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Exploring the Systemic and Speculative dimensions into Service Design

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Abstract

The scale and process of Service Design are expanding and evolving as the emerging challenges they face become increasingly complex and uncertain. In order to cope with the systemic complexity and uncertainty of future changes when designing service (eco)systems, more holistic and speculative dimensions are needed to be considered. In the field of design, Systemic Design and Speculative Design are considered to have the capacities to deal with systemic complexity and critically consider future uncertainty. Therefore, this study aims to explore from the theoretical level to the operational level to understand if and how Systemic Design and Speculative Design can help to expand the Systemic and Speculative dimensions into Service Design. Through literature review and expert interviews, this paper presents the theoretical relationships between these three approaches and discusses the opportunities and criticalities of approach integration. In the end, we propose three future research directions and open up open questions about Service Design evolution in Systemic and Speculative dimensions.

Keywords: Service Design, Service systems, Systemic Design, Speculative Design

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Introduction

The world is increasingly facing emerging challenges of volatility, uncertainty, complexity, and ambiguity, which is described as a "VUCA" world, or the other acronym, "TUNA" world, which describes challenges in terms of Turbulent, Uncertain, Novel, Ambiguous (Laurin et al., 2018; Mack & Khare, 2016). Either way, at its core, it describes systemic complexity and future uncertainty due to the increasing interconnectedness and dynamic changing environment in the global and connected development processes. In terms of complexity, the rapid development of technology has brought the interconnectedness to more and more things, which also leads challenges that are compounded with open, complex, dynamic, and networked character (Dorst, 2015). And disruptions such as climate change, pandemics, economic crises, and social exclusion within the last decade have increasingly led to the recognition that the high level of unpredictability of the future and future uncertainty shatter the conventional images of the future that humans use to plan (UNESCO, 2019). In this context, the design challenges faced by Service Design are also emerging next level of complexity and future uncertainty in parallel, which requires Service Design to evolve further to address the challenges better. Therefore, this paper aims to explore the evolution of service design in the dimension of Systemic and Speculative future thinking, thus providing insights into how Service Design can better cope with the design challenges of complexity and future uncertainty.

Based on a literature review and interviews with experts who work on or work related to service design, we investigate and reflect on how Service Design is expanding its boundaries integrating systemic and future oriented approaches. To gain a multifaceted understanding of design practice, we conducted semi-structured interviews with ten experts from design schools and design agencies. We then coded the interviews for narrative analysis to understand the emerging practice from academia and practice and to reflect on it.

This paper will serve as an exploratory paper that aims to understand the current integration of Systemic and Speculative approaches in Service Design and to open up new research directions for Service Design evolution in Systemic and Speculative dimensions.

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Theoretical Background

The emerging complex and future uncertain challenges and the evolution of Service Design

Humans live within multiple levels of social systems, which are all service systems (Fisk, 2009). Service systems are connected via shared institutional arrangements and form service ecosystems that span from individuals to communities, organizations, cities, countries, shared information, and technology (Barile et al., 2016; Maglio et al., 2009; Vargo & Akaka, 2012; Vargo & Lusch, 2011). Service systems of all sizes are constantly reproducing or reconfiguring themselves (Koskela-Huotari et al., 2021). Different levels of service (eco)systems interconnect and interact with other service (eco)systems to co-create value by sharing information and value propositions (Maglio et al., 2009; Spohrer et al., 2007). Therefore, service (eco)systems are dynamic entities and capable of adapting to the changing conditions of internal and external structures (Polese et al., 2021), such as emerging forms of resources integration within service systems (Koskela-Huotari et al., 2016; Vargo et al., 2020) or external shocks and megatrends (Kleinaltenkamp et al., 2018; Skålén et al., 2015), through service (eco)system transformation (Spohrer et al., 2007). Service (eco)system transformation is defined as the process of "reconfiguring of actors, resources, resource-integration practices, and the corresponding institutional arrangements within or across service systems." (Koskela-Huotari et al., 2021)

What is noteworthy is that service (eco)system transformation is increasingly facing challenges of emerging systemic complexity and future uncertainty. In terms of complexity, the rapid development of technology has brought the interconnectedness to more and more things, which also leads systemic challenges that are compounded with open, complex, dynamic, and networked character (Dorst, 2015). And disruptions such as climate change, pandemics, economic crises, and social exclusion within the last decade have increasingly led to the recognition that the high level of unpredictability of the future and future uncertainty shatter the conventional images of the future that humans use to plan (UNESCO, 2019). In this context, the endogenous and exogenous challenges faced by service ecosystem transformation are also emerging next level of complexity and future uncertainty in parallel, which requires Service Design, an intentional pathway to facilitate service system transformation (Patrício et al., 2018; Sangiorgi, 2011), to evolve further to address the challenges better.

As Service Design has evolved over the past three decades, its development in recent years has seen it increasingly recognized as being able to serve as one of the

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key practices to promoting the complex service (eco)system transformation. During its initial decade, Service Design was primarily focused on the interaction paradigm, with the purpose of designing service interfaces and interactions between customers and service providers (Sangiorgi, 2009). Over time, there has been a gradual and iterative shift from designing intangible experiences towards the design of tangible elements that enable coherent service experience (ibid.). In the subsequent decade, Service Design was expanded beyond dyadic interactions to the level of organizational and transformational change (Junginger & Sangiorgi, 2009).

Over the last decade of development, building on the overlap between Service Design and Service-Dominant (S-D) logic (Vargo & Lusch, 2017), the focus of Service Design has shifted from the Design of Services to the Design for Services (Kimbell, 2011; Kimbell & Seidel, 2008; Meroni & Sangiorgi, 2011; Sangiorgi & Prendiville, 2017; Wetter-Edman, 2014; Wetter-Edman et al., 2014). Service design has further expanded its role in the transformation and is seen as an intentional pathway to facilitate service (eco)system transformation and a broader engine of societal change and catalyst for change (Koskela-Huotari et al., 2021; Kurtmollaiev et al., 2018; Patrício et al., 2018; Sangiorgi, 2011; Vink et al., 2021).

During the development path of Service Design, it can be seen that Service Design already introduced some systemic perspective (e.g., Darzentas & Darzentas, 2014; Manzini et al., 2001; Sangiorgi & Pacenti, 2010; van der Bijl-Brouwer, 2017; Yulia & Roberta, 2018) and emphasized its role in the service systems transformation (e.g., Koskela-Huotari et al., 2021; Patrício et al., 2020; Villari, 2022). However, it is essential to recognize that with the rapid development of the world, Service Design is facing increasingly significant complexity and large-scale problems brought about by the dynamic changes inside and outside the service systems, multi-actor dynamic interaction, and interdependence challenges in its environment (Dorst, 2015; Manzini, 2011; Sangiorgi et al., 2017; Villari, 2022; Vink, 2021). The interconnectedness of things brings complexity, so systems must be viewed holistically to identify effective leverage points and further foster systemic transformation (Meadows, 2008; Sevaldson, 2009).

In addition, the complex dynamics of the interconnectedness of global systems, such as economic, climate, social, technological, health, etc., bring a high degree of exogenous uncertainty about the future to the service system transformative design challenges (Kleinaltenkamp et al., 2018; Skålén et al., 2015). Also, when Service Design operates in a human-centred world, the transformative challenges are driven by human behaviour, attitudes, needs, and desires. However, humans are affected by the endogenous dynamics of the systems they live in (Polese et al., 2021), and the needs are always changing, so the system transformative challenges are not

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always predictable and not limited to the "now" (Locy, 2020; Mager et al., 2020; Prosser & Basra, 2018).

Although Service Design is essentially a future-oriented, creative and iterative process that employs a divergent approach to envisioning new possibilities (Karpen et al., 2017; Mager et al., 2020; Runco & Acar, 2012), the results are generally applied from the "now" to the "short-term future". If only considering the short-term futures, the "design for short-term" services may repel or constrain the uptake of serious futures anticipation or have negative effects and impacts when some unpredictable challenges arise (Jones et al., 2019).

Therefore, Service Design needs to evolve to further think critically about the problem from a longer-term perspective, considering how internal and external influences at different levels of the system may change the behaviour and needs of actors within systems over time, in order to address the challenges of uncertainty, open the way for potential new pathways, create services that are more resilient to potential changes, and play an active role in fostering the radical transformation of service systems (Koskela-Huotari et al., 2021; Prosser & Basra, 2018; Sangiorgi et al., 2017).

Towards a systemic perspective of service design

As mentioned, some Systemic perspectives have been introduced into Service Design, and service design scholars have recognized the complex systemic nature of services (Vink et al., 2021). To further explain, the "Systemic perspectives" were interpreted into two understandings:

- **Systems thinking perspective derived approaches to the design of services**

    Systems thinking as a thinking tool for dealing with complexity has been integrated into many other fields and disciplines as early as the twentieth century, such as biology, information theory, management, engineering, and cybernetics (Darzentas & Darzentas, 2014). With the development of systems thinking, there was a growing acknowledgment and emphasis on the contribution of soft systems thinking (Checkland, 1981) in dealing with the high complexity of ill-structured problems (Checkland, 2000), as compared to hard systems thinking, which contributes to deal with structured systems problems (Checkland, 1981). By emphasizing the structure and patterns of systems, as well as the relationships and connectedness of elements within a system (rather than unrelated objects or just its parts), systems thinking provides a perspective for understanding the relationships between things, which can reveal some of the "invisible" properties and elements underneath the iceberg (Darzentas & Darzentas, 2016, 2014).

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Therefore, this systems thinking has also led to some new derived approaches for Service Design, such as Product Service System Design (PSSD) (Manzini et al., 2001; Sangiorgi & Pacenti, 2010) and a range of methods and tools for identifying elements and relationships in systems, such as service blueprint (Bitner et al., 2008), system map (Morelli, 2006), ecosystem map (Forlizzi, 2013), stakeholder map (Giordano et al., 2018), etc., to better help deal with the complexity that Service Design faces.

- **The systemic conceptualization of service design informed by S-D logic's service ecosystem perspective**

In recent years, another systemic perspective, the service ecosystem perspective (Vargo & Lusch, 2016, 2017) with the service systems concept of service science (Maglio et al., 2009; Spohrer et al., 2007), which both based on the S-D logic (Vargo et al., 2017; Vargo & Lusch, 2016), have become increasingly common in the service research and service design literature.

According to Lusch and Vargo (2014, p. 161), service ecosystems are "relatively self-contained, self-adjusting system[s] of resource-integrating actors connected by shared institutional logics and relatively self-contained, self-adjusting system[s] of resource-integrating actors connected by shared institutional logics and mutual value creation through service exchange." The service ecosystem perspective emphasizes the complexity, dynamics, and multi-actor nature of value co-creation (Vargo & Akaka, 2012). Another similar concept, the service science definition of a service system is, "a configuration of people, technologies, and other resources that interact with other service systems to create mutual value" (Maglio et al., 2009). Research on service systems emphasizes collaboration and adaptation in value co-creation (Vargo et al., 2008).

From the definition of the two concepts, we can see that their main difference is that the service ecosystem perspective emphasizes the more general role of institutions rather than technology. However, technology can be considered an institutional phenomenon (Vargo & Lusch, 2016).

As for the development of service ecosystem perspective in service design: it has recently been adopted by service design scholars and conceptualized as service ecosystem design (Vink et al., 2021). Service ecosystem design recognizes the agency and participation of all actors. It emphasizes the intentional shaping of institutional arrangements that facilitate the emergence of desirable forms of value co-creation through the collective reflexivity and reformation of actors at different levels (Vink et al., 2021); service design scholars are also researched how Service Design understands and design complex service systems (e.g.,

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2023

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Sangiorgi et al., 2017; van der Bijl-Brouwer, 2017, 2022) and service system transformation (Koskela-Huotari et al., 2021; Patrício et al., 2020). This perspective also emphasizes actors' collective participation and value co-creation interactions within and across service systems (Koskela-Huotari et al., 2021; Patrício et al., 2018, 2020; Wetter-Edman, 2014).

As can be seen from the related studies that come with the systemic dimension, there is a need for a systemic understanding of the service phenomenon that is no longer limited to the common dyadic relationships and interactions of customers and service providers. There is a need to recognize the design agency of all actors within and across systems, thereby co-creating value for service (eco)system transformation and even societal transformation (Koskela-Huotari et al., 2021; Sangiorgi et al., 2017; Vink et al., 2021).

Systemic Design is a design approach integrating systems thinking and design, it emphasizes that it can help to shift designers' attention from a single element to the big picture by constructing a holistic view of the systems while considering the actors within and related (Jones, 2018); and that it can engage with value conflicts between stakeholders and bring diverse stakeholders towards a shared frame of reference for collective action (Ryan, 2014). Also, by convening and strengthening relationships between different system actors, Systemic Design can to support actors' relational thinking and capacity (Aguirre-Ulloa & Paulsen, 2017) and help them to develop new value systems that can in turn contribute to systemic change (Drew et al., 2021). Thus, we can see that Systemic Design can further cut into Service Ecosystem Design, and thus come to enhance its systemic dimension to deal with systemic complexity of complex service ecosystems.

Embedding future-visions perspectives in service design

The intersecting characteristics of future thinking and design thinking are both future-oriented and designed to seize new opportunities; as such, they have both common grounds and elements that supplement each other (Ojasalo et al., 2015). Furthermore, future thinking actually involves systems thinking, considering not only the (micro or meso) factors directly related to the current service context but also the (macro) factors that influence the service (eco)systems that shape the lives of actors (Griffel, 2020), which makes future thinking challenging (Bishop & Hines, 2012). Therefore, creativity and critical thinking are necessary to create alternative futures to critically view the dynamic factors of change in the systems (Bishop & Hines, 2012) and think outside the box to reframe the problem (Alstyne, 2010).

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Future-oriented practices are also increasingly influencing design disciplines, with developments of approaches and methods such as Speculative Design (Dunne & Raby, 2013), Critical Design (Dunne, 2005), Design Fiction (Sterling, 2009), Discursive Design (Tharp & Tharp, 2013)，Experiential Futures (Candy & Dunagan, 2017), and the integration of foresight and design as a new support for strategic decision making (Buehring & Bishop, 2020) , and so on.

As for the integration with Service Design, future thinking has been deployed piecemeal in some service design practices by way of methods and tools, such as trend analysis or scenario building, which are mainly applied for frame design challenges and discover insights (e. g., Kumar, 2012; van Boeijen et al., 2014), these applications are seen as complementary to the Service Design process (Prosser & Basra, 2018). Some Service Design researchers have also raised the consideration of introducing future thinking or foresight approaches in Service Design (e.g., Kimbell, 2014; Ojasalo et al., 2015), but (especially critical) future thinking is not as deeply integrated into Service Design methodologies or mindset as the systemic perspective (Prosser & Basra, 2018). However, it is foreseeable that since the Service Design work essentially aims to create a future that does not yet exist, future thinking could play a promising role in this context (Mager et al., 2020).

Although Service Design is future-oriented, it tends to focus on the near future of service conception and deployment. As a complementary aspect to this short-term future perspective, future thinking also has a long-term and critical perspective. The integration of design comes mainly in the range of design approaches that can broadly be considered as kinds of Speculative Design (e.g., including Critical Design, Design Fiction, Discursive Design, etc.) since this work uses designerly means to express foresight in compelling and provocative ways that engage audiences in considering possibilities (DiSalvo, 2012, p.109). Therefore, Speculative Design mentioned in this study is referred a futures-oriented, critical, and discursive practice that provokes new ways of thinking and problematizes ideas or issues into focus by envisioning or crafting imagination and visions of possible future scenarios (Auger, 2013; Dunne & Raby, 2013; Mitrović, 2015). The goal of this long-term and critical design approach is to critically question what kind of future actors want to achieve with the help of their services (systems). In this case, "realizability" is no longer essential, and the purpose is not about predicting the future; it is important to go beyond the "plausible future" and to reveal and examine the possibilities of "possible futures" in order to back cast, reflect on and discuss unforeseen opportunities and risks (Auger, 2013; Dunne & Raby, 2013; Griffel, 2020).

Therefore, when thinking about how critical future thinking can expand Service Design, the focus needs to be on how the long-term and critical perspective of future

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thinking can reveal the limits of the current situation or ways of thinking and provoke new thinking and reflection for supporting deal with the high level of uncertainty that comes with interconnected and interacting service (eco)systems.

Following a literature review of the systemic perspective and the future thinking perspective on Service Design, we recognize the capacity of both thinking to address the complexity and uncertainty challenges faced in Service Design evolution and believe that the design approaches of related thinking mentioned before, the Systemic Design and Speculative Design, have the potential further to enhance the Systemic and Speculative dimensions of Service Design. However, despite the early introduction of systemic perspective into Service Design and their deep integration development, as mentioned earlier, in most of the Service Design practices, future thinking-related design methods and tools are still deployed in a fragmented manner (Prosser & Basra, 2018) and are not well interacted with the application of a systemic perspective of Service Design. The practical connections between the three design approaches also need to be further validated, from research, education and practice perspectives. Therefore, this paper aims to investigate and add insights into how the three approaches can be integrated by investigating the research and practical experiences of Service Design researchers, educators, and practitioners.

Methodology

In order to build an understanding of how Systemic and Speculative approaches can expand the systemic and critical future dimensions of Service Design, this paper conducted a literature review at the theoretical level and expert interviews at the operational level.

Firstly, the literature review of Service Design, Systemic Design, and Speculative Design discourse is conducted to understand these three approaches' key concepts and perspectives. Through this process, we summarized the relationships in pairs and compared the existing design processes under the same latitude. We then identify the current gaps by comparing the relationships between the approaches and the design process.

Then, we conducted semi-structured expert interviews with twelve experts from service design research, education, and practice, to understand the current status and relationships at the operational and practical levels and further compared them with the theoretical findings to see if there were any gaps. Our reason for exploring the perspectives of these different fields is that the integration of these three approaches is rarely mentioned in the literature related to design research, so we

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want to explore as much as possible the possibilities of the integrated application of these three design approaches in operational level, and thus inform the possibility of the theoretical level of combination of approach integration.

Finally, based on the literature review and the findings from the interviews, we propose three research directions for further research.

Expert interviews

- **Interviewee selection**

    This paper employs expert interviews to understand the emerging integrated practice. To explore both academic and practical areas, we have listed global academic experts (mainly selecting from the collection of key scholars from the literature review and the recommendations of the interviewed experts) and practitioners from service design consultancies (mainly selecting from the database of The Service Design Landscape (https://www.servicedesignmap.polimi.it/) who indicate their work involves service design with Systemic or Speculative Design approaches). Based on the list, we sent invitations to more than thirty experts, and eventually conducted seventeen online in-depth expert interviews. After the interviews, we selected twelve interviewees whose work areas involved two or more design approaches involved in this study and transcribed and analyzed their interviews.

    In these twelve interviews, six interviewees were researchers and professors in the academic field of service design, and the other six were senior service design practitioners working in multinational design agencies (Interviewees are left anonymous in the paper, see Table 1). The reason to understand from academic and practical perspectives is that academics are more cutting-edge and experimental in their application of design approaches, while service design practitioners have more experience in using design approaches with actors from non-design backgrounds for co-creation in realistic environments. The interviewees each had at least five years of experience in the related field.

    However, one of the limitations of this interview methodology is that since most of the experts who academically work on both or more design approaches (especially Speculative Design) and the responded practitioners are from Europe, North America, or East Asia, it leads to a lack of interviews from experts from, for example, South Asia, Oceania, Africa, and South America from the perspective of the interviews in this paper.

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- **Interview questions**

In Service Design education, we considered five design schools' Service Design Master programs that explicitly applied Systemic and Speculative approaches in the program descriptions on their official websites or in their curriculums, and through interviews with the head of the programs, we learned in depth how the approaches are adopted in the educational journeys.

By asking open-ended questions about interviewees' perceptions on how Systemic Design or Speculative Design can be extended to the Service Design process, this paper aims to share the ongoing findings describing the overlaps between Service Design, Systemic Design, and Speculative Design and how researchers, educators, and practitioners are embedding them into their practices.

Interviewees were separately asked the following questions (accordingly to their backgrounds), and more open discussions were explored when appropriate:

1. **Current application in research project/school programs/practical projects:** Description of how interviewees introduce Systemic/Speculative approach in the Service Design research/education/practice and how it worked (including process, methods, and tools).
2. **Opportunities and criticalities:** description of opportunities and the criticalities that Systemic/Speculative approach brought to their Service Design research/education/practice.
3. **Reflection:** Interviewees were asked to express their reflections on the approach integration.

Out of a total of twelve interviews, three were conducted in Chinese, and the remaining interviews were conducted in English. Each interview was transcribed, and the interviews conducted in Chinese were transcribed and translated into English. Each transcript was read repeatedly and then coded for topic classification and identification by coding text fragments. We divided these codes topics into five groups: Relationships, Opportunities and criticalities, educational process, practical process, and methods and tools.

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Interviewee	Current role	Related areas	Themes
A1 Work in Europe	Service design researcher, course Leader of MA Service Design at school A	Service Design Speculative Design	Service design pedagogy; Service design for public engagement; Design fiction
A2 Work in East Asia	Associate Professor at school B	Service Design Speculative Design	Service design and smart city; Design futures and innovation tools
A3 Work in Europe	Associate Professor at school C	Speculative Design Service Design	Design as a political and critical aesthetic practice; Social design (public services); Design fiction
A4 Work in Europe	Associate Professor at school D	Systemic Design Service Design	Systemic & transdisciplinary design; Complex service systems; Social innovation
A5 Work in North America	Associate Professor at school E	Systemic Design Service Design	Systems thinking and service/system design; Strategic Foresight; Complex social system design
A6 Work in North America	Associate Professor at school F	Speculative Design	Speculative Design; Strategic Design
A7/P1 Work in Europe	General Manager at agency A Researcher and lecturer at school G	Service Design Speculative Design	Service Design; Design Futures and Speculative Design
P2 Work in Europe	Senior Service Designer at agency B	Service Design Speculative Design	Service Design; Speculative Design

SERVDES
2023

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P3 Work in East Asia	Senior Service Designer at agency C	Service Design Speculative Design	Service Design; Future living; Strategic design
P4 Work in Europe	Lead Designer at agency D	Service Design Speculative Design	Service Design; Strategic design
P5 Work in Europe	Service Systems Designer, Service Design Lead at agency E	Service Design Systemic Design	Service Design; Systemic Design; Corporate foresight
P6 Work in Europe	In-house Service Designer at company A	Service Design Speculative Design	Service Design; Design futures

Table 1. Interview list ('A' refers to academic researchers/educators; 'P' refers to practitioners.)

Findings

In the Theoretical background, we have described the state of the art of embedding systems thinking and future thinking in service design. The systemic perspective in service design emphasizes the systemic understanding of service phenomena, the value co-creation of actors between service systems, and enabling and creating interactions for value co-creation (Patrício et al., 2020; Sangiorgi et al., 2017; Vink et al., 2021; Wetter-Edman, 2014); future thinking is deployed piecemeal in service design as a complement focusing less on a long-term and critical perspective (Prosser & Basra, 2018).

Through the expert interviews, we gained insights that can complementally verify the integration potential of Systemic and Speculative approaches. Based on the experts' insights, we have summarized the following four opportunities that Systemic and Speculative approaches can bring to and help expand the Service Design domain and support the evolution of Service Design.

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Opportunities

- **Managing complexity**
  - Access the system
  - Understand complexity and relationality
  - Navigate complex problems and work with complexity

Systemic Design as a holistic mindset and approach can be fully embedded in Service Design to better design with the systems. Both researchers and practitioners have emphasized the benefits of Systemic Design's capacity to visualize complexity. During the exploration and research phase, visualizing complexity can be used to allow designers and actors to understand the multiple levels of complexity in the system and integrate information to inform the design process.

Furthermore, in addition to understanding the current state and relationships of service systems, as service (eco)systems emphasize the collective participation of actors, the value creation of actors in service systems collectively designs the systems and drives change in the systems. Researchers and practitioners mentioned that the Systemic approach could better enable actors to understand the complexity and relationality for the co-creation. And thinking about the relationships between different system actors and multi-tiered systems through a systemic perspective and applying the Systemic Design Principles (van der Bijl-Brouwer, 2020) during the design development and framing phases can help advance changes in service systems.

Besides, the educators said the Systemic approach is taught by applying methods and tools as the entry point. By learning why and how to use methods and tools, students understand the theoretical knowledge behind them and have a systemic mindset shift to better work with complexity.

"By building visualization maps, such as Giga maps to understand what designers are dealing with and use that information to inform the design process.

The service designers do use a lot of systemic insights into the challenge, but in order to then change the system, they need to apply more systemic ways, which we call Systemic Design Principles, to address the problem.

(…)

Getting people to think in a systemic or complex way is a mindset shift. Our students learn how to recognize complexity when they're working on a challenge, how to explore a complex domain and so kinds of tools that they need, and how

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to integrate Systemic Design Principles into their design reasoning into their design rationale to develop a concept. (A4)"

"The course assigns students the systemic design tools, and then they go through the relevant references to get an in-depth understanding of how to use the tools. (A5)"

"In our design process, we use maps to visualize the complexity within the organizations to understand the differences and the connections. Also, we tried to involve the employees in the co-creation sessions to better propose the bottom-up solutions instead of only having a top-down decision with the management. (P6)"

- **Understanding and co-creating service systems**
  - Engage actors better
  - Identify resources
  - Shape discussions

Interviewees from all three fields (research, education and practice) mentioned this opportunity of better engaging actors to co-create.

By recognizing and visualizing complexity, Systemic Design can enable designers and actors to co-create with the system by identifying resources within systems, understanding complexity and relationality, thereby consciously contributing to the service systems transformation (Sangiorgi et al., 2017).

Speculative Design has the potential to lower the threshold for collective participation in value creation, help break down social conventions and interpersonal boundaries, and encourage and engage actors to speak, act and discuss in the process of "design futures" by building alternative future scenarios. Discussions built based on alternative future scenarios can stimulate debate or build consensus, which both have impacts on the value system of actors, which in turn can contribute to systemic change (Drew et al., 2021).

"As designers, we shouldn't just try to understand what happens in that system and design something for it, but we need to understand that the actors who are already working within it are actually continuously designing the service system… Give them 'things' that can help them to redesign the system, and constantly redesign their own practices. (A4)"

"There is a lack of cooperation within the organizations, and every unit works independently like silos. Employing Speculative Design in Service innovation can

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help break silos. Participatory Futures helps different groups imagine common futures, fewer boundaries, more connections and alignments, and adds power to co-creation. (A7/P1)"

"Sometimes alternative futures can push us (designers/students/actors) away to debate; sometimes they can build consensus, bring us together, and help us support one another in shaping futures. (A6)"

- **Translating future uncertainty**
  - Adopt long-term future thinking
  - Be able to open imagination and explore uncertainties
  - Distill specific images of futures or images of change

Design practitioners emphasized that due to the business-oriented thinking and the frame of reality narrow actors' perspectives to recognize future uncertainty and its possible impact, it is essential to have (long-term) future thinking and future visions in the service design process. The (long-term) future scenario-building method from Speculative Design is well suited to engage non-design background actors in the co-creation process. Placing people in the common future scenario and distilling specific images of futures or images of change allows them to think and discuss using more straightforward visual or experiential language rather than professional terms. In this way, complex or abstract issues can be better communicated to and among actors.

Researchers and educators also talked about that since Speculative Design's long-term future thinking does not pay attention to "feasibility" or "realizability", thus opening up the imagination to explore many issues that seem "unrealistic" from the current view. Problematizing these issues and reflecting on them is actually exploring uncertainty and translating uncertainty into unforeseen opportunities or risks/challenges that can be reflected today.

"Speculative Design helps to break the social conventions between people. No one knows more than the other, because we are not talking about here or now. It can help bring everyone to a similar level, allows people to go beyond the limits of what is 'realistic' or 'ridiculous'. And then you transfer it to the critical dimension, making the contribution very different. (A1)"

"Speculative Design is good for helping our students to think outside the box by creating future scenarios and using speculative prototypes. (A2)"

SERVDES 2023

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DAD | PUC-Rio Pontifícia Universidade Católica Do Rio De Janeiro
Livework

"We made a video showing future scenarios to decision-makers. The user needs and future trends shown in this form will be more impactful and prevent the business-oriented thinking of decision-makers from dominating. (P3)"

- **Foster critical thinking**
  - Be critical and reflective during the design process
  - Critical self-reflection

Speculative Design, an approach that can provoke thought and reflection of designers and actors, has also demonstrated its capacity to drive critical thinking in the design process in the embedded application of Service Design and to enable designers and actors to think about the "unthinkable".

Besides the process, Critical thinking also needs to be reinforced to service designers themselves. Researchers have started to consider the self-reflective view of designers. The ideologies of designers are based on the socio-cultural context of their knowledge and design practice (Søndergaard & Hansen, 2017). Different perspectives from different backgrounds might lead to different visions. For example, the feminist perspective of Speculative Design can help to avoid the designer-centric dilemma and the "privileged" issues (Light, 2021; Martins, 2014). However, the critical perspective can be further reinforced in the design practice.

"In this way, we can look at kind of the non-White, non-Western approaches to thinking about change. (A6)"

What different fields look for in focus

Service Design is an evolving multidisciplinary approach. In the context of increasingly complex and future-uncertain challenges of service systems, Service Design Research needs to continuously integrate multidisciplinary efforts to foster a broader knowledge to expand the boundaries of Service Design to help address emerging design challenges (Blomkvist et al., 2010; Joly et al., 2019; Sangiorgi et al., 2019). Therefore, in the context of this study, the researchers value the new possibilities that the integrated application of systems thinking and critical future thinking can bring to the Service Design discipline, such as the evolution of Service Design capabilities, the transformation of the service designer's role, and the development of design processes, methods, and tools for Service Design at the operational level, etc. By drawing on different perspectives and experiences of other disciplines, the evolution of the Service Design discipline can be advanced.

Design educators are mainly interested in the "extra" construction of students' design capabilities that the teaching of these two design approaches can provide. Educators

SERVDES 2023

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DAD | PUC-Rio Pontifícia Universidade Católica Do Rio De Janeiro
Liwework

see the potential for the development of Systemic and Speculative related capabilities in the marketplace and add these to the curriculum, aiming to build "extra" capabilities beyond the "general" service design capabilities. In fact, the development of thinking or mindset shift is part of the design capabilities, so there is an overlap between the design researcher's focus and the educator's focus.

In addition, it is clear from the design practitioners' interviews that they emphasize the value that many Systemic and Speculative approaches can bring to co-create with people from non-design backgrounds or how to communicate more effectively with clients, lowering the barriers to understanding and engagement. This is certainly a needed, but not necessarily the most crucial point for design researchers and design educators in their research projects and curricular programs. Therefore, it is clear that the real-world value of the application is of greater concern to practitioners.

Three emerging directions of Systemic and Speculative dimensions that can be extended into Service Design

- **Extension of Service Design based multi-directional Systemic and Speculative pathways**

  From the literature review and expert interviews, we recognize that Systemic and Speculative approaches complement the Service Design process in a decentralized form. We believe designers are initiatively introducing these methods and tools because these complements are based precisely on the need to deal with the complexity or uncertainty of design challenges. We, therefore, consider the integration of the Systemic and Speculative approaches into Service Design will not be a single and linear design process but rather multi-directional paths that can be extended depending on the context of the design project. Depending on the context of the service (eco)systems they are working in, service designers can choose different modular paths to better adapt and extend the Systemic and Speculative dimensions of their design process from the perspective of dealing with system complexity or future uncertainty.

  Based on this hypothesis, an area to be further researched is how to conceptualize this Service Design based multi-directional Systemic and Speculative pathways.

- **The Service Design capabilities to better work with the extension**

  In expert interviews, many experts mentioned the capabilities development that Systemic and Speculative approaches could bring. For example, Systemic Design can enhance the designer's capability of systems thinking and visualizing and

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Livework

shaping complexity; Speculative Design can enhance the designer's capability of (long-term) future thinking and critical and reflective thinking, and so on.

According to Core Service Design Capabilities defined by Morelli et al. (2021, p. 27-30), the core service design capabilities involve: Addressing the context; Controlling experiential aspects. Modelling; Vision building; Engaging stakeholders; Working across levels; Building logical architecture; Open problem solving. From these capabilities, we can see that these capabilities are both related to and variant to the capabilities that Systemic and Speculative approaches can help to enhance. Take "Vision building" and the "(long-term) future thinking" as an example; in common ground, they are both about imagining visions of possible futures, but they have short-term and long-term differences in scale. As we have discussed in the previous section, compared to the "short-term future", the "long-term future" has the opportunity and possibility to help Service Design deal with future uncertainty and build resilience.

In addition, by comparing academic definitions and market demands, service design scholars argue that there is consistency between academic definitions of service design capabilities and the synthesis of capabilities required by the market (Ehn et al., 2020). However, the design capabilities required by the market for service designers are not necessarily able to be educated or developed through current service design education. For example, some design practitioners in the interviews mentioned the challenging situation of their real-world practices and the acquisition of relevant knowledge.

Therefore, we reflect on design capabilities building and consider whether and how service design capabilities should evolve as the Systemic and Speculative dimensions of Service Design expand as a future research direction.

- **Align language and redesign/redefine the integrated methods and tools of the extension**

A need to reduce the language distance between these three approaches emerges and align the language of methods and tools of the overall modular pathways. This argument also comes from insight from expert interviews.

The incomplete access to Systemic and Speculative knowledge and fragmented application of relevant methods and tools might lead to usage gaps between some design methods and tools with the same core. This situation will likely create a threshold for designers and actors to understand, apply and facilitate in design practice.

SERVDES 2023

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Livework

Therefore, we think another interesting research direction is to reduce the language distance between these three design approaches and align the language to lower the threshold of integrating Systemic and Speculative into Service Design. And consider how might some of the core overlapping methods and tools can be redesigned/redefined for integration and propose a library of methods and tools that can be used in extension multi-directional paths.

Discussion

As an exploratory paper, we would like to ask the following open questions: Does the current linear service design simplify or ignore the complexity and uncertainty that service design needs to deal with? What evolution is in service design processes, methods, and tools needed to move away from the reductionist issue (Mortimer, 2021; "Non-Linear Approaches to Service Design," 2021; Patrício et al., 2011; Vink et al., 2021)? Does the role of the service designer change when the Service Design embeds Systemic and Speculative dimensions? How can service designers be aware of the importance of Systemic and Speculative extension in Service Design and acquire new knowledge to evolve their design capabilities?

We also reflect on what value this extension could bring at different levels in order to reflect on the open questions. At a disciplinary level, this extension also responds to the Service Design reductionist issue by evolving the conceptual extension framework that includes Systemic and Speculative perspectives to highlight the complexity and uncertainty challenges that need to be addressed.

As mentioned earlier, because we live in complex social systems that keep changing, service designers who follow the current linear approach do not necessarily mean they can make good, responsible services with long-term impact and resilience. So we also believe that service designers need to reflect critically on the impact of their design process and design outcomes, including the short/long-term impact on individuals, communities, society, the environment, etc. When choosing a path, service designers also need to reflect on what dimensional extension is required in their design process based on context.

Also, as mentioned in the expert interviews, in design education, by using design methods and tools as an entry point for knowledge transfer, students can learn theoretical knowledge and develop thinking capabilities from operations. Therefore, we believe that the application of multi-directional extension with corresponding methods and tools can also be one of the entry points for a Systemic and Speculative mindset shift.

SERVDES 2023

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Conclusion

In this paper, we raise a concern about how Service Design should expand its Systemic and Speculative dimensions in the face of increasingly complex and uncertain service challenges. We live in times of great change shaped by technological innovation, global crises, and a commitment to a fair and sustainable future. We are aware that the emerging challenges of Service Design have moved into the next level of systemic complexity and future uncertainty because of the complex interconnections and interactions of service (eco)systems and the disruptions caused by forces of change (e.g., global pandemics, social unrest, and climate crises). Therefore, exploring Service Design evolution to deal with these complexities and uncertainties is needed.

In this context, as an exploratory paper, we explored the current embedded relationships between Systemic and Speculative approaches and Service Design at the theoretical level, understanding the theoretical gap and the next opportunity. Through expert interviews, we understood the current practice of design researchers, educators, and practitioners in Systemic Design or Speculative Design integration with Service Design and summarized the possibilities and advantages that Systemic and Speculative approaches can bring to Service Design to inform future research of approach integration. Finally, based on the literature review and expert interviews, we propose three future research directions, i.e., an extension of Service Design based multi-directional Systemic and Speculative pathways; aligning language and redesigning/redefining the integrated methods and tools of the extension; and the Service Design capabilities to better work with the extension.

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