

Collaboratories: Designing Universal Innovation Ecosystems in the Era of Transitions

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This paper discusses the development of the Col.laboratori programme in Catalonia as a model for testing the theory of universal innovation ecosystems. This programme aims to address the challenges faced by societies in the current era of transitions by combining theories of techno anthropology, social innovation, and living labs.

The authors propose collaboratories as crucial social innovations that can facilitate the absorption of changes and promote creative construction. These collaboratories are considered meta socio-digital innovation mechanisms that establish quadruple helix collaborative structures, bridging different actors, types of innovations, and diverse worldviews.

To achieve a Just Triple Transition (social, green and digital), the paper suggests bringing together actors from business, academia, government, and society in collaborative processes that generate short-term optimal results and long-term synergies. This approach involves including society as the end-user in common tasks to ensure better design and higher-value outcomes. The paper advocates for a democratization of the innovation ecosystems, aiming for a broader distribution of social benefits through negotiated approaches focused on solving common challenges in pursuit of the common good.

Keywords: collaboratories, innovation, triple transition, health and wellbeing, quadruple helix, universal innovation ecosystems

“THE NATIONAL COLLABORATORY”

William Wulf, director of NSF, was the first to coin the term “national collaboratory” in 1989 to design a “center without walls”, a model for imagining the national research community as a big lab of labs connected through digital networks. At that time, the Internet moved from connecting the ARPA research community (Advanced Research Projects Agency), to linking the whole science and technology community in the US.

After 30 years, the Internet already connects more than 5 billion people across the globe. An intercontinental, national and local mesh of digital fibers, wireless, and satellite systems powered by artificial intelligence applications and services remains a digital network of research and innovation open to potentially every citizen on the planet. The Internet Society's motto: "The Internet is for everyone," lives on. Universal access to the Internet is already accepted as a goal by United Nation (UN) organizations such as the International Telecommunications Union (ITU) and major national governments. This network of networks designed from and for the research and innovation community still remains open to everyone.

If we accept that universal access to this research and innovation network is a reasonable goal, why not imagine the possibility of the whole of society being connected and learning to innovate using this research and innovation network?

UNIVERSAL ACCESS TO WELFARE STATE'S SERVICES

Social innovation played a key role in designing and constructing universal social systems after World War 2 as part of the Welfare State model. The National Institute of Health (NIH) in the United Kingdom (UK) was one of the new institutions to provide universal access to the health system for all citizens. The pension system and elementary education for all completed European countries' basic social security system.

Social scientists became social innovators, as it was the case of Michel Young. As Daniel Bell explains: "In 1945 he became the secretary and key figure in the research department of the British Labour Party. He was influential in drafting the postwar election program of the Labour Party and, one of the principal aides of Clement Attlee in helping shape the major welfare-state program" (D. Bell's Introduction to Young, M. 1983: xiv). Finally, Young became in 1965 the first chairman of the Social Science Research Council, the first central public source to fund social research in the UK.

Other European countries and the new European Union adopted the Welfare State institutions and services. This European social security system model has finally been introduced in the recommendations of different UN institutions in the form of "universal social protection" policies. (Ortiz, 2018). Nevertheless the "universal service" was not limited to the social protection services. "Universal service" in telecommunications was introduced for the first time in the United States Telecommunication Acts of 1934. In 2005, the International Telecommunications Union organised the first World Summit on the Information Society conference in Tunisia. One of its main conclusions was: "Universal, ubiquitous, equitable and affordable access to ICT infrastructure and services constitutes one of the challenges of the Information Society" (ITU, 2005: 14).

SOCIAL INNOVATION IN THE ERA OF DIGITAL SOCIETIES

The digital era opens now new range of key issues connecting digital technology with social problems:

- Digital skills and reskilling: new models of digital education
- Digital rights: new human rights in the digital era.
- Ethics in the digital era: the ethics of AI.
- Digital Jobs: new kind of jobs in the digital era (Industry 5.0)
- Digital divide: new social inequalities in the digital society.

The European Commission started introducing social innovation into its main research and innovation program to respond to these and the rest of global challenges. An important step forwards was the Social Innovation Lisbon Conference, organised under the Horizon 2020 program. (European Commission, 2017) and the rest of programs and initiatives that accompanied this conference like the SI-DRIVE project (EC 2017) or the creation of the European School of Social Innovation¹.

Now under the the Horizon Europe, there are still timid, but significant key turning points on social innovation as reflected in the Health Work Programme 2023-2024 that takes into consideration:

1. The integration of different types of actors: patients, citizens, health professionals, providers and payers, health authorities and regulators, researchers or innovators from academia and industry;
2. The pursuit of the adoption of **new approaches and perspectives** on child and adolescent health and the surrounding context;

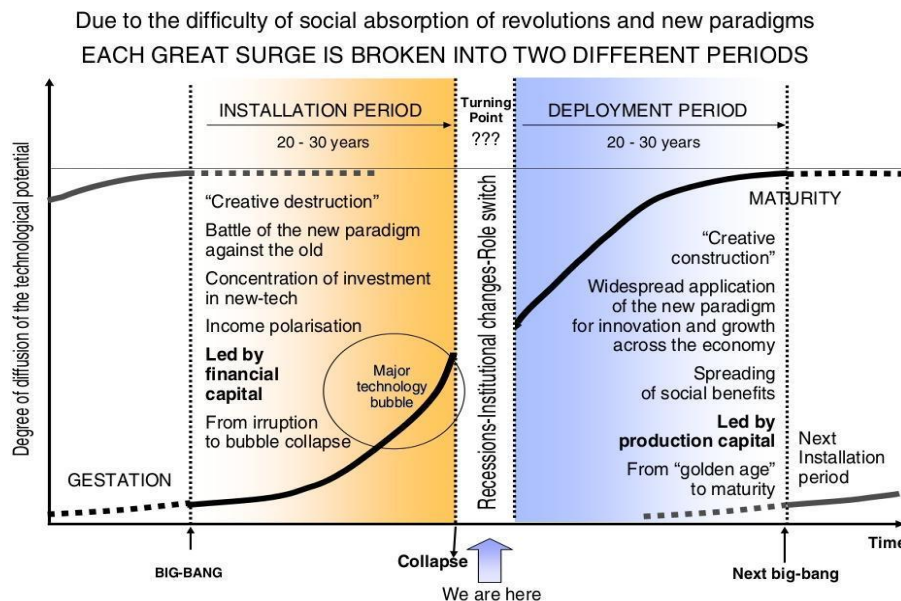
3. The contribution of **social sciences and humanities (SSH)** and the involvement of SSH experts, institutions, as well as the inclusion of SSH expertise, to produce significant effects that enhance the societal impact of related research activities; and
4. The requisite of funded activities to **motivate the development of innovative, feasible, implementable, financially sound and scalable solutions** in the various dimensions of healthcare systems

Social innovation can grow exponentially to design and build key changes in, particular concerning digital society policies. Our approach is to understand the historical evolution of digital technology systems and to understand the role it plays in this digital age, we follow Carlota Perez's² model of technological cycles.

Following the theories of Carlota Perez (2022) we see that each new technological paradigm follows two periods. First one, the emergence and "installation" of the new technology with its technologists and entrepreneurs generating the new disruptive technologies, endangering the old technological and social paradigm. It is the moment of "creative destruction" Schumpeter (2003) described. Nevertheless, Perez establish a second period, the "creative construction" in which new technologies can really transform the economy, social relations and the values of society as a whole. It is the "deployment" period in which the whole society can enjoy the benefits of such a new paradigm.

In the middle is a "turning point", a period of change from first to the second period, where social polarisation occurs. We are now in just this moment. In 2008, with the financial crisis, the digital world entered the great economic crash that particularly affected the digital economy. Trump's victory in 2016 in the land of ICTs showed that these technologies destroyed the economic model of entire industrial regions that reacted by voting for conservative and nostalgic ideas. This cycle entered in "an inflection point", the crossroads between the "installation period" and the "deployment period". The new policies should stress not only digital innovation but social transformation. They need "impacts" of the new technologies. Digital technologies should become social technologies as well.

FIGURE 1
"A TOURNING POINT" BY CARLOTA PÉREZ³



However, this scheme exists as a whole. The settlement of a new infrastructure by itself cannot transform the whole social, economic, political, legal and symbolic superstructure of societies. We need a new "technology": the social innovation of this era.

Our hypothesis is the following: to achieve the “creative construction” phase, there is a need, and the possibility, of a new type of innovation and innovators: **the digital social innovators and its theories and practices, that can initiate a broad social innovative mobilization for transforming political, economic, social and ethical society. Without this new type of innovation wave in each cycle, the “creative construction” period may be delayed and the collapse of “creative destruction” prolonged with profound destructive consequences.**

In the previous industrial cycle, social innovation took different forms. On the one hand, in advanced industrial countries, industrial management was the social innovation that helped train engineers to become corporate leaders. Incorporating social science disciplines such as economics, psychology, and sociology into engineering schools produced a set of new disciplines such as human relations, advertising, marketing, finance, producing a new type of centers, the management industrial schools at universities all over the world. The book “America by design”, by David Noble (1986), is a key study for understanding this historical process in the US. On the other hand, in less industrially developed countries, disruptive “social” innovations such as centralized political parties and new models of central planning of the economy helped to advance industrialization in countries like Russia and China.

We are now in the midst of a completely different technological cycle. The strong social, economic and political polarization in our current societies results from a combination of new digital technologies and infrastructures that continue to serve old economic, political and social structures and superstructures.

However, new fields are emerging to facilitate the deployment of a more “human-centered digital society”. Living labs, fab labs, collaboratories, superlabs, policy labs, and other “labs” are trying to change the innovation ecosystems as an important part of our social fabric. “The Lab” could be a term that symbolizes all these dispersed and unconnected pieces of a new social structure. New disciplines like techno-anthropology or techno-sociology are trying to blend social sciences and design (Borsen, Botin, 2013; Matus, Colobrants, Serra, 2023).

There is a hypothesis behind “the lab” program: digital societies could be seen as universal innovation ecosystems. Universal access to the Internet may evolve towards universal access and participation in these socio-digital innovation ecosystems in the coming years.

Next, we will explore a new research program of a new type of social innovation for the digital age being developed in Catalonia through the piloting of the Col·laboratori initiative.

THE COL·LABORATORI CATALONIA, A PROGRAM ON DIGITAL SOCIAL TECHNOLOGIES

The Col·laboratori Catalunya Program is an ongoing research and innovation program funded by the regional government, the Generalitat, and led by the i2cat Foundation. It started in 2019 as a pilot called Col·laboratory 1.0 in the southern part of the region. This initial pilot aimed to generate a framework for collaboration between the official regional innovation ecosystem, led by the university, companies and local authorities, and social innovation organizations and projects in this territory. This kind of innovation is still not well recognized by the official innovation system of the region, despite their evident existence and impact (Blanco et al. 2016).

The Col·laboratori sought to fill this gap by coordinating local quadruple helix actors active in a territory and to promote innovation projects that connect territories through themes of general interest and the use of advanced digital technologies.

It was designed as open and shared spaces for collaborative innovation no matter their origin and academic accreditations. Facilitators of the digital community centers, university researchers, vocational training educators, nurses, local public authorities and companies could share its problems and solutions peer to peer. We followed these principles:

- People-centred innovation
- Active participation and open collaboration from the territory
- Research and experimentation, training, entrepreneurship, and joint innovation projects - Quadruple helix coordination in the territory

In Catalonia, the generation of digital social innovation projects has a long tradition since the opening of the Internet at the end of the 1990s. In November 2000, the first Global Congress of Community Networks (Serra, 2000) was held in Barcelona, bringing together 600 activists, administrations, academics and technology

companies from the five continents who saw telecentres and citizen networks as a great opportunity to organise digital civil society by connecting technology, economy, society and cultural diversity. This initiative had two more editions: Buenos Aires (2001) and Montreal (2002).

This movement in Catalonia gave rise to two significant initiatives that would influence the design of the Col·laboratori 1.0 project. Firstly, the birth of a Catalan network of ICT points (Xarxa Punt TIC) was dedicated to facilitating access to computers and the Internet for the population and digital literacy. Secondly, the opening in November 2007 of the Citilab in Cornellà, the first European citizen laboratory. The dialogue between the ICT points and the initiatives of the Citilab in Cornellà formed a generation of socio-digital promoters and innovators, with an impact beyond Catalonia. Ten years later, in 2017, aiming to open up digital technologies to citizens and coordinate initiatives at the country level, the CatLabs Programme was launched as part of Catalonia's regional innovation strategy and as an attempt to coordinate the sociodigital movement in Catalonia. Two years later, the current Catalunya Col·laboratory Program was born.

The second thread of social innovations is the creation in 2003 of the i2CAT Foundation, whose founding mission was to promote broadband Internet in Catalonia, or second-generation Internet. The i2CAT Foundation, originally linked to the Polytechnic University of Catalonia, focused on research in advanced digital technologies. Citilab and i2CAT were two very different entities, i2CAT promoted research in advanced digital technologies and Citilab connected society with the digital world. However, both Citilab and i2Cat were the first Spanish members of EnoLL, the European Network of Living Labs created in 2006. Citilab was generating a blended community of AI and software engineers, techno anthropologists, digital journalists, community activists and local educators, supported by local politicians in co-creating a new institution: the first European citizen laboratory.

In parallel, i2cat started to incorporate more digital social scientists and digital technologists. Tresearcher. In 2008, the Living Lab Unit started at the i2CAT Foundation. This unit would become the Digital Citizenship Lab (2017) and, later, in the area of Digital Society Technologies (2019), starting the Col·laboratori Catalunya Programme. One of the missions entrusted to the DST area is to coordinate this social collaboration with the territorial deployment of 5G, which is also carried out by the i2CAT Foundation within the Smart Catalonia Programme, so that the double social and digital innovation would be promoted through collaboration.

Politically, several steps were taken to introduce the new innovation model into public policies. Since 2009, the Catalan government has promoted two separate strategic pacts, the National Pact for the Knowledge Society and the National Pact for the Digital Society. The Col·laboratori Catalunya project brings together the perspective of building the knowledge society and that of the digital society for the first time. The fact that the president of i2cat is always the higher responsible of the digital policies in the region has also played a key role in promoting this project.

In Catalonia, there is a strong community of laboratories that have been members of ENoLL working on the four-helix model since 2006. In parallel, Barcelona is one of the main capitals of the fablab community, inspiring a network of public fablabs supported by the Barcelona City Council called Ateneus de Fabricació. Finally, in Catalonia there is the Xarxa PUNT TIC, which develops a policy of universal Internet access, digital literacy and some social innovation projects. However, none of these initiatives and networks are included in the region's official innovation ecosystem.

The hypothesis of the digital society as a synonym for a universal innovation system or col·laboratory was formulated to put together both types of institutions and cultures: i2at and Citilab, digital technology and social technologies. (Serra, 2014).

In 2017, i2cat and the regional government took a first step by generating the Catlabs⁴ programme trying to coordinate the set of digital social innovation labs in Catalonia (Fernández and Serra, 2017). The project mapped this broad community of innovative location-based structures and projects with its diversity of forms: living labs, fablabs, social labs, edulabs, citizen science, in each territory across the region... The map of identified actors is here. <https://catlabs.cat/la-xarxa/>.

The next step was integrating this unofficial community of innovators into the official innovation ecosystem. In 2018, the i2CAT Foundation launched the Col·laboratori 1.0 project to generate an integrated model of innovation in Catalonia and the first prototype in the province of Tarragona, the Col·laboratori CatSud. This gave

rise in 2020 to the current Col·laboratori.cat program, funded by the Department of Digital Policies of the Generalitat de Catalunya, like the previous one. This project helped to

create a new unit within i2cat called Digital Society Technologies (DST), aimed at providing strategic research and innovation support to this program. This unit brings together researchers from the techno-anthropological and Social Innovation communities, who collaborate with other i2Cat digital engineer units.

These collaborations function as spaces of attraction for innovators and socio-digital entrepreneurs and its membership provides an identity and a work plan. Associations of people and entities from different areas of the quadruple helix are also formed, associated with economic sectors or technologies.

Design and Validation of Colaboratory 1.0: Colab CatSud

As mentioned above, the Colaboratori 1.0 Catalunya programme was launched in 2018, starting in the southern part of Catalonia, Catalunya Sud, corresponding to the province of Tarragona. In this territory there had been a movement promoted by the local university, Universitat Rovira i Virgili and the local administrations whose aim was to turn the province of Tarragona into a Knowledge Region by 2040. For several months, more than a hundred agents met to carry out a prospective exercise on the future of this territory. The Catalunya Sud 2040 strategy (2019) sought to make this territory a competitive area in the knowledge economy and identified the energy issue as the most relevant through a top-down approach. This region has several nuclear power plants, which will be shut down in the next ten years, and the most important petrochemical industrial estate in southern Europe needs reconversion, which will completely alter the socio-economic balance of the area.

However, this initiative had not taken into account as a Region of Knowledge the various initiatives or innovative laboratories that had been forged in recent times from the digital world. The Col·laboratori CatSud began by putting the local university (URV) in contact with these initiatives, such as CoEbreLab, a digital social innovation laboratory in the capital of the Ribera d'Ebre region that had organized the most important rural co-working network in the country. This opening and interconnection of both university and local labs favored interactions between other emerging local actors, such as the Interior Living Lab, the Fablab Terres de l'Ebre, the Complex Educatiu de Tarragona, and various highly innovative vocational training institutes. This new community has been nurturing synergies and new projects, also promoted by i2cat and the regional government.

As a result, a more open innovation ecosystem is emerging, where in addition to addressing issues such as climate change or the energy transition, digital (5G), educational, business, and social projects are also included, but from a citizen perspective, not just an industrial one. The result is that the territory called CatSud, already has two initiatives underway, the CatSud Col·laboratory and the Catalonia Hydrogen Valley, aimed at turning this area into a major center for the production of green hydrogen. It is unclear how these two initiatives will come to collaborative agreements.

The CatSud Collaboratory was designed with a dual structure: operational and political. It started with the operational part, bringing together technicians, researchers and innovators who wanted to carry out joint projects and signed a Memorandum of Understanding (MoU). In fact, from the social innovation point of view it was interesting and significant to note that the project group went ahead without waiting for the MoU to be signed.

The driving force behind the project was a group that brought together researchers from i2cat and local agents from both the URV and CoEbreLab that called itself the CatSud Col·laboratory Secretariat. This promoter group was connecting, incorporating agents, and consolidating itself through a participatory co-design process framed following the metaphor of “base camps” in the mountains. In this way, a wider team was created, including people from Cenfim, from el Complex Educatiu Laboral, from Tarragona Impulsa, from ImpulsAmposta, social activists from the citizen lab Ciutat Sàvia, and many others. These profiles with the capacity to mobilise and take action, made up the first operation of the Cat Sud Col·laboratory, La Plenaria.

Both the Secretariat and the Plenary met periodically to promote innovation projects, until alliances and cooperation between the members of the Col·laboratory and the new members began to be forged, following the “collaboration effect” with the following steps:

- A. Drafting the hypothesis of a col·laboratory as a universal innovation ecosystem open to the diverse forms of innovation in a territory (the design effect)
- B. Discovering the known and unknown innovative initiatives in this territory and making connections between them (the interconnection effect);

- C. Exchanging knowledge and experiences between them, promoting the creation of new ideas and projects from this exchange (the exchange effect);
- D. Assuming that, in this collaboration, all the participants are in equal conditions to experiment and learn ones from the others (the experience effect).

FIGURE 2
“FAMILY PICTURE” OF COL·LAB CATSUD IN 2019



During the first months of CatSud, training was a central activity, individually for the initial entities and for the 50 CatSud Col-laboratory members. By the end of the second year, several innovation projects had been submitted to national and European competitive calls for proposals, some of which have already been carried out or are currently being implemented.

However, the process has not been without conflict. In the beginning of the CatSud Col-laboratory, much energy was devoted to the issue of governance, leading to conflict between the “theoreticians” and the “practitioners”. The first group was precisely the one that had pushed the MoU the hardest and saw the Col-laboratory as a new power in the territory. The second group, the majority and with great support and complicity in the Plenary, was made up of very practical, decisive and agile profiles that put action before rationalisation and saw the Collaborative as an instrument of territorial transformation. The group valued its members for their skills and focused on solving real problems. Over time, an agile, fast, open and collaborative organisational culture has become the norm, with social and digital transition projects standing out.

However, we are not sure that the conflict has been resolved. There are currently two markedly different innovation initiatives. The first focuses on the world of energy transition around the Hydrogen Valley Consortium of Catalonia, bringing together mainly large companies and the regional university, and operating with an industrial model management mentality. The second is the Col-laboratori CatSud, which also includes the University (URL), i2cat, the regional government, and different local laboratories linked to social and digital innovation and operating with a digital society culture inspired by the Internet and ICT model. At the time of writing, the connection between the two initiatives has not yet occurred.

The evolution of the CatSud Col-laboratory Secretariat is remarkable because it ended up being an opportunity to put into practice a way of understanding the world of social and digital innovation and its ways of doing things. By the middle of the second year, the Secretariat had become institutionalized as part of this learning process. The senior members formally sponsored the new members who joined the Col-laboratory Plenary, transferred their experiences and knowledge to them, empowered them, and then transferred their responsibilities to replicate the process. In this way, the Secretariat had become a socialization platform for the social and digital innovators of the territory attached to the Col-laboratory. Since its creation, there have been four secretariats:

- A first promoting secretariat
- A second secretariat focused on governance,
- A third secretariat focused on projects,
- A fourth secretariat focused on projects with members of the second-generation

In this evolution, i2Cat progressively gave way to the self-management of the territory's members. Nowadays, i2Cat participates and promotes projects like any other active member of the collaboration, but the members of the territory take the decisions on the evolution of the CatSud Col-laboratory.

The most surprising thing about this new social space is that it has been operating with "liquid" structures outside the traditional models to the extent that they didn't have to create their own website for the first two years to publicise their actions.

In the summer of 2021, the Col-laboratori CatSud continued to incorporate new people and entities and to promote new projects. The connection with URV was being strengthened and consolidated with research groups from the departments; the connection with rural 5G projects was underway; a robust connection had been created with a furniture, design and interior design cluster; a space for knowledge transfer in advanced digital technologies had been opened from i2CAT and social and digital innovation nodes had been consolidated in various towns in the territory, which resulted in the emergence of various types of social and digital innovation laboratories. Although the Col-laboratory 1.0 model was an initial way of doing things, the complexity of the social experience has been forcing the model and demanding its adaptation to reality. If we had to take stock, improvisation has prevailed over planning, meaning that we learned and continue to learn through action and reflection.

DESIGN AND VALIDATION OF COL-LABORATORY 1.0 AT COLAB ANOIA

The case of the Col-laboratory de Anoia is different. This is a territory of the province of Barcelona where the Col-laboratory was born, closely linked to the main city of this region, Igualada. The municipality established several specific project lines: mobility, health, women and ICT, and the promotion of the leather industry, fashion and design. In the Colaboratorio de Anoia, the MoU was the first step taken due to the interest of the mayor of Igualada⁵.

There was a lack of training and no network of organizations to request its creation, so the first project that gave dimension to the Col-laboratori Anoia was the promotion of a social and health laboratory. The promotion of the Health and Wellbeing laboratory provided a comprehensible prototype of what the Col-laboratori Anoia could be and how it could work, and the model of the social-health laboratory served to design a second one, the Industry, Design and Skin laboratory, which came into being in the summer of 2021. And then it was extended to other lines of interest.

The experience of promoting the socio-health laboratory and the discovery of other municipalities also concerned about this issue made us think that the Col-laboratory 1.0 model needed a second version.

Territorial collaborations could be "intertwined" with common themes, generating cross-cutting collaborations. In this sense, the socio-health laboratory (Health and Well-being) was a thematic laboratory that made it possible to connect the Anoia territory with other territorial laboratories also interested in health and well-being in Catalonia. Thus, the Education and ICT laboratory focused on Vocational Training that was emerging in CatSud, a second thematic laboratory that had a scope throughout Catalonia. Finally, the deployment of the 5G areas or the advances of the i2CAT virtual reality lab, as well as the conversations held with the heads of the digital areas of the i2CAT Foundation as a result of the transfer of knowledge to educational centers, suggest that, in addition to weaving territorial collabs with thematic and sectorial collabs, digital technology introduces a third dimension. The collabs are also "woven" with digital technology collabs. The result of this "weaving" is not a tapestry but a relief, something like a sculpture linking threads in three dimensions.

The Col-laboratori 1.0 was a prototype centered on territories, from there came the one in CatSud, the one in Anoia and from there would come the third collaborator, the one in Northern Catalonia that was promoted later, as well as others that are in the spotlight such as Western Catalonia, Central Catalonia, or Coastal Catalonia that could be promoted at a later date. However, the research that was carried out to identify the agents that could integrate the socio-health laboratory and the subsequent links that were established with other health and wellbeing

laboratories in Catalonia helped to discover that the network of territorial collaborators that we were weaving needed a type of transversal connection that transcended the territories and connected them. This discovery was important to redefine and reimagine the collaborative prototype we were exploring. We needed to revise the Colaboratorio 1.0 prototype based on a territorial quadruple helix model and turn it into a Colaboratorio 2.0 in which we had to get territorial partners to form an ecosystem with thematic, sectoral and technological partners. Based on this experience, we started talking about four collaboration types.

THE COL-LABORATORI 2.0: DESIGNING FOUR TYPES OF COLLABORATORIES

One of the conceptual aspects that we had to resolve in the Catalunya Col-laboratory Program was the conceptual clarification of the terms laboratory and collaborative. We defined a collaborative as a laboratory of laboratories. In a first approach, Colobrans (2019) had distinguished territorial labs from scientific-technological labs, but this distinction was still insufficient. From another perspective, Ståhlbröst and Holst (2012) had distinguished 5 types of living labs: research, corporate, organizational, intermediary and time-limited living labs. This approach was confusing, as there were too many overlaps between one and the other labs. On the other hand, Schuurman, Mahr, de Marez and Ballon (2013) distinguished 4 types of labs, basically focusing on their way of doing things: Labs for collaborative activities and knowledge support, original “American”, as an extension of testbeds, and those supporting context research and co creation with users; but, in our opinion, this did not solve the problem we had in connecting theory with reality either.

Leminen, Westerlund, Nyström (2012) distinguished types of living labs by their use: Utilizer-driven, Enabler-driven, Provider-driven and User-driven, which also did not help us to organise collaborations. On the other hand, we had observed the appearance everywhere of urban labs, energy labs, environmental labs, policy labs, social labs, Fab labs and many others that made us think that labs were more than a research methodology, that they had evolved into much more complex social technologies. The case of the Col-laboratori de Catalunya was a proof of that. We needed a more complete scheme to validate new products or innovation projects and articulate innovation systems as a whole.

Finally, we established four types of laboratories or partners (territorial, thematic, sectoral and technological) according to the different interests that drove them. Research on the state of the health system in the Anoia region contributed to this clarification and revealed that, about the world of health, there were several overlapping realities: territorial, sectoral, technological, commercial, thematic, cultural and social. Each of these realities approached the issue of health and well-being with different agents, resources, technologies, and knowledge. Several previous experiences of the DST had also contributed to the construction of this clarification, such as the proposals for the design of energy-themed living labs, or the experience in the design of the MINDb4ACT Living Lab Guide (Colobrans, 2019) that served to design a living lab for the prevention of radicalization, as well as various living labs for the evaluation of multimedia technologies, the design of i2Health Sant Pau (Colobrans, J.2014) and various experiences resulting from several years of collaboration between livinglabing.com and i2CAT. The typology of labs and collabs we arrived at was as follows:

a. Territorial collaboratories.

Territorial laboratories or collaboratories are facilities generally promoted by public entities and linked to public policies. In Catalonia, the territorial laboratories were initially designed to combat the digital divide and educate the population, and evolved towards the training of digital citizenship and the promotion of local innovation projects. Its origin was a network of telecenters that became the current network of ICT points where the population could get closer to digital culture. The ICT points joined the network of Omnia points, a network more social than technological but connected to it. They integrated the network of FabLabs, coworking spaces, bibliolabs, free programming associations and other entities, forming a network of about 500 entities or initiatives. In 2008 the Citilab of Cornellà, a municipality located in the Metropolitan

Artur Serra, Vicenc Badenes and Ramón Sangüesa, designed and promoted the area of Barcelona, opened its doors to the public. This citizen laboratory based on territorial-local scale intervention, inspired a whole generation of new centres such as CoBoi Lab, CoEbreLab or Sant Feliu Innova.

In this direction, the CatLabs Programme tried to articulate a network of local digital, social, and collaborative innovation spaces, integrating the network of living labs in Catalonia, among which are the i2CAT Foundation, the Cornellá Citilab, Neápolis de Vilanova i la Geltrú, and other university foundations, professional training institutes and university chairs. In this scenario, the Catalunya Col-laboratories program emerges with a clear vocation of coordinating people and entities on a territorial scale.

b. Thematic col-laboratories

For a while, we doubted about the difference between thematic and sectoral laboratories. In the end, we concluded that we had to differentiate between the two approaches. A thematic or collaborative lab focuses on topics of general interest, such as energy transition, digital transition, climate change, city transformation, sustainable development goals, health, education, politics, etc., and are usually promoted by universities, research centers or foundations. Around them are woven networks of stakeholders that research, train and promote innovation projects that seek to include citizens as a defining condition. From the Anòia Territorial Col-laboratory emerged in 2022 a regional Health and Wellness Col-laboratory, now incorporated into the European INTEGER Project (Interconnecting four helix innovation ecosystems in European Regions) with the regions of Hamburg and Krakow. The INTEGER project encompasses research, socio-digital innovation and design with practical application. The project applies a systemic approach to social innovation with a long-term strategic vision that tests and aligns:

- A. The existing (mature and young) experiences of organizations, labs, clusterings and networks in the Catalan territories around the ample field of health and wellbeing;
- B. The DST research hypothesis of designing and developing the new generation of quadruple helix lab of labs where socio-business-technology driven innovations are coming together through a multi-i6 and multi-stakeholder approach;
- C. The existing and in the making, processes undergoing in the other two participating regions (Hamburg and Krakow), where social and business driven innovations are brought together in very different manners; and
- D. The future evolutions as captured from the perceived needs stated by all parties involved, actors from the quadruple (or -n) helix spectrum⁷.

In INTEGER we are following a continuous learning iterative process: design, co-create, experiment and implement, learn, re-design, adjust, co-evolve.

c. Sectorial col-laboratories

Unlike the previous ones, sectoral laboratories are promoted by the economic sectors represented by associations of entrepreneurs, industries, and traders. Sectoral or collaborative labs are very much oriented towards research and validation of products and services. Sometimes they are laboratories of large companies, such as the NTT Data Living Lab of Everis, or laboratories promoted by different industrial clusters, such as the Kid's Cluster of the toy cluster, or the Interiors Living Lab of CENFIM. In these labs, user-centered design is very much in mind, and various types of tests and validation actions are carried out on functionalities, uses and showrooms of product and service prototypes.

d. Digital col-laboratories

Technological or digital laboratories could be considered sectoral laboratories. However, when what is explored are specific technologies, the technology prevails, which defines them. A technology lab can be created to apply technologies to Industry 4.0, or for research into advanced digital technologies such as 5G, virtual reality, Blockchain, IoT, AI, or Cybersecurity. These technologies have been articulated for some years from alliances between companies and technological research centres and networks of companies, universities and public institutions that promote the technological transformation of society. Sometimes these laboratories are called labs and sometimes they act as such without using the term "labs".

LESSONS LEARNED FROM COL-LABORATORY CATALONIA PROGRAM

The first two years of promoting collaborations have resulted in three territorial collaborations (Cat Sud, Anoia, and Catalunya Nord) and two thematic collaborations still under construction (Health and Wellness, and Education). Initiatives have been identified that could lead to new collaborations and an effort is being made to coordinate the deployment of 5G areas with collaborators based on the 5G Strategy of Catalonia.

However, and despite the results and impact obtained, in the Catalunya Col-laboratory Programme we continue to discover the growing complexity of the enterprise undertaken. It is important to establish a unique collaborative model. Each territory has a different configuration and interests and, above all, because the people involved are investing more from their commitment than from their institutional affiliation. In partnerships, people use the entities to which they belong to promote proposals and projects that transcend the entities themselves; perhaps for this reason, the participants in these partnerships are not very attentive to communicating what they do. It seems that, in the collaboratives, people feel more comfortable working from the shadows or the invisible than from the media space. In fact, just as important is the invisible day-to-day work that goes on before and after meetings, and that barely shows a part of what goes on in a lab beyond what is documented. Documenting what happens in a collaboration is a huge task that requires time that no one seems to have.

The Col-laboratories function as networks of innovative people who have established trusting relationships and who periodically update, inspire, and coordinate to promote innovation projects. They are places where people go to “fish” for projects, resources and grants with which to promote innovation projects. So far, they have not needed to become legal entities and their liquid governance may surprise classical organizations. The label “colab” or “col-laboratory” is enough to identify them. In the case of Colab CatSud for now, they do not need to become an entity, as this would be overloaded with work and administrative obligations that would detract time they need for the projects. In reality, what they are doing is avoiding the institutionalization of their experiences. They are willing to devote their time to action, but not to formal organisational models that they consider atavistic functioning. This gesture should make us reflect on the misperception of bureaucracy in the context of innovation. And above all, it should draw our attention to the new forms of organization that are emerging in the digital and knowledge society.

The validation process of the Col-laboratory 1.0 hypothesis led us to revise the initial model and to propose the Col-laboratory 2.0 hypothesis, which intertwines territorial and thematic partners. Each new collaboration that we promote continues to be a social-digital innovation surprise, which compels us to explore new ways of approaching its promotion and consolidation. This is modeled from feedback with reality and experience, and we are seeing that each new collaboration we open or explore raises different cases. It is not the collaboration that must adapt to the model, but the model to the collaboration that emerges from the experience itself. It seems that collaboratives do not behave under an industrial production logic, but a digital one, i.e. based not on mass production but on the customization of each product. Along these lines, it also makes sense for organizations to personalize themselves.

Will we discover/design a Colaboratorio 3.0, 4.0... model later? What will we have learned a year from now, and five from now? Will this model ever stabilise or, as in the world of software development, will it be an open social-digital innovation with more and more features?

In 2021 a new opportunity arose: The integration of the living lab approach we had followed since the beginning of the col-laboratory programme with the social innovation programme of ESSI, the European School of Social Innovation, propelled from its inception with international peers by Josef Hochgerner, Jürgen Howaldt, and Toni Caro, who started to work at i2cat (just to mention a few). She helped us better understand the role of social innovation in the new Horizon Europe program and the importance of social innovation examples and approaches worldwide evidenced in the Atlas of Social Innovation⁷.

WHAT ARE WE NOW?

Through the aforementioned Horizon Europe project, INTEGER⁸, we are applying and testing novel methodologies to formulate similar experiences on a European scale, integrating social innovation into the European innovation ecosystem. We are linking the local and regional levels with the European and international

levels to address the complex challenges of a triple-just social, ecological and digital transition (Caro-Gonzalez et al. et al., 2023).

We are moving towards a social-digital innovation model that is testing how to generate not only positive but also regenerative social impacts, in line with:

- A. precepts of ‘the one for all, all for one’ just triple transition, explained before, and
- B. the principles defined by the impact investing players with three key concepts that can be applied to social innovation: intentionality from the innovators and investors’ side, impact measurement and management and additionality, which the social challenge identified⁹ will determine.

We are seeing novel ways of collaborations, new social enterprises and companies being born, seeking to generate income, but also being born to generate wider societal impacts. Three key concepts stand out: convergence, collaboration and jointly defined theories of change adapted to contexts and needs.

An ever evolving forward looking socio-digital innovation needs to be flexible and adaptable. However, it also needs to establish clear goals that are aligned with negotiated more ambitious objectives and impacts that go beyond the social, environmental and governance criteria (ESGs)¹⁰. Criteria that are able and willing to innovate and focus on generating real impact by a) boosting more decisive and committed institutional leadership; b) creating physical spaces where the actors from the quadruple (or n-) helix encounter and co create; and c) defining strategies that create the future economic and social connections between the different types of innovations (social-business-technology-driven).

Looking ahead, we find a future of great challenges for socio-digital entrepreneurship and collaborative economy evolving towards a structural change engaging all actors at all levels. To achieve this impact and meet society and the planet needs, we need to create and develop new forms:

- A. to generate spaces of trust where we bring financial and social agents closer together and build a common language between the parties; and
- B. to develop more adapted financing to the specific demands of society.

In summary, in Catalonia we are currently developing the Col.laboratori.cat programme as the first demonstrator of the possibility of testing the theory of universal innovation ecosystem as a model of societies facing this era of transitions. This model is the result of a convergence of theories of techno anthropology, the living lab research community and the social innovation assets and continues to be open for future synthesis with other fountains of knowledge that still we do not know.

We see the col-laboratories as a crucial social innovation and solution to solve the difficulty of absorbing changes and propelling the creative construction proposed by Carlota Pérez. This new generation of ‘lab of labs’ are meta socio-digital innovation mechanisms able to set up quadruple helix collaborative structures. They can serve as a bridge between actors, types of innovations and different (and in many cases opposing) ways of understanding the world.

So, how can we carry out the Just Triple Transition? By bringing together actors into Quadruple Helix (Nguyen & Marques, 2022), collaborative processes that yield optimal results in the short term and create synergies in the long-term. This translates into the meeting of business, academia, government and society in common tasks, including society (the end-user) to better guarantee the design and higher value of the results. We aim for a total democratization of the innovation process in order to reach a wider spread of social benefits based on negotiated approaches toward the common good.

ENDNOTES

1. <https://www.essi-net.eu/>
2. <https://carlotaperez.org/portada/>
3. “A turning point” by Carlota Pérez (Figure 1)
4. <https://catlabs.cat/>
5. This was in fact signed before the Cat Sud MoU.
6. Eoh-for-good, Leading Systemic Transformations for the Common Good, <https://eohforgood.com/>
7. <https://www.socialinnovationatlas.net/>
8. <https://integercollab.eu/>
9. <https://spainnab.org/publicaciones>

10. ESG criteria have become very relevant in recent years and have given rise to the figure of the Socially Responsible Investor. ESG factors are the most valued by today's investors beyond financial results. This reflects the new behaviour and concerns of shareholders towards companies that are committed to the environment, society and good corporate governance practices.

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