

# Urban Living Labs and ICTs in a context of social distancing

Luis Miguel Benavides Cabrejo and Alicia Soto Robles

Supervised by Finn Arler

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Cities & Sustainability

Rendsburggade 14

9000 Aalborg

<http://www.aau.dk>

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Alicia Soto Robles

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Luis Miguel Benavides Cabrejo

### Abstract

Taking as a point of departure the pressing socio-ecological challenges that the cities are confronting, this thesis focus on the exploration of how Urban Living Labs are facing a sustainable urban transformation through Information and Communication Technologies in a context of social distancing derived from COVID-19 pandemic. This project aims to research: the mechanisms by which Urban Living Laboratories participate in urban governance, ICTs that are useful in facing a transition towards sustainability, how they are used in co-creation ULL contexts, and whether the online could alternatively replace these face-to-face interventions. For this, we have explored three Urban Living Labs TeRRIFICA at an international level, SYNCITY in Vienna and ParticipaLab at MediaLab Prado in Madrid. Findings in this report show that ICTs can supplement and will need to supplement physical engagement due to social distancing regulations, but they should not be regarded as the panacea, since co-creation processes are still highly reliant on physical engagement.

By signing this document, each member of the group confirms participation on equal terms in the process of writing the project. Thus, each member of the group is responsible for the all contents in the project.

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# 1 | Introduction

To start off, it is worth mentioning that this Master's Thesis has been carried out during the months of February to June 2020, in a global pandemic scenario (COVID-19). Taking as a point of departure the pressing socio-ecological challenges that the cities are facing, the initial chosen topic addressed the movements and grassroots collectives aiming for a fundamental systemic change through understandings related to the field of political ecology, politics of nature, degrowth, and prefigurative movements. The thesis was meant to be conducted by involving ourselves in the organization of activities related to two environmentalists movements in an action research manner, thus making a double collaborative case between Madrid-Berlin, where each authors reside.

However, the efforts applied in this matter were interrupted by the arrival of the pandemic in mid March, when it spread drastically from Italy to Spain (residence of one of the authors) and subsequently to the rest of European countries, which would make impossible direct participation in this activist movements, not only because of social distancing and lockdown conditions but also because the groups themselves interrupted most of their scheduled activities.

In this way, we were forced to abandon this initial research, gradually uncovering a new topic for research, which happened to be Urban Living Laboratories (from now on, ULL), - still related to grassroot governance geared towards systemic change. ULLs develop their action on urban territories by bringing different stakeholders together and having knowledge generation and learning as their distinctive focus. Participation and local experimentation are meant to promote urban or civic innovation and governance.

This crisis has brought a series of complex global consequences linked to the economic, ecological, social, etc. In this new paradigm, establishments have closed their doors, work is done from home and communication is executed digitally to avoid new infections. Specifically, Urban Laboratories have ceased physical interventions, risking their role as urban governance carriers. It is unclear whether Urban Living Labs can achieve their activities through ICT (Information and Communication Technologies) and if these could replace face-to-face interventions. Three Urban Living Labs (TeRRIFICA, SYNCITY and ParticipaLab in MediaLab el Prado) have been worked as cases in this report in order to understand their use of ICT tools in their co-creation context.

The report is structured in nine chapters. The introduction is followed by the problem formulation, elaborating the understanding of Urban Living Labs and their context, as well as the COVID-19 situation and its related social distancing. On Chapter 3 the research design is framed, which provides an overview of how we have approached the research. The theoretical framework is presented in Chapter 4, covering: in-depth relations between ULL and their governance, applications of ICTs and co-creation understandings. Chapter 5 encompasses an analysis of digital ICT toolbox related to ULLs. A second analysis is carried out in Chapter 6, classifying our ULLs by type and co-creation attributes, as well as exploring the way they use their ICTs within the lab. One last analysis searches for the ways social distancing has affected our cases (Chapter 7). Chapter 8 tops off with a discussion of the results from previous analyses. And finally the conclusion in Chapter 9 will present the outcomes of the project.



## 2 | Problem formulation

There is a growing urgency to address effectively the socio-ecological challenges derived from global issues such as climate change or the increasing inequality between and within countries. Due to the rapid rates of global urbanization, the urban sphere is regarded as the arena where these challenges ought to be faced and solved. Urban Living Labs (ULLs), thus, represent a novel approach to do so and is currently being widely supported by European policy (Steen & van Bueren 2017). Under this framework, cities are considered as a laboratory to test and co-produce situated knowledge able to produce systemic innovations that overcome unsustainable socio-technical arrangements, that is to say, that addresses "*markets, practices, cultures and policies alike*" (von Wirth et al. 2019, p.230). Despite its conceptual ambiguity, there have been efforts to clarify its meaning. In a recent meta-study, Chron er et al. (2019) suggest the following definition:

*"An urban living lab is a local place for innovative solutions that aims to solve urban challenges and contribute to long-term sustainability by actively and openly co-constructing solutions with citizens and other stakeholders."* (Chron er et al. 2019, p.60)

However, while ULLs represent a novel approach towards governing sustainable urban transitions, current literature is calling into question whether this approach is actually able "to think beyond dominant visions and the interests of the most powerful actors" (Bulkeley et al. 2019, p.25). By understanding ULLs as a wide range of formal and informal actors not only engaged in the co-construction of systemic, innovative and sustainable solutions to urban challenges, but also engaged in performing what it means to govern (Bulkeley et al. 2016), it becomes crucial to bring into the discussion co-creation methodologies involving participation.

On the other hand, the outbreak of a coronavirus disease (COVID-19) started in Wuhan, China 2019 and has spread globally in a few months. The evolution of the disease have had and is still having several impacts regarding health, economic, environment, international relations, etc. Quarantine conditions to appease this epidemic have been adopted by a large number of countries. The quarantine has been of a different nature depending on the country, but a generalized social distancing has constituted the common denominator globally, either by limiting the number of people per meetings or even reaching months-long home confinement in some cases, preventing contagion from occurring in a massive way. Most physical establishments and workplaces have remained closed or capacity limited for certain periods of time to avoid

such social contact, favouring the use of virtual spaces and Communication and Information Technologies (ICTs) to trigger and/or substitute several activities: online shopping, leisure and cultural activities by social media platforms, everyday relationships through video calls and the continuation of labor activities through home working are just a few examples of the digitisation phenomena. Faced with this unpredictable situation, it is unknown when this online interactions will return to normal face-to-face and whether they will do it partially or totally.

ULLs are no exception and have been equally affected by this epidemic, risking many of their action in regards to experimentation and co-creation activities, partially attached to face-to-face interactions and thus hindering or re-contextualizing their governance approach. Some Urban Living Labs previously have been involving ICT tools at some point in their practices, aimed mainly for citizen participation and data generation purposes. Altogether, ICTs and their use in Urban Living Labs remain as a fundamental focus in the urban governance paradigm being the problem formulated as the following research question:

*How can the Information and Communication Technologies (ICTs) support a sustainable urban transformation, as understood by Urban Living Labs (ULLs), in a context of social distancing?*

## 3 | Research design & methodology

This chapter aims to give an overview about the research conducted throughout this project in terms of its structure, limitations, methods and procedures.

### 3.1 Research design and sub-questions

The problem identified in the previous section has led to the formulation of a research question which has been the lighthouse guiding the development of this thesis. This research question is:

**How can the Information and Communication Technologies (ICTs) support a sustainable urban transformation, as understood by Urban Living Labs (ULLs), in a context of social distancing?**

Which, in order to answer it, has been divided into five sub-questions:

1. *How is the sustainable urban transformation understood by the Urban Living Lab concept?*
2. *What are the possible applications of ICTs in a sustainable urban transformation and their underlying assumptions?*
3. *What are the characteristics of the digital tools that support a sustainable urban transformation?*
4. *How do ULLs understand co-creation based on their design and their use of ICTs?*
5. *How do ULLs see their work affected by social distancing?*

The first two sub-questions have the intention to provide a theoretical foundation for the understanding of two key concepts in our project: ULLs and the role of ICTs in a sustainable

transformation. Moreover, the answers obtained from these two sub-questions will be crucial for the development of the project since they will define categories, narratives, and functionalities that we will later use to conduct the analyses. Thus, the third sub-question will, on the one hand identify concrete digital practices that are being or have been used in ULLs, and on the other hand will categorise them according to the results of sub-question 2. The next step will be to answer sub-question 4, which will deepen our understanding about how do these digital tools develop in the concrete setting of an ULL. Finally, the project will end up exploring the context of social distancing and the use of ICTs in the chosen cases, aiming to establish a connection with sub-questions 3 & 4.

## 3.2 Limitations of the research

It is relevant to note that the COVID-19 crisis is a complex phenomenon whose effects are being perceived in multiple dimensions: health, environment, economy, international relations etc... and by the moment that this thesis was finished, the outcomes of the crisis were still uncertain. This project acknowledges the existence and relevance of all these effects, but narrows the consequences of COVID-19 to the unprecedented regulations regarding social distancing.

Moreover, since we are exploring the potential uses of ICTs in the context of social distancing, we are narrowing our understanding of ICTs to those who can be useful in this situation. Thus, it is the reasoning why the project focuses on ICTs applied to the co-creation aspect a sustainable urban transformation.

## 3.3 Methodology

This section will describe the methodology used to answer each of the sub-questions that guided the development of the project. Thus, it will include a detailed explanation of the methods used, as well as reflections about the limitations of these methods.

Sub-question	Methods
SQ 1: How is the sustainable urban transformation understood by the Urban Living Lab concept?	- Literature review
SQ 2: What are the possible applications of ICTs in a sustainable urban transformation and their underlying assumptions?	- Literature review
SQ 3: What are the characteristics of the digital tools that support a sustainable urban transformation?	- Internet search - Classification of tools according to the theoretical framework
SQ 4: How do ULLs understand co-creation based on their design and their use of ICTs?	- Document analysis - Semi-structured interviews
SQ 5: How do ULLs see their work affected by social distancing?	- Webinar - Semi-structured interviews

Table 3.1: Relation between sub-questions and methods

### 3.3.1 How is the sustainable urban transformation understood by the Urban Living Lab concept?

The first sub-question will be answered in our theoretical framework. In order to do so, we have used key literature regarding the theme of Urban Living Labs to define the main characteristics of an ULL, the background of the term and the different types that exist. The most relevant literature that we have used to frame this sub-question includes the meta-study about the characteristics of ULLs conducted by Chron  er et al. (2019), the book *The Experimental City* by Evans (2016), and the research of Bulkeley et al. (Bulkeley & Cast  n Broto 2013, Bulkeley et al. 2016, 2019)

### 3.3.2 What are the possible applications of ICTs in a sustainable urban transformation and their underlying assumptions?

In the same way as sub-question 1, this sub-question will be addressed in the theoretical framework. Firstly, we will look into the concept of co-creation because it is one of the key parts of how do ULLs understand the sustainable urban transformation, and at this point of the report we are scoping the project around this concept. In order to establish the theoretical framework for the concept of co-creation, we are using the guidance of Tesseract Urban Social Research (more on Tesseract on chapter 5), and the knowledge created from the European project CO-CREATION, in which they are participating. Specifically, the conference "Impossible Complicities" (Brownhill & Colini 2019) will be the central piece around which the concept

of co-creation is explained.

Once this is settled, we will expand the discussion again around the use of ICTs in connection to sustainability by talking about the Smart City paradigm. We will provide an overview of the term by relying on both critical (March 2018, Meijer & Bolívar 2016) and hegemonical literature (Taylor Buck & While 2017, Giffinger et al. 2007, European Commission 2018), to then finally, use, on the one hand, Dörk & Monteye (2011)'s typology to classify the different uses of ICTs for co-creation and, on the other hand, Hughes (2020)'s work to classify the functionalities of the ICTs in the co-creation context.

### **3.3.3 What are the characteristics of the digital tools that support a sustainable urban transformation?**

The third sub-question is answered in chapter 5. The procedure to do so consists in three steps: (1) recollection of digital tools for co-creation, (2) classification of the tools according to 5 criteria, and (3) analysis of tendencies, commonalities and differences between the tools. The details about each of the steps are explained in chapter 5.

### **3.3.4 How do ULLs understand co-creation based on their design and their use of ICTs?**

This sub-question is answered in chapter 6. In order to answer this sub-question we are using two methods: document analysis and semi-structured interviews, with the aim to define the cases according to two aspects: (1) what type of ULL are they, (2) and how do they understand co-creation based on their design and their use of ICTs.

#### **Document analysis**

In order to define these aspects, we have looked into a series of documents and websites that contains the information that we were looking for. In the case of Terrifica it has been their website (<https://terrifica.eu/>) and their guide on co-creation and engagement (Terrifica 2019). For Syncity it has been their website as well (<https://www.syncity4.eu/>) and documentation about the development of the project (Syncity 2020). And finally for ParticipaLab we have used the website (<https://www.medialab-prado.es/laboratorios/participalab>) and the final report of the project (Noguero et al. 2019).

## Interviews

The intention with the interviews was twofold. On the one hand we wanted to complement the information that we obtained via document analysis and dig deeper into how they were integrating ICTs into the co-creation process as well as to understand their co-creation process itself, and on the other hand, and only relevant for the last sub-question, to identify the ways in which social distancing was influencing their practice. The interview partners are presented in table 3.2.

Interview partner	Description
Norbert Steinhaus (Steinhaus 2020)	Project coordinator of the Terrifica project and board member of WILA Bonn, Science Shop
Thomas Stollenwerk (Stollenwerk 2020)	Co-founder of Oikoplus, the ICT development team part of the Syncity project
Yago Bermejo (Bermejo 2020)	Project coordinator of ParticipaLab

Table 3.2: Contacts

The choice of semi-structured interviews was to give room to the interview partners to express freely about the themes we were proposing, since we were looking to identify a narrative and we were not interested in getting a specific type of answer. The interview questions and the notes taken from them can be looked at in appendix B.

### 3.3.5 How do ULLs see their work affected by social distancing?

The last sub-question is answered in chapter 7. In order to answer this sub-question, we used partially the interviews that were already used to answer the previous sub-questions, and we participated in a webinar called Moving Dialogue organized by Stickydots. The procedure consisted in identifying the ways in which the social distancing context was affecting the co-creation practices of each of the cases and the possibilities and limitations that they saw in the situation. Then, we participated in the webinar in order to obtain an overall vision about the opportunities and limitations about co-creating in an online way instead of doing it face-to-face. Based on these two inputs we could then identify the ways in which our cases perceived this situation both in a positive and a negative light, in order to define the threshold in-between online and face-to-face interaction.

### Webinar: Moving dialogue

The webinar was coordinated by Stickydots, a platform located in Brussels, whose expertise is related to the field of multi-stakeholder engagement in research and innovation projects. The webinar *Moving dialogue* was a five-part workshop designed to provide insights into how to move participatory processes to the online realm, specifically oriented to projects working at a European level. We only participated in the first session due to time constraints and the fact that the rest of the sessions required payment.

The first session was held on May 28th from 15:00-17:00 in the platform Zoom and the theme was "*A shift in mindset*", in reference to the changes associated to engaging in co-creation practices online rather than physically. The structure of the session was participative to some extent, since there were a couple moments to discuss certain themes with other participants in groups of 2 and 3 people. As a result of the workshop, we identified a series of possibilities and barriers for ICTs in co-creation processes that were both facilitated by the workshop organization and also as a result of the moments of deliberation.

### 3.3.6 Limitations in the methodology

It is essential to reflect on the validity of the methods that we have chosen to conduct our research. That is why in this section, we will present the limitations that our methods might or might have encountered during the development of the project.

Sub-question 3: "*What are the characteristics of the digital tools that support a sustainable urban transformation?*" takes as a point of departure a recollection of digital tools for co-creation. However, it cannot be guaranteed that this sample is representative for all the ULLs since there is a dimension that is missing which is the actual use of a tool, meaning that there might be only a tool to co-draft, but if that tool is Google Docs, it is pretty clear that is the one that everyone is using it, and the fact that there is only one tool for that does not mean that it is not being used. In line with the issue of representativity, it is uncertain whether our chosen cases can be generalized. When deciding which cases to consider, we prioritized cases that we knew were engaged in the use of ICTs for co-creation rather than choosing a "model" ULL, which we still did to some extent, with the intention to learn from practice rather than to establish a universal understanding about how ULLs use ICTs.



## 4 | Theoretical framework

This chapter presents the theoretical framework that this project is based on. It will begin by presenting the concept of Urban Living Lab, its characteristics, background and types, to then dig deeper into the concept of co-creation and the different understandings around the term. Finally, we will introduce ICTs in the light of urban sustainability and their connection with the Smart City paradigm and co-creation.

### 4.1 Urban Living Labs

The phenomenon of urban experimentation has gained significant relevance in the last years, as a mean to address pressing socio-ecological challenges derived from global issues such as climate change, or the increasing inequality between and within countries on the urban scale (Evans et al. 2016). Its emergence is tightly linked to an understanding of urban governance that regards cities as a complex and heterogeneous assemblage where the capacity to govern is fragmented and contested, and thus, requires a provisional and adaptive framework in order to make sense of the present as well as to materialise visions of the future (Bulkeley et al. 2019).

Bulkeley & Castán Broto (2013) defines three overlapping categories of urban experimentation: governance experimentation, socio-technical experimentation, and strategic experimentation. The first one refers to policy innovations at the city-regional scale. This approach on its own, though, fails to recognize the socio-technical nature of the urban infrastructure that these policy innovations are trying to shape (Bulkeley & Castán Broto 2013), which is precisely the second category: socio-technical experimentation. Socio-technical experimentation is directly influenced by the "multi-level perspective" (Geels 2002), and in this context, it argues for the creation of experimental niches that could at a given point replace unsustainable socio-technical systems. The third category is strategic experimentation which is primarily embodied by the concept of Living Lab, a place to promote social and technological innovation in a real life setting (Evans 2016).

It is precisely this last category the one that has brought increased attention both in the academia and practice (Evans et al. 2016) in the last years.

### 4.1.1 Characteristics

Urban Living Labs (ULL) represent a branch of the Living Lab concept, that develops their action on urban territories by bringing different stakeholders into action and having knowledge generation and learning as their distinctive focus. While Living Labs focus on the interaction between the private and the user (Chron  er et al. 2019), ULLs are characterized by participation in local experimental projects that promote urban or civic innovation. Cities are pointed as key elements for innovation in sustainable transitions due to the availability of resources, spaces and interconnections (von Wirth et al. 2019).

Chron  er et al. (2019) defines Urban Living Labs in the following way:

*“An urban living lab is a local place for innovative solutions that aims to solve urban challenges and contribute to long-term sustainability by actively and openly co-constructing solutions with citizens and other stakeholders.”* (Chron  er et al. 2019, p.60)

Moreover, Chron  er et al. (2019) provide in their study the 7 key components of an Urban Living Lab:

1. **Governance:** In a regular Living Lab governance corresponds to management, however in the city scale it acquires a political dimension connected to decision-making. ULLs need to be supported by politics and policies.
2. **Financing:** Financing and maintenance plans are needed from cities representatives for the sake of the long-term vision of ULL.
3. **Physical Place:** The physical place has to enable experimentation and co-construction, also it should enhance nature and sustainability awareness. Financing and governing is also connected with this ULL "office", since it will need to be maintained and cover some technologies to ensure a proper atmosphere for citizens to value and develop innovation.
4. **Innovation:** Innovation is essential for ULL, since it is the main driver for activities. It is not necessary to decide this innovation beforehand. Instead, it can be contemplated as an outcome, as the scope of the project.
5. **Partners and Users:** The lab is a multi-stakeholder setting. This means that a variety of actors is involved: research institutes, citizens and public and private sectors. It is remarkable that citizens are not necessary seen as "users" but also as empowered participants that co-create together with the rest of stakeholders, arriving in a co-construction of the place.
6. **Approach:** Multidisciplinary approach nurtures the activities with a variety of methods and tools.
7. **ICT and Infrastructure:** Ensuring an open and responsible management within an urban living lab.

### 4.1.2 Types

Different typologies for ULL are presented below, not only to deepen in their description, but also to be able to distinguish amongst cases, understand their functioning and relations, identify their objectives and be able to have an overview of their frames of action. The classification is done through the lenses of design, experimentation, funding, flexibility and actors amongst others, even though each case is contextual and it should not necessarily be limited to the frames here exposed.

Despite of their interventionist nature, in the form of "learning by doing", and apart from representing "discrete arenas for research and development", there is concern on governance of urban transitions through ULLs (Bulkeley et al. 2016). ULL represents a real life simulation scenario where several actors are involved in socio-material practices and actions - interventions-, not only constituting them but also (and ideally) governing them (Bulkeley et al. 2019). This governance is carried on by experimentation or interventions whose outcomes are abstract knowledge, techniques generation and learning, systemic and transformative change, political order and mobilization (von Wirth et al. 2019).

Transition literature emphasises the relationship between power regime formations and agent-based power for innovations. Meaning with agents those that not only rely on the individual, nor the interests nor human-center, but those that empower the regime structure, ideas, values, norms, political ecology, actor-network theory and new materialism (Bulkeley et al. 2016) in form of new socio-material entities relations. Thus, Bulkeley stress that ULL methodologies (partnerships, participation, data gathering) are then crucial to understand and achieve governance with the consecutive open window of possibilities for transformative processes.

Bulkeley et al. (2019) resorts to two key concepts for building her typology, namely control and contingency. *Control* would serve to "relate specific elements of the urban within the laboratory" so they can be improved or re-shaped (Bulkeley et al. 2019). Intervention in a control disposition brings certain elements of the urban into the laboratory, while leaving others aside and determining the limits of the laboratory in pursue of an specific solution. On the other hand, *contingency* "seeks to only loosely configure socio-material relations through creating novel forms of intermediation that enable alternatives to co-exist". Intervention in this last one leaves space for new imagination and relations; the problem is not readily articulated and observed as it was before, but rather one that appears through the process.

#### Depending on their design and practice

Laboratories are designed in a continuous improvement process of intervention-observation. This intervention and improvement characterise ULL as forms of governance (Bulkeley et al. 2019). The focus is on the design and practice of these interventions, which include actors, arrangements, resources and visions.

This categorization (Bulkeley et al. 2019) finds its roots in understanding ULL priorities, mechanisms or practices and financing in pursuance of political improvements based on observation

and documentation. Ultimately, scaling up or expansion will depend on the political impact that this dynamics have. Here, we find three ideal archetypes: strategic, civic and organic.

- *Strategic*

Characterized by an array of national or regional authorities together with corporate or private sector partners and funders. This model pursues a development and implementation experimentation based in live test-beds, often by involving technology programs such as competitions with dominant economic interests. The urban is a test-bed for aims and aspirations. Financing relies on partnership investments. In this strategic design, high levels of control are expected, being the laboratory's interventions attached to the interests of the partners. Strategic ULLs often mean the involvement of large projects, not only in space but also time, working under lump sums of funding.

- *Civic*

Municipal, local companies and civic universities are the main actors, still open to national and corporate funders, in which case there would be an influence of strategic national state priorities. The urban is seen as a public or civic domain where experimentation takes place. Main objectives here are innovation, economic development, translating research into demonstration and speed transitioning within a framework, all in sake of transferring learning and benefits in the urban. The financial mode here is often based in co-funding from municipal, research and/or engagement or even national and European funds. We contemplate here a balance between contingency - represented by the experimentation and research - and control - carried by some of the strategical actors or concrete interests for demonstration.

- *Organic or Grassroot*

Civil society and non profit groups (charities, grassroots, community organizations and NGOs) are key actors involved in this type. Very related to grassroots innovation and socio-technical innovation, the objectives cover diverse needs and concerns such as social needs, pollution, unemployment, etc. Urban is the context within experimentation grows. Fundings are here limited and matched with volunteering or other resources. Contingency dominates this type of design and practice, being opened to the several actor's perspectives an the possible new socio-material configurations.

### **Depending on their "disposition"**

Disposition refers to the relationships between the objects engaged in the ULL and will affect the ways in which they govern urban sustainability transition. Different combinations between control and contingency will result in different dispositions.

- *Trial*

Dominated by control, some ULL secure particular outcomes by limited forms of interventions which are designed in order to observe and learn within minimum risk under certain time and space. This implies disciplinary power and classic actors support such as market and political.

- *Enclave*

Enclave sets limits in the spatial but still with some flexibility in form of new alternative visions, new intermediaries, different entities and a design based in a reconfiguration of the socio-material. Its framework is limited from the wider urban in experimental neighborhoods or districts treated as a microcosms in order to draw lessons and replicate. Thus control is dominant also here but leaves a contingency window. The framework limitation finds its justification in serve to further replicate or draw lessons.

- *Demonstration*

Demonstration is characterised by power in governmental mode. It functions by pre-setting the socio-material conditions in an exhibition way in order to activate knowledge and experimentation but with no predetermined outcomes. It does not have a control on the limitations either, allowing alternative relations to arise. Thus, demonstration is an example where contingency dominates. Demonstrative dispositions can go from smart cities built from scratch to test-beds for sustainable technologies building, always serving as a showcase for other practitioners.

- *Platforms*

Platform creates an atmosphere to foster socio-material relations instead of pre-setting them. It does not have limited frame since it looks for experimentation between the inside and the outside of the experimental setting. Its aim is to "cure connectivity" rather than simply set itself as a nexus of connections. Alternative socio-material relations arise from coincidental entities encounters. Interaction and circulation makes of this disposition one in which contingency is also dominating and disciplinary power is limited. Maker Spaces are often considered as platforms because of the way the experimentation carries on where resources are disposed to be brought in relation to one another. Labs curating data, mediating user behavior and allowing intermediation and connectivity are other example of platform disposition.

Controlled interventions on formalised processes of learning such as strategic and economic designs or trial dispositions, are considered constrained when dealing with the social and material entities shaping governance on the ground (Bulkeley et al. 2019), meaning they are unable to reach the diversity of the urban ecosystem and the active role of civil society. On the other hand, civic, organic, platform and demonstration urban living labs, find limitations in their autonomy or resources, often being unable to expand or translate their societal learning into wider sustainability transition.

All in all, ULL it is not only an adaptive research infrastructure alone but a space embedded in a real urban context, a co-creation of transformative knowledge and a potential governance instrument in the policy sphere (von Wirth et al. 2019). In this regard, the closer the laboratory gets to the changing conditions of the city, the greater the level of contingency (Bulkeley et al. 2019) and the greater alternative views through stakeholders and opportunities for ground governance. Thus, an emphasis is put on the importance of "user involvement" and its active engagement (Chron er et al. 2019, von Wirth et al. 2019), which brings such knowledge alternatives, possibilities for innovation and transition governance. User involvement would then require an active co-creation process focused in concrete structures such as planning and urban design for governance purposes (von Wirth et al. 2019).

## 4.2 Co-creation

Co-creation is a fundamental characteristic of ULLs which is currently faced with the challenge of keeping an active stakeholder engagement in the context of social distancing. The ambivalence of the term represents an obvious challenge in terms of scoping what it is that we are actually talking about when we use this word, which is why, this section will provide an overview of the concept of co-creation regarding its multiple meanings and understandings e.g: "co-construction", "open innovation", "multi-stakeholder engagement" and the like.

The term co-creation belongs to a set of approaches with the prefix "co-", such as co-production, co-design, co-construction, co-management, co-responsibility, whose definition is in most of the cases used interchangeably (Voorberg et al. 2015) and their practical implications can be pulled in many different directions (Brownhill & Colini 2019). The origin of the term co-creation can be traced back to private sector initiatives in the 90s, where collaboration with customers started to be regarded as a competitive edge by which end-users were integrated in the production process of a service or a product, and their experiences allowed to fine-tune the product itself (Prahalad & Ramaswamy 2000). Despite its original inception in business circles, other areas such as public management and academic research have engaged as well in the use of the term. On the first case, the concept referred to the inclusion of the third sector and citizens in the provision of public services (Bovaird 2007), and in the second it referred to the inclusion of non-academic partners and relevant stakeholders in the process of knowledge generation (Horner 2016). In this sense, co-creation is deemed necessary as an approach that promotes an active citizenship (Boyle & Harris 2009), while providing more efficient and effective services (Realpe & Wallace 2010).

Moreover, connected to this expansion of co-creation into other fields, Brownhill & Colini (2019) argue that co-creation is understood in at least four different but interrelated ways: co-creation as co-design, as co-option by the state, as knowledge, and as innovation.

- Co-design. Understood as the design of urban spaces, and thus fundamentally connected to neighbourhood and urban planning. The origins of such participatory approaches were

first developed in the 1970s in Scandinavia, and nowadays, examples such as the concept of "placemaking" has made it to mainstream practice (Brownhill & Colini 2019). The aim is to include the user expertise into the design process of public spaces, thereby redefining the relationship between the designers and the community. Critical literature, however, is calling into question whether this user involvement is representative of the needs of systematically marginalized communities or if it is actually a trigger for gentrification processes (Peck 2005, Marcuse 2011, Mclean 2014).

- Co-option by the State. Which is deeply connected to the themes of "citizen participation", "community engagement" and "collaborative governance". The systematic review conducted by Voorberg et al. (2015) showed that co-creation is mostly seen as a virtue on itself and the outcomes of the process of involvement are often not explored. As a result of this, it is not clear at all that the processes of co-creation actually challenge expertise knowledge, but are rather used as a legitimization tool or to re-script community aspirations (Lehtimäki et al. 2020).
- Knowledge. This understanding of co-creation is deeply connected to well established traditions such as "participatory action research" (Greenwood & Levin 1998) and "co-operative inquiry" (Horner 2016). Through these lenses, the aim is to break down the historical hierarchy between the researcher and the subject of research (communities, workers...), so as to engage in a co-production of knowledge in which both parties learn from each other, shifting from research "on" to research "with" (Beebeejaun et al. 2014).
- Innovation. As previously expressed, the idea of co-creation first appeared in the corporate environment, and gave rise to concepts such as "open innovation" - a way to foster innovation processes in collaboration with customers (Chesbrough 2003). The benefits of such an approach were clearly limited to the business sector, however, the understanding around innovation has been expanded by the notion of social innovation. Similarly to co-creation, social innovation has become a buzzword for policy making and thus, it is a term with multiple meanings and interpretations. Our understanding of the term is shared with Voorberg et al. (2015), who defines it as:

*"[...] the creation of long-lasting outcomes that aim to address societal needs by fundamentally changing the relationships, positions and rules between the involved stakeholders, through an open process of participation, exchange and collaboration with relevant stakeholders, including end- users, thereby crossing organizational boundaries and jurisdictions"* (Voorberg et al. 2015, p.2)

In this sense, co-creation is: (1) a methodology/approach aimed towards generating social innovation in its multiple dimensions, and (2) a governance innovation itself since it rearranges the relationships between the involved stakeholders. However, even if co-creation and social innovation are often regarded as normatively positive concepts (Voorberg et al. 2015), the practical application of the term social innovation has been criticized for being biased towards promoting forms of entrepreneurialism (Blühdorn et al. 2018, Srinivas 2015), which reinforces market imperatives and places the burden of a sustainable transformation in the so-called agents of change or social entrepreneurs. At the end, the actual

transformatory power of these terms is connected to the ways in which they understand social change (Howaldt & Schwarz 2016), which is a larger sociological problem and will ultimately define whether they represent a transformative tool or not.

Summing up, we can see that, on the one hand co-creation can be understood as an ideal type of collaboration between relevant stakeholders aimed towards enacting a sustainable transformation, and on the other hand, the practices in which co-creation is materialized can be problematized in many different ways. Building on top of the previous section, we can see that, even if there are intersections with the other understandings of co-creation, ULLs understand the concept of co-creation mainly as a innovation process, that is, a methodology to generate social innovation and in doing so, a governance innovation itself since it rearranges the relationship between the actors involved. It is worth noting though, that the opposite is not necessarily true, as governance innovation can be geared towards e.g improving access to government data or rate services (Elstub & Escobar 2019).

### 4.3 ICTs and sustainability

Digitalization and ICTs have fundamentally changed the way in which we relate to one another and the outside environment. In Woods et al. (2018) words:

*"The spectacular rise of hyperconnectivity technologies brought with itself a number of promises, assuring to make our lives easier. Many of these promises have become reality, but often at a high societal price, given our increasing dependence on solutions provided by private actors acting on the global scene. These powerful centralised solutions present a number of risks, in terms of privacy, dependability, ownership of data, decisional autonomy, and ultimately of democratic control, which motivate the search for different, more decentralised approaches, where each citizen can and must play an active role."* (Woods et al. 2018, p.1)

This statement clearly expresses both the opportunities and perils of ICTs and remarks the relevance of reimagining the ways in which these ICTs could produce new forms of community action and social learning. Already in 1998, Calhoun (1998) warned about how ICTs facilitated popular mobilization at the expense of outstripping organizational roots, and argued that ICTs were the most valuable for communities when they added to the capacities of people that were already organised, rather than aiming to substitute them with "virtual communities" (Calhoun 1998). Mäenpää & Faehnle (2017) argue that digitalization and ICTs are key drivers behind the self-organization of citizens in what it is referred in the literature as the "fourth sector" - a sector of civil society organised outside governmental structures in a proactive and activity-centred nature (Lehtimäki et al. 2020). A clear example of this kind of self-organised communities around ICTs is the hacking community. By creating a global circuit of heterotopic spaces with horizontalist organizational alternatives (autonomism and consensus-based governance), hackers around the world are engaged in the experimentation and creation of "alternative circuits of production, exchange and bricolage" (Murillo 2019, p.11) that fundamentally challenge current



modes of ownership and production of ICTs. However, the hegemonic approach by which ICTs are integrated in the urban context is represented by the Smart City paradigm that will be explained in detail below.

### 4.3.1 Smart City

Smart City is defined by the European Commission as a place where “traditional networks and services are made more efficient with the use of digital and telecommunication technologies for the benefit of its inhabitants and business” (European Commission 2018).

The “Sustainable” Smart City finds itself in a paradigm where it fosters green growth and urban sustainability through several digitalized or technological responses. The aim is to develop the use of technology in order to make a more efficient use of resources and decrease emissions by working in arenas such as water supplies, waste disposals and smart building heat systems. Not only that, but the concept goes further to cover an urban governance network through citizen, administration and other stakeholder involvement (European Commission 2018). Thus, the label "smart" would be falling into a simplistic approach if it did not go beyond a reflection of the sole use of technology and digitization or Information and Communication Technologies (Mosannenzadeh et al. 2017) .

Such involvement brings together a variety of actors as industry, small business, banks, researchers and others but also opens the door for new progressive agencies taken by civic organizations, grassroots and social movements (March 2018).

Smart City is often related to foster market opportunities by “overlapping interest of academia, government and industry focusing on multi-level and multi-scale innovation, experimentation and design in laboratory trials” (Taylor Buck & While 2017). National and international competition initiatives try to stimulate creativity between governments and private sector in pursue of a product development and urban intervention (Meijer & Bolívar 2016, Taylor Buck & While 2017) not only covering the national but also aiming to competitively export strategies abroad (Taylor Buck & While 2017), seeking to "mobile capital rather than specific local priorities” (Hodson & Marvin 2010). This traduces, as Hodson & Marvin (2010) state as an “eco-competitive race”.

Private sector is seen as key element to embrace ICTs solutions, given its privileged technological position. Smart City sets its bases in a techno-centric vision that covers digitalized urban infrastructure such as smart transport, smart buildings, and data management systems through technological and digital solutions such as ICT, Big Data, Smart meters, 3D printing, sensors, Internet of Things, Citizen Science, Smart Grids or digital open source fabrication, being often, but not always, enacted through ICT companies, large international consultancies and private utility companies (March, 2018). Also referred as a potential “technological fix” (Viitanen and Kingston, 2013 in Taylor Buck & While (2017)), some would define smart city to “help people to make more intelligent decisions” (Taylor Buck & While 2017), opening a paradigm where

the citizen looks more as a consumer with the private as provider (Taylor Buck & While 2017) rather than a co-creator in this smart complex network.

*“Smart City restructuring has emerged as a significant source of hope for urban futures. It promises a new era of optimised ‘smart’ infrastructural management that connects the supplies and demands of people, organisations and objects in new and exciting ways. The Smart City formulation is integral to enhancing economic competitiveness, quality of life and a dynamic image -a key urban imaginary for the emergent 21st century city.”* (Taylor Buck & While 2017, p.503)

Nevertheless, the Smart City promise hides different undesirable consequences that may appear following the dominant global Smart Cities narratives. Falling into overoptimistic and technologically deterministic discourses may hinder socio-environmental justice. There is a risk of reducing urban solutions to technological and engineering practices, assuming that the implementation of those innovations lead automatically to an urban sustainability improvement (March 2018), while other non-technologically salvageable problems or non-technological effective solutions remain aside (Vanolo 2013).

Already mentioned, Smart City can also fall into a mere economic instrument (Wiig, 2016 in March (2018)) trying to solve socio-economical crisis with private sector as main agent for change, starring its own concerns and imaginaries, rather than those pursued by public sector (Vanolo, 2014)(March 2018). This solely technological perspective may fall into a socio-technical lock-in, preventing other alternative socio-technical arrangements to emerge (March 2018)) and keep ongoing the hegemonic understanding of Smart City. Another economic consequence is the tendency to redirect the target to wealthier sector, where the economic flows, leaving other nuclei behind, for example, prioritizing some cities and forgetting about others (Taylor Buck & While 2017) which may still present socio-environmental problems.

Main features of the smart cities imply not only those referring to technological innovation, but also processes of governance that cover its political understanding and managing of the economic and public values. Artifacts do have politics (Winner 1986), and these are embedded in cities, already configured by specific politico-economic dynamics and power relations (Carvalho 2015). Each city is different and prefabricated solutions may not work in all of them (Mosannenzadeh et al. 2017). This may not happen in Smart Cities built from scratch, where the fetish Smart City seem closer to reach, but when attending already made cities, some social groups with limited access (aging population, migrants, poverty) remain overshadowed and displaced by digitalization and sensed urban environments (Angelodiu 2014). Focusing too much in the democratization of technology can forget the social and political assemblage where it is embedded, risking other more effective and long-lasting solutions (White 2016), such as behavioral change, social and ecological justice and participation.

There is also a complex material perspective attached to production of ICT and Smart City devices, paradoxically said to be a contributor to the decrease of materialistic economy (Berkhout and Hertin, 2004 in March (2018)). Contradictory, devices production have some post-implications such as a rebound effect (Jevons paradox)(March 2018), that could increase resources con-

sumption, and other concerns regarding its origin, production and even transportation. The extraction of some of the materials which devices are composed of, are already known to be controversial, not only because their conflicts behind, but also because difficulties and concerns on their recycling processes (Berkhout and Hertin, 2004; Williams, 2011 in March (2018)). E-waste is indeed a problem in a short shelf-life technology paradigm or because its tendency to upgrade (Mosannenzadeh et al. 2017).

While some authors will underline that Smart City should keep on with a growing path tendency (wealth and representation) (Kourtit et al. 2012), others will stress that sustainability and participation are outcomes (often classified in post-material outcomes) meant to be strengthened. This falls into a division of Smart City dimensions between economic growth vs. environmental protection and structured order vs. participation (Meijer & Bolívar 2016).

Beyond the aforementioned "quick fix" pretended from efficient technology, there is still interest and room for more inclusive and participatory uses of the same, calling for "another kind of smartness" (Hollands 2015). One which strengthen multistakeholder engagement in drive for long-lasting solutions. Sustainability and social inclusion could be fostered through stimulation of value creation in regards not only to urban governance and management, but also to design, production and consumption of technology, from DIY sensors, mapping apps, fablabs, hackerspaces and makerspaces. The aim in this alternative smartness is more directed towards a vindication of neglected urban problems, such as health issues or urban pollution, carried by a citizen based co-production of knowledge and looking forward to "produce data, make visible hidden urban problems and organize contestation" (March 2018, p.1695).

For instance, grassroots have achieved housing access in North American Cities (Shelton et al. 2015), while MediaLab (Urban Living Lab in Madrid) offers a Fablab in which citizens can engage and participate in research activities and programs or just simply repair in digital fabrication workshops.

In regards of those Fablabs and together with Makerspaces and Hackerspaces, they have the potential to bring citizen agency and open a window to alternative design and production away from a market-oriented urban governance (Kostakis et al. 2016). Anyways, this is not a new panacea for reverting the actual systems of production and design. Rather, it is calling for a technology serving citizen's concerns, being open and participatory, furthermore and ideally, aligned with the 8 R of Latouche: "re-evaluate values; re-conceptualize entrenched concepts; restructure production; redistribution; re-localization of the economy; reduction; reuse; and recycling" (March 2018).

### **Smart City, Sustainability and ICTs**

When digitalizing the city, Information and Communication Technologies represent a main language to shape the infrastructures of the "smart". ICT is contemplated as a set of tools for conveying governance and management.

Smart City is usually framed under six characteristics (Giffinger et al. 2007); Smart Economy, Smart People, Smart Governance, Smart Mobility, Smart Environment and Smart Living. ICT sets itself within all of them.

- Smart Economy: referring to economic competitiveness, entrepreneurship, innovation, productivity, flexibility and trademarks and their integration in the national and international. ICT is closely related to industrial innovation.
- Smart People: human capital, quality of social interactions and the role of ICT to address participation.
- Smart Governance: referring to citizen and other stakeholder participation in the political and administration. ICT could allow co-creation as well as citizen's concerns and needs so they can participate in decision making processes through instruments for collaboration, service integration and data exchange (Maltby 2013)
- Smart Mobility: transport systems through use of ICTs also for interconnection at local, national and international level (Bifulco et al. 2016)
- Smart Environment: conservationism, pollution, environmental and species protection and resource management through efficiency and substitution of natural resources Tang et al. (2019).
- Smart Living: identified not only with well being, housing, culture or health but also to tourism.

The way that ICT gets involved in these characteristics is by getting data, processing and interpreting it. Hardware and software are the needed technological elements. Some of the features that ICT encompasses are database technologies for health and energy efficiency, GPS, mobile technologies for engaging with people and pattern recognition software (Bulu 2014).

From Bifulco's et al. literature study of relationships between ICT and the different six characteristics of the Smart City, results show that there is a principal close relationship between ICT and people, based in a sense of community enhancement driven by mobile phone apps and information availability. Secondly, a strong link between ICT and living, closely related to people driver, where ICT is "seen as a method of improving service provision to communities" (Bifulco et al. 2016). Thirdly, ICT and environment, founded on sensor networks performing waste and water management.

However, when relating these characteristics to sustainability, it appears that governance is the main carrier, seen as the node of citizen and other stakeholder value co-creation. Governance is followed by economy, justified by the innovation and competitive smart city projects. Thirdly, sustainability and people.

In this way, it makes sense to emphasize sustainable governance interlinked with the use of inclusive or co-created ICTs with the people (users).

### 4.3.2 ICTs and co-creation

Having already explored the different uses of ICTs in the urban context and its relationship with sustainability, we will now focus once again in the concept of co-creation and particularly how it intersects with ICTs. In this regard, Dörk & Monteye (2011) classifies the use of digital tools for co-creation in three categories: (1) understanding urban reality or deciphering the urban code, (2) improving the city or filing bug reports and feature requests, and (3) re-imagining underlying principles or hacking the city.

- **Deciphering the urban code** refers to the practices by which citizens make sense out of the urban complexity, while creating streams of data and information about urban themes such as energy usage or mobility. Digital tools can, in this sense, further citizen engagement and generate a collective understanding around urban issues relevant for the communities involved (Dörk & Monteye 2011).
- **Filing bug reports and feature requests** refers to digital instruments that allow communities to raise their concerns, report issues, or even engage in long-term campaigns advocating for general urban improvements. The challenge in this aspect is *"to help people and groups extend their impact and connect activists with related causes"* (Dörk & Monteye 2011, p.3).
- **Hacking the city** refers to practices related to the previously mentioned "fourth sector", in which communities self-organise in opposition to traditional top-down modes of governance. The activities can be diverse but the core distinction with the two other forms of participation relies in the subversive and transgressor nature of this approach, which is aimed towards a temporary and experimental re-imagination of the urban sphere (Dörk & Monteye 2011). The ways in which this network of actors can be integrated into the governance sphere is referred in literature as "hybrid governance" (Mäenpää & Faehnle 2018), and its relevance lies in the interaction processes between different societal actors itself, rather than in the decision-making power that emerges from the collaboration (Lehtimäki et al. 2020).

From this categorization we can see that ICTs can contribute to generate co-creation understood as a social innovation, but not necessarily. In this regard, Elstub et al. (2019) uses the concept of "civic tech", which is related to the concept of "smart governance", to refer to technologies that help citizens *"to access government data, rate services, report problems, enter into dialogue with policy makers and service providers, and, in a growing number of instances, participate in the design of budgets, policies, laws, and even constitutions"* (Elstub et al. 2019, p.105). From this definition, we can see that the previous categorization intersects with the notion of "civic tech", but also expands it by including non-formal state-citizens collaborations (hacking the city) as a form of co-creation that fundamentally changes the relationships between actors that govern the sustainable transformation.

To conclude, it is relevant to reflect on how ICTs can facilitate co-creation understood as a methodology to generate social innovation. The diversity of methodologies and their practice-oriented nature makes it hard, and also not desirable given the complexity of the discussion, to present a master framework with prescriptive guidelines to co-create social innovation. That is why, we will define a set of practices that can support co-creation in its multiple understandings. Hughes (2020) classifies these digital practices in: (1) argument visualisation: tools that allow to visualize different arguments of a discussion, (2) co-drafting: tools to edit and work on texts, (3) commenting/feedback: tools to gather insights on pre-written texts, (4) crowdmapping: tools to report issues or make suggestion on a location map, (5) decision-making: tools to organise discussions with an emphasis on making decisions, (6) discussion forums: tools to encourage deliberation, (7) ideas generation: tools to submit ideas given a question or challenge, (8) interactive Q&A.: tools to gather questions during an online or physical conference, (9) interactive whiteboard: tools to gather insights similarly to a physical whiteboard, (10) knowledge base: tools geared towards gathering knowledge in a collective way, (11) video-conferencing: tools to conduct meetings in a non-physical way, and (12) voting/prioritisation: tools to vote proposals/ideas and the like.

#### **Conclusions from chapter 4 and further steps**

- ULLs represent a real life simulation where several actors are involved not only in the creation of sustainable socio-material practices, but also (ideally) in the governance of the sustainable urban transformation.
- The closer to the changing conditions of the city, the higher contingency level the laboratory has, being this contingency reached through user involvement and its multiple visions through co-creation processes and ultimately leading to governance.
- Control (referring to the limits of the laboratory design) and contingency (unexpected relations) will help to categorize our cases by type and also to orientate co-creation within the labs
- Co-creation can be understood as an ideal type of collaboration between relevant stakeholders aimed towards enacting a sustainable transformation, but the practices in which co-creation materializes can be problematized in many different ways.
- ULLs understand the concept of co-creation mainly as a innovation process, that is, a methodology to generate social innovation and in doing so, a governance innovation itself since it rearranges the relationship between the stakeholders.
- The concept of Smart City can or cannot be related to sustainability, depending on the understanding of the latter, and therefore the use of ICTs in this context is potentially sustainable but not necessarily.

**Conclusions from chapter 4 and further steps**

- We will use Dörk & Monteye (2011)'s typology to classify the different uses of ICTs for co-creation in chapter 6, and Hughes (2020)'s work to classify the functionalities of the ICTs in chapter 5.

## 5 | Digital tools

This chapter will provide the foundation to answer the third sub-question of the project:

*What are the characteristics of the digital tools that support a sustainable urban transformation?*

In order to do so, as expressed in chapter 3, we will identify a series of digital tools that will be then, classified according to a series of parameters with the intention of identifying tendencies, commonalities and differences between the tools.

The chapter is structured as follows: methodological considerations about the recollection of tools, methodological considerations about the classification of tools, presentation of results and finally an interpretation of the latter.

Before moving into the bulk of the analysis, it is relevant to note that we are building on top of the previous sections and that is why at this point of the report, we have already scoped how do ULLs understand a sustainable urban transformation and based on that, we will be focusing on co-creation - understood as a methodology to foster social innovation.

### 5.1 Methodology for the recollection of tools

The digital tools that we will be presenting have been collected from multiple sources. These sources have been:

- JPI Urban Europe
- Digital tools database by Hughes (2020)
- Tesserae Urban Social Research



## **JPI Urban Europe**

JPI Urban Europe was launched by the European Commission in 2008 as a knowledge hub for European projects addressing a sustainable and innovative urban transition. Even if not all the projects that belong to the hub use the approach of Urban Living Labs, it is part of their strategic vision on how to conduct research (JPI Urban Europe 2015). In this sense, taking as a point of departure the 84 projects that comprise the JPI's database, we explored on a case by case basis the documents available for each of the projects looking for insights about their methodologies and therefore, digital tools that could apply to our collection. Since most of the projects did not include that kind of information, we opened up the investigation to related projects. The way in which we did this was by exploring the partners behind some of the most appealing projects and seeing what kind of projects they were involved, even if it was not under the framework of JPI Urban Europe, to then look for the same information that were looking from the JPI's projects.

## **Digital tools database by Hughes (2020)**

This database has been created by Involve, a public participation charity from UK, whose work is focused on improving the current process of democratic decision-making through the promotion of openness, participation and deliberation. More concretely, this database has been created as an answer to the COVID-19 crisis in collaboration with other practitioners in order to provide a set of tools to foster participation, collaboration and discussion. As expressed in the theoretical framework, we are using their typology to classify our own set of tools, while at the same time establish a connection between how governance innovations can be used as a methodology to create social innovations.

## **Tesseract Urban Social Research**

Tesseract Urban Social Research is an independent research organization based in Berlin. Throughout their involvement in multiple projects at the local, national and European level, they have developed a set of techniques and methods to engage with local communities in the co-production of these same projects. Currently, they are putting together all these methods into an overall methodology, which is one of the tasks where one of the writers of this thesis was involved while doing an internship there in the autumn of 2019. Building on top of that previous work and an on-going collaboration, more digital tools were identified. The previous work already involved a mapping of co-creation tools to expand the ones used by Tesseract, and the current collaboration consists in an informal supervision by which we are updated on the progress of Tesseract's methodological framework, we are given theoretical support (specifically on the concept of co-creation, as expressed in section 3.3), and suggestions about relevant tools that might be applicable for our research.

### 5.1.1 Criteria for selection

Given the diversity of ICTs used in the context of the projects researched and the multiple definitions of co-creation, it was not clear where to draw the line in what tools to include and which not. In this sense, the filter needed to be adjusted depending on each tool, since not the same information was available for all of them. However, there were a few criteria that were consistent in the inclusion or exclusion of a tool.

#### Inclusion

A tool was included if the information available provided enough evidence that:

- it had been used in a social innovation project as a co-creation tool.
- it understood co-creation as an innovative approach to governance.

#### Exclusion

A tool was excluded if:

- there was not enough information to classify them according to our categorization.
- it was the result of a co-creation process but its purpose was not to co-create.
- it was a digital tool to improve governance but it did not have a focus on the co-creation of solutions.

## 5.2 Evaluation of the tools

The aim of this analysis is to identify the characteristics of the digital tools used for co-creation, which is why the procedure will consist of classifying each tool according to 5 categories and then identify what is predominant in every category and what is minority. Moreover, we will go further into the interactions between the different categories in order to determine possible correlations. However, not every interaction between the categories will be presented based on the subjectivity of the researchers and their perception while conducting the classification of the tools.

### 5.2.1 Classification of tools

The tools have been categorized according to 5 criteria: (1) purpose, (2) proprietary status, (3) independence in its use, (4) technical expertise, and (5) usability.

#### **Purpose**

The purpose of the tool will be evaluated according to the 12 categories defined by Hughes (2020), who places the emphasis on the functionalities of the tool. These categories are (1) argument visualisation, (2) co-drafting, (3) commenting/feedback, (4) crowdmapping, (5) decision-making, (6) discussion forums, (7) ideas generation, (8) interactive Q&A, (9) interactive whiteboard, (10) knowledge base, (11) video-conferencing, and (12) voting/prioritisation.

#### **Proprietary status**

The proprietary status of the digital tools refers to the property of the software. It can be either open source or proprietary software, meaning in the first case that the source code of the software is open and can be modified and distributed freely, and in the other case it is not accessible since the source code is privately owned.

#### **Independence in its use**

The independence of the digital tools refers to whether the tool is freely integrable with other tools or if its use is prescriptive, meaning that it is embedded within a larger process. A tool will be classified as integrable if it is process-oriented but could be changed via a different use or a source code change.

#### **Technical expertise**

The technical expertise that requires to use a certain tool will be measured according to the programming knowledge that it requires to have in order to start using it: (1) it does not require any programming knowledge, (2) it requires amateur programming knowledge, and (3) it requires professional programming knowledge.

#### **Usability**

The usability of the tools refers to whether or not the tool could be directly used if wanted to.

## 5.3 Results

This section will present the results extracted from the categorization of the tools, which can be looked in detail in the appendix A. A total of 55 tools were identified.

### 5.3.1 Purpose

We can identify three tiers:

1. Ideas generation (25 tools) and voting/prioritisation (21 tools)
2. Co-drafting (7 tools), commenting/feedback (8 tools), crowdmapping (9 tools), decision-making (5 tools), discussion forums (11 tools), interactive Q&A (5 tools), interactive whiteboard (9 tools), and video-conferencing (9 tools)
3. Argument visualization (2 tools) and knowledge base (3 tools)

It is clear that there are two functionalities that most of the reviewed tools had: ideas generation and voting/prioritisation. And on the opposite of the spectrum, two functionalities that most of the reviewed tools did not have: argument visualization and knowledge bases.

It is worth noting that most of the tools had more than one purpose and that is why, the sum of the functionalities does not add to 55.

### Interpretation of the results

Most of the functionalities have in between 5-10 tools from which one could decide, but there is a clear distinction between the two extreme tiers. Argument visualisations and knowledge bases are functionalities only provided by 2 and 3 tools respectively. This could be attributed to two reasons: (1) they require a stronger level of engagement in both cases since the creation of knowledge bases requires a very committed community, and argument visualisations require big amounts of data to be generated, and (2) in the case of argument visualisation, it sometimes relies on artificial intelligence, which it is not an easy technology to develop and implement in a software.

On the other side of the spectrum, ideas generation and voting/prioritisation were the two functionalities that most of the tools had. In the case of ideas generation it can be linked to the concept of brainstorming, which is a fundamental part in the concept of innovation, and in the case of voting, it could be due to the fact that it represents the easiest way to express support or disapproval.

### 5.3.2 Proprietary status

From the reviewed tools, 11 were open source and 44 were proprietary software. There is open source software for most of the functionalities except: crowdmapping, interactive Q&A and interactive whiteboard.

#### Interpretation of the results

As one could expect, it is evident that there is more proprietary software than open source software among the tools, which reaffirms the big dependability of co-creation processes on commercial solutions. Moreover, it is not clear the extent to which these open source solutions can replace their proprietary counterparts.

### 5.3.3 Independence in its use

From the reviewed tools, 46 were integrable with other tools and 9 were process-oriented. Moreover, all the open source solution were integrable with other tools and processes, which was not the case for the proprietary software, 9 tools were process-oriented and the 36 left were integrable.

#### Interpretation of the results

The fact that all open source solutions are integrable to other tools happens in two levels: (1) they are integrable in the sense that they can freely complement other tools in a co-creation process and (2) they could be modified and thus, they could integrate or be integrated into other tools with an adequate programming knowledge, which in some of the cases only required to follow a guide. The tools that are process-oriented cannot be integrated into other tools in the same two levels: (1) the process that they are part of is prescriptive and it is only understood as a whole, and (2) their source code is not modifiable and even if it could it was not designed to be integrated to other tools.

### 5.3.4 Technical difficulty

From the reviewed tools, 49 did not require any programming knowledge, 2 require basic programming knowledge, and 4 require professional programming knowledge. All the tools that require programming knowledge (either amateur or professional) were open source tools.

## **Interpretation of the results**

It is obvious that only open source tools require programming knowledge in order to implement them. The technical difficulty comes as a double-edge sword by which the tools can be modified, embedded within others and tailored to each project, at the expense of requiring variable levels of technical expertise.

### **5.3.5 Usability**

From the reviewed tools, 42 were directly usable, 12 were available on request and only 1 was not available as it was part of a specific project. There is a strong correlation between the tools that were directly usable and the tools that were integrable, since all of the directly usable tools are integrable. However, this does not apply the other way around and not all the integrable tools are directly usable (4 tools are only available on request). Similarly all the process-oriented tools are only available on request.

## **Interpretation of the results**

It is evident that most of the tools are directly usable, which facilitates the use of one tool or another. However, we must take into account that the condition of directly usable is not accounting for the time or money invested in the process of starting to use it but rather the possibility of doing so. In this sense, this is the reason why there are 4 integrable tools that are not directly usable: because it requires to go through a demo first (monetary and time constrains). In the case of the process-oriented tools they are clearly only available on request as they require they counseling of the creators in order to implement it appropriately.

**Conclusions from chapter 5 and further steps**

- The reviewed tools cover all of the functionalities defined by Hughes (2020), with a special emphasis on tools to brainstorm and to vote between ideas. There are not as many tools for argument visualisation and to generate knowledge bases.
- Most of the tools are proprietary software, but there are still open source software for most of the functionalities. However, these tools require variable levels of technical expertise.
- Most of the tools can be used independently, and only a part of them are conceived in a prescriptive way (only proprietary software).
- In order to gain more insights about the tools and their usage, chapter 6 will dig deeper into the context in which some of the tools are used.
- It is needed to identify how do these characteristics interact with the limitations of online co-creation, which will be looked in chapter 7.

## 6 | ULL Cases

This chapter will answer the sub-question:

*"How do ULLs understand co-creation based on their design and their use of ICTs?"*

Three cases of urban laboratories that use ICT to carry out certain parts of their co-creation activities are described below. The intention is to investigate their design and their co-creation processes based on the descriptive information gathered from their website, documentation and interviews, so that we can have a better understanding of how each laboratory is heading towards a sustainable transition, explore the use of their tools within an actual context and study the relationship they have with co-creation.

Based on that, each section will include a summary of the characteristics of the case, covering a brief description, history and purposes, co-creation understandings and tools explanation.

After that, an analysis for each case is driven with the previous information; first classifying the ULL by "design" and "disposition" typology, with Bulkeley's concepts of control and contingency already explored in section 4.1.2. Secondly, interpreting their understanding on co-creation - taking into account the terms co-design, co-option by the state, knowledge and innovation - based in section 4.2, and thirdly an analysis of their tools regarding Dörk & Monteye's classification (Section 4.3.2).

### 6.1 Terrifica

Terrifica project emerged in January 2019 with a three and a half years of activity (ending in 2022) and supported by European Union's Horizon 2020 programme. Its aim is to *"set up tailored roadmaps and key performance indicators of the of the developed methodologies and climate change adaptation and mitigation activities in regional practice"* (Terrifica 2019).

- Climate change mitigation refers to efforts to reduce and/or prevent greenhouse gases emission. Actions cover enhancing efficiency and innovation on technology, use of renewable energies or changing consumer behavior, to mention some (European Commission).



- Climate change adaptation refers to those actions trying to cover the anticipation of adverse consequences of climate change in order to prevent or minimise the damage caused. Examples include setting aside land corridors for helping species migrate, use resources more efficiently or building flood defenses (European Commission).

Terrifica searches to co-create solutions by empowering local communities in partnership with regional authorities and policy makers through workshops and summer schools. Its focus sets on research, regional innovation and stakeholder engagement via feedback loops.

Ultimately, knowledge around climate change and innovative climate action are meant to be explored in this co-creative multistakeholder approach. Terrifica operates in six different pilot projects placed in Brittany, Normandy, Minsk, Poznan, Belgrade and Barcelona. All them considered as Living Labs and coordinated by WILA Bonn (Bonn, Germany). In those Living Labs, stakeholders - science, academia, education, civil society, policy makers and business - work together to develop and experiment co-created activities.

Many methodologies cover Terrifica co-creation, co-design and participation goals (for engaging, communicating, ideating, co-designing, co-creating, co-making...) Most of them are designed to be used physically at workshops but, because their international character, several activities already happen in a virtual space (Steinhouse, 2020). Amongst all, a geo-questionnaire or crowd-mapping tool constitutes their ICT tool which aims to engage participants. In a geo-questionnaire, participants sketch or mark geographical issues on an interactive map. This is a method of crowdsourcing that fulfills a double task: on the one hand to create public participation, and on the other hand to trigger more questions about a location. It is useful in order to gather citizen knowledge and to identify key players. This way, the people are invited to put a mark on the map and later on they will be asked to meet with the rest of stakeholders: municipality, engineers, urban planners... to research an answer for the particular problem. People are also seen here as an agent to maintain a "green space" (Steinhaus, 2020) by awareness and engagement. Regarding other ICT tools, it is not clear where they will be placed, since their use will depend on the results and solutions coming from the mapping tool. Steinhouse states some examples such as fog or polluting sensors whose data would be digitally collected.

### **Terrifica on Co-creation**

Terrifica gathers several actors, from scientists, civil society organizations, policy-makers, education and businesses of all the six pilots, which are seen as "living labs". That is why, co-creation and stakeholders' engagement is at the top of the project. Co-creation in Terrifica finds its means through core groups where stakeholders are directly involved, participation workshops or trainings, and crowdmapping or summer schools for targeting a wider public and further get it all together in sake of research. Citizens who put a mark on the map are also invited to research solutions for the observed problem together with the rest of stakeholders (architects, urban planners and the like) (Steinhaus, 2020), thus attaining direct participation from civil society on co-designing the mitigation and adaptation measurements. In order to

engage multiple stakeholders and get the co-creation process started, Terrifica calls for a higher degree of participation. Citizens are considered a key element to avoid further conflicts, meant to be involved in local community planning. In their pilot regions, a lack of citizen involvement in public policy-making has been observed, prior to already existing conflicts in policy-making institutions, tension between economic interest versus general and climate action interest and visions, conflicts on the public communication and expertise on climate change and a lack of ambition on climate actions.

Steinhaus understands co-creation as a continuous process together with all relevant stakeholders in which mapping provides the information to reveal the problems further developing a design-thinking to reach for common solutions (Steinhaus 2020). Thus, everybody should have a room to count with every idea.

### **Mapping Tool**

Terrifica frames this tool by allowing population to help build a map with the region's main climate threats, getting an overview of the actions to foster a competence in climate change adaptation and mitigation action. From climate change's adverse effects to positive adaptation measurements, participants are able to stress them and make comments to illustrate the issue by putting a mark on the map.

Crowdmapping allows to gather data further contrasted with other official data collections, valued and reviewed so as to develop co-creative climate change adaptation and mitigation opportunities. It is possible to work with a large number of stakeholders and initiate their engagement and process of co-creation. Also it aims to be an inclusive approach and could potentially drive to "learning by doing". It not only provides geographical data, but also descriptive information. Likewise, it also lacks of a complete trust and data quality, may carry digital exclusion, need for technical skills or costs for licenses, maps and server renting.

#### **6.1.1 Terrifica Analysis**

##### **Design and disposition: Strategic Platform**

Due to its large scale programming and design, with multiple actors involved, its international character, non-continued funding, and such concrete objectives, Terrifica project could represent a strategic platform. Nevertheless, its aim is not that of an economical or competitive nature, rather one of knowledge creation with research institutions as partners for international priorities. Terrifica has a high level of contingency by creating conditions for new socio-material relations which arise through initiatives such as summer camps and the crowdmapping tool. For the moment, it also has no demonstrative traces from experimentation nor for providing a showcase or exhibition or serving as a test-bed. All together, Terrifica's disposition is closer to that of a platform where to curate connectivity through all actors involved, get together new entities, get interaction and circulation with limited control on the outcomes. Nevertheless,

there are limitations due to its scale and multiple strategic interests on involving multiple social and material entities, difficulties to get enough citizen participation and enacting ground governance, even though citizens are meant to be included from the first stage till solution processes. But, at the same time, there is an emphasis on international communication in order to explore across different contexts, which points towards a scaling for sustainable transition pathway.

### **Co-creation in Terrifica's design**

In this way, Terrifica lays its foundations for co-creation in the development of bi-directional knowledge within the tool, in summer camps and workshops, not only for the citizens themselves through awareness and engagement, but also for the benefit of a broader community of experts, academics, urban planners, municipalities and other stakeholders. The divisory line between researcher and subject of research disappears by engaging users who participate in the crowdmapping with the rest of the stakeholders in workshops in search of solutions for mitigation and adaptation measurements. Based on that, co-creation in this case is a methodology to generate social innovation and, therefore, a governance innovation as well.

### **Terrifica Crowdmapping as a co-creation tool**

Regarding the use of the tool, there is a clear focus on "deciphering the urban code" and data gathering by mapping the observations of citizens in reference to climate effects, generating data and information in line also with "filling bug reports" and being open to the requests of the people who put a mark on the map by later physical gatherings with the rest of stakeholders. ICTs in Terrifica context point towards social learning and approaching governance innovation by being an open tool for the citizenship to rate, report climate adaptation and mitigation problems or advantages and enter into dialogue with experts.

## **6.2 SYNCITY**

SYNCITY is a project based in Cureghem, a central neighborhood in Brussels characterised by poor living conditions, unemployment and deindustrialization. SYNCITY describes itself as an Urban Living Lab looking for an integrated and participatory neighborhood planning for desirable and sustainable urban development projects. This lab is funded by regional, national and international authorities together by research institutions and state intermediaries such as JPI Urban Europe. Their project in Cureghem develops a toolbox for European municipalities to better implement stakeholder integrative and sustainable urban transformation processes in the future.

For developing this innovation, they count on the interests and needs of the residents in the Cureghem neighborhood so they "don't fall over the cliff when it comes with participation or how the neighborhood develops in years" (Stollenwerk, 2020) and get it together with the municipality via a digital tool to get in touch with the people and their concerns.

The lab is focusing in three main objectives: Three Urban Design Solutions, an Urban Innovation Toolbox and an European Network "Creating Cities Together" (Syncity 2020). Specifically, in their Urban Innovation Toolbox they provide a guide for municipalities including a stakeholder mapping tool and an ICT tool for awareness raising and bottom up narratives, also known as Cureghem Tales.

### **SYNCITY on co-creation**

Co-creation is focused on stakeholder engagement for SYNCITY. A first stage lies on looking for stakeholder insights and key actors having a role in a social-cultural landscape together with consortium partners. In a second phase, they reach stakeholders that have an in-depth engagement in the neighborhood. And a third stage targets those actors who are likely to maintain the project after it is finished and aims to spread the results into the European level. Stollenwerk (2020) talks about an interdisciplinary and multidisciplinary approach involving, social scientists, architects, urban planners and local knowledge.

Community building is also an ultimate idea of SYNCITY through their tool Kju:Ti (explained below). Not in an explicit or obvious way because the tool works anonymously due to data privacy and protection. But still, building community within the community, as it happens for example with people with children (Stollenwerk 2020), where parents or tutors with children are getting similar questions based on their interests, materializing in map spots in form of unsafe areas or recreational areas, thus co-shaping the neighborhood.

### **Kju:Ti**

At the beginning SYNCITY thought about working with mapping tools but found difficulties to use them in Cureghem context as "you don't really know what information is necessary to start creating a map"(Stollenwerk, 2020). That's how the use of Kju:Ti emerged: it brings an information gathering that further could be mapped. Already described and clasified in 5, Kju:Ti is a mobile app for Android and Apple through which messages with questions appear, and the users can reply and also trigger other questions for data collection purposes. Once again, SYNCITY also sees citizen's participation as a key piece for co-designing, gathering valuable information to be treated by urban planners, architects and the municipality.

However, the tool also has certain challenges. For example, in the neighborhood of Cureghem, in a context strongly marked by immigration and rotation, languages are diverse: Romanian, Polish, French... there is not a common language and SYNCITY was forced to reduce them to have a functional platform (Anranter, 2020). This conflicts especially with regard to the construction of narratives, since these are basically built upon language. Meanwhile, another problem arises in terms of infrastructure: SYNCITY tries to provide WiFi in certain parts of the neighborhood, but it is still unclear how well users can connect to the internet. This carries with it the need to reduce the data content from the team on Kju: Ti platform to make it more easily downloadable and even cheaper (Anranter, 2020).

Cureghem Tales are one of Kju:Ti's consequences to explore, this tales are brought by individ-

uals' live history and developed as a narrative in a manual way (so far) with data collected from the tool. Stollenwerk and Anranter show interest in further developing this tales through an automatized extra tool.

### 6.2.1 SYNCITY Analysis

#### **Design and disposition: Civic Enclave**

From the description above, we conclude that SYNCITY represents an ULL designed on a civic basis, where interests on the economic is not the priority, neither the trial of specific innovation. Rather there is a focus from local and regional authorities together with research institutions on this stand-alone project that could serve as the means to transfer research into demonstration for other experiments. This clearly carries a certain level of contingency reflected in the randomness of interactions and interventions with neighborhood residents and their alternative visions of the future with other entities, despite having concrete objectives, questions, problems and solutions as a result of their relations with strategic national state priorities and the focus on the development of their digital tools. Added to these last control conditions is the fact that this case has marked limits for action - the neighborhood as a microcosms - , which is considered within the laboratory while the rest of the city remains outside. This combination of control and contingency makes SYNTICY as a candidate for an enclave disposition rather than a demonstrative lab. Limitations on resources (as we have seen regarding internet facilities for the neighborhood) and on the design of the tool, influence their autonomy, thus determining their urban transformation. Something similar happens regarding limitations when getting multiple social entities from ground governance, where language is a barrier (Stollenwerk, 2020) and hinders interactions and governance.

#### **Co-creation in SYNCITY's design**

SYNCITY uses both physical and digital tools to gather knowledge from the citizens to transfer it to the municipality and the set of architects, urban planners and social scientists for urban development purposes. In this case there seems to be a division between the researchers and the subject of research. In fact, co-design here takes as a point of departure, citizen's needs and concerns but it remains as data for the stakeholders mentioned above and not directly involving such civil society in the solution-making process. This does not classify as co-creation understood as knowledge, where knowledge is meant to be a bi-directional process, but rather as co-design, meaning that the citizens' input is used by the other stakeholders to design the urban environment. Moreover, innovation in this project is directed towards the development and testing of the Urban Innovation Toolbox, thereby using co-creation as a methodology to generate innovation but not substantially changing the relationships between the stakeholders and therefore not innovating in the governance sphere.

#### **Kju:Ti as a co-creation tool**

Being designed as a Q&A tool, Kju:ti focus is, on the one hand, to "decipher the urban code" with pre-determined topics that the citizens can answer, and on the other hand, to "fill bug reports and feature requests" since it allows to citizens to launch their own questions. There is a limitation in how the tool engages with the citizens due to language constraints.

## 6.3 ParticipaLab in MediaLab Prado

MediaLab is an Urban Living Lab located in Madrid coordinated together with Área de Gobierno de Participación Ciudadana, Transparencia y Gobierno Abierto (Government Area of Citizen Participation, Transparency and Open Government). It defines itself as a "space in which anyone can collaborate with others, produce knowledge in experimental forms and generate models that can later be replicated for the common good". Physically it consists of three work rooms and three open spaces with capacity for more than 300 people. Main topics along the years have covered information and transparency, environment, urban planning, participation and democracy. Its action is not only reduced to city centre but they operate in five Madrid districts by pop-up laboratories rotating through every neighborhood. Within MediaLab several "sub-labs" can be found, encompassing areas such as citizen science (Ci-CiLab), data gathering (DataLab), 3D modelling and fabrication (PrototipaLab), innovation (InCipaLab), audio visuals (AVLab) and citizen participation (ParticipaLab). Each of them has several activities or programs being carried on over years, finished already or ongoing.

One of the ParticipaLab main projects, "Laboratory of Collective Intelligence for Democratic Participation" expanded MediaLab's activity to democratic innovation, currently closed because of change in city government. After three years of workshops, researchers, intellectuals and democracy experts ultimately developed a free participatory software, created in MediaLab, *CONSUL* which served as a digital platform of citizen participation, for Decide Madrid project (Noguero et al. 2019).

The way that Decide Madrid works with public participation is by two main lines: proposals and participatory budgets projects.

- **Proposals:** Decide Madrid is a basic discussion online forum where threads can be published by the citizenship as debates or proposals with the possibility to be "liked" or "disliked" together with commentaries. Those comments can be further branched leading into other threads. By joining citizen proposals to support online, the City Council of Madrid created a space for engaging in debates, sharing opinions and making proposals for designing the city. Once a proposal has reached a certain amount of support, it comes to a vote by postal, personally or via Decide Madrid Platform. Only two of the 26 000 citizen proposals reached the threshold (1% of registered voters). If the proposal doesn't reach the threshold, it comes to archive for one year.
- **Projects:** Parallel to proposals, participatory budgeting projects (managed by the City

Council) can also be supported by citizenship. Those most supported projects, will be then reviewed by a technical commission configured by administration employees and assigned a cost. After that, projects receive another round of votes by a "shopping basket" method; every district has a certain amount of budget able to spend. Each time a user votes for a project, the budget needed for the proposal is reflected in the screen (similarly as an online shop purchase). One can keep voting until reaching the budget assigned to the specific district. As long as the most voted project stays under the budget limit, it will be selected. Participatory budgets represent a way to assure projects without the challenge to reach the 1% threshold attained in the proposal methodology.

### **Proponent Communities**

Proponent Communities refers to the emergence of spontaneous communities resulting from Decide Madrid platform. Individual and fragmented online participation ends up transforming and clustering into real communities that can generate a self-managed deliberative process by making informed and collaborative proposals. Individuals from the generated communities ended up meeting face-to-face and as a result, more concrete proposals emerged such as "Right to play: for a more child-friendly Madrid", "Greener Madrid" and others. Collectives find a space, which is sometimes not endorsed or represented by any political figure (Bermejo, 2020), as is the case of an animal community that proposed a center to recover abandoned pets or shelters for women victims of domestic violence. Frustrated proposals and positive outcomes have both resulted from the experience. In worst case, proposals remain as a city "wish" while in best scenario, the platform represents a fact of listening, mapping and knowledge sharing exercise.

MediaLab explores a further use of another tool as a result of these Proposal Communities under algorithms such as Carrot2 (information retriever) and other techniques from the field of Natural Language Processing (NLP). Its objective here is to pre-design those Proponent Communities by requesting the user's interests and presenting their associated themes in thematic clusters. Thus, if one searches for a topic, a group of related proposals with along with the votes will be displayed. The themes are basically probability distributions on used words from which a thematic trace emerges. This could open the door to facilitate an interaction of users with common interests and finally leads to Proponent Communities.

### **ParticipaLab on co-creation**

MediaLab had already a history on co-creation, considered a Fablab in its beginnings and characterized by 3D design and open software technologies. As Bermejo recalls, architects got progressively involved in co-design processes, not only regarding objects but also urban spaces where citizens were able to include their own input and concerns. By MediaLab's definition, a citizen's lab should then involve a place enabling continuous exploration, slow reflection and creation of needs by engagement. Several spaces resulted from these bottom-up approaches with architects and artists, such as Matadero Madrid (<https://www.mataderomadrid.org>) and Basurama (<https://basurama.org>). MediaLab further expanded the spectrum by bringing in-

novation around open technological software for public participation in political arenas with ParticipaLab. Under ParticipaLab's framework, the citizen laboratory serves to explore new possibilities brought by public policies hand in hand with citizens. Bermejo talks at this point about a meta level of co-creation across citizens and municipality through lenses of city governance. Being involved with the Municipality definitively added value and catapulted ParticipaLab strategies in Decide Madrid platform (Bermejo, 2020). Co-creation in this "meta" terms claims for deliberation, data, information gathering and possibilities to create larger proposals, proposals going beyond the threshold which sometimes take the ultimate form of solidified communities, as happened with Proponent Communities.

ParticipaLab goes beyond face-to-face dynamics but maintaining human interaction at the core of the participatory process through inclusion and collective intelligence, looking towards common goods. Inspired in 15M movement, Decide Madrid tries to give voice to active members of society which could trigger a counterpower channelled on participation tools so it is possible to handle media agenda as well as establish the city's public policies.

### **CONSUL: the tool**

Decide Madrid uses "Ruby on Rails" programming language for the open and international CONSUL tool. CONSUL was created by programmers of the City Council of Madrid, voluntary collaborators, MediaLabs' #CodingMadrid program and UCM (Universidad Complutense de Madrid) through a master student's thesis. The code is publicly available, allowing fast error detection and inefficient practices, such as biased algorithms. CONSUL itself has created an international network gathering around CONSULCON since 2016 in MediaLab. Governments from around the world, already using the tool or interested on it have shared the experiences and got help to install this tool on their participation projects.

## **6.3.1 ParticipaLab Analysis**

### **Design and disposition: Civic Demonstration**

A civic design and practice is also present in this case, predominantly funded by municipality and coordinated by specific programs, but also having a high level of contingency translated into the creation of communities and urban civil society currently participating and creating in the many opened projects. MediaLab navigates between demonstration and platform dispositions, being some of the projects developed with replication pursues and preset conditions while others count with enough flexibility to arise by themselves and create new socio-material configurations. However, the majority of the projects will fall into demonstration disposition, as well as the sub-lab that we are focusing on, "ParticipaLab", which serves as a showcase of how democracy processes could look like through the use of their participatory tool. Scaling or transferring the tool in this case saw itself interrupted due to changes in the city council (Bermejo, 2020), which highlights the difficulties that experiments go through to upscale or roll-out across sustainable transition (Abdullah Almaqashi et al. 2019) and the limitations



that civic organizations, municipalities or research institutions suffer because of their limited autonomy or restricted resources.

### Co-creation in ParticipaLab's design

ParticipaLab's knowledge generation is bi-directional between the citizens and the team since the citizen's input is gathered thanks to the Consul tool in form of proposals and discussions, but also the citizens are invited to participate in the form of research groups and workshops that co-create solutions. Therefore, there is a mix between online and physical engagement. It is not clear, though, whether this bi-directional engagement fundamentally changes the relationships between the actors and therefore, their understanding of co-creation can be in some cases a methodology to generate social innovation, but also simply co-design.

### Consul as a tool for co-creation

The Consul tool, as expressed in chapter 5, covers the functionalities of ideas generation, discussion forums, voting and prioritisation, thereby helping "to decipher the urban code" and at the same time, "filling bug reports and feature requests" by allowing proposal for urban improvements. The proposals and discussions that citizens make are used as a knowledge resource for other citizens' and for ParticipaLab's team, which leaves space for the emergence of self-organised communities, as it happened with the part of "*proponent communities*", which can be understood as "hacking the city".

### Conclusions from chapter 6 and further steps

- Terrifica is a strategic platform that co-creates knowledge with stakeholders with a two-sided aim: to foster innovation in climate change adaptation and mitigation solutions, and to innovate in how these solutions are governed. Co-creation is thus, understood as a methodology to trigger social innovation. The process relies on both online and physical user involvement. The Terrifica crowdmapping tool is used to "decipher the urban code" and to some extent to "fill bug reports and feature requests"
- SYNCITY is a civic enclave that co-designs urban development by transferring knowledge from the citizens to the rest of stakeholders, without directly involving the user in their co-designing processes. The process involves both online and physical tools. The aim of the project is to generate innovation in how urban development is governed, however it does not fundamentally change the relationships between the actors involved, and therefore, co-creation is understood simply as co-design and not as a methodology to trigger social innovation. The Kju:Ti tool is used to "decipher the urban code" as well as to "fill bug reports and feature requests".

**Conclusions from chapter 6 and further steps**

- ParticipaLab in MediaLab Prado is a civic demonstration whose work is oriented towards innovating in the governance sphere. Their understanding of co-creation integrates both physical and online engagement, and it is, in some cases, a methodology to generate social innovation, and in others simply co-design. The Consul tools is used "to decipher the urban code", "to fill bug reports and feature requests", and to some extent "to hack the city".

## 7 | Social distancing in ULLs

This chapter will be answering the last sub-question of the report:

*How do ULLs see their work affected by social distancing?*

In order to do so, we will begin by explaining this in the context of our chosen cases, to then provide a bigger picture of the issue based on the webinar "*Moving Dialogues*", and finally discuss the intersections in-between these two parts.

### 7.1 Cases

The first part of our inquiry begins with an expansion of chapter 6, meaning that, while on the previous chapter we deepened on the understanding of the cases regarding co-creation and the use of ICTs, this part of the analysis focuses on the problems experienced by our cases regarding social distancing and their understanding of the threshold between face-fo-face and online interaction. As expressed in section 3.3, this part is based on the interviews conducted to the ULLs that were also used to answer the sub-question of chapter 6. It is worth mentioning that the case of ParticipaLab will only address the threshold between face-fo-face and online interaction since it is a finished project and they did not suffered the COVID-19 situation.

#### 7.1.1 Terrifica

**How have the COVID-19 context, particularly social distancing, affected the project and the already used tools?**

Terrifica is a project that develops on a European level, which is why the project already involved several activities that were conducted in the virtual space. However, the project partners were supposed to meet every 6 months, which due to current regulations is not possible, and thus, required to be conducted online. These online conferences needed to be expanded compared to the physical ones (from 2 days to 3,5 days).

Regarding the development of the project itself, the main focus of Terrifica was based on face-to-face work. The intention was to connect people that hadn't seen each other before and to create a commitment to develop solutions based on that. In this sense, the crowdmapping tool was used to gather data about how people perceived climate change on a local scale but also as a way to foster future engagement. Due to the current unpredictable regulations regarding social distancing, the project partners are thinking on new ways to make the tool still relevant and able to reach different audiences, e.g by encouraging people to map direct effects of the lockdown in the environment, but this is still not defined, it will be contextual to each of the cases that they are working on.

Beyond that, the social distancing context has required to cancel all physical events that were about to happen such as exhibitions and summer camps, and to extend the number of tools that they use involving in practices such as webinars.

### **Where is the threshold between physical and online interaction?**

The position of Steinhaus (2020) regarding the use of digital tools for co-creation is that they can be a substitute but not a replacement for physical interaction. In his understanding, co-creation is deeply connected to social interaction. The way conversations flow and spending big amounts of time together (e.g: summer camps) allow to make "friends", not only colleagues, which is foundational to co-create. However, he recognizes that the digital sphere allows to develop more focused work, which can be more exhausting but also a good solution for parts of the process that do not rely that much on the social element.

### **7.1.2 Syncity**

#### **How have the COVID-19 context, particularly social distancing, affected the project and the already used tools?**

The Syncity project was about to start the engagement process with the Kju:Ti app, but the social distancing regulations have affected them in terms of promoting its use. They were considering to do hold a meeting to launch and test the use of Kju:Ti, which has been postponed, and they were also planning some actions to promote the tool in the streets that are no longer possible (Stollenwerk, 2020).

### **Where is the threshold between physical and online interaction?**

The project is developing in a very particular neighbourhood, and therefore it is very important to be present to grasp the problems and the atmosphere, which is something that video-conferencing tools cannot do (Stollenwerk, 2020). The kind of knowledge that Kju:Ti

aims to obtain is highly reliant on a previous exploration of the neighbourhood in order to find possible conflicts and opportunities that do not appear on books and articles. In this sense, Stollenwerk (2020) emphasizes that Kju:Ti is a tool that builds on top of the work of the municipality and social workers that are already working with the community, also as a way to keep the community in contact and engaged.

### 7.1.3 ParticipaLab

#### Where is the threshold between physical and online interaction?

The ParticipaLab project considers physical encounters irreplaceable. Bermejo 2020 expresses this in the following words:

*"Face-to-face exchanges are not only what one can see, there is another dimension when it comes to gestures. Freedom of movement generates a type of relationships and exchanges of trust that the online can't provide"* (Bermejo 2020, translation by the authors).

He also references to the implicit bias of engagement towards certain demographics, that are not a representative sample of population. In this sense, online participation could exacerbate these biases or on the other hand it could make co-creation more accessible to everyone, by, for example, drawing random people into a participative process avoiding socio-economic/gender/race/age biases. Also, physical events are difficult to make them happen due to participant's constraints and thus, online tools could facilitate a certain flexibilization in this aspect.

Finally, Bermejo (2020) emphasizes how physical meetings are expensive and often have associate a high carbon footprint, which is why, in his opinion certain parts of a process could be easily conducted in an online manner. He mentions current technologies such as Zoom and their functionalities to split video-conferences in little groups and to create surveys that are answered instantly as a good example of this. He concludes that the social distancing regulations are opening up possibilities that were not being considered before by showing that some parts of the co-creation process can be done online, thereby allowing physical meetings to be done only for what is strictly necessary.

## 7.2 Webinar: Moving Dialogues

The webinar was divided in two sections: (1) benefits and opportunities, and (2) challenges and limitations, both referred to the necessity to move co-creation practices from the physical realm to the online.

### 7.2.1 Benefits and opportunities

1. **Saving costs.** Specifically cost associated to travel, venue rentals, food etc... Logistics costs which can re-channeled into conceptual work for online meetings.
2. **Increased flexibility.** It is easier to bring people together online than to do it physically
3. **More efficient.** Meeting are more focused and more structured.
4. Possibility to **connect with other digital tools:** e.g surveys, or send instantly documents
5. **Building new digital communities.** As a consequence of COVID-19, we have seen the need for people to be together and that is a possibility to bring communities together.
6. **Diversity.** E.g: narrow the urban/rural divide (overcoming mobility issues), or enlarging the types of audience that attends this type of meetings.
7. **Balanced participation.** Online participation provides ways to express through different media and overcoming barriers like: language, hierarchy, or shyness.
8. **Reducing carbon footprint.**
9. **Transparency and evaluation.** Digital tools make recording easier in order to share processes internally and externally. Also, collaborative tools provide transparency in terms of who has written what and how has a team arrived to certain conclusions.
10. **Experimentation.** The current situation allow practitioners to experiment with the interface of online and offline, which is also an opportunity to reflect on the ways in which one is trying to co-create with the stakeholders.

### 7.2.2 Challenges and limitations

1. **Inclusiveness.** The digital gap needs to be addressed, since there are groups who struggle in terms of access to a computer or even to internet. Moreover, online spaces are not necessarily neutral, and thus, online meetings can amplify existing dynamics of oppression.
2. **Restructuration.** What one can do in a physical meeting changes when it is transferred into the online sphere. Studies point towards a 90 minutes concentration cap online.
3. **Tech limitations.** There are limitations intrinsic to the use of computers and internet such as unpredictable technical difficulties. Moreover, first experiences participating in online meetings might be decisive for certain people, and that can be affected by their digital literacy
4. **Distractions.** One way communication can be exacerbated in online meetings.

5. **Dynamics:** It can be hard to create dynamics that function the same as they would in a physical environment, such as an atmosphere of brainstorming. Moreover, the social spaces are not there anymore which makes it harder to build a sense of community.
6. **Trust.** Trust is already hard to create with participants offline, which makes it almost impossible to create this kind of ties online. Online spaces can generate issues regarding the protection of data of the participants and how to make it transparent, which can affect the trust of the participants in the process.

### 7.3 Interpretation of the benefits and limitations in each case

Based on the classification provided by the webinar, and the interviews conducted with each of the cases, this section will identify what are the problems and opportunities that have arisen as a consequence of social distancing. The results can be seen in table 7.1.

Case	Benefits	Limitations
<b>Terrifica</b>	<ul style="list-style-type: none"> <li>- More efficient</li> <li>- Experimentation</li> </ul>	<ul style="list-style-type: none"> <li>- Trust</li> <li>- Dynamics</li> <li>- Restructuration</li> </ul>
<b>Syncity</b>	-	<ul style="list-style-type: none"> <li>- Trust</li> <li>- Restructuration</li> </ul>
<b>ParticipaLab</b>	<ul style="list-style-type: none"> <li>- Diversity</li> <li>- Flexibility</li> <li>- Saving costs</li> <li>- Experimentation</li> <li>- Building new digital communities</li> <li>- Reducing carbon footprint</li> </ul>	<ul style="list-style-type: none"> <li>- Trust</li> <li>- Dynamics</li> <li>- Inclusiveness</li> </ul>

Table 7.1: Benefits and limitations of social distancing in the cases

The questions that were asked to the interview partners were done in a neutral way so as to identify both the benefits and the limitations of social distancing in their experience. In the case of Terrifica, 2 benefits and 3 limitations were mentioned. For Syncity, 2 limitations were mentioned but no benefits. And ParticipaLab mentioned 7 benefits and 3 limitations. The fact that certain limitations or benefits were not mentioned by the cases do not mean that they are not relevant to the discussion, but simply that the case have not experienced them so far.

From table 7.1, we can observe that there is a big difference in how ParticipaLab understands the possibilities of co-creation online compared to the other two cases. This can be due to two reasons: (1) the ParticipaLab project was over before the COVID-19 crisis, and (2) the main focus of their work was already the exploration of possibilities to co-create with ICTs. Despite this, there is an issue that was mentioned by the three interview partners and it is the issue with the trust. Terrifica and Syncity consider the impossibility to engage in a physical way as a clear constraint to generate mutual trust with the stakeholders, while ParticipaLab agreed but it understood it also as an opportunity to build new digital communities. Terrifica and ParticipaLab both alluded to social interaction as a key characteristic that was not replaceable with online meetings, which they considered basic to generate not only trust but also to facilitate certain dynamics. Finally, Terrifica and ParticipaLab understood this situation as a possibility to experiment with the limits between online and face-to-face, which is consistent with the overall approach of ULLs, and further reinforces the fact that Syncity is a type of ULL with low levels of contingency.

#### **Conclusions from chapter 7 and further steps**

- Terrifica and Syncity consider the impossibility to engage in a physical way as a clear constraint to generate mutual trust with the stakeholders, while ParticipaLab agreed but it understood it also as an opportunity to build new digital communities.
- Terrifica and ParticipaLab both alluded to social interaction as a key characteristic that was not replaceable with online meetings, which they considered basic to generate not only trust but also to facilitate certain dynamics.
- Terrifica and ParticipaLab understood this situation as a possibility to experiment with the limits between online and face-to-face.



# 8 | Discussion

This chapter will discuss the results from chapters 6, and will include critical reflections on the limitations of that analysis, as well as the ones conducted in chapters 5 & 7 .

## 8.1 Discussion analysis 2

Our cases have been classified according to the criteria explained in chapter 6 and its results can be seen summarised in table 8.1

Case	Type	Understanding of co-creation	Use of ICT tool
<b>Terrifica</b>	Strategic platform	- Methodology to foster social innovation	- Decipher the urban code - Fill bug reports and feature requests
<b>Syncity</b>	Civic enclave	- Co-design	- Decipher the urban code - Fill bug reports and feature requests
<b>ParticipaLab</b>	Civic demonstration	- Co-design - Methodology to foster social innovation	- Decipher the urban code - Fill bug reports and feature requests - Hack the city

Table 8.1: Classification of cases according to type of ULL, understanding of co-creation, and use of ICTs

Firstly, we can see that Terrifica and ParticipaLab are classified as a "strategic platform" and a "civic demonstration", two types of ULL dispositions where contingency dominates, while Syncity is classified as a "civic enclave", where contingency is only residually present. Based on our theoretical framework, we had seen that high levels of contingency in ULLs, that is, high levels of unexpected outcomes, is the ideal governance scenario for an ULL since it depicts

more accurately how would a systemic urban transformation look like: full of possibilities and different configurations.

Regarding the understandings of co-creation, Terrifica and ParticipaLab both understand co-creation as a methodology to foster social innovation (only partially in the second case), and therefore they aim to fundamentally change the relationships between the actors involved, while in Syncity the knowledge only flows in one direction: from the citizens to the planners, and therefore co-creation is understood as co-design. Based on this, we can see a correlation between the level of contingency in the ULL and their understanding of co-creation: high levels of contingency are reflected in co-creation processes that aim to fundamentally change the relationship between the actors.

Regarding the use of the ICTs, we see that the three cases use their digital tools as a way to "decipher the urban code" and "fill bug reports and feature requests". Only the case of ParticipaLab has a focus on hacking the city, and therefore empower co-creation outside governmental structures (hybrid governance as described in section 4.2). Based on this, we cannot see any correlation between the use of the ICT tool and the type of ULL and their understanding of co-creation since e.g Terrifica and Syncity use their ICT tool equally but their type of ULL is different and their understanding of co-creation as well. The reason behind this could be that the differential factor are the physical methods that are used to co-create.

## 8.2 Limitations of chapter 6

As it will be expressed in the limitations of chapter 7, there is an issue regarding the generalization of the results obtained from the analysis of these 3 cases. Moreover, even though it was a conscious decision, we acknowledge that the fact that two of these projects are still on-going might have influenced the results of the analysis and there would have been another kind of richness in the discussion if the cases were already finished. However, due to the current circumstances, we believe that the downsides of not being able to evaluate the projects from beginning to end are compensated by the necessity to capture the situation in the current context. Moreover, the decision to capture just one digital tool in each of the cases might seem somehow biased if we take into account that we mapped 55 tools in chapter 5, but this decision was taken based on the unavailability to establish a connection between every ICT used in a ULL and their co-creation process, specially for those cases that were not finished.

## 8.3 Limitations of chapter 5

This chapter has had the intention to provide an overall image of the digital tools that are being used in ULLs. We argue that our results are valid but they would have been enriched if we would had considered other categories, such as: (1) how often are these tools used in ULLs,

or (2) how do these digital tools handle data privacy. For this last one, due to the complexity of the issue, we decided not to engage in that aspect since it would have probably required an analysis on its own.

## 8.4 Limitations of chapter 7

There is a clear limitation regarding the generalization of the results obtained from this analysis since only three cases of ULL are being considered. However, this analysis should be understood as an expansion of chapter 6, in which we dig deeper into the three cases rather than an attempt to provide an overall image of the state of the art of ULLs and their problems regarding social distancing. Moreover, at the time the interviews were conducted we still had not attended the webinar "Moving Dialogues", which might have shaped the way in which we conducted the interviews e.g: by providing a list of the benefits and problems that we had identified and making them choose which ones they had experienced. However, we still argue that our approach might have some perks, as our interviewees have only mentioned benefits and limitations that they have experienced during these weeks.

## 9 | Conclusion

This chapter delivers our concluding remarks, extracted from the development on the thesis.

Firstly, we understood ULLs as a real life simulation where several actors are involved not only in the creation of sustainable socio-material practices, but also (ideally) in the governance of the sustainable urban transformation. In this sense, they are defined as *"local places for innovative solutions that aims to solve urban challenges and contribute to long-term sustainability by actively and openly co-constructing solutions with citizens and other stakeholders"* (Chron er et al. 2019). We narrowed down our investigation to the aspect of co-creation, which in ULLs it is understood mainly as a innovation process, that is, a methodology to generate social innovation and in doing so, a governance innovation itself, since it fundamentally rearranges the relationship between the stakeholders.

Secondly, we relied on D rk & Monteye (2011)'s typology to classify the different uses of ICTs for co-creation: (1) understanding urban reality or *"deciphering the urban code"*, (2) improving the city or *"filing bug reports and feature requests"*, and (3) re-imagining underlying principles or *"hacking the city"*; and Hughes (2020)'s work to classify the functionalities of the ICTs: (1) *"argument visualisation"*: tools that allow to visualize different arguments of a discussion, (2) *"co-drafting"*: tools to edit and work on texts, (3) *"commenting/feedback"*: tools to gather insights on pre-written texts, (4) *"crowdmapping"*: tools to report issues or make suggestion on a location map, (5) *"decision-making"*: tools to organise discussions with an emphasis on making decisions, (6) *"discussion forums"*: tools to encourage deliberation, (7) *"ideas generation"*: tools to submit ideas given a question or challenge, (8) *"interactive Q&A"*: tools to gather questions during an online or physical conference, (9) *"interactive whiteboard"*: tools to gather insights similarly to a physical whiteboard, (10) *"knowledge base"*: tools geared towards gathering knowledge in a collective way, (11) *"video-conferencing"*: tools to conduct meetings in a non-physical way, and (12) *"voting/prioritisation"*: tools to vote proposals/ideas and the like.

Thirdly, based on chapter 5, we have observed that the catalogue of digital tools is very broad and they cover all the functionalities described by Hughes (2020), with an special emphasis on tools to brainstorm (*"ideas generation"*), and vote between them (*"voting/prioritisation"*). Moreover, most of these tools can be used independently and therefore, they can be tailored to the needs of each co-creation process. However, there is a big dependency on commercial

solutions and it is not clear the extent to which open source software (there is as well open source tools for most of the functionalities) perform as good as the proprietary software.

Fourthly, from the discussion of chapter 6, we have concluded that the way in which ICTs are used in the different cases does not necessarily have an influence in how co-creation is understood in the ULL, but it is rather dependant on how the ULL is governed and how are these ICTs integrated with physical engagement.

Finally, from chapter 7, we have seen that there is a clear limitation, identified by all the cases, in terms of how can ICTs provide the social interaction element that allow to carry out certain dynamics as well as to generate mutual trust between the stakeholders.

Based on these results, we can conclude that the identified digital tools can substitute certain parts of the co-creation process that were previously conducted in a physical manner and it will not affect the overall understanding of co-creation, whatever it is. However, there is a fundamental piece to generate a meaningful and transformatory co-creation process that these ICTs cannot fulfill on their own, and it is the generation of bonds and trust in-between the stakeholders. ICTs, then, can supplement and will need to supplement physical engagement due to social distancing regulations, but they should not be regarded as the panacea, since co-creation processes are still highly reliant on physical engagement.

Further steps for this research would be to actually engage in the use of ICTs for co-creation purposes and experience the limitations and possibilities of these tools in comparison to the physical ones, since the fact that they can replace physical engagement does not mean that it is easy or that it is desirable in every case.

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# Appendices

# Appendix A: Digital tools

<b>Tool</b>	<b>Purpose</b>	<b>Proprietary status</b>	<b>Integrability</b>	<b>Technical difficulty</b>	<b>Usability</b>
<b>Acceptify</b>	Decision-making Ideas generation Voting/prioritisation	Proprietary software	Integrable	1	Directly usable
<b>Adhocracy</b>	Co-drafting Commenting/feedback Crowdmapping Decision-making Ideas generation Voting/prioritisation	Open source	Integrable	3	Directly usable
<b>Adobe Connect</b>	Videoconferencing	Proprietary software	Integrable	1	Directly usable
<b>Citizen Space</b>	Commenting/feedback	Proprietary software	Process-oriented	1	Available on request
<b>Cmnty</b>	Ideas generation Voting/prioritisation Video-conferencing	Proprietary software	Process-oriented	1	Available on request
<b>Concept Board</b>	Ideas generation Interactive whiteboard	Proprietary software	Integrable	1	Directly usable
<b>Considerit</b>	Argument visualisation Commenting/feedback Decision-making	Open source	Integrable	1-3	Directly usable
<b>Consul</b>	Ideas generation Discussion forums Voting/prioritisation	Open source	Integrable	3	Directly usable
<b>Crowdspot</b>	Crowdmapping Ideas generation	Proprietary software	Integrable	1	Directly usable
<b>Dialogue</b>	Crowdmapping Ideas generation	Proprietary software	Integrable	1	Available on request

Tool	Purpose	Proprietary status	Integrability	Technical difficulty	Usability
<b>Dialog Box</b>	Commenting/feedback Ideas generation Crowdmapping	Proprietary software	Process-oriented	1	Available on request
<b>Discourse</b>	Discussion forum	Open source	Integrable	2-3	Directly usable
<b>Discuto</b>	Commenting/feedback Ideas generation Voting/prioritisation	Proprietary software	Integrable	1	Directly usable
<b>Dropbox paper</b>	Co-drafting	Proprietary software	Integrable	1	Directly usable
<b>Engagement HQ</b>	Commenting/feedback Crowd-mapping Discussion forum Ideas generation Voting/prioritisation	Proprietary software	Integrable	1	Available on request
<b>Etherpad</b>	Co-drafting	Open source	Integrable	2	Directly usable
<b>Flarum</b>	Discussion forum	Open source	Integrable	3	Directly usable
<b>Google Docs</b>	Co-drafting	Proprietary software	Integrable	1	Directly usable
<b>Google Forms</b>	Voting/prioritization	Proprietary software	Integrable	1	Directly usable
<b>Google Jamboard</b>	Interactive whiteboard	Proprietary software	Integrable	1	Directly usable
<b>Group Map</b>	Ideas generation Interactive whiteboard Decision making	Proprietary software	Integrable	1	Directly usable

<b>Tool</b>	<b>Purpose</b>	<b>Proprietary status</b>	<b>Integrability</b>	<b>Technical difficulty</b>	<b>Usability</b>
<b>Idea Flip</b>	Ideas generation Interactive whiteboard	Proprietary software	Integrable	1	Directly usable
<b>Idea scale</b>	Ideas generation Voting/prioritisation	Proprietary software	Process-oriented	1	Available on request
<b>iObeya</b>	Ideas generation Interactive whiteboard	Proprietary software	Process-oriented	1	Available on request
<b>Isso</b>	Commenting/feedback	Open source	Integrable	3	Directly usable
<b>Joe Docs</b>	Co-drafting Knowledge base	Proprietary software built with various open source tools	Integrable	1	Available on request
<b>Jitsi</b>	Video-conferencing	Open source	Integrable	1-2	Directly usable
<b>Kju:Ti</b>	Crowdmapping Interactive Q&A	Proprietary software	Process oriented	1	Project specific
<b>Konveio</b>	Commenting/feedback Crowdmapping	Proprietary software	Process oriented	1	Available on request
<b>Lifesize</b>	Video-conferencing	Proprietary software	Integrable	1	Directly usable
<b>Loomio</b>	Ideas generation Decision-making Discussion forum	Open source	Integrable	1	Directly usable
<b>Maptionnaire</b>	Crowdmapping Voting/prioritisation	Proprietary software	Integrable	1	Directly usable
<b>Mattermost</b>	Discussion forum	Open source	Integrable	1	Directly usable

<b>Tool</b>	<b>Purpose</b>	<b>Proprietary status</b>	<b>Integrability</b>	<b>Technical difficulty</b>	<b>Usability</b>
<b>Mentimeter</b>	Interactive Q&A Voting/prioritisation	Proprietary software	Integrable	1	Directly usable
<b>Microsoft Teams</b>	Video-conferencing Voting/prioritisation	Proprietary software	Integrable	1	Directly usable
<b>Miro</b>	Ideas generation Interactive whiteboard	Proprietary software	Integrable	1	Directly usable
<b>Notion</b>	Co-drafting Discussion forum Interactive whiteboard Knowledge base	Proprietary software	Integrable	1	Directly usable
<b>Padlet</b>	Interactive whiteboard Ideas generation Voting/prioritisation	Proprietary software	Integrable	1	Directly usable
<b>Pol.is</b>	Argument visualisation Ideas generation Voting/prioritisation	Proprietary software	Integrable	1	Available on request
<b>Poll everywhere</b>	Voting/prioritisation Interactive Q&A	Proprietary software	Integrable	1	Directly usable
<b>Quip</b>	Co-drafting	Proprietary software	Integrable	1	Directly usable
<b>Slack</b>	Discussion forum	Proprietary software	Integrable	1	Directly usable
<b>Slido</b>	Video-conferencing Interactive Q&A	Proprietary software	Integrable	1	Directly usable
<b>Social pinpoint</b>	Discussion forum Crowdmapping Ideas generation	Proprietary software	Process-oriented	1	Available on request



<b>Tool</b>	<b>Purpose</b>	<b>Proprietary status</b>	<b>Integrability</b>	<b>Technical difficulty</b>	<b>Usability</b>
<b>Stormz</b>	Ideas generation Voting / prioritisation	Proprietary software	Integrable	1	Directly usable
<b>Stormboard</b>	Ideas generation Voting/prioritisation Interactive whiteboard	Proprietary software	Integrable	1	Directly usable
<b>The Hive</b>	Crowd-mapping Discussion forum Ideas generation	Proprietary software	Process-oriented	1	Available on request
<b>Trello</b>	Ideas generation Knowledge base Voting/prioritisation	Proprietary software	Integrable	1	Directly usable
<b>Typeform</b>	Voting/prioritisation	Proprietary software	Integrable	1	Directly usable
<b>Ushahidi</b>	Crowdmapping	Proprietary software	Integrable	1	Directly usable
<b>Voicevoice</b>	Video-conferencing Voting/prioritisation	Proprietary software	Integrable	1	Directly usable
<b>Whereby</b>	Video-conferencing	Proprietary software	Integrable	1	Directly usable
<b>Wissembly</b>	Ideas generation Interactive Q&A Voting/prioritisation	Proprietary software	Integrable	1	Directly usable
<b>Your Priorities</b>	Discussion forum Ideas generation Voting/prioritisation	Open source	Integrable	1-3	Directly usable
<b>Zoom</b>	Video-conferencing	Proprietary software	Integrable	1	Directly usable

# Appendix B: Interviews

## .1 Terrifica: Norbert Steinhaus

**How do you understand co-creation within the Terrifica project?**

first phase is finished. there is no experience with the crowdmapping. how they can use it in the this months in corona. One of the possibilities is to extend the project (From summer 2022 to December 2022).

It's an international project so several activities already happen in a virtual space. every 6 months they were supposed to meet, but it is not possible now. The online conferences will be extended compared with the physical ones (from 2 days to 3,5 days)

Co-creation is a continuous process, together with all relevant stakeholders, using engaging and motivating methodologies. After the design thinking to evaluate results and make it to the next phase. Everybody should be in the room so every idea is counted, common solutions. Early stage involvement. They start with the problem mapping.

they will invite the people who put a mark. and the rest of stakeholders; engineers, municipalities, stakeholders. to research the answer you also need people to maintain for example the "green space".

**In which part(s) of the co-creation process are ICTs integrated?**

It's not clear where icts will be placed, it will depend on the project arose from the mapping tool (concerning on co-creation) Sense fogs to measure air quality concerning other tools. The data will be collected digitally.

**To which extent what used to be face-to-face can be replaced with virtual interaction and vice versa? Where have you seen a limitation?**

The basic idea was to work face-to-face. There is a commitment for activities there. To work with people you haven't seen before. Social element of face-to-face meetings is missing We have to extend the number of tools to use and there are no exhibitions at the moment. Invite to

physical limits. If it works in the digital way. they are depending on digital tools, digital can be a substitute but not a replacement.

Co-creation is really close to social interaction, conversations flow. with summer camps allow to make “friends”, not only colleagues. If the meeting is face-to-face,

at the beginning digital activities could make people get lost, but there is a point when doing focus work. Social element is still lacking. The experience is that in digital meetings some elements get lost. For the technical point of view, it is possible. For the personal not so much, it will be harder to

**How have the COVID19 context (social distancing) affected the project and the already used tools?**

Now they are looking how can they promote the crowdmapping in terrifica, getting to different audiences, motivating people to map what they saw before corona and after corona.

they have to change the strategy depending even on the country and the specific situations of the country. It will be discussed further. One of the big things they want to make use is the direct effects of the lockdown in the environment. There is an awareness race to bring ecological.

**Have you been using or thinking about using any other ICT tool to adapt yourselves to the situation?**

Within the team they have different tools. Big blue button, skype, etc. Webinars. As they are spread all over europe, they use communication and exchange tools.

There are other projects involving citizens. One is with housing companies, the idea was to revitalize with environmentally friendly places. They created benches, walkways, local flowers for biodiversities. Because there was a group creating these initiatives, now there is still a group taking care of them. Other projects: industries have composite areas unused, the aim is to use this areas for social issues for the industry and also for biodiversity. because staff was involved, there is still care of it.

So terrifica looks for this effects. Involve people in planning, in creation. There is an impact, a benefit for people getting involved.

## **.2 SYNCITY: Thomas Stollenwerk**

**How do you understand co-creation within Syncity project?**

Local people in Cureghem live in very low wages, and there is a fear that those people could not be on board in all the development. That their interests and needs could fall over the cliff

when it comes with participation or how the neighborhood develops in years.

So we thought would be nice to able the municipality with a digital tool to get in touch with the people and their particular needs. Creation of spatial and urban planning, not only involving architects and urban planners but also including the views and perspectives of local people.

Trans disciplinary and multidisciplinary way. Influx perspectives from social scientists, architects, urban planners and local knowledge.

Communities are an ultimate idea of kju:ti. Making people aware that there are more people with they concerns, not like social media. It has to be anonymous because of data privacy. It is not very obvious the community. For co-creation when talking about urban planning and development, they have communities within the community. When there is a gathering of the making of an specific road. Most likely there will be people interested in urban planning. There are communities more difficult to access, people that don't have citizenship sense, they are sensitive for not only performing or making people aware but also for making arise other sub communities. Empowering with the less as possible.

Participation is a key piece for urban planning in order to design, it requires people. Make it possible for people to stress their needs and concerns for municipality.

### **In which part(s) of the co-creation process are ICTs integrated?**

At the beginning we thought "let's work on mapping tools", it's difficult as you don't really know what information is necessary. Kju:ti brought a gathering information, come up with information that further could be mapped.it is a mobile made app for Android and Apple, they receive push messages with a question and the can also ask people other questions. It is can be further use as information for urban planners and architects.

Curegheim tales:

Individual people's history of their lives would be interesting for urban planning. A tool which automatically do this storytelling but it's difficult. They develop it with kju:ti (not automatically).

### **What are the overall strengths and weaknesses you have seen within the use of Kju:Ti tool? Could these weaknesses be improved by any other ICT?**

Car park dimensions:

Although Brussels is not near the coast, that particular part of Brussels is full of comercial cars for Africa, selling and reselling: noisy polluting,

Language: ICT they were staring from a narrative approach, but the whole district is about people coming and going and there is not a common language, it is diverse. It's something they didn't take in account. Narrative approach basically building in language. Extremely reduce

the amount of languages because it wouldn't work out. French is a minority, Rumanian, polish, what is the common language in this particular part of Brussels?it is crucial.

Low data volume: they are basically trying to put WiFi but they are not sure how good they can connect to internet. So they try to develop something that requires low data to be able to send it and also because it is cheap. Can they approach it?

There is kujuti and then syncity. Within syncity they have urban planners, architects, with kujuti they try to go beyond statistics. It also works with two people.

**To which extent what used to be face-to-face can be replaced with virtual interaction and vice versa? Where have you seen a limitation?**

Kjuti can only add on, it's a tool that can help municipalities to stay in contact or mantiene the contact with people. For example, there is an event (physical) where you can raise your hand and discuss with the other participants. But after that, kujuti helps continue the process. "Did you like what you hear yesterday?" Would you change something about the meetings?

**How to use this information physical or digitally?**

The knowledge always have to be processed, municipality or a project group has to do a research. If you're a user of kjuti, the next question will be built on your answer, there can be an storytelling. For example people with children, you will have people with children also and you can work on that gathering. You then can map, "where is a particular place which feels unsafe?".

Intersection with the physical: There is the municipality part of the project, they use social workers and they are a crucial point for getting the people work with kjuti. In physical events they encourage kjuti for participation projects. If you develop a mobile app there is just one shot to make people really use it.

**How have the COVID19 context (social distancing) affected the project and the already used tools? Have you been using or thinking about using any other ICT tool to adapt yourselves to the situation?**

There was a project meeting for testing Kjuti which was postponed, it would have been perfect to have this platform already ongoing to text within covid context.

Internal work of the project is done through Skype and zoom meetings. Jitsii also with the app developers.

They are working with a very particular neighborhood, so you have to be there to grasp the problems and the atmosphere so Skype or zoom doesn't cover that. Physical is very important for projects that should have an impact on the ground. Kjuti it is not strictly empirical tool, where they might be local knowledge for assessing the needs of local people. Find a way for asking people for their knowledge. There are things that are not official: for example Muslim

woman carrying their children to the doctor, it is not a question pre made but a question that you have to ask the people personally, you can't find it in a book or in articles. Marketing with a bike, to make people use the mobile app. They cannot do it right now.

### .3 ParticipaLab: Yago Bermejo

*Interview translated by the authors*

#### **How do you understand co-creation within ParticipaLab?**

It doesn't have financing anymore, the project between ParticipaLab and Decide Madrid doesn't exist anymore The connection between citizen laboratory, an ambitious bet of the city council for the laboratory

Medialab as ULL: We started from the Medialab laboratory that already had experience. It is a space where co-creation has been practicing for many years. Open software technologies were introduced in electronics. Back in the days it started with open knowledge sharing, community of designers, artists, engineers participating in the co-creation ecosystem. Medialab was a Fablab mainly at the beginning. Architects co-design got involved in co-design: design of urban spaces, not just objects. Example: Matadero, Basurama. They built an urban ecosystem design. Architects are quite pioneers with this. Medialab continues to expand the spectrum. Labomem (Labomemo.net) after 15M. Digital participation tools : Innovate around free software tools to participate in the political sphere.

Co-creation at the meta level, city governance. Connection with the city council: the possibility of having an impact. Examples from the book: proponent communities and democracy. Try to insert collaboration, deliberation, that generates information and larger proposals. Some proposals pass the threshold. Artificial intelligence algorithms that cluster ideas, that bring together people who think the same ideas and generate a community that supports this: Proponent communities

#### **To which extent what used to be face-to-face can be replaced with virtual interaction and vice versa? Where have you seen a limitation?**

Face-to-face encounters have irreplaceable wealth. Getting that to happen is difficult. People have to coincide in space and time and have to get to the place. There is a very big bias. The people who go to co-creation: they are profiles that demographically repeat themselves. It is not representative of how the population thinks

Draw: try to include in decision processes to co-create people from lower socio-economic classes. These meetings have always been face-to-face. They are very expensive, dates, facilitate, catering etc ...

Tools like zoom can start to make this easier. It is not the same as face-to-face, but it is being seen that it can be done. You are going to keep doing it online, you are going to combine both.

Decide Madrid: collect ideas from people (crowdsourcing) and reach more people than a project would usually do. It is a radical change from what was done so far. Avalanche of proposals. Example: parent communities to improve schools, sports communities for rugby fields. Digital provides openness to an input of proposals and filters it too (the same people do it through votes), generates support. Example: animal community proposes a center to recover abandoned pets, a shelter for domestic abused women.

At the experimental level: a law prior to its approval is shared: usually only lobbies, or unions. Citizenship is excluded from this process. DecideMadrid proposes to open the deliberation process on a law. It is ready to scale. Collaborative legislation.

A proposal is more like crowdfunding than Facebook. Community behind the proposal. Collect supports, not money.

Communities are activated, the way is open for them to participate. They will self-generate communities. Proposal communities: clusterization. Miguel Arana. Artificial intelligence algorithms. The analysis of the text suggests communities already. So that there are connections at the moment, and a proactivity is generated. An efficient way of connecting and transcending what the city council does or does not, generates a process of elevating it to execution.

Another government that wants to continue with this innovation process

**Have you been using or thinking about using any other ICT tool to adapt to the situation?**

Zoom is the best tool. It is not open software but has a neat technology. Groups can be separated and put back together. Dynamics are very fast: surveys that are answered at the moment. They had not been really used and they work quite well. Bring together an assembly to think globally. A process can be done. The human has quality of face-to-face. But the online can be done much cheaper, without pollution.

Face-to-face exchanges are not only what one can see, there is another dimension when it comes to gestures. Freedom of movement generates a type of relationships and exchanges of trust that the online can't provide. Participating is very expensive. Take into account the online meeting as a way to advance the participatory process and use the physical to really advance in warm relationships. For online, let what can be done be the same.

Using face-to-face for what is unique: research.