organisation can create

more value between customer and company. So much so that an international standard on human-centred design was introduced in 2010: ISO 9241-210:2010. One of the core principles of the standard is 'users are involved in design and development'.

Today, the term co-creation is a commonly used term. So commonly used that it may have lost its meaning. Over time, the principle of co-creation has fueled the idea that innovation cannot take place in closed environments and instead must be pursued in tandem with key stakeholders. This has consequently triggered a significant mindset change, towards a shift from a solution-based approach to a collaborative one, more akin to partnership (even if this means collaborating with one's own customers), where the most important goal is that innovation is shared, as is the development, and potentially the commitment and effort (as well as ownership) of the end result of the innovation project.

The Internet and the digital network seemed to be the perfect tool for developing collaborative solutions, as the proliferation of networked objects in the spaces of individuals, as well as businesses and organisations, allowed greater access to data than in the past, which helped in solving problems, sharing feedback from users, and testing new products and services, even with people in different locations in the space. The collaborative phygital [Biffi, 2022] world aims to unite physical and digital and with personalised customer journeys, shopper engagement, innovative payment solutions, artificial intelligence, and augmented and virtual reality, it re-places Man at the centre of collective living (including his/her own emotions) to establish an increasingly fluid communication between different users and stakeholders.

Undoubtedly, the advent of digital technologies, open source developers and of online collaborative platforms enabling connected solutions and innovation ecosystems, has facilitated and supported a greater spread of interest in co-creation approaches. Creativity and online audiences are influencing the meaning, expression, and impact of creativity [Literat & Glăveanu, 2018]. The goal of maximizing users' online time can lead to the monetization of opinions, thoughts, emotions, and actions, with potentially serious consequences for relationships and interactions [Lewis, 2017] [Center for Humane Technology, 2019] even in LLs.

On one hand, the suggestion that digital tools can exploit human vulnerability could have significant implications for co-creativity. On the other hand, even as technology platforms become increasingly interactive and collaborative, there seems to be a skills and competency gap on how to manage co-creativity in phygital environments. Thus, the phygital world offers new arenas for group engagement from which creativity can emerge, but also new dilemmas about the value and purpose of creative work and how to distribute it respectfully.

Co-creation: collaborative challenges and creative opportunities

2.1 Who is involved in co-creation

Co-creation is everyone's business nowadays. Stakeholders in the innovation process are diverse, ranging from customers to suppliers, competitors, academic institutions, NGOs and government agencies, companies. Co-creation in particular supports end consumers in the driving seat of the innovation process. Market

dynamics and the study of competitors give way to strategies that allow consumers (who do not yet know what they want) to identify products that perfectly fit their needs and desires, and to personalize products, services and business models. Co-creation allows for a more agile and fluid approach to innovation, and value is created with citizens, partners, academic and research institutions, and other sectors/actors/stakeholders.

Co-creation has become a commonly used term encompassing previous concepts such as user-centred, experience-centred and value-centred design. Some define co-creation strictly as collaborative design between companies and consumers (IDEO.org); others apply co-creation also within organisations, in municipalities, schools, policies, including collaborative design of strategies, processes and culture in every field [Manzini, 2015]. Just as design thinking has succeeded in extending the application of design principles from typical design challenges (such as product design and interactive design) to problem-solving in general [Rizzo, 2020], co-creation is a rapidly expanding concept that no longer refers only to co-design between businesses and consumers, but to the co-design process among any stakeholder group.

Although all these terms converge, a distinction needs to be made. Methods such as design thinking, human-centred design and agile prototyping help us answer the question 'how do we approach design'?

Co-creation, on the other hand, seems to seek answers to the question 'who should design'? Although design thinking and co-creation have a natural affinity, they have different functions in describing an approach to design. Manzini [2015] distinguishes between *diffuse design* (performed by everybody) and *expert design* (performed by those who have been trained as designers) and describes how they interact. He maps what design experts can do to trigger and support meaningful social changes, focusing on emerging forms of collaboration. This explains how there are design studies that fervently uphold "design thinking" but ultimately do many "black-box" conceptual studies. Examples are surveys of participation that allocate individuals to different 'participation boxes' by means of a binary logic, leaving a void of what is actually happening inside the boxes [Hustinx & Denk, 2009]. Similarly, actors as diverse as urban planners, researchers, scientists and activists use the principles of co-creation without applying the methodology of design thinking.

Considering the above, a key issue is thus *who* designs. Keeping co-creation as a powerful and distinct idea forces us to always ask who the designer is and challenges us to broaden our expectations of who should be allowed to design.

2.2 The role of participation in co-creation

Design participation (or participatory design) often is refereed to three different approaches, which are co-production, co-design, and co-creation. In the co-production process, end-users are "maker partners"; tasks are divided among everyone, decreasing the overall effort [Lember, 2018]. Nygaard [1975] explained co-design by saying that users may have different ideas about a product or service than its creator, but although those ideas are richer, they are not structured. They

must be captured with the appropriate tools. Here designer's expertise and tools are paramount.

The co-creation process is the active involvement of the end-users of a product or service in the different stages of the production process; end-users are considered "creative partners" who can help in the design stages, rather than being regarded as end-users, who do not take part in the design processes (IDEO.org).

Some authors have identified co-creation as the composition of co-production and co-design (Figure 1-case A), while others have referred to co-creation as a particular case of co-design (Figure 1-cases B, C, E), [Dudau, Glennon & Verschuere, 2019; Grönroos & Ravald, 2011; Sanders & Stappers, 2008].

Co-creation means that an organization involves a group with which it does not normally collaborate, and they work together effectively to create something new. In co-creation, strategy formulation involves imagining a new value chain that benefits all players in the ecosystem. It assumes that a co-design strategy will be completely defined at the outset, though uncertain circumstances often make that difficult [Ramaswamy & Gouillart, 2010a]. (Figure 1-F)

While the literature mentions LLs funded by EU co-creation projects, few have a clear and coherent co-creation strategy from their initial proposal (Figure 1-A). Co-creation seems to be an aspiration rather than a fully defined and formed strategy. While it is true that there are projects that claim to have achieved excellent results on co-creation, there is no clear data on the impact of co-creation on LL activity. From our experience based on the participation in more than 10 projects based on LLs there is thus an excitement and eagerness for co-creation, but there are often real obstacles to implementation. Some of the main obstacles to co-creation are 1) time availability and management, 2) commitment and transparency and 3) loss of interest by some of the stakeholders, the lack of investment to support creative facilitation and the organisation of working sessions, the long-term view and investment on potential results instead of short-term results, and a realistic a priori definition of resources needed for a project.

As we could observe in the projects in which we participated, some of these obstacles, especially the time-related ones, were somewhat overcome when during the Pandemic, as many of the activities moved to the virtual world. Collaborative platforms and digital interaction tools made it possible to achieve results in the short term, with limited costs. A major challenge of co-creation continues to be the transparency: fear about sharing of data and information among actors and organisations does not encourage collaboration and sharing of ideas. This problem is partially solved within co-funded projects involving LLs, where there is an agreement between the parties that establishes this right from the start.

When working in teams, people with different experiences, mindsets, and backgrounds come together. Gathering partners and stakeholders is indeed crucial, and a lack of participation is considered one of the biggest obstacles to the implementation of co-creation. Actors who are involved in co-creation very often need to be motivated and sometimes this does not happen.

Collaboration requires people to come together to address a shared challenge, with stakeholders coming in at various stages of the process and contributing with their

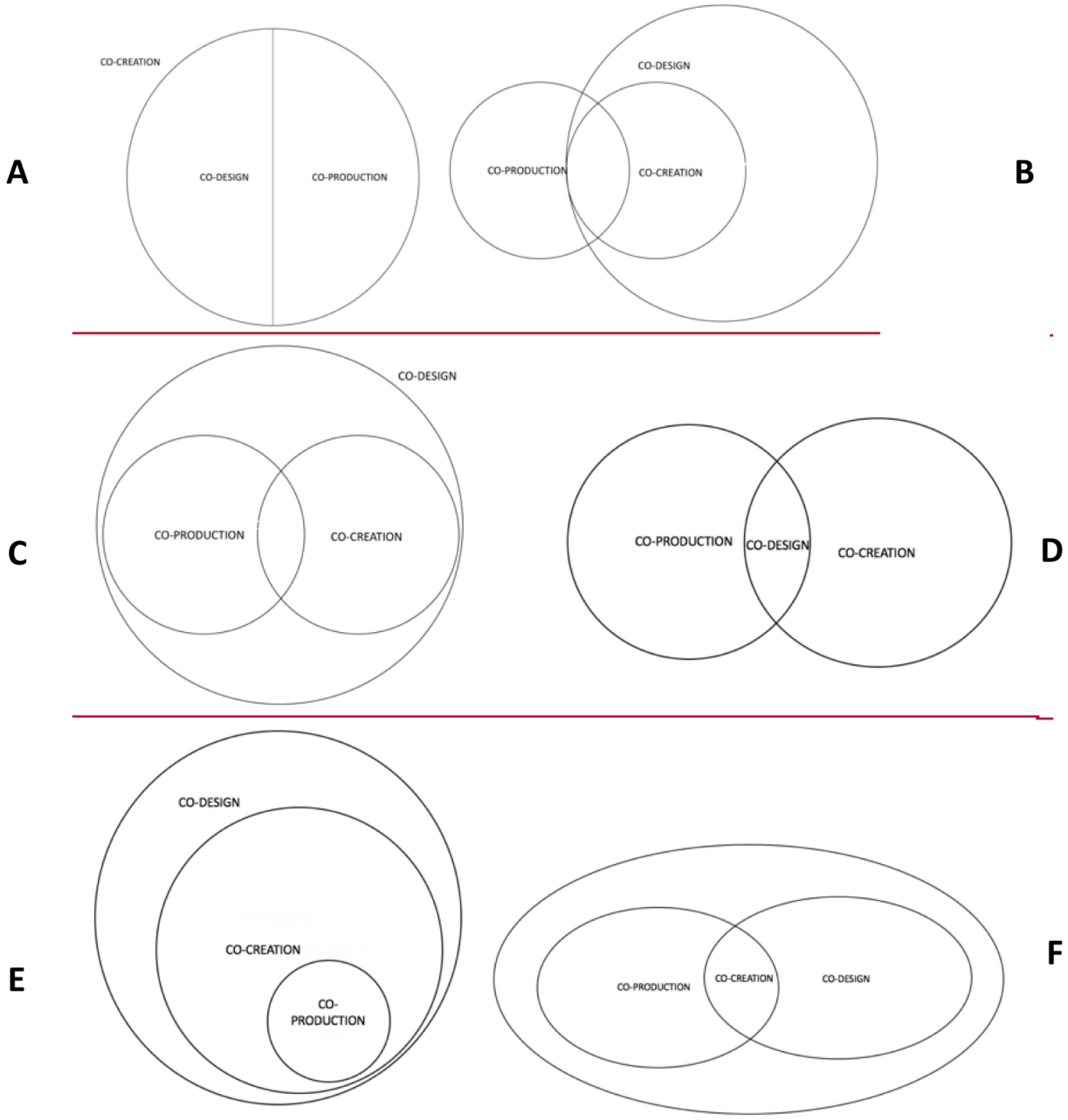

Figure 1. Different representations about the relation between Co-Creation, Co-production, Co-design Source: authors.

skills and expertise before passing the work along. But this is not enough. A different kind of collaboration is needed to tackle complex problems and harness the power of different perspectives to develop innovative ideas and solutions. In order for a culture of innovation and transformation to emerge, the co-created idea must be adequately stimulated by the contribution of all parties within the innovation ecosystem, but also and above all, successes must be shared.An engaged community is a creative community, one that not only drives activities but also rewards participation in those activities, and by doing so entices members to be part of the action.

2.3 Iterative processes of co-creation and co-learning

Co-creators can include a wide range of players, from different backgrounds, each bringing something special to the table, but in the collaboration processes it is important to apply different methods and disciplines, and to collect and exchange inputs, comments, feedbacks on new solutions. During co-constructive processes, all the actors recognize that they do not have all the answers and enable others to contribute towards finding a solution.

Co-learning, (or collaborative/collective learning), as opposed to individual learning, takes place where two or more people learn or attempt to learn something together [Dillenbourg, 1999]. Collaborative learning processes requires an explicit team building process that needs to be carefully designed and facilitated and for which trust is important. It also requires that the different types of knowledge of those involved are made clear and considered at a similar level of relevance. The equal level in the co-construction process is fundamental, as trust and collaboration are important to promote the exchange of knowledge.

The literature on LLs — specifically those on food — shows that carrying out collaborative innovation activities is one of the main functions of LLs, and is this done through testing, validation, experimentation and co-creation [Hossain et al., 2019]. Close collaboration however brings challenges, such as the risk of a collision of ideas among stakeholders and the difficulty of creating an effective learning environment among diverse stakeholders [Leminen & Westerlund, 2012]. Living Labs are the concrete settings where co-learning and co-creation blend and nourish each other, in an iterative, nonlinear, process of interaction.

The Figure 2 is a possible visualization of the Living Lab main processes. In the horizontal axis we see Living Labs' main phases of development: after the start-up phase, the Living Lab will develop and grow, until it stabilizes, and if possible, consolidates in a maturation phase. The co-learning and co-creation processes (nonlinear and recursive) take place along the development phases of the LLs (vertical axis). The process starts through stakeholder identification and engagement, definition of the common vision/aims and action planning (for co-creation). This initial phase is followed by analysis (data collection), self-assessment and reflection (for co-learning). A redefinition of actions, revisions of aims and plans may then take place [Massari, Mattioni & Galli, 2022].

In a collaborative learning process aimed at addressing "real world" problems, diverse actors come together to solve problematic situations that are beyond individual possibilities. Addressing these problems together and finding relevant solutions are key issues of transdisciplinary research. Restrepo, Lelea, Christinck, Hülsebusch and Kaufmann [2014] proposed co-learning as one of the ways of implementing transdisciplinary research leading to change of practice: this kind of collaboration, specifically between academics and practitioners improve the ability to respond, adapt and transform in facing complex scenarios in food.

To enhance creative collaboration, we need a process that unlocks the creativity of diverse teams. Two main modes of thinking during creative collaboration — divergent thinking and convergent thinking — should be used in tandem to create and make choices [Cross, 2008]. Divergence allows teams to come

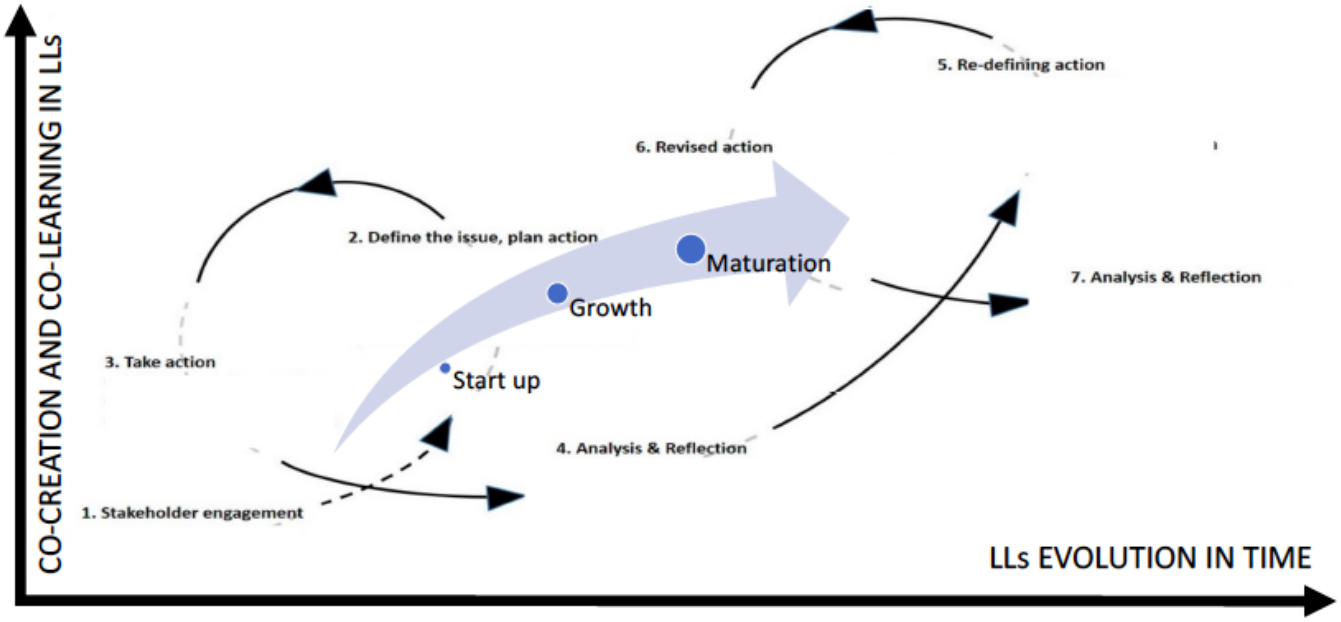

Figure 2. Living Labs iterative processes of co-creation and co-learning (source: authors).

up with as many ideas as possible, while convergence focuses on what is most important. The collaborative iterative process produces collaborative learning. Although there is a misconception that the process is linear, with ideas starting broadly and then narrowing more and more, creative collaboration includes multiple cycles of divergent and convergent thinking. At an early stage, LLs team might imagine all the possibilities of a solution before moving on to what it should realistically be, what it will ultimately be, and then to the actual prototype. This iterative process allows groups to combine the best elements of different options and refine them into entirely new concepts, incorporating feedback and discussion.

2.4 The role of creativity in co-creation

In a creative co-creation process, imaginative and critical skills are complementary and follow divergent and convergent thinking patterns [Guilford, 1957]. Systemic and collaborative models of creativity are useful when we seek to understand creative productivity within a specific domain of activity (i.e., an organization, an industry, the LL) [Csikszentmihalyi, 1998; Gardner & Weinstein, n.d.]. If creativity creates conversations among groups in a domain, it could have great impact on the field, and the potential to transform the domain or create a new domain. These models are particularly useful in contexts where a product is created for a specific audience, such as research and development (e.g., LL) contexts or start-ups.

Despite the absence of a shared definition of "co-creativity," some key characteristics of creative collaboration can be summarized [Schmoelz, 2017; Zeilig, West & van der Byl Williams, 2018] as a focus on shared process, shared ownership, inclusiveness, reciprocity, and relationality [Zeilig et al., 2018]. Creative collaboration takes the social and dialogic nature of co-creation to the next level. Indeed, a key component of an effective creative collaboration is the ability to be

reflective and take the perspectives of others on board [Glăveanu & Kaufman, 2019]. Staying open to new ideas and perspectives throughout the creative process is important to facilitate collaboration and co-creation of outcomes. Socio-emotional imagination facilitates group creativity by expanding imaginative potential, creating the right environment and mental flexibility that allow ideas to flow and grow [Gotlieb, Hyde, Immordino-Yang & Kaufman, 2019]. Co-creativity requires and creates openness, equality and imaginative space. Above all, it contrasts with the restrictive notions of solitary creative "genius" that tend to dominate the view of creativity [Camic et al., 2018]. Finally, agency, in its broadest form, is the idea of meaningful intentional action [Schlosser, 2015] that can support transformation and thus generate change. The ability to act and produce change in the external world is a fundamental part of personalities acting in an environment that feels creative, free and open. Co-creativity as an inclusive and equal approach is always based on empathic connections and generates a safe space that enables creative engagement, sharing of ideas (collaboration) and thus co-creation.

Based on different definitions of creativity, researchers have developed different instruments to measure it [Batey, 2012; Belcher, Rubovits & Di Meo, 1981; Horn & Salvendy, 2006]. Each instrument reflects its developer's conception of the nature of creativity [Treffinger, Renzulli & Feldhusen, 1971]. These tools are typically classified into four approaches that represent the four main categories of definitions of creativity: process, product, person, and place [Barbot, 2011; Couger, Higgins & McIntyre, 1993; Fishkin & Johnson, 1998; Horn & Salvendy, 2006; Rhodes, 1961; Thompson & Lordan, 1999].

In summary, the concept of co-creation has evolved over 50 years and has become increasingly popular as a solution that enhances open innovation, departs from outdated traditional management models, and adapts to managing today's complexities. For these reasons co-creation is encountered in many EU projects where LLs are developed. The European Union (EU) promotes collaboration across functions and boundaries in its funded innovation projects, which are seen as complex collaboration to co-create knowledge and fuel innovation. This requires the engagement of multiple stakeholders throughout the duration of the project.

The literature on participatory design, confirms that collaborative creativity provides the tools to create truly collectively something new that is greater than just the sum of the "parts" sitting around a table. But while the literature confirms that collaborative creativity is an important part of co-creation because it stimulates creative and collaborative learning [Turnbull, Littlejohn & Allan, 2010; Amabile, 1983; Csikszentmihalyi, 1990] and contributes to the co-construction of knowledge [Vygotsky, 1976; Hardt & Negri, 2004]; from our experience based on the participation in more than 10 projects based on LLs, creativity doesn't seem to be explicitly emphasized within European projects multi-actor processes, or — al least — not as much as participation. The DIVINFOOD EU project is an opportunity to address this issue.

Case study: co-creation and learning in the DIVINFOOD Living Labs

3.1 DIVINFOOD project: goals and nine LLs settings

Launched in 2022, co-creation is a key approach of the DIVINFOOD project (Co-constructing interactive short and mid-tier food chains to value agrobioDIVersity IN healthy plant-based FOOD). The aim of the project is to study minor cereals and legumes (Neglected and Underutilised Crops) in European regions that face various climatic hazards and diverse socio-economic challenges to developing agrobiodiversity-rich value chains. The project takes place in 7 countries — Italy, Switzerland, France, Hungary, Portugal, Denmark and Sweden — and has an overall number of 9 Living Labs. Living Labs are central in the project, as they foster co-construction with farmers, small-scale processors, food SMEs, breeders and other stakeholders in the regional context. Indeed, LLs have a territorial dimension expressed through territorial multi-actor networks, where the labs are demonstration sites on how to proceed in setting up territorial networks, managing and valuing agrobiodiversity and how to collectively address specific challenges/opportunities regarding agrobiodiversity use in food value chains.

Living Labs contribute to the overall aim of the DIVINFOOD project through co-creation activities. Co-learning and co-creation are thus key approaches of the project, considered as part of the same process, that overlap, interact, and feed each other, and contribute to new models of action and innovation in diverse territorial networks. The co-learning process strengthens LL's awareness of their role in the process of change and innovation, and undoubtedly helps participants acquire something meaningful, not only in terms of knowledge, but also new relationships and skills [Massari et al., 2022].

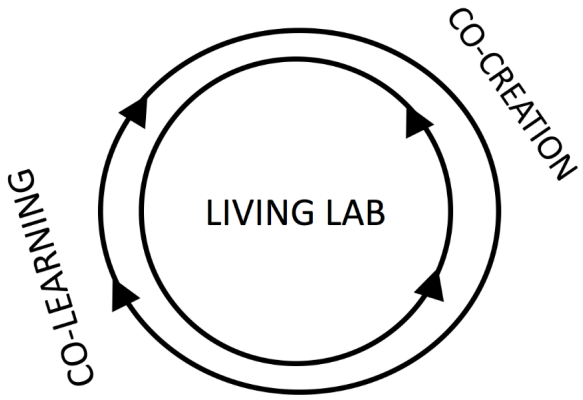

Figure 3. Co-learning and co-creation take place in all DIVINFOOD Living Labs (source: authors).

Co-learning and co-creation take place both within and between LLs. As Figure 3 shows, the relationship between the two concepts is bidirectional: co-creation is one of the means of co-learning, and effective co-learning is the result of co-creation activities. Co-learning and co-creation evolve in parallel and are interconnected concepts: researchers and LLs are interactive partners and co-creators of their learning. In fact, in DIVINFOOD co-creation is not just two or more actors and stakeholders who come together in the activities, but involves various types of interactions between actors, economic systems, technological production and social and cultural environments. However, how to foster collaborative creativity in DIVINFOOD LLs to strengthen co-learning and co-creation?

3.2 *Methodology*

In the context of the DIVINFOOD project described above, the authors investigated how co-creation is understood by different audiences and whether its creative dimension is considered. The investigation took place in the process of drafting the project's facilitation guidelines aimed at the nine LLs (Deliverable 5.1- Divinfood Project, Conceptual framework and methodology for LLs activities and data collection[4]). Here, the authors highlighted some doubts and identified questions to be answered:

(a) co-creation might be a term understood and defined differently by project partners with very different backgrounds, and this misunderstanding could affect the overall project as well as the set up and development of the LLs.

(b) some partners seem to understand and emphasize more the participatory, collaborative and inclusive component of co-creation (i.e. everyone is involved in data collection, everyone contributes to data and knowledge sharing, everyone participates, etc. . .) rather than the creative collaboration as part of the process. This could affect the effective engagement of the LLs and partners in the co-learning process, in sharing ownership of the project and thus also the ability to survive even after the end of the project.

Based upon these initial reflections, the aim of the research was to answer the main question, "Can collaborative creativity have a substantial impact on learning in the co-creation process in LLs?" If so, it could be hypothesized to use creative collaboration tools not only to provide more collaborative learning (in the long term) but also to plan, monitor and finally measure the results achieved during the knowledge co-construction process.

Three empirical experiments were conducted, (including one within the course of the project) as described below, to address these questions.

The goal of the first experiment was to collect data on how people with different backgrounds define the concept of co-creation. Specifically, the goal was to find whether there were differences between definitions from people with different backgrounds and geographical origins. Data were collected by engaging participants of three international events in which the authors participated as organizers during the period 16th September–23rd October, 2022. Specifically the participants and the events were: 28 participants of the workshop "From Brainstorming to Groupthink" organized inside the annual conference of ENOLL Open Living Labs Days Turin September 16, 2022 (users involved in LLs in different settings); 20 auditors of the workshop conducted at the Science Festival in Genoa (general public not related to LLs); 20 people (general public, but more creative/design-oriented) participated to the international event of WFDD22 (World Food Design Day) organized by FORK.[5] In addition, an online survey was launched as part of the event. In the case of ENOLL, data were collected using post-it notes within an interactive design thinking workshop. In the case of

[4]See the deliverable here https://divinfood.eu/divinfood/wp-content/uploads/2023/03/DIVINFOOD_D5.1_Framework_LL_20220930_clean-1-with-citation.pdf.

[5]See at https://theforkorganization.com/.

WFDD22 an online questionnaire was administered with open-ended questions in which respondents were asked to describe the terms provided, while at the Festival of Science, the entire audience attending the conference was asked to define the terms and deliver their descriptions at the end of the event.

The second experiment was carried out during the kick-off meeting where a collaborative and creative exercise was done involving all DIVINFOOD partners. Everyone was asked to think concretely about their idea of Living Lab, without trying to give a standard and elaborated definition to express it. So, each partner was asked to answer the question: "If the Living Labs in DIVINFOOD project were animals, what animals would they be?". All the animals were displayed on a wall. The facilitator asked partners to motivate their choice of the animal, providing a brief explanation, by using post-its, such as: "In my opinion the LL is a chameleon because he adapts continuously and physically to the external environment . . . ". The participatory and creative technique used during the kick-off was useful to collect the opinions and contributions of all the partners in a short time (i.e., few minutes), but above all it helped to provide a set of thirteen characteristics considered to be the most important to define the LLs in the DIVINFOOD project. Through a simple and iconographic language, the LL was described by the partners in a concrete and shared way. This short and fast activity aimed to concretely show how simple applied design thinking techniques can help people with different cultural backgrounds and skills to communicate easily and quickly, and to compare and discuss definitions.

The 13 characteristics identified in the first step were then discussed in depth in the second activity (during an online workshop). These were then used in a second phase of the project to help the LLs to identify any changes to the objectives of the single LL, and monitor their progress. For example, the 13 animals / characteristics were used as one of the means of reflection for the preparation LL work plans. Each coordinator was asked to update other partners on the current status of their LL by choosing at least 3 of the animals identified and included in the list of main characteristics of LLs, and to critically justify their choice. They were then asked to envision and narrate the desired future of their LLs, again choosing the characteristics (defined by the animals) they aspired to acquire. This creative activity aimed to encourage collaborative and proactive energy, but also transparency for a more dynamic and collaborative learning environment between participants. This along with other creative storytelling tools (use of pictures, statements in the form of twitter, use of the word dreams instead of expected outcomes. . .) contributed to the co-construction of a mutual sharing and learning environment. The use of Design Thinking techniques fostered a positive and proactive environment [Koh, Chai & Lim, 2015].

The third experiment was during the last conference ENOLL Open Living Lab Days held in Turin on 16th September 2022, the authors organized a workshop to help to create a shared meaning and language for cross-disciplinary LL teams. The title of the workshop was "From brainstorming to groupthink", a participatory, transdisciplinary and creative workshop to define project objectives among different stakeholders using a shared language. This workshop aimed to concretely demonstrate how simple applied design thinking techniques can help people with different cultural backgrounds and skills to communicate easily and faster and to align themselves to co-create something.

This design thinking workshop was addressed to everyone: scientists, researchers, entrepreneurs, LL managers and collaborators, stakeholders from public and private sectors, students, young people, and not. The workshop opened the opportunity for a holistic assessment of the problem, showing how it is not about "my opinions" versus "your opinions" but rather "How are my opinions related to yours, and how do our concerns paint a broader picture of our challenge?". It aimed to dismantle the myth that design thinking methods are complicated, expensive, and time consuming, and indicates when a method is best employed to help prioritize appropriate project strategies and goals. Although the results of this workshop were subjective and qualitative, it was a powerful way for 28 participants to define and co-develop together a common definition of the term "co-creation".

Initially, all participants were asked to write their definition of co-creation on a post-it note. Then the authors applied the "IF. . . ." Design Thinking methodology (as described in the previous section), that is, all participants were asked to answer the following question: "If co-creation was animal, what animal would it be?". and write their answers on a poster. Then reading and discussion on the results sessions followed a clustering session; the facilitator asked all participants to motivate their choice of the animal, providing a brief explanation, by using post-its, such as: "In my opinion co-creation is a bird because it has a different perspective. . . ". This creative exercise helped to finalize the main meanings and co-edit a shared and common definition of co-creation. The final definition was co-developed by all participants.

3.3 Results

The definitions provided by all participants in the first exercise reveal that, regardless the background or the discipline, the collaborative aspect of co-creation is valued more than the creative aspect. Interesting are the terms, on the other hand, used to define 'co-creativity,' which refer to an imagery related to dynamic growth, variety of emotions, proactivity and agency, typically associated with an active learning process, thus with change and transformation (such as: dream, energy, joy, beautiful, fun, inspiring, future, imagining, disruptive, creativity flow, and more).

The second exercise, carried out during the DIVINFOOD kick off-meeting, proved to be useful to provide partners and LL members with tools to co-create a shared meaning and common language for interdisciplinary activities. This approach was used not only to define the characteristics of the LLs in the DIVINFOOD project, but also to develop a team building moment and shared understanding of what a LL is (or could become). It was a simple and seemingly playful activity but helped DIVINFOOD partners to start from something concrete and real to "construct" something abstract together (such as a common definition). The "if. . . " exercise is an indirect way of asking questions and provoking in participants meaningful and relevant ideas with the problem being analyzed. The technique used has proven that there is a more creative way of asking questions to make brainstorming more effective, immersing oneself in another's problem, and then seriously considering the emotional perception of our interlocutor.

The exercise described here not only enabled one to develop a common understanding of the LL, but also to define general characteristics that need to be treated with higher priority; to build a robust understanding of one's partners: needs, emotions, motivations, and ways of thinking; to achieve insights that to a superficial consideration would have remained hidden (e.g., a partner's deeper frustration and motives in the LL).

Therefore, the technique used seemed very promising to validate information already gathered and to obtain new insights, establish a solid basis for future discussions with the team.

The third exercise demonstrated to participants and to the authors that creativity is an important component of the co-creation process and that the results it can provide are often unexpected, ameliorative and augmentative. Collaborative creativity impacts learning and adds something new to the group's knowledge and therefore potentially has a transformative function. Creatively using animals as "concrete objects" to define abstract co-creation concepts, helped them to come up with further comments and position statements about co-creation such as "co-creation is like a weka, it is a bad bird and risky, like for ownership of ideas, people may feel robbed", "co-creation is like an ant, it doesn't work unless you are fully committed","it is like a kangaroo, always hiding secrets","it is like a platypus, strange and unusual, but it seems to survive","it is like a fox, it knows how to have fun and entertain others","co-creation is like a unicorn, it has something magical, what happens is always unexpected", "it is like a sheep, it moves with others, it is nice and useful, but it is totally underestimated by others", and so on.

3.4 Discussion

The empirical experiments conducted by the authors confirm that users struggle to define co-creation as a form of creativity, but rather see it as a multi-actor form of collaboration, aimed at achieving tangible and concrete outcomes (new products, services, systems). The survey results seem to confirm that co-creativity for users plays an important role in supporting individual and group agency, in transforming a domain and engaging diverse people in a group or community.

Workshops 2 and 3 aimed to demonstrate how useful sharing creative techniques that encourage collaborative, proactive and creative energy can be, but also transparency for a more dynamic engagement of users and co-creation of a collaborative learning environment. Design thinking and narrative brainstorming techniques provided accessible tools for organizing and sharing ideas effectively, activating change in a unique and fun way, but above all demonstrating how the diversity of thoughts in the group can become an opportunity for discussions and development.

As the empirical experiments have shown, creative methods can help a group of very different individuals share and communicate a common vision and mission. Participative creative techniques naturally engage everyone in a co-creation process (i.e. in a meeting or a goal-setting process).

Furthermore, the literature emphasizes that underlying co-creation is the assumption that all actors should be involved in the creative process from

beginning to end, to be an integral part of learning. The creative design thinking techniques used in empirical experiments 2 and 3, helped to develop a responsive, flexible organizational culture. Through creative participation people coming from different sectors could strengthen relationships, take on shared challenges, and build a common understanding of the potential results that can be unlocked by working more collaboratively. Collaboration was essential to the success of design thinking, but creativity was not isolated to designers and facilitators only. Design thinking required everyone to act as a part of the design team, as each member of the team has a voice and adds value to the co-creation process.

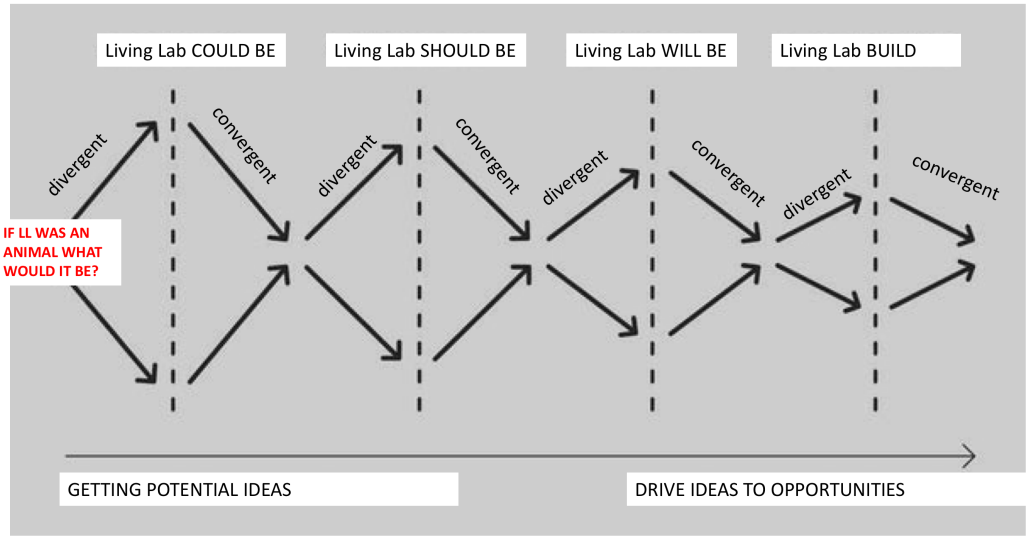

Figure 4. Collaborative creativity: combination of divergent and convergent processes applied to the «if exercize» Source: authors.

Two processes of creative collaboration were activated for producing collaborative learning and innovation: divergence and convergence. In divergence, teams expanded on ideas (for example, with the "if it was an animal…" exercise, each participant brought his or her own experience, and the collection of animals, as well as that of ideas was expanded). In convergence, there is a focus on what is most important (i.e.: in the clustering and discussion phase, everyone's ideas are discussed, analyzed, selected, and then organized). A common misconception is to think of these modes as linear: you start with a broad range of ideas and narrow your scope more and more. But it is not a funnel it is more of a "playful, back-and-forth dance," a process of reiteration, and often finding the right idea involves many iterations of divergence and convergence (see Figure 4).

Moments of divergence are conceived and designed to bring out as many ideas as possible, for the creativity of the individual and then the group to flourish. But it is in convergence that perhaps the most creative activity takes place, when the best ideas are clustered and selected, the best elements of existing concepts are combined into an entirely new option, a process that benefits from multiple perspectives and discussions.

Understanding these two modes of thinking was the real basis for creative collaboration. The leader (either the facilitator or the LL coordinator) had the role of signaling what stage of the process the team is in, what mental attitudes they should embody at any given time, and when to shift gears. This requires practice and experience, which can only be developed by going through the creative process many times.

Asking the participants complex and ambiguous questions was an important part of the design strategy, such as "if the LL was an animal, what kind of animal would it be? how would it approach a certain problem? how would it approach that problem? what would it aspire to?". Creative collaboration then becomes useful when you have a question with no clear answer and many potential solutions. Therefore, collaboration is so important in LLs, because there is no single answer to the kinds of challenges facing them today, and they need to look at problems from many different perspectives. Through the process of creative collaboration, LLs can expand the number and range of ideas, including those that are risky, scary, and potentially revolutionary. It enables teams to evolve, transform, and thrive in uncertainty, to use iteration to stimulate creativity, to work through challenges together, and to turn tensions between ideas into opportunities.

The creative process supported by design thinking (especially in the second and the third experiment) for example involved multiple iteration cycles and with each step, we move closer to a refined solution.

In Divergence, teams expand to find insights and generate new ideas. In Convergence, teams narrow their focus by refining ideas and synthesizing information.

Although it may seem haphazard and spontaneous from the outside, collaboration was not just a free and chaotic activity. Collaborating in a way that brings out wild new ideas requires intention and planning. We must have some sort of structure for creativity to flourish. This structure can be designed, and then also measured and monitored.

The three experiments showed that we need to nurture the creative mindset of the individual in a group and facilitate the whole group to imagine new possibilities to make unexpected connections. In the LLs there is diversity of disciplines and backgrounds, and this allows to broaden the types of ideas that will emerge.

This prompted the authors to think that instead of focusing exclusively on measuring the execution and efficiency of collaboration (as is usually carried out now), we could start measuring the intangible and tangible outcomes of creative collaboration, as a tool (with its creative techniques and methodologies) that helps teams meet today's complex challenges, navigating changing conditions, discovering bold insights and embracing a new way of working.

For example, we could begin to measure how collaborative learning impact on learning process in LL by measuring, for instance: how many new problems have been discovered by applying collaborative creativity techniques; what new tools were discovered by transdisciplinary actors, and how many tools they already knew and used turned out to be innovative when collaborative creativity was applied; how many new solutions were found by applying creative methods… and more.

Conclusions: why is collaborative creativity so important for LLs?

This article discusses the role of creativity in the co-creation process in Living Labs. Creativity today is not adequately encouraged in co-creation processes; it is often underestimated and not understood by the different actors involved in the process.

Studying how and where to apply collective creativity (co-creativity) is an interesting field of research to support co-creation processes in Living Labs. This paper aims to prove that fostering "co-creativity" in LLs is more than just executing an existing plan more efficiently, but it requires different teamwork, which needs to create completely new ideas, because today's challenges cannot have only one answer, and it is necessary to approach problems from many different perspectives.

But creative collaboration needs to be "choreographed" and guided, and there are methods and techniques for guiding teams through a collaborative creative process, especially as when working in the LL, where we proceed with uncertainty and from start to finish, we do not know the questions and answers.

Since creative collaboration harnesses the power of diverse perspectives to develop innovative solutions, and since the LL brings together a large group of diverse people, it makes the LL the right setting where to increase the number of ideas that could be generated. Seeking a diversity of perspectives expands the types of ideas that might emerge. The LL should foster a culture that encourages and welcomes these ideas by improving the likelihood that people will feel comfortable moving beyond the safe ideas and sharing the riskier, scarier, and potentially brilliant ones.

People have different perspectives on how to achieve a shared goal and strong opinions on how to proceed, and this causes tension. But instead of seeing tension between ideas as negative, in the LL, this holds the opportunity for creativity and innovation. The creative management of these tensions must also be prepared in advance so that it can be an opportunity for valuable conversations. If there is tension, it is very likely that there is the right scenario for innovation to occur, because that is where people place their values most, and invest.

The greater and more ambiguous the challenges, the more radically new solutions are needed, which is why the LL is the ideal place to design and develop creative collaboration. As LLs are increasingly asked to generate creative solutions to new and difficult challenges (see those in DIVINFOOD[6]), the need for creative collaboration-and for people who can facilitate this kind of unique teamwork-will only increase. It is necessary to cultivate the ability to drive creative collaboration, but also to monitor it.

Creative collaboration processes can pull out solutions that individually no one would be able to think of on their own. We could almost describe creative collaboration as that moment when different people come together to understand and especially address ambiguities.

Although it may seem messy and spontaneous from the outside, it takes intention and planning to enable a team to come up with wild new ideas. Bringing people with different background together in a co-funded project, or within a LL is only the starting point of a more thoughtful process.

[6] https://divinfood.eu/.

Applying creative methods, such as Design Thinking methodologies, can increase collaboration and by involving all LLs stakeholders in co-creation (from problem identification to solution development), design methods gather a broad commitment to change and transformation. Designers have the role to combine creative and practical tools with human intuition and community-based approaches. For these reasons, the profile of designers seems to be an interesting one to explore and to include in the co-creation strategies of EU projects with LLs.

The conclusion reached by the authors is that co-creativity has a great potential to boost innovation in EU projects. In addition to the multi-actor participatory component, which is valued in such projects, providing more favorable environments to co-creativity is thus needed and for situated and dialogic learning. Such collaborative learning is a fundamental part of co-creation, endures over time, and provides the tools and skills for LLs to thrive and mature. Studying collaborative creativity as a tool for fostering co-creation in Living Labs may be an interesting discussion point for further research.

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