Article

Designing Sustainable Services for Cities: Adopting a Systemic Perspective in Service Design Experiments

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Abstract: Cities provide a privileged context for observing environmental, social, political, and economic changes. They offer great opportunities for experimentation, often becoming laboratories for innovative practices in different fields of research. This article describes how Service Design can concretely contribute to promoting sustainable and inclusive services at the city level by adopting participatory, collaborative, and multi-stakeholder processes. In particular, the article analyses, through a literature review, the evolution of service design applied to complex and large-scale systems, identifying in the recent conceptualization of service ecosystem design the framework for designing sustainable and inclusive solutions in urban contexts. Two design studios were developed through a collaborative design process to link theory and practice. Three examples of service concepts are described as experiments in transformative service design practices that incorporate systems thinking. The article explains how service designers can deal with complex and large-scale transformations in terms of sustainable urban services and outlines a service design process and some design and research implications related to the ability to adapt to uncertainty and incorporate complexity as design elements.

Keywords: service ecosystem design; transformative service design; sustainable services; services for cities

1. Introduction

Currently, 80% of global greenhouse gas emissions and 50% of global waste are generated in cities [1]. Furthermore, it is estimated that by 2050, 66% of the world's population will live in urban settings, and much public and private investment in most countries will support this rapid growth [2].

In 2015, the European Commission published the first Circular Economy Action Plan [3] to support sustainable waste management, land use, reuse, and recycling through cocreation strategies between economic actors, politicians, organizations, and citizens. The policy thus includes the strategic and management issue as closely linked to the social one, supporting an integrated, multilevel approach in which people are recognized as active actors. These strategies are then implemented through the European Green Deal, which supports the integration of circularity and sustainability mechanisms in urban contexts in line with the goals of the SDGs (Goal 11 Make cities and human settlements inclusive, safe, resilient and sustainable and Goal 12 Ensure sustainable consumption and growth patterns) that deal with safe, resilient, and sustainable city models. The recent concept of the circular economy is then applied to urban contexts through the circular city, eco-city, and resilient city, which complement the more technological smart-city model. Many European contexts have embraced these principles by explicitly putting them on the political agenda. For example, Helsinki has integrated circular economy guidelines into development policies, supporting design, production, and consumption models based on the regeneration of resources, with a participatory and inclusive approach [4]. Similarly, Amsterdam has implemented a strategy embedding circular processes in the housing sector and the involvement of citizens in numerous initiatives related to recycling and reuse

processes at neighborhood level [5]. Milan has developed a resilient strategy to tackle environmental, social, and economic challenges through collaborative actions involving citizens and policy makers.

Transition models towards sustainability [6] also pay more attention to people as knowledge agents able to support transformation processes towards more sustainable, resilient, and inclusive cities by unleashing their creative potential and adopting collaborative and participatory strategies to improve quality of life and well-being [7]. In recent years, the European Commission has played an essential role in supporting sustainable transition, calling for an increasing involvement of people in development processes. A model called the "human-centered city" has been proposed: "Citizens become city-makers and shapers, architects and cocreators of their own evolving urban development" [8] (pp. 12–13), going beyond technology or market-led models and considering participation, codesign, and cocreation as enablers of innovation. Consequently, emphasis is placed on needs, expectations, and lifestyles as elements around which innovation strategies can be developed. Citizens are thus seen as active parts of the system and not only as recipients of top-down decision-making processes. The New European Bauhaus initiative, linked to the European Green Deal [9], is a recent example of how these issues are at the center of the EU policy agenda. The initiative aims to support more robust connections between theoretical frameworks and practical initiatives in different local contexts, where the connections between different actors and competences becomes crucial.

Cities are considered creative laboratories [8] where the great potential of research, knowledge, and skills can foster innovation processes. The design (and redesign) of urban services to meet the renewed needs of citizens, organizations, and institutions towards more sustainable and inclusive scenarios is at the center of the international debate and local policy agenda. For service designers, this implies having a major role in societal change and managing complex systems and long-term and large-scale changes, and interacting with various actors who with different roles influence and participate in the decision-making and design process. This scenario highlights the need to move from the individual and the one-to-one relationship between provider and user to a systemic and large-scale vision with transformative impact [10–13].

This article discusses the implications for service design of sustainable solutions and collaborative and multistakeholder processes at the city scale, adopting the service ecosystem design perspective conceptualized by Josina Vink et al. [14]. Services are one of the critical infrastructures of contemporary society, and urban contexts are a privileged arena in which to experiment with service design by adopting a systemic, collaborative, and large-scale perspective, supporting the disciplinary advancement towards greater integration of complexity as an element that connotes both conceptual frameworks and practices [15–17].

Contemporary cities are increasingly adopting collaborative, participatory, experimental, and innovative governance models [18] that involve the ability to coordinate different actors around shared goals. As far as service design is concerned, the human-centered approach and codesign and cocreation processes facilitate and enable the construction of consensus relationships and help to visualize (including through experimental prototypes) solutions, validate their effectiveness, and imagine their feasibility. In these design processes, communities play a crucial role in promoting and accompanying innovation at the local level [19,20] concerning infrastructures that can reduce the gap between the political class and citizens.

This article aims to contribute to the debate on the evolution of service design in its transformative role applied to large-scale and inclusive sustainable urban service design, adopting a service ecosystem perspective. Due to the relatively recent theorizing on these issues, how theoretical principles can be applied in service design practice and how processes and tools can be revised remain underexplored.

What conceptual and operational revisions are needed when service design deals with the urban scale and sustainable issues, that is, when the design object is a complex, multi-actor system with long-term development?

To better describe the research path adopted, the following sections are structured as follows:

1. Section 2 describes the objectives, design methodology, and tools adopted to support the overall research path.
2. Section 3 focuses on the literature review.
3. Section 4 describes the design studios process and illustrates three service concepts that emerged.
4. Section 5 provides a discussion of the results.
5. Section 6 identifies limitations and directions for future research.

2. Materials and Methods

This article reflects on the importance and necessity of adopting a systemic and collaborative approach to service design when dealing with complex issues and contexts. By adopting the theoretical framework of service ecosystem design, two areas of design research and development are outlined that imply an implicit relationship with the uncertainty of the design outcome and the complexity of both the design object and the service design itself [14]. Furthermore, a design process is outlined that incorporates systemic, multilevel, multi-actor elements.

The research followed a research-through-design process. First, a literature review was conducted on publications indexed in Scopus and Google Scholar (from February and March 2022 and updated as of September 2022), which led to defining the state of the art of the scientific literature on sustainable service design and service design about urban systems. The review revealed, on the one hand, the need to update service design processes and tools to move beyond linear models to more circular and relational ones and on the other hand, the need to develop and better integrate collaborative practices in which value is cocreated in different circumstances and contexts [14,21]. The theoretical phase led to the identification of the concept of service ecosystem design as a conceptual reference for the application of service design in complex systems. The research was linked to two design studios developed at the Design School of Politecnico di Milano to reflect on the theoretical model through practical action. The courses, entitled Design for Better Futures, aimed to generate service concepts capable of creating value for urban contexts, focusing on issues of sustainability and inclusiveness. The studios were conceived as experimental processes incorporating systemic and complex dimensions, involving many actors able to contribute with different roles and in different phases through collaborative and reflexive processes.

3. Literature Review

3.1. Sustainable Services and Service Design

In the design field, the relationship with sustainability, the systemic perspective, and the large scale have been explored from different angles. Ceschin and Gaziulusoy [22] describe how the concept of design for sustainability has evolved by shifting the focus from product innovation to the product–service, social innovation, and socio-technical systems. This evolution implies a shift in the focus of design from the material to the immaterial, towards solutions that address social, economic, political, and environmental problems, considering design as a competence that can contribute to the transition towards a resilient, equitable, and sustainable society [23,24]. Issues related to the large-scale, systemic perspective have been explored through the concepts of systemic design [25], transition design [26,27], transformation design [12], Design X [28], and design for social innovation [29–31] including related to the enhancement of territories and communities [32,33]. All these models emphasize how design is increasingly moving around social changes and emerging values in environment and culture, in the connection between local and global scales, and through new relational models between stakeholders.

As far as services are concerned, the exploration of systemic and large-scale changes is related to the activity that Ostrom et al. [34] propose as "leveraging service design", i.e., the investigation of crucial societal problems [15]. Service design is described as a holistic, collaborative, and human-centered approach that includes strategic aspects [35–38]. Sangiorgi [16] identifies three areas for service design evolution: interactions, complexity and transformation. From this perspective, service design as a strategic approach is applied to urban contexts by incorporating the complexity of sustainable transitions [39], including organizational, social, and technological aspects, along with qualitative components concerning users' needs and how they interact with providers and their context [40]. The adoption of design approaches to support sustainable societal development [22,29,41] entails the recognition of systemic and complex dimensions, the transformative capacity of long-term outcomes, and the importance of connecting and involving different actors in the design process [42], strengthening what Irwin refers to as the "connective tissue" [41].

In recent years, the integration of service design research and practice and codesign processes with systemic aspects of sustainable transition on an urban and territorial scale has been investigated from different perspectives [43,44]. Research initiatives are contributing to the advancement of knowledge by exploring the role of design in large-scale sustainable transformations. Examples include projects such as Reflow (https://reflowproject.eu/about (accessed on 12 October 2022)), which explores how cocreation can contribute to circularity at the city level; Retrace (https://projects2014-2020.interregeurope.eu/retrace (accessed on 12 October 2022)), which aims to investigate the link between systemic design and urban policies; and NetZeroCities (https://netzerocities.eu (accessed on 12 October 2022)), focused on achieving climate neutrality for cities through a broad participatory process. On a practical level, some experiments have been proposed by service design agencies, such as Snook or Koos that have created specific tools to promote circularity at the urban scale from a service design perspective. However, there is a need to revisit the processes and tools according to the broader design focuses, application scales, and timeframes. In general, the explicit contribution of service design in sustainable city transition processes is still under-explored, and the role of service designers within large-scale transformations remains marginal, underrated, or confined only to the execution phases.

3.2. Service Ecosystem Perspective

The concept of a service ecosystem is related to the discipline of marketing concerning the issue of value creation through a multi-actor process [45]. From the service logic perspective, the service ecosystem concept describes a system of interacting actors who cocreate value and share norms, rules, and practices [46–49]. The concept of service ecosystem is adopted in management and marketing to describe value creation models in service innovation and design processes. Recently, service ecosystem design has been conceptualized [14,50] providing a comprehensive understanding of service design and opening new research and experimentation opportunities. It emerges as an evolution of the service design concept and then design for service [14]. The approach implies the consideration of updating service design and its design object by acting on different scales and linking the micro, meso, and macro levels of the system in which it operates [46,51], integrating a system thinking dimension [52]. Therefore, the service ecosystem perspective is related to the design of complex systems in which the transformative aspect becomes significant [11,13]. Vink et al. [14] identify four constitutive elements of service ecosystem design that refer to (i) the purpose (why), described as the facilitation of the emergence of desired forms of value cocreation; (ii) to materials (what), such as institutional arrangements and their physical implementations; (iii) to processes (how), such as how to incorporate feedback loops of reflexivity and reinforcement; and (iv) to actors (who), such as the collaborative design by all actors. These elements will guide the reflections within the teaching process described below.

4. Service Design Studios Process and Tools

The design studios involved in the research process are part of the master's degree in Product Service System Design at Politecnico di Milano. They aimed to lead students through a service design course that simulates a real-life experience and enhances the participants' critical and reflective research and design skills. They developed over four months.

The studios considered for this research were developed in academic years 2018/2019 and 2020/2021. They involved four lecturers: an academic expert in service design and innovation, an academic expert in business and social entrepreneurship, a professional designer expert in service prototyping, and a professional expert in new technologies. About 40 students per academic year participated in the courses.

The didactic programs were linked to the urban context through direct contact with local stakeholders (i.e., municipalities, public and private organizations, local authorities, and citizens) who were actively involved in the service's research, design, and validation phases. In addition, experts were invited to provide specific thematic contributions, such as on ethnographic research, social innovation, sustainability, and circular economy.

The studios were structured according to iterative research–idea–verification procedures lasting four months each year. In particular, the macro phases were as follows: (1) understanding the context and problem farming; (2) the creation of project scenarios; (3) service concept; (4) idea evaluation; (5) idea refinement; (6) service development; and (7) service simulation and feedback (see Figure 1).

(1)　Understanding the context and problem farming is the phase in which the systemic and multi-actor dimension of the urban context is analyzed and understood. In addition, research gaps, i.e., potential areas for project intervention, are identified. This phase is characterized by desk research activities (e.g., policy reports, city data, academic articles, consultancy reports, case studies) and interviews with citizens, city experts, key people, and practitioners. The outputs are related to the descriptions of the local resource system, the macro-drivers that will guide urban transformations, and the design opportunities to be better explored in the subsequent phases.

(2)　Crafting design scenarios outlines a long-term vision of urban development regarding sustainability and inclusiveness. Design areas are explored and described through the definition of a long-term design vision (scenario). Design questions are then formulated from the knowledge and data acquired (i.e., what if or how might we questions). The outcomes are design directions—speculative in nature—that are integrated with the research data and are intended to guide the generative phases. The scenarios are then validated through face-to-face interviews with citizens (possible end-users) and with professionals and policymakers to identify promising development paths, as well as potential barriers and constraints.

(3)　Service ideation is the phase linking the theoretical part to the design part, identifying a potential solution, and outlining the service ecosystem and the system of actors connected to it to analyze their needs and behaviors. In this phase, the elements contributing to the value creation process are outlined, together with the service-specific aspects such as the offerings, interactions, and touchpoints.

(4)　Idea validation comprises an additional desk research and case study analysis phase together with a validation process of a qualitative nature carried out through expert interviews, codesign workshops, and early-stage prototypes. This phase represents the first feedback loop concerning solutions by initiating a collective design process with users and stakeholders.

(5)　Idea refinement is the phase in which service ideas are further refined through a second feedback loop. Refinement takes place through interviews with service actors, sector experts, and users involved in codesign workshops aimed at improving the qualities and processes of the solution coherently with the identified scenario and the principles outlined in the initial phase.

(6)　Idea development is the moment in which the service concept is developed in all its parts through mapping the interactions of actors and resources, the offer system, the

business or social model, and the various journeys, and touchpoints. In this phase, the service is prototyped in the user experience parts and touchpoint components (i.e., through experience prototyping or video prototyping). At the same time, from the users' perspective, the study of the interactions between stakeholders and the user journeys of the service is supported by a business model that considers the value cocreation process [53], the market analysis, and the study of potential competitors.

(7)　Service simulation and feedback refer to the moment in which the service is presented and discussed with a selection of users and actors potentially involved in the solution and stakeholders that could facilitate or inhibit the process, or, in other cases, the identification of real development potential identifying possible partnerships and collaborations, potential conflicts in the system, opportunities to obtain resources, and obstacles.
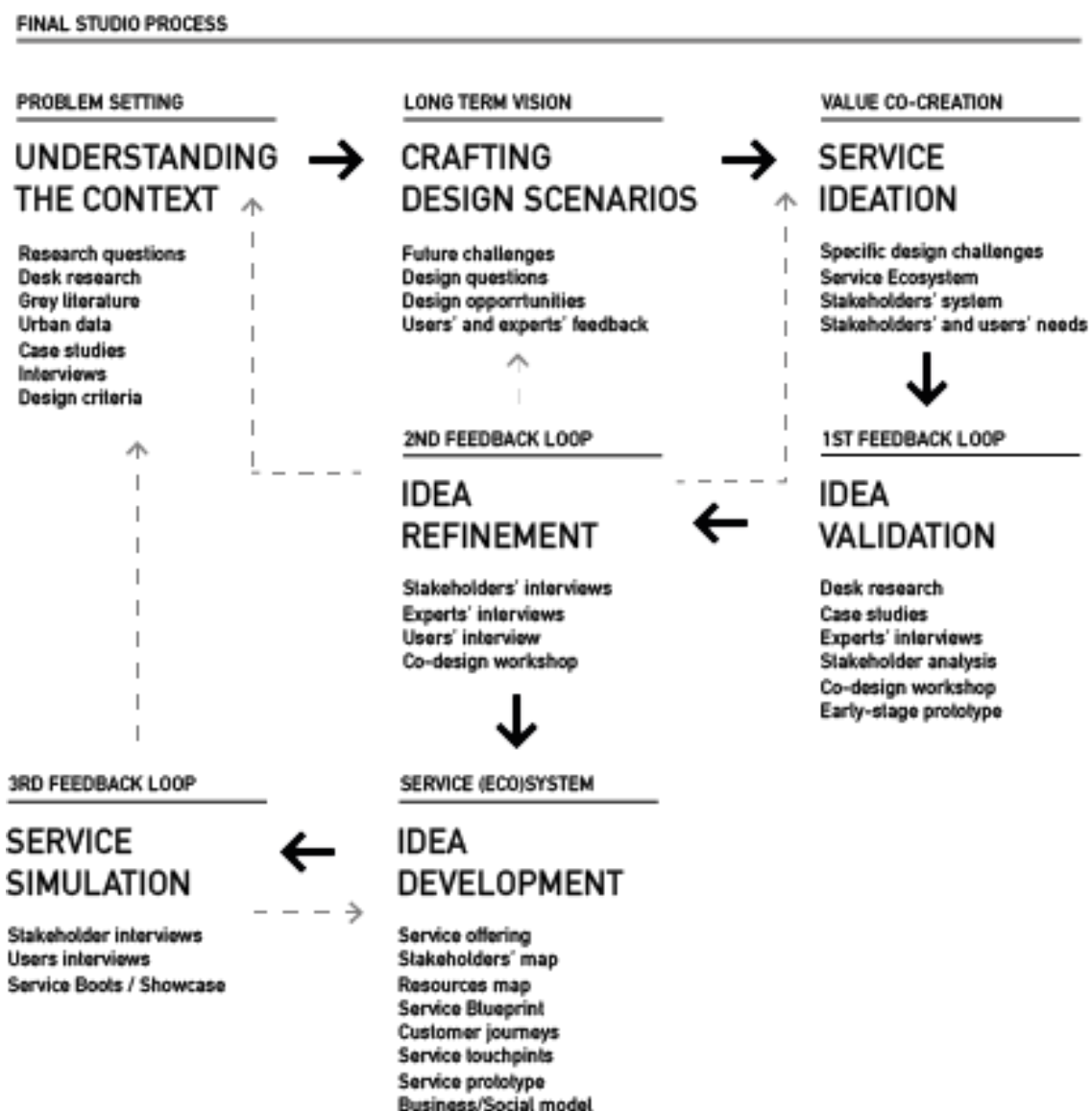

Figure 1. The studio design process.

On the one hand, continuous iteration and experimentation allowed the projects to evolve through ongoing testing to focus more specifically on the forms of value cocreation, the ways in which the service actors interact, and their role in the process from conception to implementation. On the other hand, they helped the students to metabolize what is required outside the university course, which Aksoy et al. [54] identify as the ability to

include potential obstacles in the process, the ability to deal with complex situations, and the ability to involve different stakeholders collaboratively. In particular, the initial stages supported the creation of shared visions and values among stakeholders. The final stages aimed to strengthen the relationships created in the previous ones to identify new forms of collaboration between different stakeholders. Throughout the journey, end users played an active role in the value creation. The service concept ideation fostered and accelerated the dialogue between the various actors sharing a common vision on integrating sustainability and inclusion in decision-making and operational choices. In addition, the stakeholders involved reflected on how to adopt a people-centered perspective, understanding the importance of relationships, processes, practices, and tools characterizing the service system rather than designing a single solution.

Three service ideas developing different themes are described below, starting from the common frame of reference.

4.1. Promote the Culture of Reuse of Building Materials

The Renova service concept aims to reduce waste from demolition or renovation to feed a reuse circuit for building materials. The idea is that of a service based on the recovery and resale of building materials in good condition that would otherwise once decommissioned become waste. This is made possible by the active involvement of private contractors, construction companies, and deconstruction companies. The model seeks to overcome the linear "take-make-reject" model by proposing a circular approach capable of creating value for end users and the territory and reducing resource consumption and the economic impacts of disposal (long-term scenario). The final solution, referring to the Brazilian context, is a digital platform where end users (i.e., architects, designers, and citizens) have access to a catalogue of used materials in good condition that can be reused in other contexts. In addition, the platform offers—through augmented reality—the possibility of virtually positioning elements in 3D models to facilitate the appropriate choice of materials and finishes through an interactive and empathic process. The circular process, therefore, connects different actors within a virtuous path of recovery and reuse of materials. It on the one hand generates less consumption of resources and an efficient process and on the other hand reduces the production of construction waste, management, and disposal costs with a consequent positive impact on the territory. This process implies coordination and collaboration between public and private actors, changing existing processes. The advantage for construction companies is the reduced waste load and considerable cost savings for end users. The solution, therefore, combines aspects related to the user experience (micro level), the relationship between companies, local authorities, and municipalities (meso level) and the link with waste management and recovery policies on an urban scale (macro level). The solution was developed through an in-depth study of the Brazilian context and discussions with local architectural firms and potential users. The service concept, therefore, starts from developing knowledge of how the actors in the system interact today, and from providing a vision of how their relationships could change the development and adoption of new processes and tools for the actors involved.

4.2. Promote the Culture of Reparation among Citizens

Waste disposal is one of the crucial issues to act on to support sustainable processes in the urban environment. StoryGood is a platform that helps citizens maintain and manage their electronic devices to reduce their early disposal. The idea of the service is based on enabling citizens to consciously manage the use and maintenance of their electronic devices by accessing a digital repository that gives access to information on the life cycle of products (service design long-term view). The service is developed through a digital platform through which users are provided with a series of information, together with guidelines and tutorials on how to repair their devices independently or by turning to specialized centers in the city. Users are then in touch with specialized centers spread throughout the city, following the model of repair cafes.

The idea of the service is that products displayed on the platform will be classified according to the sustainability of the production process, durability, energy consumption, and ease of repair. This information will be obtained through data collection from company reports, repair center evaluations and end-user feedback (stakeholder relations). In addition, the community system generates a reward mechanism for users who make the community of good practices visible at city level, supporting conscious consumption and the consequent reduction of electrical waste. The idea is that end-users can be empowered to adopt sustainable consumption behavior, saving money, and helping to reduce CO_2 emissions. The repair centers also become neighborhood hubs that on the one hand support the spread of circular models and on the other hand strengthen the connection between citizens by fostering the emergence of new local networks. The expected long-term result is that companies are incentivized to produce easily repairable products, involving users to motivate a repair culture, thereby discouraging premature disposal.

In this case, the concept of sustainable service can be described as the ability to promote sustainable behavior of a system of actors through the creation of different business models (local hubs) and favoring virtuous cycles on a large scale, strengthening social capital, and supporting sustainable growth and development. Here again, the final solution stems from direct dialogue with the system's potential stakeholders and reflection on how different players can participate in the creation of value for the local context through new forms of relationships between citizens, businesses, and public administrations.

4.3. Promoting the Social Inclusion of Elderly People

The NET service concept falls into the area of sustainability mainly related to social innovation. In particular, the service concept focuses on including fragile groups in using digital services and, therefore, on the need to foster learning processes of digital tools and devices. At the same time, it enables communities to maintain and strengthen social ties. On the one hand, municipalities support smart city concepts in which technologies are fully embedded in everyday life; on the other hand, a segment of the population remains marginalized with the consequent difficulty in accessing public services and, to some extent, being restricted in exercising their rights. NET's purpose is to support people's learning processes using technologies and technological devices, through practical courses (online and face-to-face experiences) in which experts and professionals share their skills through informal and experimental approaches. In particular, face-to-face experiences are designed to be implemented in significant places in the neighborhood (e.g., shops, bookshops, cafés) to foster social relations and create new mutual aid networks (stakeholder involvement). The idea is based on the concept of proposing peer-to-peer learning paths that support citizens' creative abilities and participative attitude (enabling skills), integrating the use of technology in everyday life. In this case, conceiving sustainability for its inclusive value capable of generating social capital is a matter of envisioning sustainability. The service idea considers the users' needs and the local capacity to respond to demands by interacting with neighborhood structures. It also proposes a scenario where micro-scale solutions can be replicated and adapted to other neighborhoods (service impact). It is also a matter of identifying the appropriate resources and locations on an urban scale to ensure the evolution of the system and its impact on citizens. Based on the city context of Milan, the service also links with the municipality's training and inclusion initiatives, thus building a link between the service, local policies and public services.

5. Discussion

The perspective of ecosystem design proposed by Vink et al. [14] outlines an iterative process based on continuous experimentation and prototyping in which functional aspects are complemented by the quality of interactions and the quality of touchpoints that determine how actors interact with the elements of the system and with each other. It means imagining new ways of cocreating value for the service ecosystem [55] by redefining connections, integrating resources, and enabling the capabilities of people and organiza-

tions. In other words, the holistic, collaborative, and human-centered approach to service design can support the creation of new value propositions through the observation and understanding of users' behaviors and needs and the links between the actors involved, anticipating future development trajectories [56].

The solutions that emerged from the educational experiments emphasize the importance of designing sustainable services in an ecosystemic perspective. The service solution is not the result of a single action but is cocreated by a community of actors contributing to the generation of value. Indeed, to imagine real impacts in terms of sustainability, it is necessary to think about the ecosystem of actors that will make the service sustainable, contribute to its formalization, support the creation of the local network, and enable the connection with the policy system. From a service design perspective, this implies considering pathways beyond the single user experience, including a broader perspective that encompasses a broad community's tensions, conflicts, values, and needs and the ability to build long-term visions and bonds of trust. [57]. As Vink et al. [14] pointed out, this implies an assumption of unpredictability due to contextual emergencies and the complexity of social interactions.

Designing sustainable solutions also implies the definition of new service ecosystems. In the experiences presented, solutions mean the creation of new local systems, in which people, organizations, and institutions actively participate, in some cases reviewing or updating their roles within the service system (as in the example of collaboration between demolition companies, municipalities, and design firms in the case of Renova). Another element that enters the design process is the impact the solution can have at the micro, meso, and macro levels in a vision of long-term growth and development. In the initial stages, it is then necessary to consider the ability to influence other contexts, generate awareness and identify potential barriers to the creation of new bonds, to behavioral change, to fostering sustainable attitudes.

5.1. Sustainable Service Design as Adaptation to Complex Systems and Systemic Design

The transition to sustainability (of products, services, processes, systems) requires the ability to address changes that need investments of time and resources. These changes must be observed from a systemic perspective that includes the connection between large and small scales and the understanding of macro-systems and the personal sphere related to people's needs and behavior. Manzini and Rizzo [58], using the lens of participatory design, emphasize the importance of adopting a systemic perspective. They describe large-scale transformation processes of social innovation as the result of a series of actions carried out at the local level that are then amplified, coordinated, and systematized on a larger scale by different actors and competences. Therefore, the design of sustainable services inherently implies a systemic approach to design [59], which becomes essential when the design object is the city.

As recognized by Nie et al. [60] designing—taking into account ecosystem relationships and implications—involves considering interrelated levels of design. The micro level concerns the user's interaction with products and services. The meso level is the relationship between the different organizations that are part of the system, while the macro level implies a relationship with national strategies and policies. These levels have been integrated from the initial stages of the design process, starting with the research, to the final stages. Indeed, the results are based on the recognition of the different needs of service users and public administration, the analysis of evidence and trends, and the data collection. The solutions outlined include the ability of organizations and individuals to participate with an active role in the delivery and maintenance of services, creating the connections for their development.

Designers are increasingly called upon to "work more and more with activities that have mostly social implications" [61] (p. S886). This implies a reflection on how design practice can and must evolve to respond to emerging needs also linked to the rapidity with which socioeconomic and political contexts grow. Given the relational nature of the

process, it is also essential to strengthen an empathic component [62] that puts people's needs, values, and behavior at the center, as well as relationships in the long term.

Acting on a large scale and through a systemic lens requires a redefinition of service design process and tools to integrate this complexity into research, design, and implementation processes. This has taken place, for example, in the context of participatory design [58,63] and design for sustainability [22], by evolving the design object from the product to socio-technical systems, which Binder et al. [64] define as *things*, i.e., the transition from a single solution to socio-material assemblages of humans and artefacts. The possibility of transforming such systems is linked to socially driven processes in which service design can contribute to more sustainable and resilient service ecosystems [65]. Integrating such complexity involves shifting the focus from single relationships to more complex relationships between different actors, rethinking the relationship with institutions and designing new service systems [11,66].

Finally, from the perspective of service ecosystem design [14], it is helpful to reflect on how value cocreation can include a more than human component. A further design and research contribution in support of sustainable city-level services can be explored through the non-human elements of the system [67,68] to understand how these may (or may not) influence decision-making and the service system. This entails a review of the approach and an updating of design tools and training processes. This process leads to consider an evolution of the profile of the service designer, who becomes a designer of sustainable service ecosystems, integrating a plurality of processes and competences [14].

5.2. Designing Sustainable Services as an Adaptation to Uncertainty and Unpredictability

Design, by its nature, is a future-oriented approach [69,70], and it aims to resolve the most challenging problems that require designers to have a holistic mindset [27] and the ability to manage the human-centered dimension and multi-stakeholder design processes. The transformative perspective of service design [13–16] entails envisioning collaborative actions on a larger scale where everyone can design [30], where the object of design shifts from product to service, to organizational level, to social transformation [25,71]. In this collaborative transformation scenario, imagining the future could help citizens, organizations and institutions reflect on complex challenges and long-term perspectives to inform the current situation [72,73].

The ability to create design scenarios that enable and guide visions is crucial for the quality of transformation processes [29] and to promote citizen participation in imagining positive futures [13]. Therefore, it is necessary to encourage collective and long-term actions to promote sustainable solutions that guide urban transformations [74]. From a design perspective, this implies considering how change and transformation can be sustained by reforming institutions, institutionalizing change [14], and designing processes adopted by stakeholders to influence the transformation process [75] intentionally.

Considering service design as a collective agent to imagine future trajectories of action for a better society [66,76], it is advantageous to integrate speculative and critical skills and tools within service design practice to enrich the design perspective and address the complexity required by large-scale actions. In this scenario, service designers can support a sustainable transition by enabling collective and collaborative processes through which they identify participatory development trajectories, stimulate conversations, and promote strategic relationships between different actors. For instance, it is about designing creative ways to empower customers and encourage decision makers [77], enabling them to be more aware of their potential as agents of transformation. Therefore, the role of service designers expands, playing a role as a mediator of relationships between public and private organizations, as a director to orchestrate processes and as a facilitator of codesign processes [78], also becoming a co-researcher, a co-problem solver, and a co-agent of change [79]. In this framework, designers work in network structures that cannot be fully controlled but enabled or directed [80]. Designers act as facilitators of a broader "design community" that actively participates in the design process [81], promoting creative ways

of dealing with complex, systemic problems in which solutions emerge. It is not only a matter of envisaging how the service will be delivered and how to support sustainable and inclusive processes and behaviors. It is also about designing the enabling conditions (i.e., relationships, tools, practices, activities) for the stakeholders to play a proactive and positive role in the system and to share the same development scenario. The adoption of speculative approaches in service design [82,83] can foster a common understanding of the impacts that systemic transformation entails (or could entail), to reflect on how to measure, over a given period, the repercussions that the service system (and the solutions) has in terms of environmental, social, and economic sustainability. Anticipation capacity can support the creation of new scenarios for cocreating value between networks in complex service systems [84] and investigating which relationships and processes may favor or hinder the transition towards sustainability.

6. Concluding Remarks

This study provides a conceptual and practical answer to questions on how service design can be adopted to promote sustainability at the city level. It proposes a reflection on integrating city transformation and systems thinking into service design. Service design is considered in its transformative capacity from a long-term perspective to creating more sustainable and inclusive cities. This perspective fits into the classification that Banerjee [85] proposes as the design of large-scale system transformation. The scholar states: "the process needs to create cocreative space that engage members and innovators from different disciplines and agencies from various vertical echelons, to look for scaled, multi-objective paradigms and to build in effective ways of implementing at scale" (p. 84). The design studios were structured as cocreative spaces embedding this complexity, including that of the design object and the service design process. The solutions emerged reflect the approach given, also incorporating the actors' intentionality of long-term transformation as emphasized by Vink et al. [14] in the conceptualization of service ecosystem design.

In this framework, service designers were required to be able to build an idea of a possible future and to generate a shared vision in a negotiation process between different actors. Morelli et al. [86] describe four service design capabilities in this scenario: vision building, modeling, working at different level of abstraction, and addressing the context. These are described as the ability to define possible futures and evaluate change, also related to its operational aspects; to identify the levels of intervention from micro to macro, and the ability to analyze the context, grasping its complexity linked to technical, economic, social, and environmental factors. To these, it is necessary to integrate the ability to act in uncertainty and to visualize complexity and shape it by including relationships, times, scales, and different dimensions. An abductive and steering capacity is therefore increasingly required in which the solution is not often the definitive one. When dealing with system transformations, designers need to be aware of the limits that managing complexity and uncertainty entail and face the discomfort of designing the invisible [87]. Consequently, further reflection on the capabilities of service designers in this specific area is needed also drawing on social theories [88], as well as additional validation cycles to update the operational tools and the cocreation process.

The service solutions proposed refer to didactic courses and, therefore, carry with them the limitations of a design simulation, which does not allow the evaluation of the real impact on the city context and the transformations of the system to which the solutions refer. However, limitations relate to assessing how the service ecosystem changes during the design process and what enablers and barriers support or inhibit service delivery need to be considered.

This study raised some questions requiring further investigation into how to integrate systemic perspectives into service design to collect evidence on service design contributions to collective action and on the impact that solutions will have in the city. How can service designers assess and monitor changes and adaptations in the ecosystem? How can long-term change in the complex service systems be evaluated? How might service

designers' competences and tools evolve from designing solutions to designing enabling platforms of relationships? These questions emphasize the need to continue action research. Researchers, citizens, experts, organizations, companies, policy makers, and designers must be actively involved in prototyping solutions to promote real transformative impacts through cocreation and codesign processes in a long-term perspective.

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