Seminar human smart cities
Framework for involving citizens in human smart city projects using collaborative events

Project Report

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Abstract

With the emergence of human smart cities the citizen has taken the greatest relevance in all aspects related to the actions of the public sector, being the main goal, their welfare and satisfaction as an individual and as part of the community. Because of this, the implementation of co-production mechanisms that strengthen a balanced, equal and transparent relationship between citizens and the public sector in a constant digital transformation takes great importance. Additionally, in this context, collaborative events are explored as useful tools to establish an entry point that promotes citizen participation in each of the stages of co-production. Therefore, this research proposes and evaluates a framework based on four different and correlated types of co-production: co-commissioning, co-design, co-delivery and co-assessment, which in combination with the implementation of collaborative events and crowdsourcing, exposes the role assumed by each of the stakeholders, mainly the citizens in the process of generating results and solutions to problems already identified in the cities.

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Chapter 1

Introduction

The relationship between humans and technology has always been the subject of great scientific debates. Kevin Kelly made an interesting contribution to this topic in his popular book "What Technology Wants" [16], where he explained how humans and technology entered into a symbiosis in the course of evolution and human history. It enabled people to constantly expand the possibilities for shaping their lives. He stated that humans and technology had a mutual relationship in their development and this he expressed in his concept of the Sociotechnical System (STS), which was an important contribution. [27]
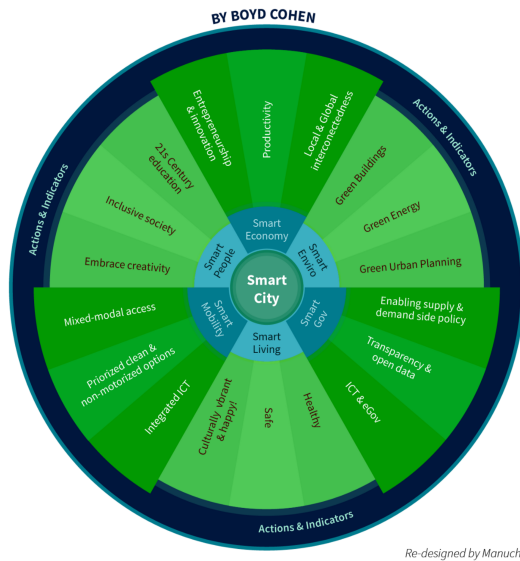
A widespread understanding of STSs in Anglo-Saxon research came from the sociology of work and organization, which was developed in the 1960s. The concept originally referred to work systems that involved a complex interaction between humans, machines and environmental factors [3]. The central idea was that all those factors must have been taken into account in equal measures while developing such systems, so that they could function well together. The study of work systems led to the development of two approaches: an analytical-observational approach and approaches that considered STSs from a design perspective [9, 3], so the aim was not only to describe systems, but also to design them. STS design methods were understood as design principles that included human, social and organizational factors as well as technological factors [3]. Since the 1970s a certain detachment of the STS topic from the main topic of the world of work has been observed. Methods and theories of STSs are widely applied in various fields that have nothing to do with the industrial and organizational sociology [25, 3, 9]. One of the topics to which the approach can be profitably applied is the modern city.[27]

The city of the 21st century is characterized by its growing complexity. For the last decades, this trend has set a pace that people can hardly follow because of the increasingly rapid globalization, worldwide urbanization and digital transformation. In addition to these current challenges, the city has become the central living space for people: more than half of the world's population lives in cities, for example, North America – 82%, Latin America – 81%, Europe – 73% (UN-DESA 2017). These concepts are quite important for urban development that support people in coping with urban complexity and living a good life in the city. In the age of digitalization, it is obvious that the solutions to these challenges should be sought in digital technologies, which are associated with the catchword "Smart City". However, it is often criticized for focusing too much on technology and too little on people, whose well-being and needs should be at the centre of development.[27]

The concept of the STS can provide a starting point for resolving the apparent contradictions between people and technology that often characterizes Smart City discourses. Here, it makes sense to link different perspectives to each other: cities can be described as complex STSs [14, 11, 25]. Accordingly, cities consist of two subsystems: the physical-
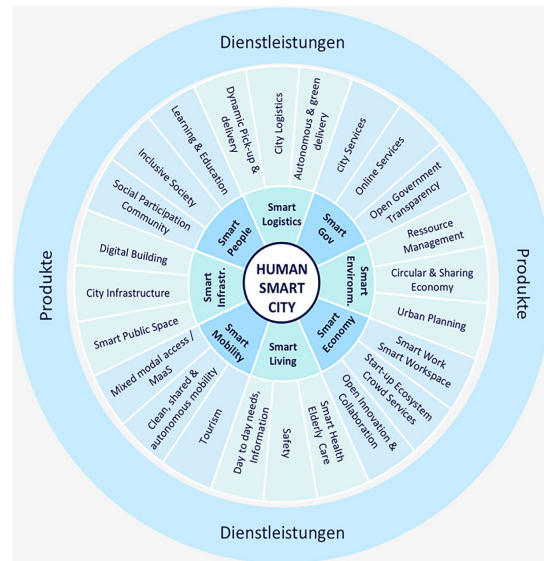
material subsystem (buildings, streets and infrastructure) and the human-social subsystem (movements, interactions and people activities). The subsystems are connected and influence each other by human beings or human cognition [11, 14]. As to the material level, smart cities are a combination of urban infrastructure systems and digitalization [11]. In this sense, the smart city is viewed as an STS in which technical and social components are linked to form a network, the aim of which is to satisfy the needs of the city's inhabitants. The proper functioning of the system depends on the interaction and the balance of the components. Such STSs can be analysed and designed, i.e. adapted and changed, so that it can fulfil its purpose in order to improve the quality of life in smart cities with the help of digital technologies.[27]

The Human Smart City architecture can help to determine citizens' needs, identify stakeholders and support the implementation of corresponding projects. Switzerland, for example, has recently founded the national association "Smart City Hub", where the members (cities, municipalities, companies with a national supply mandate) share information on projects and learn together. The language of understanding of terms and ideas related to the topic of human smart cities plays a decisive role. The main purpose is to actively involve people in the smart city and to shape it, so that it can meet citizens' wishes, interests and needs. The satisfaction of different stakeholders' needs and also their balance conflicting needs with the help of digital technologies are important elements for forming the Human Smart City, which is different from the technocentric Smart City. Due to the interaction of the actors, the uniqueness of the city becomes the manifest. The Future belongs to the Human Smart City.[27] To understand different components in a smart city, researchers created a framework for it. It helps understand important components of the city. In the figure 1.1 is mapped two different kinds of wheels. In the left figure 1.1a is plotted the smart city wheel with different layers, the first layer includes indicators and actions, the second layer describes the components, which belongs to the third layer (the six indicators).[27]

(a) Smart Cities Wheel by Boyd Cohen

(b) Human Smart City Wheel, extended by Edy Portman [27]

Figure 1.1: Two types of city wheels

On the right side of the figure 1.1b you see the extended version of the smart city wheel by Edy Portman. Two new indicators are added to the wheel by Boyd Cohen: smart infrastructure and smart logistics, which are important components to have a complete human smart city. These are the concept definitions for smart city wheels [27]:

- **Smart Environment**: It explains how a local government manages the built and natural environment in order to enhance citizens and visitors living conditions.
- **Smart Mobility**: Focuses on enhancing the reliability and quality of service of urban transport to improve the usage and implementation of new technologies for mobility, as well as increasing people's mobility through effective management of mobility and targeted investment in infrastructure.
- **Smart Economy**: It defines all measures intended to transform and enhance the economy of a municipality.
- **Smart Living**: By pursuing an integrated strategic plan across all age groups and backgrounds, it seeks to improve the quality of life of residents and tourists.
- **Smart People**: Aims at transforming the way citizens interact with the public and private sector. The creation of social and digital inclusion through smart forms of education for all age groups and demographics are a fundamental aspect of "Smart People".
- **Smart Government**: It is about strengthening the connections and interactions between the government and all stakeholders - citizens, businesses and other organizations of the civil society - within a municipality.
- **Smart Logistics**: It incorporates the structuring of traffic control and the navigation of traffic for the optimum use of the traffic system and the management of logistics.
- **Smart Infrastructure**: It is made up of a variety of operators from various fields of operation, such as electricity, public transport and public safety.

Hence to the above paragraphs the following research question has been formulated:
How to involve citizens and the public sector working together to solve defined city problems using collaborative events?

In chapter 2 literature review is presented. The next chapter 3 is the framework, which gives some guidelines how citizens and public sector can be involved in city projects, which is the answer for the research question. In a further chapter 4, evaluation based on the questionnaire and informed argument. The next chapter 5 is to analyse the results and feedback from users. Finally, there is a conclusion in chapter 6.

Chapter 2

Literature Review

Within the framework of smart cities, e-governance and the digital transformation of cities, the concept of Human Smart Cities has taken on increasing strength, because people rather than technology are the true actors of the cities and the creation of a participatory innovation ecosystem in which citizens and communities interact with public authorities and knowledge developers is key [22], in other words, the citizen moves itself from being a passive consumer of public services to being an active actor, participating in the analysis, design, implementation and evaluation of solutions to problems identified in the cities [7], through the implementation of collaborative processes which generate sustainable results that go beyond traditional public services[21]. Although the topic has been widely studied and applied in specific contexts, there are still uncertainties that arise about the role played by the actors involved and how the citizen can become part of this collaborative process. Therefore, it is necessary to define a set of rules or framework that determines the role that each citizen as an individual and as a member of a community plays in the stages, from when a problem is identified to what possible solutions are generated and implemented.

2.1   Co-production

The development of this research is largely supported by the proposals given by Elke Loeffler in [19][20][21] who approaches the concept of co-production, as a key element for the transformation of strategies in the public sector, actively involving the citizen in a collaborative and continuous way in different stages for the creation and improvement of public services that solve citizen problems and although it was born in the corporate environment, it was not until the late 1970s and early 1980s that Ostroms and their colleagues in the Workshop in Political Theory and Policy Analysis at Indiana University, Bloomington [24] gave a formal definition to the process of interaction by consumers as collaborative producers of public services, which has recently been strongly promoted in public administration, thanks to the direct adoption of advances generated by the digital transformation of cities, such as the use of social networks in web 2.0 to the internet of things in web 4.0 [17], technologies which can significantly empower citizens, providing them with more direct channels of interaction with their peers and with local and national public authorities. In addition to the existence of scenarios of austerity and financial crisis that encourage the implementation of collaborative processes for the common good [19]. An example of this is currently evident while developing this research, because of the situation facing humanity globally, generated by the consequences caused by the virus SARS-CoV-2 or COVID-19.

Before addressing the details of co-production related to the Human Smart Cities context, it is important to consider the principles of good governance encapsulated in the Council of Europe in 2008 [1], which are relevant to establish a framework for the proper development of activities in the field of co-production covered by this research. Based on these principles, in [19] the author suggests 11 principles of good governance, which are important to consider and 5 principles required for co-production. Table 2.1 lists such principles and their role in the interaction between active members or also called co-producers in the processes of collaborative interaction between citizens and the public sector.

Good Governance Principles	
Citizen engagement	Co-production activities focused on foster citizens participation
Transparency	Co-producers want and require to be informed every time
Accountability	In Co-production, Co-producers create a proactive atmosphere of responsibility
Human rights	Co-production must ensure a human rights environment
The equalities agenda	Co-producers must consider diverse aspects in society equally (gender, ethnicity, age, religion, etc.)
Equity	Co-production tasks should be fair procedures and following due process
Social inclusion	Co-production must be open to the citizens as much as possible
Ethical and honest behaviour	Co-producers behavior is framed by ethics and honesty. (moral laws)
Respect for the rule of law	Co-producers must adhere to laws, which create a controlled environment of interaction
Sustainability of results	Co-producers must propend for maintaining the results in the future
Maintenance of privacy and confidentiality.	Co-producers require preservation of their privacy and confidentiality. Especially important in the context of digital co-production
Co-production Principles	
Assets-based	Co-producers as active contributors and asset-holders
Enabling	Co-producers to encourage and value each other's contributions
Collaborative	Co-producers promote collaborative rather than paternalistic relationships between public sector and citizens
Outcome-oriented	Co-producers achieve outcomes rather than just services
Democratic	Elected politicians need to pay attention to the needs and capabilities of citizens

Table 2.1: Principles of good governance and co-production modified from [19]

In [20] the author exposes 4 types of co-production, in which the citizen as an individual or as part of the community, has an active participation and is involved in the different phases for the creation and improvement of public services and results in the citizen problems in a city. Table 2.2 briefly defines each of the types of co-production and the role of the citizen in each of them, where the citizen should be understood not only as the

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individual who legitimately belongs to a geographic space because he or she is identified under a specific nationality, but also as any temporary or permanent inhabitant of a city who uses directly or indirectly the public services offered there, regardless of his or her condition [19]. And the public sector, not only as the government, but as all those institutions, organizations and entities that participate in some extent in the generation, maintenance and improvement of public services, even if the nature of that organization is private, but its contribution influences the public service.

Co-production type	Definition	Citizen's role
Co-commissioning	Citizen and public service providers working together to prioritize, to plan and to resource public outcomes. *Citizens know best what matters to them.*	Citizens as strategic thinkers Citizens as funders
Co-design	Citizens and public service providers co-developing new pathways to create and to improve public services and outcomes. *Citizens know things which professionals don't know.*	Citizens as innovators
Co-delivery	Citizens and public service providers taking action to achieve improved public services and outcomes. *Citizens have capabilities, skills, time and resources to improve public services and public outcomes, they can promote the value of public services they engage with, so that other citizens are more likely to work closely with those services and agree to their co-funding.*	Citizens as asset-holders Citizens as legitimators and testimonial providers Citizens as co-workers and financiers
Co-assessment	Citizens and public sector providers working together to monitor and evaluate public services and outcomes. *Citizens often know better than professionals whether a new pathway works for them.*	Citizens as evaluators Citizens as critics

Table 2.2: Four co-production types modified from [20]

These terms independently identify the role that all stakeholders can play at each stage, primarily the citizen as an individual and as part of the community. Another example can be found at [23], where co-production is approached by applying the methodology WIN (Wishes, Interests and Needs), a fundamental tool which supports the process of citizens engagement and motivation for their collaboration in co-design and co-creation of

civic solutions, implemented in the "MyNeighborhood" project as part of the European Commission ICT PSP Programme in the field of Smart Cities. This project was divided into 3 important phases: i. Rebuilding Neighbourhoods, ii. Empowering Neighbourhoods and iii. Scaling up Neighbourhood Value, each one of them focused on the citizen through the implementation of mechanisms such as, living labs, designing thinking and gamification respectively.

It is necessary to take into account that for the application of co-production processes it is necessary to verify which is the path to follow, as indicated in [19], in which the author presents 2 perspectives: "inside-out", which service organizations bring citizen power into public services and invite service users and/or communities to add their resources and capabilities to those public services and "outside-in" is much less common, where public service organizations map what service users and communities are doing already to improve their quality of life or public governance and build on this by adding their assets, resources and contributions to those citizen activities [19].

Engagement of Citizens			
Engagement of public services (public sector, third sector or private sector)		Active	Passive
	Active	C. Co-production	A. Traditional provision
	Passive	B. Self-help or self-organising	D. Service and community failure

Table 2.3: Pathways to co-production took from [19]

In Table 2.3 it is possible to see the two pathways proposed in [19], where citizens moving from A to C implies to change from a passive role to an active one, in other words coming from the inside-out perspective to co-production and moving from B to C, where the citizens' performance the active role and the public sector move from a passive role to the active, or the respective with outside-in perspective. The concept of collaborative events is addressed below, in order to demonstrate their contribution to the collaborative process in the context of human smart cities.

2.2   Collaborative events

On the other hand, today has grown the realization of various types of mass participation events, such as Hackathons, often competitive events of short duration and usually require certain technical skills by participants [26], Gamejams, short term competitive event for developing games and game concepts commonly around a specific topic or message [15], or open social innovation events, which involves greater participation among participants and organizers in order to obtain results of common benefit [8]. Events aimed at generating ideas, prototypes, knowledge or solutions to a specific problem or problems [1], popularized mechanisms mainly by companies in the private sector, which found in this type of collaborative and/or competitive events a chance to provide solutions and generate innovation through the direct participation of users, collaborators and consumers. A more extensive list of these events can be seen in Table 2.4 [15], and their principal focus, either collaborative or competitive, for the generation of innovation, according to the definitions of each event.

Event Type	Typical Goals	Typical application
BarCamp	Knowledge sharing, development of concepts, agendas and conventions.	Collaborative
Camp	Knowledge sharing, crowdsourcing, innovation generation, community building.	Collaborative
Charrette	Solving a specific design task, creation of visions and concepts.	Collaborative
Codefest	Software and application development, innovation generation.	Competitive
Editathon	Content generation, knowledge sharing, crowdsourcing of information, community building.	Collaborative
Festival	Knowledge sharing, concept development, community building.	Collaborative
Forum	Concept development, community building, opinion formation.	Collaborative
GameJam	Development of games and game concepts, application of gamification techniques.	Competitive
Hackathon	Technology development, application development, innovation generation.	Competitive
Installfest	Assisted roll-out of specific software, best practice sharing, community building.	Collaborative
Sprint	Creation of concepts, designs, prototypes and products.	Competitive
Startup Weekend	Creation of concepts, designs, prototypes and business models, competence building, innovation generation.	Competitive
TeachMeet	Best practice sharing, development of concepts and agendas, community building.	Collaborative
World Café	Concept development, knowledge sharing.	Collaborative
Datathon	Content generation, knowledge sharing, crowdsourcing of information.	Collaborative
Living labs	Creation of concepts, designs, prototypes and business models, innovation generation.	Collaborative
Textathon	Public claimore Generation of possible text in the period of time massive Content generation, knowledge sharing, crowdsourcing of information.	Collaborative

Table 2.4: List of potential events for innovation and education took from [15]

In addition to the use of collaborative events, the inclusion of techniques that strengthen the processes and promote the motivation and commitment of the participants is also considered, such as gamification, which allows the application of strategies based on game-design elements and game principles in order to increase the user engagement [12], or crowdsourcing as an innovation strategy that favours the direct or indirect participation of a social group in the generation, analysis, support and evaluation of data for a particular objective, such as promoting solutions to commonly affected problems [4], whose nature of application can be both competitive and collaborative [10] and the contributions vary from the generation of theoretical data to the co-implementation of solutions [18] in various application environments, such as in the context of cities, the use of crowdsourcing for strategic planning, government support, emergency management and the search for common interest solutions [2]. All this takes on great value in the context of Human Smart Cities, where the motivation of citizen participation is essential to the well-being and quality of life for citizens.

2.3　Digital transformation

The above has been strongly influenced by the digital transformation that has been deployed in cities either directly by the public sector (i.e., urban intelligent vehicular traffic networks) [6] or indirectly by citizens (use of social networks) or even private companies (i.e., last generation wireless networks) [17], whereby the models of citizen participation have expanded thanks to the inclusion of technology, facilitating and accelerating processes that previously required greater effort on the part of the public authorities, such as zuriwieneu[2], an online platform that residents can use to inform the city of Zurich about damage to the urban infrastructure or Energie Wasser Bern(ewb)[3], created and maintained by an independent, public company owned by the City of Bern, which ensures modern life and work in the city and in the Bern region, or FixMyStreet[4], as well as zuriwieneu, this digital application helps to connect citizens from the UK with public sector to report issues related with streets.

The following section integrates the different concepts previously addressed, in order to propose a framework that involves citizen participation and collaborative events that are adapted according to the respective stage.

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[2]https://www.zueriwieneu.ch/
[3]https://www.ewb.ch/
[4]https://www.fixmystreet.com/

Chapter 3

Framework

The main idea of the framework is generating a tool that allows to identify the citizen's role in each stage of the city's problem solutions, problems which are identified by citizens or public sector until solutions are achieved, integrating massive and popular citizen participation mechanisms such as hackathons, forums or crowdsourcing. The framework in the Figure 3.1 is the proposal of a full version which depicts all the stages involved since the problem is defined, until possible solutions arise, all this delimited by a context which defines the specific parameters and features, it means that in the behaviour of co-production processes are dependent on the context.
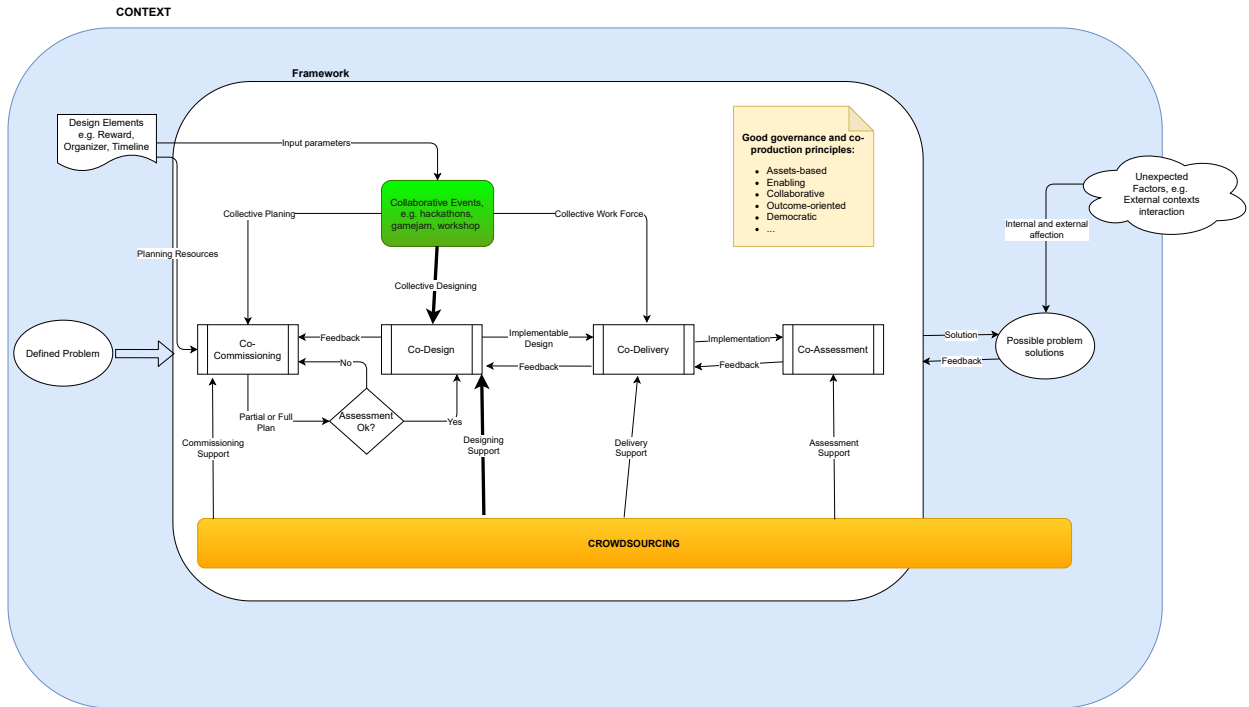

Figure 3.1: Framework for involving citizens in co-production process in human smart cities using collaborative events

In order to understand the role that each stakeholder plays in the entire process, each of the components which compose the framework is described below.

3.1 Context

At the beginning before using the framework, it is necessary to have a context. After that, based on the context the problem should be clearly defined. Additionally, it is important during problem definition to identify which design elements are going to be used. This means the designing of elements are defined by the context, which is discussed in the next section. Moreover, it is necessary to mention that in this stage, Good Governance and Co-production Principles found in Table 2.1, provide a guideline to base the framework behaviour, although it is not always possible to consider all the principles, therefore, it is required to prioritize some of them. The 5 bottom listed on Table 2.1 should be at least implemented, due to correspond directly to co-production. It is important to have the context very well-defined, because based on such a definition, it is possible to identify the parameters and prioritize the principles, in order to optimize co-production processes.

3.2 Design elements

Design elements, for instance type of reward, event duration or timeline, target group are kind of parameters which are needed to consider for building the collaborative events (see Figure 3.2). In the literature review it was found approximately 17 design elements [1], but there could be another design elements that is not listed here dependent on the context. It can see in the Table 3.1 all design elements found in [1] which provide a standard set of rules or checklist to consider at designing event time. Such design elements can be used in co-commissioning process as input elements for planning (see Figure 3.2). It Is important to mention that in the most of the cases the organizer is the public sector.
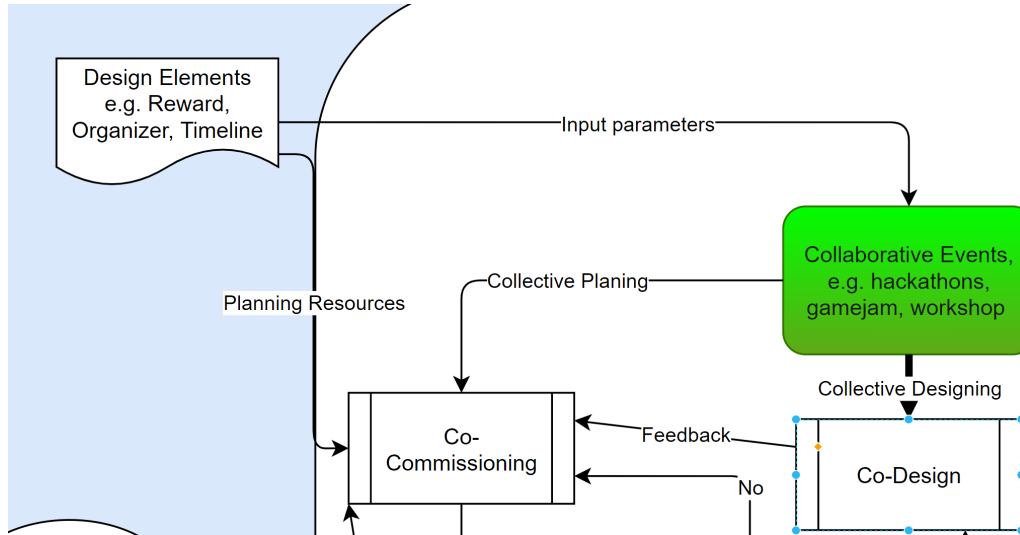

Figure 3.2: Design elements

Design elements	Description design elements
Media	Appearance (online, offline, mixed)
Organizer	Body in charge (company; public organization; non-profit; individual)
Task / topic specificity	Issue (open task/low; specific task/high)
Degree of elaboration	Required level of detail of submission (idea; sketch; concept; prototype; solution; evolving)
Target group	Participants (specified; unspecified)
Participation as	Mode (eligibility) (individual; team; both)
time period	Runtime (very short term; short term; long term; very long term)
Reward / motivation	Incentives to encourage and reward participants (monetary; non-monetary; mixed)
Community functionality	Functionalities to support interaction between participants (given; not given)
Evaluation	Assisted roll-out of specific software, best practice sharing, community building.
Attraction	Notification (online; offline; mixed)
Facilitation	Support of participants (professional facilitation; peer facilitation; mixed)
Sponsorship	Specification of sponsors (family, friends and colleagues; universities; national associations; specific industries; state and local education agencies; mixed)
Phases	Number of rounds (one; two; more)
Replication	Revision cycles (biannual; annual; less frequent; more frequent)

Table 3.1: List of potential design elements [1]

3.3 Unexpected factors

The city's environment is integrated for a complex group of factors, which interact affecting between them positively or negatively, that is why in framework is considered the unexpected factors on the context right boundaries, because such factors can be internal and/or external (see Figure 3.3) those have a big influence on possible problem solution. Internal factors are those aspects which maybe were not considered, undervalued, overvalued or missing in any of the internal framework's stages. Besides, external factors could be another context or radical changes those are not part of the framework's context, but affect the possible solutions or outcomes, for instance, other contexts overlapping or unexpected critical situations like natural catastrophes or pandemics. Consequentially, should be decided which type of co-production required to be adapted to handle the changes occasioned by unexpected factors.
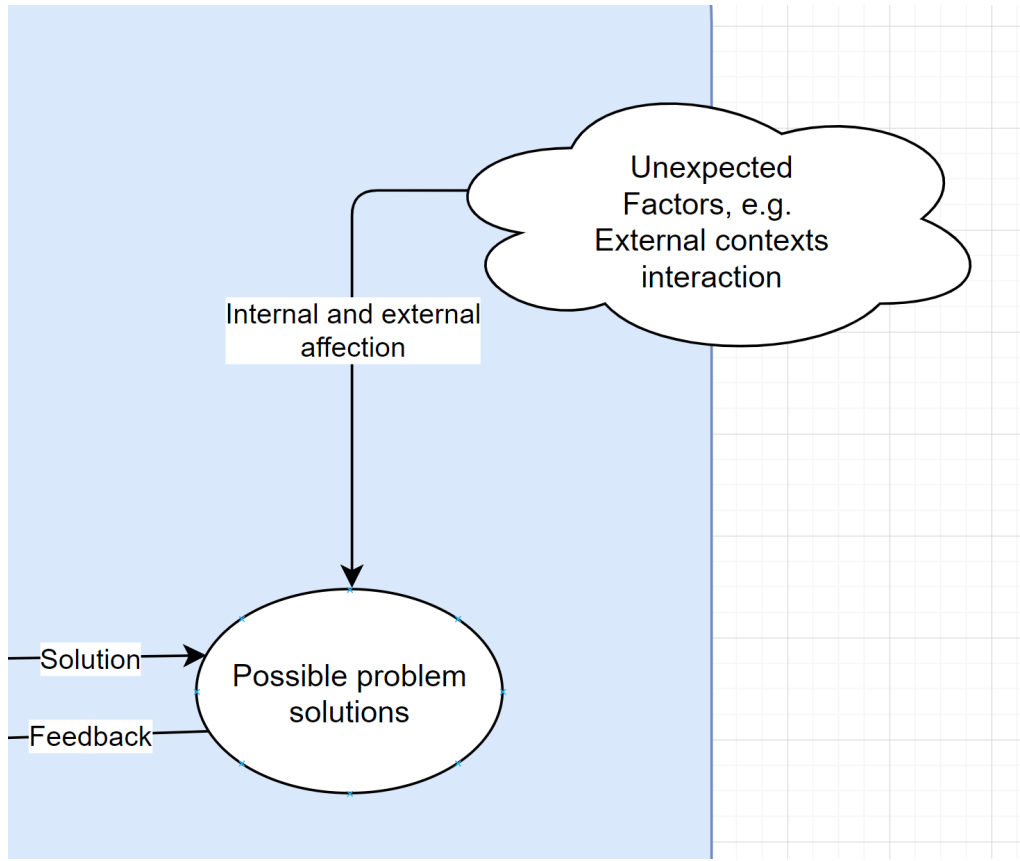
Figure 3.3: Unexpected factors

3.4 Collaborative events

Collaborative events are kind of medium types, which provides citizens to participate in the city related problem solutions and outcomes. They enable citizens to participate in co-production processes and provides controlled environments for citizens collaboration. Furthermore, they structure the citizens and public sector participation according to the context (to see different kind of collaborative events check Table 2.4). The green colour for this block in framework indicates its relevance, due to provides an entry point for citizens and settle a controlled environment to the co-productions types. Collaborative events are essentially inside the co-design process, but we took them out to make it more general, because their contributions are not limited only to co-design processes, therefore citizens through collaborative event can participate collectively in the planning tasks for co-commissioning, as well as volunteering activities in co-delivery.

The link between collaborative events and Co-Design is thicker than others, because almost all collaborative events can be used here, by nature the collaborative events involve the generation of ideas, prototypes, knowledge, data, etc, depending on the context, which establish the specific features of implementation.
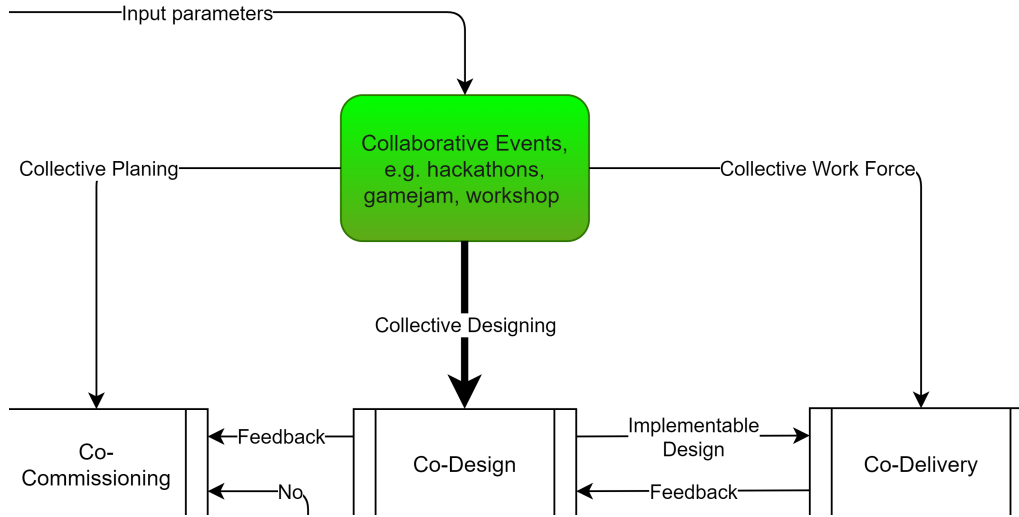
Figure 3.4: Collaborative Events

3.5 Co-Production

3.5.1 Co-Commissioning

Co-commissioning refers to the collaborative work between public sector and citizens to carry on all the activities involved in analysing the requisites to tackle an identified problem, planning and prioritizing resources and outcomes and risk evaluation (see Figure 3.6). In this type of co-production it is important to assess if the co-commissioning process is satisfied and only after satisfaction it goes to co-design. Co-Commissioning overall includes more than only service planning, It covers the planning, prioritization and resource mobilization tasks, which are strategically important for reaching the results required by a public sector organization.[20]

Co-commissioning process consists of four main parts to follow see Figure 3.5. The first phase is **Analyse**: from a co-production point of view commissioners have to indicate the assets for of service users and local communities. From a co-production point of view, commissioners have to explore the risks for service users and communities.

In this phase is also included the mapping of new co-production options, which makes it better utilizing existing user and community assets and to response to determined needs.[20]

The second phase is **Plan**, which involves citizens in different planning activities, that is dependent on the context. These are the activities: co-deciding on priority outcomes, co-determining a new vision for a service, co-developing a novel overall commissioning strategy A major part of most planning tasks are resource, budget and human resources planning. [20]

Figure 3.5: The co-commissioning process cycle. Taken from [20]

The third Phase is **Do**: here citizens have to take an important role to help commissioners to confirm the service provision arrangements, that have been co-planned, are realized in an adequate way. It can be seen as a monitoring phase and motivation to others, but do not mix up with co-delivery. [20]

The final phase is **Review**: In this phase citizens have double roles:

1. In a one hand co-assessing (evaluating) the previous steps
2. on the other hand propose additional or fundamental novel enhancements for existing commissioning actual applications.

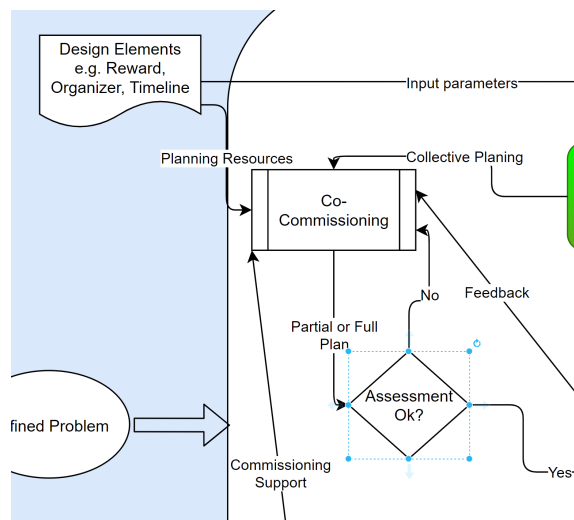So here as you can see in Figure 3.6 is more about 're-co-commissioning' or not.

Figure 3.6: Co-Commissioning

3.5.2 Co-Design

Co-design is considered all the collaborative activities carried out by citizens with the public sector, not only for improving service quality but also for harnessing the creativity of communities to find new solutions for complex problems. Co-design often involves the use of creativity and social innovation techniques such as brainstorming, story-telling, prototyping of models and experimental approaches in an iterative process [20]. In this collaborative process the citizens are taken as innovators [19]. There exists four types of co-design: short-term and incremental, short-term and radical, long-term and incremental, long-term and radical. The use of innovation contests is located as a short-term and radical co-design process, whereas long-terms and radical forms are utilized for innovation open labs or scaling social innovations for citizens according to the context.

Public services in the co-design commonly composed of a step-by-step procedure. There exists typically five key internal processes in co-design, which citizens should follow to provide their contributions.[20]

1. **Experiencing:** the first phase includes the innovation challenge or defining the problem to be solved
2. **Exploring:** the goal is that the insights and ideas should be developed through brainstorming and other techniques.
3. **Experimenting:** priority ideas are checked and proved in an iterative process and transformed into prototypes according to experimentation.
4. **Evaluation:** here, it is necessary to formalize the learning from the experimentation phase. This may include both qualitative and quantitative methods.
5. **Evolve:** concentration is on scaling the prototype by changing both the hardware and the software of public service organizations.
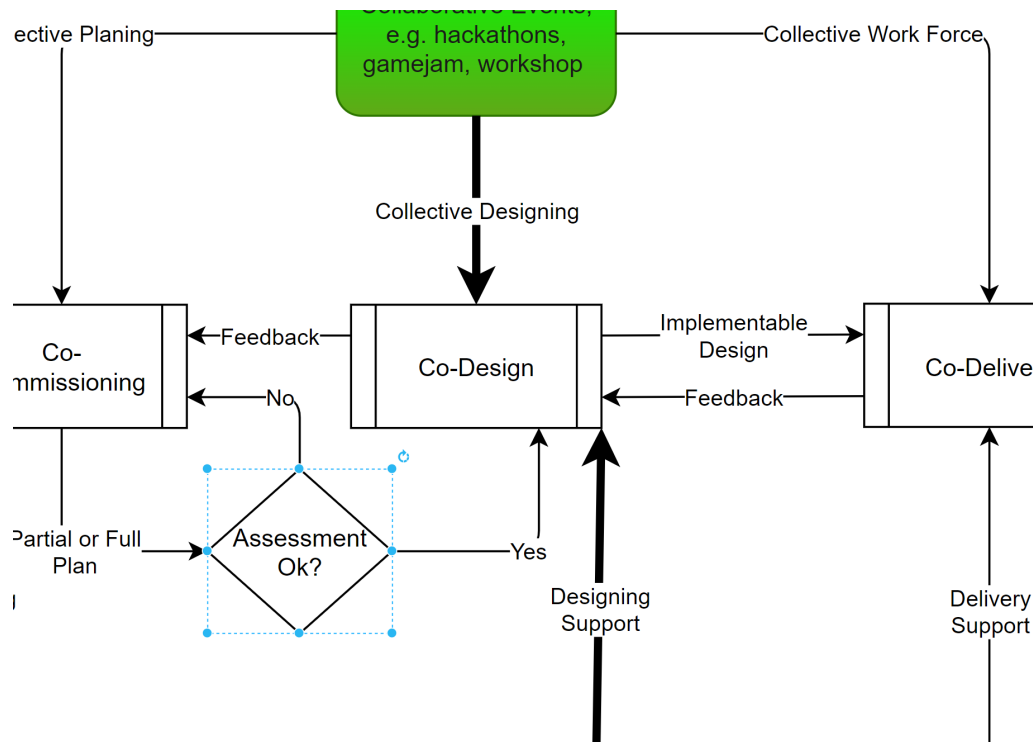

Figure 3.7: Co-Design

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3.5.3 Co-Delivery

The core of the co-delivery is the action, it means, how the citizens and public sector are involved together in a collaborative way to achieve outcomes. Here citizens should participate in real implementations. The point of view of citizens and public service organizations, users and communities both in co-delivery have a life cycle [5]. People's interactions and interests with public services are essentially changing over time. [19]

In the co-delivery type there exists some internal phases. In a one hand, from the point of view of public service organizations, there exists an **initiation phase** with 'recruit-ment' and 'incentive' of citizens to bring co-deliverers on board, if the course of action to co-delivery is 'inside-out'. In the 'outside-in', in which public service organizations initiate to support citizens self-help, the initiation phase includes establishing citizens, that want to benefit from public sector support. On the other hand, the subsequent **developmen-tal phase** of co-delivery actually demand accomplishment of a safeguarding policy, and sometimes training or other capacity-building activities. This means, there is a need to set up costs for citizens and public service organizations for realizing this phase of co-delivery into practice.[19]

In another hand volunteering in co-delivery is a very important part, where citizens give time and labour, and take the action for improving or helping different types of public services. Sometimes there exists the overlap of volunteering between co-production and co-delivery, which means not every type of volunteering can be seen as co-delivery. When public sector support volunteers then volunteering is actually transforming into a co-production, because they are not helping or organizing themselves. For example during Covid-19 pandemic some governments requests theirs citizens to increase the help for fighting against crisis. For example in Unites Kingdom about 750000 citizens accepted the request for volunteering to take the action for several types of co-delivery such as doing the shopping for, distributing the food to people in quarantine, and co-influence humans to follow and accept main behaviour change for example physical distancing. [20]
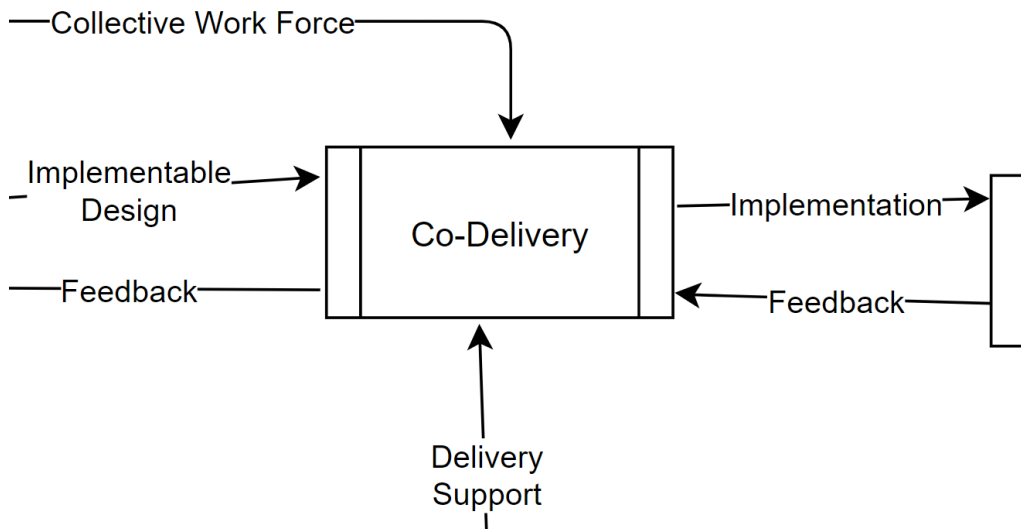

Figure 3.8: Co-Delivery

3.5.4 Co-Assessment

In Co-Assessment process the citizens should work with professional staff, managers, and local councilors to give feedback to public service organizations on their perceptions and expectations.
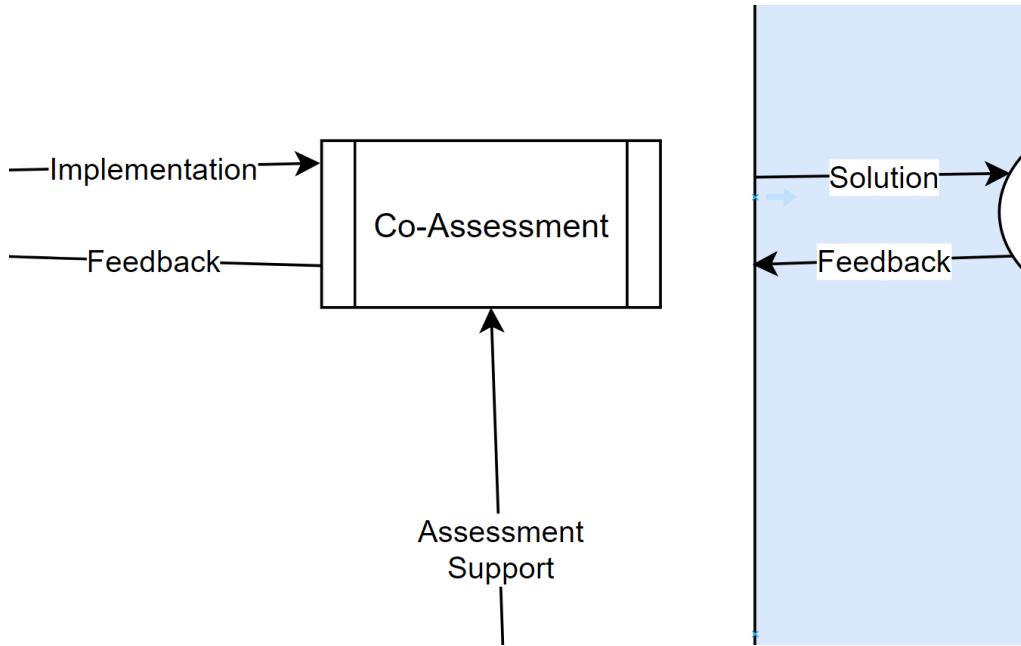

Figure 3.9: Co-Assessment

There exists multiple ways to get feedback, either online or offline, and even an intensity level, which implies how the citizens can handle the feedback. Citizen surveys are mostly very informative, they are getting a common standard and typical part of services. This is a low intensity. It is important to get attention that there is no lack of complaints, because this can lead to bad services. Public services and public infrastructure can be rated by citizens, this is also a feedback. In this case online rating platforms provides fast ways to get a feedback. An interactive application example is FixMyStreet in UK mentioned in Section 2.3, where citizens can report, view, or discuss local problems. This is a direct method of users' feedback. Moreover, interactive websites, where citizens can ask questions to service providers by participating in inspections and service reviews. However, the most intensive type of co-assessment makes possible for citizens to tackle joint research together with professional staff, this is a high intensity feedback.

3.6 Crowdsourcing

Crowdsourcing involves seeking knowledge, goods or services from a crowd, which purpose in our project is to support every type of co-production. In the co-commissioning the aim is to support the analyses(e.g. risk) and planing(e.g. prioritizing outcomes). In the co-design type it is about to support co-design process (e.g. Experiencing, Exploring, Experimenting). In the co-delivery process, it supports co-implementation and co-management. In the last type of co-production in the co-assessment process, it can support the evaluation of the possible solutions. So in all these types of co-productions citizens can submit their ideas regarding online requests realized through smartphone

apps, social media or online platforms.

In the literature were found 10 types of crowdsourcing [4], which is summarized in the Figure 3.10. This figure can also be used as a guide to decide what crowdsourcing type to choose depending on the context.
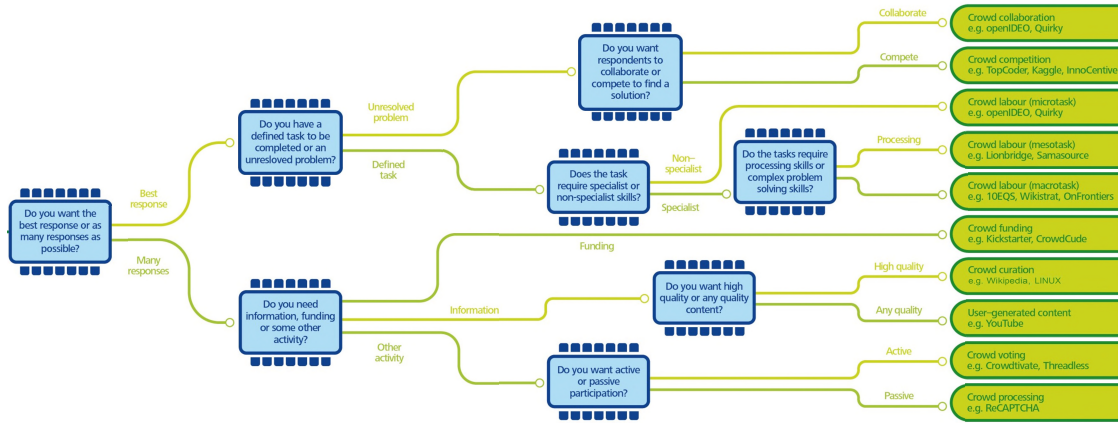

Figure 3.10: 10 types of crowdsourcing, choose what type of crowdsourcing is suited [30].

In the next chapter 4 is about evaluation of the framework.

Chapter 4

Evaluation

To evaluate the framework proposed in the previous section, the type of descriptive evaluation was implemented, which, given the nature of the research can be focused under the informed argument, that uses information from the knowledge base chapter 2 to build a convincing argument for the artefacts utility [13]. In other words, the main objective of this evaluation is to support the framework proposed in the concepts of co-production, principles of good governance and collaborative events, arguing each of the elements, their relationships and behaviours that define the interaction of citizens-public sector in the context of Human Smart Cities. On the other hand, in an attempt to obtain an expert perspective on the framework, two questionnaires were designed with the digital tool google forms, one for citizens and the other for public sector representatives respectively. These questionnaires are complementary to each other, since the questions are related, in order to establish points of comparison between the two perspectives. The questionnaire is structured in 5 main sections, distributed as follows:

- Demographics: Age, gender and occupation (for citizens) or Sector of influence (for the public sector)
- Co-production
- Co-design
- Co-delivery
- Co-assessment

As it is possible to appreciate, the questions were distributed mainly among the co-production blocks of the framework, but key elements, such as collaborative events or crowdsourcing are equally related in the questions, since the purpose of this research is not to evaluate if co-production is accepted by citizens and the public sector, but how collaborative events involve participants in the co-production processes. For more detail on the above, the questionnaires starting with the version for citizens, followed by the version for the public sector, due to the practicality of the design.

The target population for the application of the interview was distributed in the following way: for the group of citizens no restrictions related to age, gender or occupation were specified, because as specified in the 2, a citizen is an individual who is part of a community independent of his or her legal belonging to a territory. In the case of the public sector, however, it is restricted to representatives of public services, third parties and private companies related only to citizen participation.

Moreover, in order to obtain relevant results at the end of the implementation of the questionnaires, two mechanisms were assumed to facilitate the process, both for the execution of the evaluation and for the analysis of the results obtained. The first mechanism was the application of questionnaires under the modality of guided interview and in real

time rather than survey, which began with previous agreement with the interviewee in order to send the questionnaire by email, and scheduling a time slot of about 15 to 20 minutes through virtual platforms such as Zoom or Skype, both for citizens and for the public sector limited to the Swiss territory, in order to obtain more consistent and comparable results among them, although the scope of the framework can be implemented in any city in the context of Smart City or Human Smart City. The decision to implement the questionnaire under the interview modality, brought benefits such as: the possibility of clarifying doubts at the moment of the interview, assisting the interviewee by transcribing his/her answers freeing him/her from executing such task, which allowed obtaining more valuable results in content and providing a guide to the interviewee in order to make the implementation time efficient.

The second mechanism was the use of a current use case found on a digital platform in the city of Zurich `https://makezurich.ch/#challenges`, focused on social and citizens problems, the specific example consist of a challenge in the mode of open call denominated AWESOME GREEN SPACES, provided by the Environmental Agency of Zurich and aims to help improve the attractiveness of green spaces by measuring the usage of infrastructure and occupancy of public recreational spaces. The purpose of implementing this mechanism is to use an example to position the interviewee in a more familiar and understandable scenario (Improvement of green spaces in your city) and guide them through each section of the questionnaire, in such a way that they respond to questions related to their role, contributions, attitudes and points of view for each of the stages of the proposed framework.

Finally, the interviews were implemented in the first two weeks of December 2020, using virtual platforms as specified above, rather than taking advantage of the use of technology in the process, it is because of the public warning situation caused by the SARS-CoV-2 or COVID-19, in order to avoid physical contact with people interviewed.

The following chapter presents the most relevant results obtained when applying the interviews described above and a brief analysis of them, from the perspective of the framework proposed in chapter 3.

Chapter 5

Results

In this chapter are described some relevant and important information obtained as feedback from the questionnaires. How was mentioned in the previous chapter there are two types of them, one for public sector [29] and another one for citizens [28].

5.1 Feedback from Citizens

Eleven people participated in the questionnaire for citizens. Among them were seven females and four males. Nine citizens ages varied between twenty-six and thirty-five and two of them was between thirty-six and fifty-five.

About 80% of the citizens considered positive to work together with public sector, which main reason for that is the wish to be heard by authorities, the people want to be considered in decisions relevant for their cities. (see Figure 5.1)
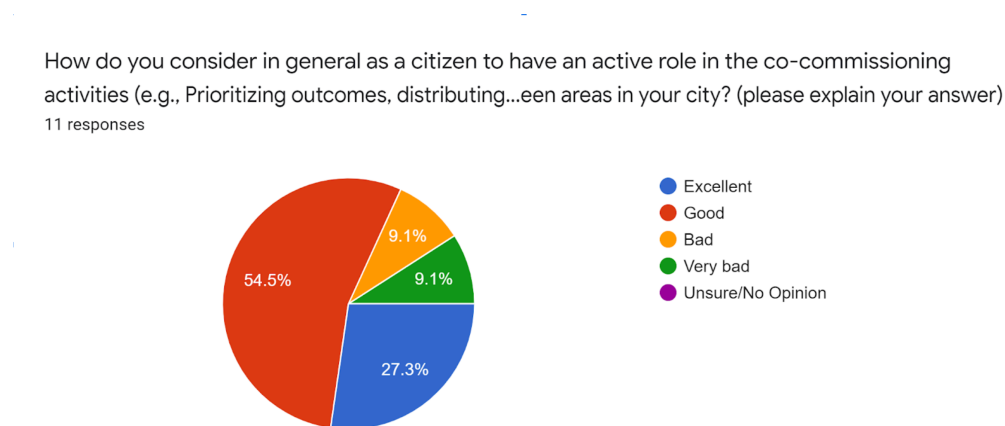

Figure 5.1: Citizen role in co-commissioning stage.

The most of the citizens interviewed are willing to contribute with skills and working time. 80% of interviewed citizens from 10 responses are willing to invest their skills to improve green areas for the city. Moreover, 90% among them want to contribute for improvements in green areas. (see Figure 5.2)

If the previous answer was positive, which kind of resources are you willing to invest in the improvement of green areas of your city in co-commissioning tasks?
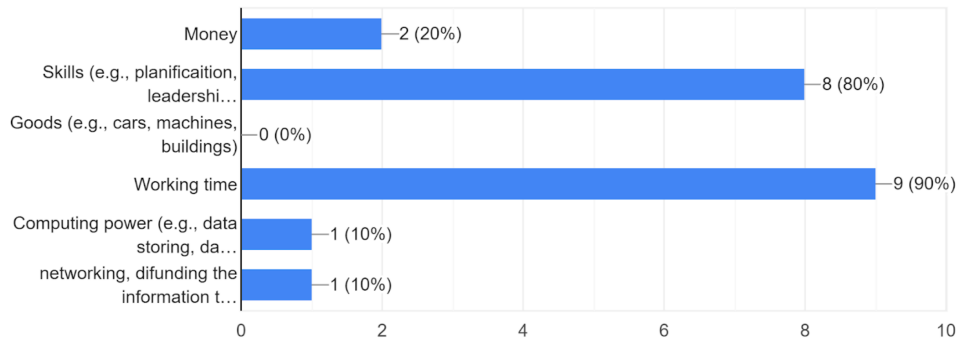10 responses

Figure 5.2: Resources invested by citizen in co-commissioning.

The citizens want to be rewarded or recognized. The most of them interviewed prefer public recognition(54.5%), instead of having money or goods with 45.5% each. (see Figure 5.3)

What kind of recognition/reward do you think is a good incentive for keeping you motivated, to work collaboratively generating ideas, and contributing with your skills for improving the green spaces in the city? (Please select all apply)
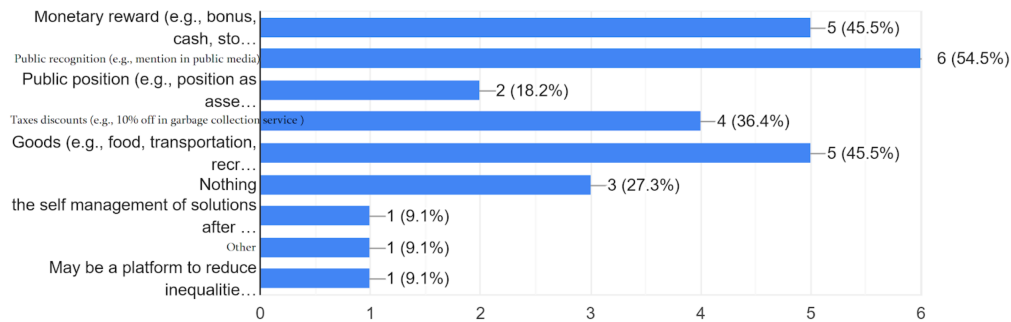
11 responses

Figure 5.3: Expected reward by citizens.

More than 80% of interviewed citizens are willing to participate in collaborative events, it seems to be that some people do not like competition. (see Figure 5.4)

Which medium of participation do you like to use for co-designing new ideas together with the public sector, which could be implemented in your city for improving the green spaces? (please select all apply)
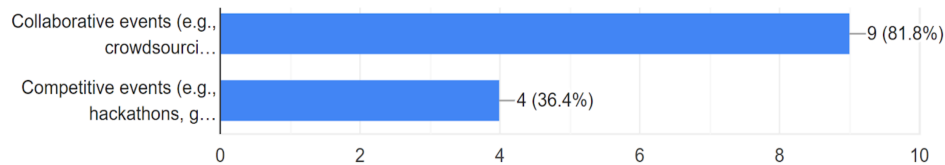
11 responses

Figure 5.4: Events modality preferred by citizens.

The 81.8% interviewed citizens prefer at the most work as volunteer. It means for citizens it is very important the improvement of green areas of the city. (see Figure 5.5)

How are you willing to work together with the public sector for implementing projects for improving green spaces in your city? (Please explain your answer.)
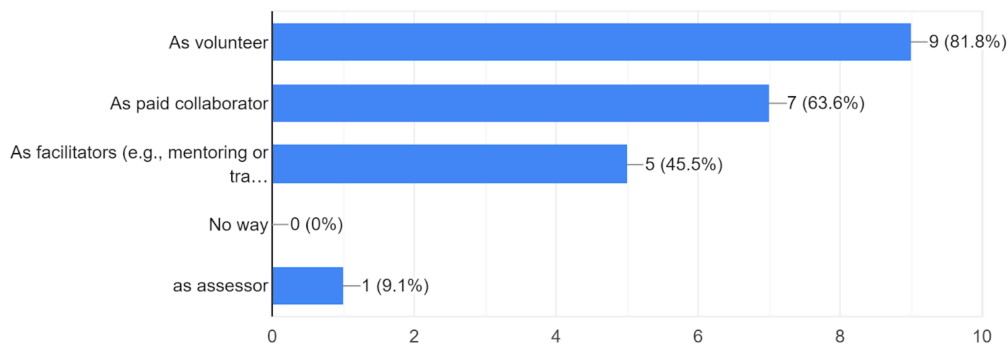
11 responses

Figure 5.5: Participation modality preferred by citizens.

For citizens who want to work as volunteers, the most of them about 63% will invest time between two and five hours, so we see here some time limitations (see Figure 5.5)

If you were a volunteer working with other citizens in activities for improving the green spaces in your city, How many hours a week are you willing to dedicate? (Please explain your answer.)
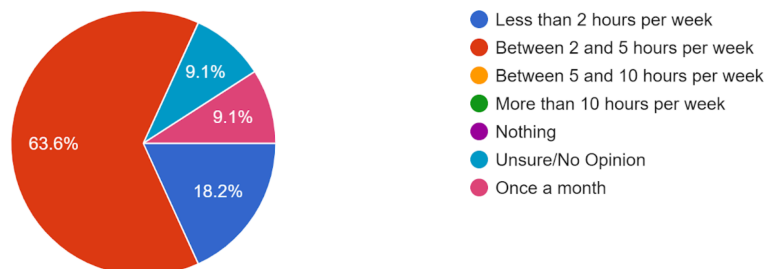
11 responses

Figure 5.6: Time for volunteer activities dedicated by citizens.

More than 80% of the citizens are willing to participate in crowdsourcing to improve the green spaces in their city.

Are you open to participating in a crowdsourcing environment (give your opinion in a collaborative way with other citizens) to provide feedback to eva...spaces in your city? (Please explain your answer.)
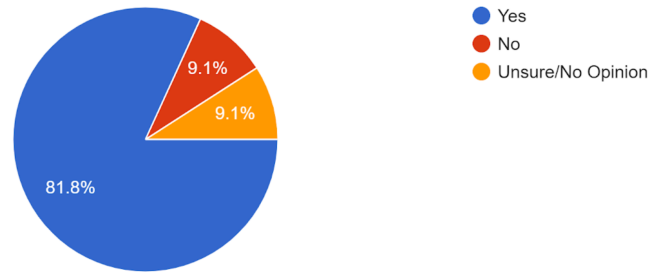11 responses

Figure 5.7: Crowdsourcing environment acceptance by citizens.

From all interviewed citizens, those who are willing to participate in crowdsourcing environment, prefer to do it using online mediums. The results are understandable during Covid-19 pandemic. Another reason could be that the most of the participants were young.

If previous answer was yes, please select which way? (Please explain your answer.)
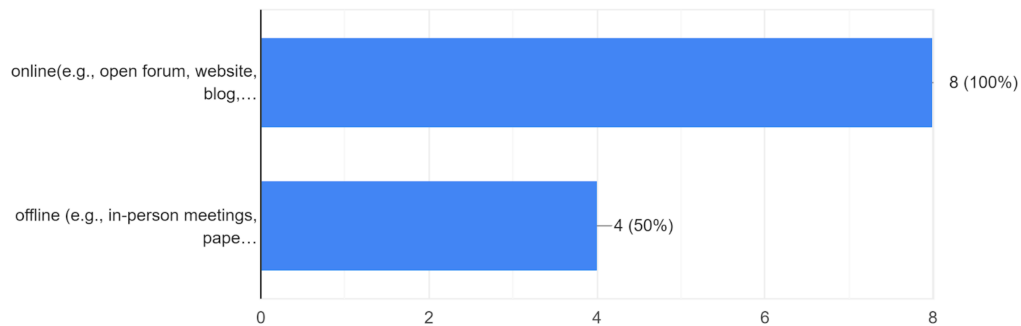8 responses

Figure 5.8: Crowdsourcing medium modality.

Most of the people indicated that online events are better, because they could save money, and it is easy to stay at home and communicate through digital medium, and also it is a good option during pandemic.

5.2   Feedback from public sector

Due to different current situations at the evaluation moment, as pandemic status or the time of the year, unfortunately it was not possible to get responses from public sector, which makes it impossible to do a parallel between citizens and public sector point of views. Therefore, feedback from public sector can be considered as feature work.

Chapter 6

Discussion and Conclusion

Co-production processes have proven to be beneficial in establishing an environment that favours collaborative interaction between citizens and the public sector. As mentioned throughout the research, such processes offer clear elements that position stakeholders, mainly citizens, to assume a role, depending on intrinsic characteristics such as their skills, personal motivation, previous experiences, acquired knowledge, material and non-material resources, etc., as well as extrinsic ones, such as the characteristics of the context itself, the rules that define the environment, the expected results and the problem to be solved, aspects which were considered at the time of designing the framework proposed in this research.

Similarly, collaborative events can provide potential means of interaction for the citizen, which facilitate their linkage with the different stages that integrate the co-production process. It is important to mention that the popularity achieved at present by some of these events, such as hackathons, workshops or crowdsourcing, has generated that such terminology is not completely unknown, so that citizens are willing to participate mainly in a collaborative way, of course, if they find a motivation on the part of the public sector, which maintains its interest always in mind, for which techniques such as gamification or open social innovation have proven to be very appropriate. Additionally, if this type of event combines technological aspects such as urban sensor networks, web or mobile platforms that provide public services, social network applications that encourage citizen participation, even the implementation of data science to anticipate the behaviour of the city and other aspects promoted by the progressive digital transformation that has been occurring in cities, collaborative events become a gateway that facilitates the interaction of citizens with the public sector and its representatives to obtain results and solutions to defined problems, while providing a controlled environment for such interaction following a set of rules, such as those presented in the principles of good governance and co-production presented so far.

Although the evaluation results do not allow establishing points of comparison between the two main actors of the co-production process since the results are not available from the public sector, it was possible to find relevant aspects of the citizen's opinion, such as the acceptance and willingness to participate in collaborative events contributing mainly skills and working time, in order to plan, design, implement and evaluate solutions or improvements of the city's public services, taking into account that the closer the effects of such results are, the more significant it will be for the citizen to get involved in the different processes. Likewise, it is important to note that the citizen prefers to interact through technological tools, such as websites or mobile applications, thanks to various benefits that involve the digital transformation, among which citizens highlighted the

possibility of maintaining social distance in the current situation of public health alert, this leads to the public sector to focus its efforts on implementing technology as a means rather than an end, to strengthen the relationship with the citizen. Finally, it is important to mention that although the citizen finds motivation in being an active part in the co-production processes with the public sector, this is not enough to keep him/her linked and encouraged, therefore the public sector must implement techniques and mechanisms that encourage such participation in a constant and lasting way, a great part of these techniques can be found in the intrinsic characteristics of the collaborative events.

Finally, as pending tasks for the present research, it is important to continue with the implementation of the interviews for the public sector, because it is necessary to establish points of comparison between the perspectives of the two main actors for each co-production process. Likewise, taking the proposed framework as a basis, a set of rules can be defined to allow the selection and implementation of the most appropriate type of collaborative event for the context where the co-production processes are developed, additionally it is required to study how the framework behaves when it is submitted to the interaction with other frameworks operating in other contexts defined by their respective identified problem, this corresponds to the unexpected factors represented with the shape of a cloud on the extreme right of the framework, it is also required to study in greater depth the roles that each actor can assume for the different collaborative processes, depending on internal characteristics such as skills, experiences, knowledge, and so on, taking into account that the main objective of human smart cities is the satisfaction and well-being of the citizen, which requires knowing the citizen in a personalized and specific way.

Acknowledgements

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