Article

# Integrating Speculative and Systemic Perspectives into Service Design Education in the Chinese Context

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## Abstract

*Service design education needs to evolve to equip students for complex and uncertain futures. In China, however, it remains dominated by linear, solution-oriented, and short-term mindsets, limiting the cultivation of students' future-oriented and systemic capabilities. This study explores how integrating speculative and systemic design approaches can reinforce service design education. Drawing on a literature review, three workshops with students, and expert interviews, the findings show that such integration can help students shift from isolated, solution-oriented thinking toward more relational, holistic, reflective, and futures-oriented reasoning, moving from fixed solutions to enabling conditions for ongoing transformation. The study contributes to exploring alternative pedagogical pathways that support more adaptive and future-ready service design models.*

## Keywords

Service Design, Service Design Education, Speculative Design, Systemic Design

## Introduction

Services have gained increasing attention as vital infrastructures in contemporary society. Designing for sustainable, inclusive, and resilient service systems is essential for policymakers, organizations, businesses, and individuals to deliver solutions or conditions for value co-creation (Villari, 2022). Service systems face emerging complex and uncertain challenges. This is due to rising unpredictability in changing environments and the complexity caused by system interconnections. Service design is increasingly recognized as crucial in tackling these multi-level challenges because of its transformative potential for communities, organizations, and society (Sangiorgi, 2011; van der Bijl-Brouwer, 2017).

Simultaneously, higher education in service design has evolved, with programs expanding, particularly in Western countries (Becermen & Simeone, 2019, 2021). Many design schools increasingly emphasize critical thinking, long-term thinking, and systems thinking as essential future design capabilities, integrating corresponding design approaches into their curricula (ibid.). In contrast, Chinese design schools are still in the early stages of teaching critical, future-oriented approaches, such as speculative design, with integrated teaching approaches largely unexplored. Thus, this study explored how integrated approaches can be incorporated into service design education in China. It examined their potential to foster complex, future-oriented mindsets among undergraduate students while highlighting challenges and opportunities.

The study included a literature review and expert interviews to examine the current state, gaps, and opportunities for integrating speculative and systemic approaches in service design education. It also explored and tested how to integrate these approaches into teaching by analyzing observational data, design outcomes, and reflections from three parallel workshops. Lastly, expert interviews offered reflections and insights on the integrated teaching

approach, highlighting how these approaches can reinforce service design education.

**Service Design and Its Emerging Challenges**

Today's service systems face challenges beyond traditional business production and user-centered interactions. As Mager et al. (2020) and Vink et al. (2021) highlight, shifting human needs and evolving forms of value co-creation are reshaping how services emerge, adapt, and generate meaning in everyday life. In this context, service design, as a human-centered and co-creative practice, has been increasingly acknowledged in both design and service research as an intentional pathway for transforming service systems and a catalyst for broader societal change (e.g., Koskela-Huotari et al., 2021; Sangiorgi, 2011). However, rapid global developments have brought increasingly complex, large-scale, and uncertain challenges to service design. These challenges arise from service system dynamics, such as multi-actor interactions, cross-system interconnections, and emergence (Dorst, 2015; Snowden, 2024).

To better tackle these challenges, service design needs to continue evolving toward expanding critical, long-term, and systemic perspectives. These expansions aim to support designing services (systems) that are more sustainable, inclusive, and resilient to potential changes. Service systems with these properties can better cope with emerging complex and uncertain challenges, open up new pathways for potential changes, and even avoid negative impacts and disruptions when some unpredictable problems arise (Jones et al., 2019). In other words, it can help strategically channel resources toward beneficial patterns while retracting them from potentially harmful ones (Snowden, 2024). In doing so, it can actively support more radical service system transformation grounded in long-term, systemic shifts rather than isolated interventions.

**Towards Integrating Speculative and Systemic Approaches into Service Design**

Amid escalating complexity and uncertainty, service design is not alone in looking for evolution. Across the broader design field, there is a growing integration of transdisciplinary approaches and methods that are related to futures thinking and systems thinking into design practice. For example:
- Foresight by design: Embeds foresight techniques with the design thinking methodologies to inform strategic opportunities for innovation and decision-making (e.g., Bühring & Bishop, 2020; Bühring & Liedtka, 2018).
- Speculative design (critical design (Dunne, 2005), design fiction (Sterling, 2009), discursive design (Tharp & Tharp, 2019), experiential futures (Candy, 2010), etc., can be broadly categorized as speculative design): These approaches transcend problem-oriented futures thinking, combining critical futures thinking with design. Through diegetic prototypes or experiential scenarios, they can serve as a critical medium to provoke public debate and reflection on social issues (Dunne & Raby, 2013).
- Systemic design (includes systems-conscious design and systems-shifting design (Drew et al., 2021)): These approaches integrate systems thinking and design through designerly approaches like visualization to construct panoramic, multi-level system maps that help navigate systemic complexity (Jones, 2021; Sevaldson & Jones, 2019).

These interdisciplinary approaches highlight the potential of design to address escalating complexity and uncertainty by expanding its capacity for future envisioning and system understanding. Building on this recognition, this study explores the integration of two particularly promising approaches—speculative design and systemic design—into service design. The rationale for this choice is threefold:
1. Engaging long-term and critical future envisioning: Compared with traditional foresight, speculative design embodies a longer-term and more reflective form of futures thinking—critical futures thinking. Critical futures thinking interrogates taken-for-granted assumptions and provokes deeper reflection on culture, values, and worldviews in order to envision possible alternative futures (Slaughter, 1982, 1999). If interpreted through the Futures Cone (Hancock & Bezold, 1994; Sangchai, 2024; Voros, 2003), this approach moves beyond forecasting "immediate futures" and "probable futures" in the near term or foresight for "plausible futures" in the next horizon; instead, it opens up public negotiation space for "preferable futures" and "possible futures". As Dator (2009) argues, embodied engagement with multiple alternative

futures is the most crucial step in the futures visioning process. Through diegetic prototypes and other experiential devices, speculative design enables audiences to experience, respond to, and further imagine alternative futures in more tangible and emotionally resonant ways. In doing so, it can reinforce collective capacity to navigate and envision desirable futures while building resilience against potential risks from undesirable futures early on (Dunne & Raby, 2013; Griffel, 2020; Masini, 2006). This capacity for use-the-future is also a form of Futures Literacy (Miller & Sandford, 2019), which is important for preparing for the uncertain challenges and transformative possibilities of service systems.

2. Reinforcing collective system understanding and participation: Systemic design employs visualization and relational mapping to help designers and stakeholders shift across scales and perspectives, develop a richer contextual understanding, and uncover systemic causality. These designerly methods contribute to a shared frame of reference that facilitates collective action (Ryan, 2014). By strengthening interconnections among system actors, systemic design can catalyze learning, coordination, and ultimately, systemic change (Drew et al., 2021).

3. Reflecting emerging trends in design practice and education: The integration of speculative and systemic approaches is gaining prominence in contemporary service design practices and educational programs (as elaborated in the following section). These pedagogical cases provide practical references and precedents that inform the approaches adopted in this study.

## Service Design Education

As the design discipline evolves, higher education programs in service design are also adapting to economic, social, and environmental challenges. Globally, universities and institutions have introduced service design into undergraduate and graduate programs to equip professionals with service design thinking and skills (Ferruzca et al., 2016). However, the multidisciplinary nature of service design has resulted in varied program structures. In addition to design-focused programs, a wide range of degrees (e.g., MDes, MA, MFA, MBA, MSc) are offered across faculties such as design, management, business, IT, and engineering (Becermen & Simeone, 2019, 2021; Ferruzca et al., 2016). Since this paper focuses on design education, we specifically explored design-oriented service design programs in higher education.

## Service Design Education in Western Countries

Reviews of service design curricula (Becermen & Simeone, 2019, 2021; Ferruzca et al., 2016) highlight the global expansion of design-oriented master's programs in service design, which is also reflected in databases from the Service Design Network (https://www.service- design-network.org/organisations) and Politecnico di Milano's Service Design Landscape (https://www.servicedesignmap.polimi.it/). At the bachelor's level, service design components are present in some lectures or courses, but full programs still need to be expanded. In the master's programs, a common feature is the integration of hands-on projects with lectures and seminars, often in collaboration with external organizations (Becermen & Simeone, 2019). This approach immerses students in service design thinking and practice, helping them gain proficiency in methods and tools.

In recent years, increasing involvement of concepts such as "social innovation", "sustainability", "critical/speculative design", "future studies", and "systems thinking" reflected an educational concern for cultivating student's capability/literacy in addressing complex and uncertain social and broader environmental issues. This trend is evident in emerging courses and studios focused on social innovation, sustainable design, design futures, speculative/discursive design, systemic design, and product-service systems design. For example, Parsons' Speculative and Discursive Design Studio, part of its Transdisciplinary Design (Service-Oriented Design) program, engaged students in using speculative techniques to reflect on phenomena, identify opportunities in complex service systems, and propose thought-provoking alternatives. This integrative studio helped students build Futures Literacy by providing conditions to practice design methods/tools and enabled them to reflect on the past, interpret the present, and anticipate possible futures (Lin & Villari, 2022).

In summary, the trend of Western higher education institutions gradually introducing new perspectives aligns with service design research. This trend aims to expand service design education to cultivate service designers

capable of addressing complex issues and exercising greater strategic and leadership capacities (Sangiorgi et al., 2022).

## Service Design Education in China

According to the China Higher Education of Service Design Survey Report (Service Design Network Beijing Chapter, 2022), although service design education in China started later than in other regions, it has developed rapidly. Studies such as Gao (2017), Liang and Zhao (2018), and Yan (2017) showed that research on service design education in Chinese higher education still primarily focused on curriculum development and practical teaching frameworks within industrial design programs.

Analysis of the Survey Report alongside Chinese literature revealed a key difference from Western institutions. In China, service design courses are often embedded within industrial design programs at the undergraduate level, where they are offered at nearly twice the frequency of graduate courses. This is largely due to the classification and prioritization of the disciplines of design education in China. China's mainstream design education system continued to prioritize industrial and product design as major disciplines, integrating other disciplines like service design and interaction design as "directions" into their curricula.

At the undergraduate level, the learning process typically spans three stages: foundational skills in the first year, applied design competencies in the second, and innovative practical design capabilities in the final two years (Liang & Zhao, 2018). Service design-related courses are usually introduced during the final stage. On the other hand, graduate-level programs often adopted a supervision system. While some programs offer service design-related courses, they need more depth and specialization. As a result, service design education in China is facing fragmentation and lacks sufficient depth in content and delivery (Yan, 2017).

Furthermore, the Survey Report identified 147 existing service design courses in China. Concepts such as "product system/product-service system", "sustainability", and "social innovation" are emerging, but key concepts such as "critical/speculative", "futures", and "systemic/systems thinking" are still rarely mentioned.

Despite these gaps, the direction of service design education in China aligns with that of Western contexts in that its goal is to cultivate more plural and interdisciplinary design professionals. The key difference is that service design in China has not yet emerged as a fully independent discipline, nor has a well-defined educational framework appeared (Zhong, 2025). This has led to fewer opportunities for new courses and a slower integration of emerging disciplines and approaches. This slower expansion is also partly due to the maturity level of service design and the breadth of the intersectional research in speculative design and systemic design. Since these three design approaches originated in Western contexts, the development of service design education is indeed influenced by the level of growth and acceptance in the local society. Nevertheless, service design in China is developing rapidly, suggesting potential for future educational evolution. For this to happen, exploring the potential direction of interdisciplinary expansion is necessary.

## Methodology

With the aim of understanding the current situation and existing issues of service design education in the Chinese context and proposing possibilities for further evolution, the research was structured into three main phases.

The first phase consisted of a literature review of service design and its education, alongside speculative and systemic design, drawing from both Chinese and English sources. This review helped to understand the current state of service design and the extent to which the two approaches had been integrated at the theoretical and educational levels.

The second phase focused on the design and delivery of three six-week parallel workshops. These workshops applied thinking, methods, and tools from speculative and systemic design into service design to facilitate the exploration of future autonomous public transportation as case studies. The workshops involved senior Chinese design students and aimed to equip them with critical futures thinking and systems thinking. These skills enabled them to understand complex service systems and reflect on alternative futures. This paper also analyzed students' learning diaries and post-workshop questionnaires to investigate their reflections on changes in service design

mindset and process.

The third phase involved a series of expert interviews with four Chinese professors and four researchers, which explored their current or previous approaches to teaching service design in China. The interviews also reflected on the differences between the integrated approaches and participants' existing or previous teaching practices. They further discussed the opportunities this integrated approach could offer.

**Workshops**
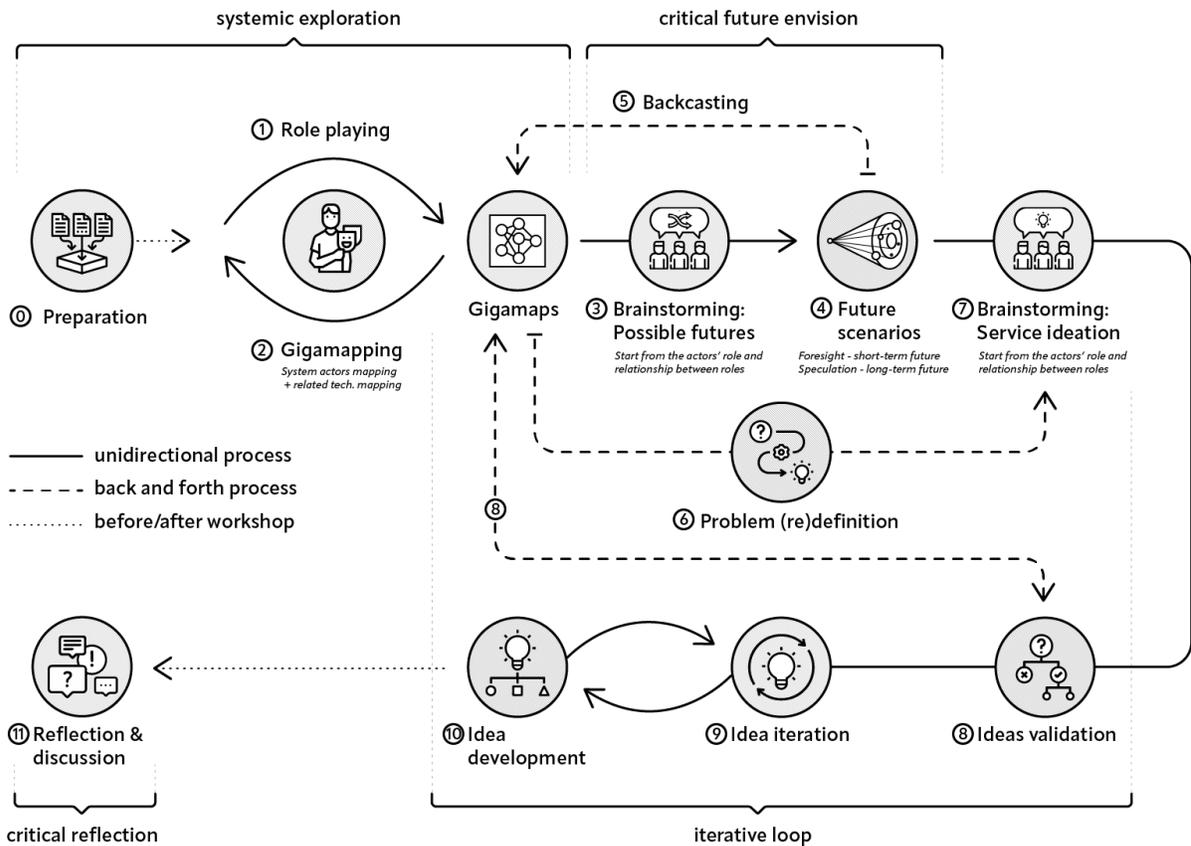


**Fig 1.** The design process of the workshops.

**Participants**

The three workshops involved 28 fourth-year undergraduate students from the industrial design program. Five researchers specializing in service design, interaction design, and automotive design facilitated the workshops. Prior to the workshops, students had studied various design "directions" within the industrial design program, including product design (96.4%), interaction design (85.7%), visual communication (60.7%), service design (35.7%), and automotive design (21.4%). The students were divided into six groups, each including at least two students already familiar with service design and its common techniques.

**Workshop process, methods, and tools**

The workshop's pedagogical structure was synthesized from established design processes, methods, and tools. The foundational service design process followed the double-diamond model (Design Council, 2019) and common methods and tools (Stickdorn et al., 2018). These were extended by integrating key components from speculative

and systemic design. For the speculative design, the technique of building visualized/experiential alternative future scenarios was adopted (Dunne & Raby, 2013); on the other hand, the principle of "holistic system understanding" was drawn from systemic design methodologies (Jones, 2021), specifically through the use of gigamapping (Sevaldson, 2011). These components were integrated into the service design process. Since this was the student's first exposure to these emerging methods, three iterative sessions were incorporated to help avoid confusion and ensure proper understanding.

The three parallel workshops lasted six weeks and were structured into four main stages: 1) systemic exploration, 2) critical future envisioning (short- and long-term futures), 3) iterative design loops, and 4) critical reflection. The detailed steps are shown in Table 1.

**Table 1.** The detailed processes of the workshops.

| Process / Steps | Description of the processes |
|---|---|
| **Prepa-ration** | Before the workshops start, students are informed about the topics of the workshops and the roles of the actors in the system under the different topics, so that they can have an advanced exploration and understanding of the issues and the roles they are going to play. On the opening day, the researchers (author 1 and 3) gave information related to Speculative Design, Systemic Design, public transportation, and autonomous vehicles, including key concepts, methods and tools, technology and design trends, and relevant case studies. |
| **Step 1** | Students put on the hat of different roles and role-play with other members of the same group on their group's topic. |
| **Step 2** | While conducting the role play, gigamapping of the roles, relationships between roles, and related technologies was conducted on the Miro. |
| **Step 3** | Based on the gigamaps, the students brainstormed on the future directions of different topics and the overall future worldview construction. |
| **Step 4** | The students gradually composed future scenarios under different directions. Each of the three workshops had two groups, A and B. Group A envisioned the short-term future (within five years), and Group B envisioned the long-term future (fifty years from now). |
| **Step 5** | Backcasting on the created future scenarios, combining gigamaps to analyze what key systemic factors make up the future scenarios they created. |
| **Step 6** | The students redefined the design issues/challenges that may arise in the future scenarios. |
| **Step 7** | Based on the previous systemic exploration, reflection on future scenarios, and problem re-definition, students brainstormed service concepts. In this stage, students were asked to consider the roles they played and the relationships between roles and other system actors. |
| **Step 8** | After the first round of concept brainstorming, by visualizing several selected service concepts, the students shared their design directions and service concepts with the rest of the groups, the professor in charge of the course, and the researchers. Then through two rounds of voting and feedback sessions, the students selected three concepts for further validation. The three concepts were then returned to gigamaps to validate that their proposed service concepts could be reasonably embedded and have a (positive) impact on the system. After the validation phase, the students decided on the central service concept. |
| **Step 9** | The students went through two to three rounds of iterations of the central service concept based on the validation and feedback sessions. |
| **Step 10** | The students developed services based on the previous iterations and feedback. This step occurred iteratively with the previous steps. |
| **Step 11** | At the end of the workshop, researchers brought the students from the three workshops together, shared the future scenarios and services of six groups, and asked the students to have a reflection and discussion. |

**Questionnaires**
At the end of the workshops, students completed questionnaires to investigate the impact of embedding speculative and systemic design into the service design process. The questions focused on changes in their design mindsets, processes, and behaviors; and their reflections on designing future autonomous public transportation systems.

**Learning diary**
Students were also asked to maintain weekly learning diaries, recording their experiences and reflections on the embedded design methods and tools. They noted any shifts in their design mindset and behaviors, along with the points during the workshop when these shifts occurred.

**Group interviews**
Authors 1 and 3 conducted group interviews at steps 4 and 8 of the workshops. The interviews aimed to understand: 1) whether students grasped the meaning and effectiveness of the speculative and systemic methods, 2) how applying these methods influenced their design process, and 3) whether their design concepts emerged from a systemic understanding and future scenario exploration.

**Data analysis**
The learning diaries and interview transcripts were analyzed using MAXQDA for inductive thematic analysis. Author 1 conducted the initial round of coding, identified themes related to students' key learnings and reflections on shifts in their design mindsets and behaviors, their frictions when applying their habitual product-design mindset, opportunities and challenges they encountered when applying the new approaches, and evidence of their capability improvements. These preliminary codes were then reviewed and iterated in collaboration with all co-authors to ensure that we could distill insights and teaching implications from the data.

**Case Studies**

**Comparative Case Analysis**

This section outlines the process and outcomes of a comparative case study based on three parallel workshops that explored service design for autonomous shuttle buses (ASB). Three workshops followed the same process but focused on different scenarios: interior, exterior, and stations. Students were divided into two groups for comparison of employing different approaches to students' design mindsets:
 • Group A focused on short-term futures (within 5 years), using foresight methods such as trend analysis and scenario planning. Their aim was to anticipate plausible near-future developments and provide service concepts that could be realistically implemented.
 • Group B focused on long-term futures (50 years ahead), applying speculative design methods to envision critical alternative futures, such as future personas and design fictions. They created fictional narratives intended to reframe complex societal issues and open up new imaginaries.

**Systemic exploration:**
The first phase was aimed at exploring the status quo and challenges more systemically and holistically. It involved gigamapping and role-play, enabling students to visualize complex actor networks and identify potential leverage points within service systems. These activities helped them shift from individual and designer perspectives to broader, multi-actor dynamics. As one student reflected (original in Chinese, translated by author 1; this applies to all following quotes):

> "Gigamapping provides us a way to narrate complex systems. The role-play made us consider both micro individual needs and macro-level relationships among different roles."
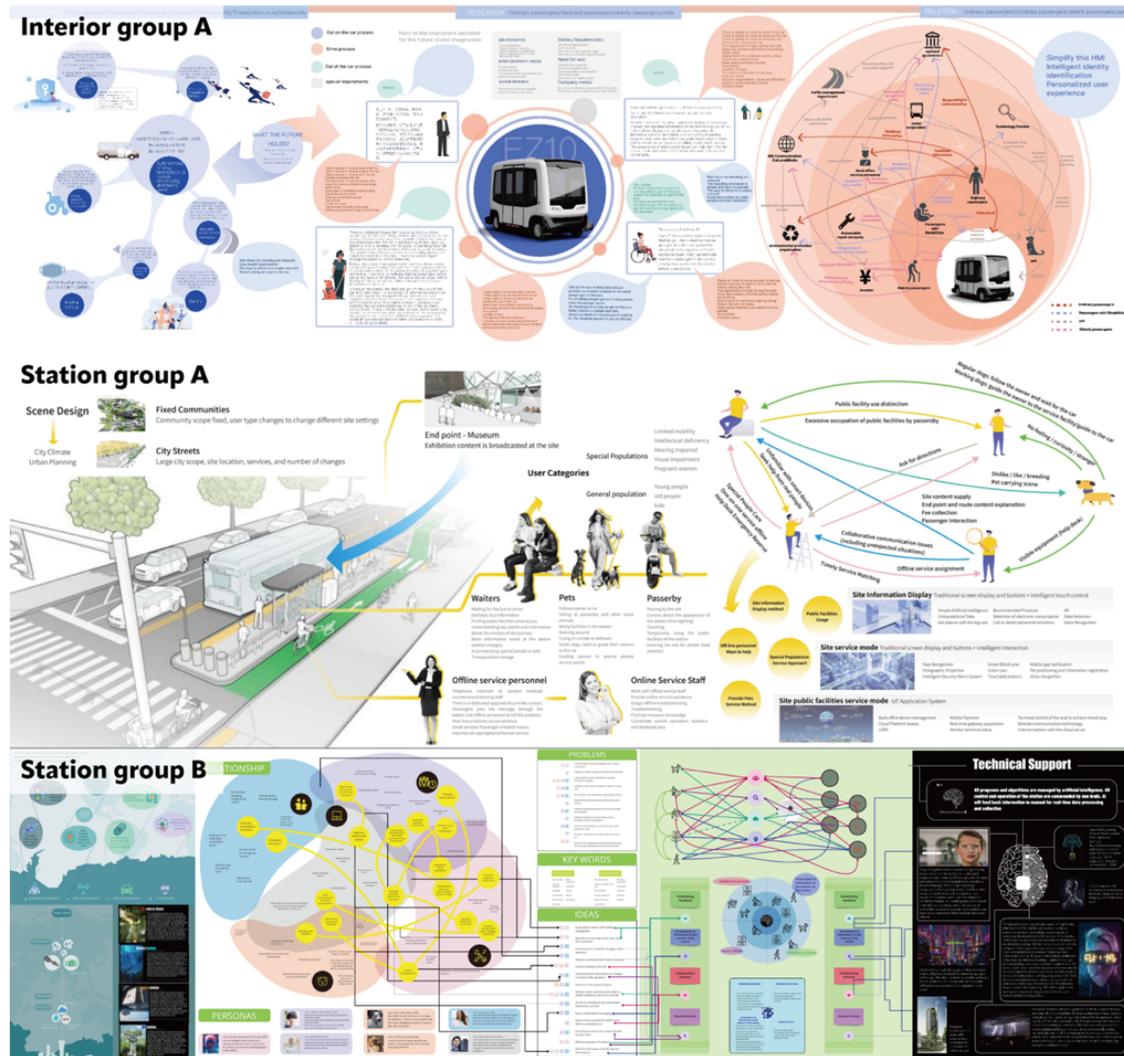
**Fig 2.** Examples of the gigamaps of the workshops.

**Critical future envisions:**

In the second phase, students were asked to design future scenarios to inform potential service concepts (Figure 3). The scenarios were built on the study of current trends in mobility systems and the analysis of broader socio-economic megatrends such as climate change, irreversible pollution, counter-urbanization, and green urban transitions. The scenarios were described through visualization tools such as mood boards and 3D modelling to make abstract alternative futures more accessible.

**a)    Group As' scenarios:**

*Interior A:* ASB dominates public transportation, necessitating the design of self-service in-vehicle services.
*Exterior A:* Increasing suburbanization prompts seamless intermodality across transit modes.
*Station A:* Bus stations become themed, immersive spaces responding to post-COVID travel growth.

**b)    Group Bs' scenarios:**

   All three groups shared a worldview in which cities are re-zoned due to rising sea levels and reduced human

habitation.

***Interior B:*** ASB can intelligently adapts interiors to external conditions and provides context-sensitive services.

***Exterior B:*** Public transport expands into aerial and aquatic realms.

***Station B:*** Shrinking habitable land leads to floating or airborne communities with new transit stations.

Compared to foresight, speculative design approaches helped students to jump out of the frame of reality and explore possible futures through storytelling, constantly reframe problems, and provoke critical reflections. Students noted:

> "Speculative approaches shifted my mindset from directly imagining feasible needs to exploring new design directions through storytelling and background-building."

> "My biggest change is learning to constantly reflect and reframe problems during the design process."
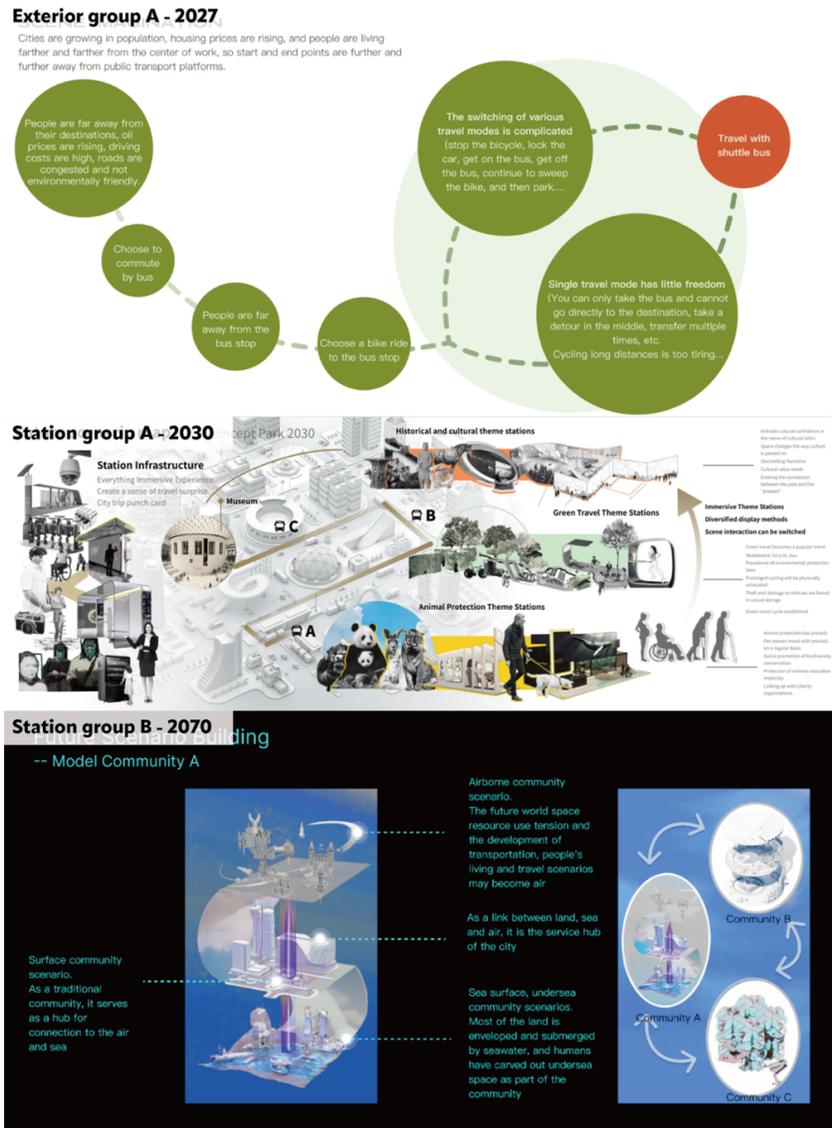


**Fig 3.** Examples of the alternative future scenarios.

**Service concepts and iterative loop:**
Each group conducted at least three iterative design sessions to develop service proposals.

   Group As' design proposals developed concepts grounded in current trends and emerging technologies, such as improving in-vehicle self-services (e.g., facial recognition, self-adjustable interactive displays for route inquiries) for ASB, intermodal travel features with bikes, and thematic bus stations for humanities education and sightseeing (Figure 4).



**Fig 4.** Design proposals of Groups A.

   In contrast, the B groups created fictional service concepts for intentional provocation, aiming not at feasibility but at provoking new thoughts and reflections on public mobility in light of environmental changes. Proposals include intelligent interiors that adapt to environmental risk levels, airborne ASB, and transit hubs connecting sea/air-based settlements (Figure 5).
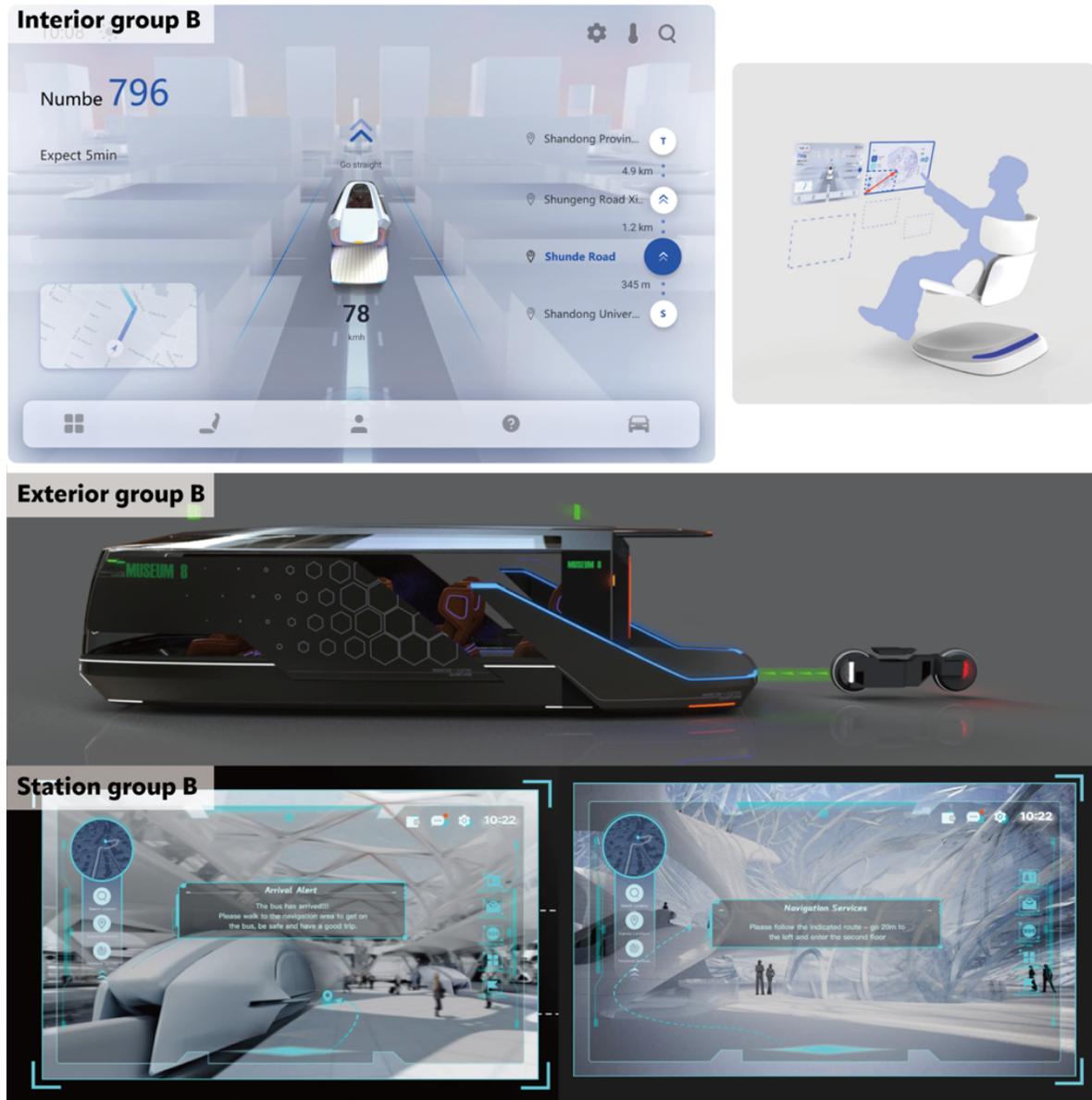
**Fig 5.** Design proposals of Groups B.

**Students' feedback, reflection, and key learnings**

Despite initial challenges with unfamiliar methods, most students reported positive gains in both critical futures thinking and systems thinking. In the post-workshop questionnaire (Figure 6), 89.3% said they would integrate systemic and speculative design approaches in future projects. The most effective methods and tools cited included future scenario building (64.3%), gigamapping (57.1%), brainstorming (53.6%), and backcasting (50%).
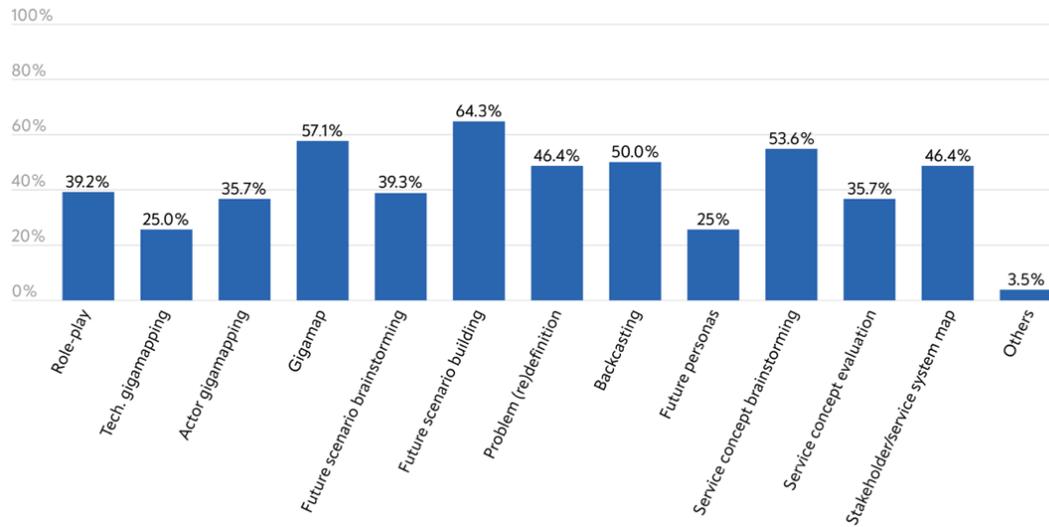
**Fig 6.** Questionnaire result: The most effective design methods and tools.

Table 2 summarizes each group's learning diary entries, capturing moments of friction, evolving insights, and reflective practices. Based on these sources, three key learnings emerged.

First, students showed a marked shift from framing service proposals as individual-centric solutions to adopting a systemic perspective attentive to multiple stakeholders. Early in the workshops, many students were still unconsciously describing needs from their personal perspectives and from a product-oriented and micro-scale solution. With the use of systemic design methods, they began to realize that there is a complex network of actors in the system and that they need to understand different perspectives in order to construct truly meaningful design problems and needs, considering not only the micro level and short-term outcomes, but also entailing a wider impact including for example the city level. One student reflected that, before gigamapping, they "unconsciously attempt to create what they think is good", but later found themselves asking, "Who else is affected, and how do they interact?" This shift revealed that embedding structured, visual systemic methods can help cultivate a more nuanced awareness of interdependencies and complexity and help to create awareness about the designers' role in designing for a long-term journey.

Second, speculative design methods acted as a powerful catalyst for building critical futures thinking. Group B students, who explored scenarios fifty years into the future, found the ambiguity both disorienting and creatively liberating. As one student reflected: "Creating a future persona forced me to justify every assumption—why this need, why this context—so I kept reframing the problem." The open-endedness of long-term speculation encouraged students to question assumptions, reframe challenges, and look beyond feasibility constraints. However, some learners also felt overwhelmed by the fictional and designerly nature of speculative tools, indicating a need to scaffold these practices with low-stakes exercises earlier in the curriculum.

Third, comparing exploration on different distances in alternative futures illuminated different yet complementary pedagogical benefits of adopting foresight and speculative design. Group As' focus on near-term trends and scenario planning honed students' capability and sensitivity to capture emerging trends, technologies, and immediate user needs, resulting in more pragmatic proposals. In contrast, Group Bs' speculative design approach cultivated a more critical stance toward societal issues, enabling designs that aim at questioning root causes rather than merely responding to symptoms. These are two different approaches and capabilities for using futures; together, they have the potential to help develop Futures Literacy complementarily.

Together, these learnings underscore the potential of these two design approaches to cultivate both systemic awareness and Futures Literacy. These insights provide the empirical foundation for the educational implications discussed in the discussion section.

**Table 2.** Summary of each group's learning diary during the workshops.

| Groups / Topics | Group A | Group B |
|---|---|---|
| **Interior** | This group **started the workshop with a mindset of "backstepping questions with answers."** Although the workshop process started with systemic exploration, their problem redefinition and concept generation were limited by their "backstepping" mindset. The process was slowly put on track only after changing this mindset in the later stages, and the content from the first phase was used. | This group **recognized the importance of imagination from the beginning and hasn't dismissed some so-called "impossible" situations**. The speculative and systemic design methods and tools helped them to expand, organize, tighten and iterate on their service proposals. The overall process was smooth. |
| **Exterior** | This group could keep up with the systemic exploration at the beginning but did not apply what was explored to the later development stages. This led to **a "fall in love with one idea" situation during brainstorming and concept development**. The problem was discovered in time during the validation session, and after several iterations, the final proposal was improved. | This group was **confused about what value these methods and tools could bring and was limited to a results-oriented mindset** in the beginning. During the validation and iterations of the sessions, they were pushed to expand their design mindset, especially in dealing with envisioning dimensions. After several iterations of the idea, the group's results became more systemic and futuristic. |
| **Station** | This group made **good use of visualization to advance systemic exploration**. And the speculative and systemic thinking is also well integrated throughout their design process. The exploration phase widely opened their mindset, and in the development stage, their **focus is backcasted to a small point to make the proposal practical and feasible**. | This group was the one that followed the process best. They understood and applied the methods and tools well at each stage, and their **proposal showcases a strong connection between the exploration and development phases**. This group indicated that the speculative and systemic approaches had a positive impact not only on this workshop project but also on other projects they were working on at the same time. They **reflected on the problems of their previous design process and learned to take a systemic and long-term view**. |

**Expert Interviews**

This section explores the previous and current state of service design education in China through expert interviews with four professors and four researchers with expertise in service design, product-service system design, speculative design, and design for autonomous vehicles. The interviews examine the teaching methods, the methods and tools students learn, and the integration of speculative and systemic design in Chinese design education.

Additionally, we posed two open-ended questions to the professors regarding the new possibilities and opportunities that speculative and systemic approaches can bring to service design from an educator's perspective, and their reflections on the development of service design education in China.

In the following quotes, P1 refers to the professor who observed all three workshops, P2–P4 are design professors from different universities. All four professors have expertise in either speculative design (design futures) or systemic design, alongside their work in service design. R1–R4 are four design researchers who studied service design courses at Chinese universities. R1 and R2 co-facilitated these workshops, supporting content related to ASB without influencing the design process.

**Critical Challenges in Current Chinese Service Design Education**

**1. Limitation of "product design thinking" and short-termism.**
Professors and researchers noted that students often rely on a reductive, linear mindset shaped by traditional product design training. Even when introduced to service design, many retain habits favoring efficiency, individual authorship, and predetermined outcomes. As a result, students may overlook the iterative and reflective nature of the service design process, leading to "taken-for-granted" outputs that inadequately address complex challenges.

P1: *"Students were trained in product, interaction, or visual communication design without a systemic view. They tend to rush into solutions, weakening early research and understanding stages."*

P3: *"Students spend too much time developing a 'perfect' concept at once, which limits opportunities for iteration."*

R1: *"In my undergraduate studies in China, we aimed to design impressive 'final solutions' since that was how we were graded. Studying in Europe shifted my perspective toward valuing the design process, as service design outcomes are not a one-time thing but will undergo multiple iterations with lasting impacts."*

**2. Late introduction and fragmented integration of key approaches**
Currently, service design is often introduced late in undergraduate studies, typically as a direction in industrial design. This could leave students with a shallow understanding of service design and even require them to figure out methods and tools independently. But this also leads to a "tool-driven" issue. Some students believe using specific methods or tools, such as journey maps, equates to doing service design, leading to superficial and ineffective design behavior.

P4: *"Our curriculum introduces service and systemic design in the second semester of junior year. My main task is to correct the student's product design thinking. I think students should encounter these concepts earlier, alongside product design."*

R4: *"Students often equate using journey maps with doing service design, without understanding their purpose."*

Although some schools now include systemic or speculative design, the integration is fragmented and limited. Especially, speculative design is sometimes positioned more as an expressive or artistic practice than as an approach for long-term futures thinking and critical reflection.

P1: *"The intense input of unfamiliar methods during workshops, combined with students' previous linear mindsets, may cause some conflicting issues to arise and reduce the effectiveness of using the methods and the quality of the final service concepts."*

P4: *"I think the cultivation of critical thinking is lacking. As far as I know, speculative design courses are not general and rarely connected to service design in China; instead, they are often treated as a form of creative exhibition."*

**Opportunities for Reinforcing Service Design Education**

While current service design education in China does not integrate both the speculative and systemic approaches simultaneously, insights from expert interviews highlight their potential to enhance learning and support service design education.

Speculative design enables students to break from immediate problem-solving and bias, and to explore alternative futures through experiential and narrative means. This exploration, along with further problematization and reflection, is the process of exploring uncertainty. Reflecting on uncertainty within service systems involves critical thinking about unforeseen opportunities, risks, and challenges. This helps interpret uncertainty and fosters the development of students' critical futures thinking skills, as a Futures Literacy (Lin & Villari, 2023).

*P1: "The two most immediate advantages of the workshops were helping students re-focus on early research and step outside their usual roles."*

*P2: "Speculative design helps our students, with or without a design background, think outside the box by creating alternative future scenarios and using speculative prototypes."*

Systemic design offers operational tools for addressing complexity. In the traditional processes, students are not always subjectively ignoring the complexity, but often lack suitable methods to manage systemic challenges. By introducing a designerly way of operationalizing systemic perspective, students can actively mobilize their systems thinking better to understand interconnected systems and leverage points within them.

*R3: "We introduced systems-oriented design in a course two years ago. Tools like gigamapping and ZIP analysis help students visualize existing complexity and evaluate leverage points to inform the later design process."*

Interviewees also stressed the importance of educators' mindset shift to better support student training.

*R2: "I have facilitated service design workshops based on the double-diamond model but hadn't previously worked with speculative approaches. The creation of alternative future scenarios and backtracking from them were new methods not only for the students but also for me. As I guided the process, I also experienced a clear shift in my design mindset."*


**Discussion**

Drawing on insights from workshop observations, student reflections, and expert interviews, this section reflects on the limitations of service design education in the Chinese context and explores how the integration of speculative and systemic approaches could inform potential directions for its development. It discusses how these approaches influenced students' mindsets, behaviors, and capabilities, and considers their broader implications for educational practices. The section concludes by outlining key limitations of the study and proposing directions for future research.


**Reflection on the Potential Directions for Service Design Education Development in China**

Based on the literature review and insights from workshops and experts, we found that service design education in China has not yet developed into an independent and mature design education program. At the undergraduate level, what students learn is still based on the linear design thinking process. For example, one educator describes service design in their course as a mindset focused on identifying, simplifying, and redesigning problems to deliver effective, practical, and desirable services (Gao, 2017).

However, increasing researchers criticize such approach, arguing that while it is promoted as a universal tool for streamlining complex problem-solving, it may overlook critical thinking and fail to address deeper systemic issues (e.g., Loewe, 2019; Vink et al., 2021). Loewe (2019) further warns that design thinking could create a gap in critical thinking within design education, leaving emerging designers ill-prepared to tackle increasingly complex and uncertain challenges. To better address the complexity and uncertainty of future service systems, service design education must shift towards a "non-linear" approach, encouraging students to embrace more flexible thinking (Kumar, 2021).

Besides, the fragmented structure of multiple directional courses within the industrial design program has

hindered the continuous and effective reinforcement of students' design mindsets and capabilities. As a result, students tend to approach design issues and goals from a one-sided and superficial perspective (Liang & Zhao, 2018). This is one of the critical problems in service design education in China. It limits student's ability to question the process and approach design from a systemic, strategic viewpoint. Chinese educators have acknowledged and reflected that isolated training cannot fully develop a comprehensive design mindset. Improving design mindset and capabilities requires iterative and continuous reinforcement exercises and repeated simulations during the educational process (Gao, 2017; Liang & Zhao, 2018).

**From Design Thinking to Futures-Oriented Capabilities: Rethinking Students' Shifts, Improvements, and Educational Implications**

As discussed, a key challenge in Chinese service design education is students' reliance on "product design thinking", with limited cultivation of systemic, critical, and longer-term futures thinking. However, designing with complex service systems—such as those supporting sustainable or digital transformations—requires precisely these capabilities to navigate complexity and uncertainty. Addressing such challenges requires a shift in mindset and behavior: instead of designing "end-form of things" or fixed solutions, students need to learn how to design "enabling platforms" (Manzini et al., 2001) that can support ongoing transformation (Drew et al., 2021). Our exploration of how speculative and systemic design approaches can reshape students' ways of thinking, acting, and reflecting within the service design process aligns with this need.

Through workshops, we explored how systemic design approaches could encourage a more holistic, relational, and contextual understanding of service systems and challenges. Methods like role-playing and gigamapping acted as lenses to help students empathize with multiple stakeholders and visualize interconnections. This integration reduced blind spots caused by linear thinking and provided a foundation for contextually evaluating and validating the potential design implications. This shift from isolated problem-solving to system-level sense-making reflects a deepening of their design reasoning.

In addition, we explored how speculative design exercises can serve as a catalyst for both social critique and self-reflection. As discussed, by employing future personas and design fictions, critical and long-term temporal perspectives were introduced to encourage critical inquiry into socio-technical imaginaries. These fictional scenarios also enabled students to surface and question their socio-economic and political biases, helping them shift perspectives and reflect on how their ideologies might constrain their design mindsets (Søndergaard & Hansen, 2017). This shift from taken-for-granted ideation to critical awareness of future possibilities reflects a broadening of their design capabilities.

Together, these interdisciplinary design methods contributed to the cultivation of both Futures Literacy and systemic awareness. Although the applications initially generated friction due to unfamiliarity with new things or students' trained design habits, they became productive moments of reflection and reframing when supported by guided exercises. This suggests that many students may not resist mindset or behavioral change, but lack sufficient prompts and scaffolding to initiate it.

From these reflections, several implications for service design education can be identified. First, integrating speculative and systemic design approaches provides a promising pathway for equipping students with the capabilities required to engage with complex and uncertain service contexts. Second, moments of friction, whether caused by unfamiliar methods or ingrained habits, can be intentionally used as pedagogical opportunities to disrupt routine thinking and encourage deeper inquiry. Third, these two approaches offer complementary educational value: systemic design supports structured understanding and sense-making, while speculative design fosters critical and future-oriented imagination. Together, they can help to broaden both the depth and scope of what and how students learn to design for complex service futures, contributing to questioning the current status quo.

In summary, embedding these approaches into service design education, particularly in contexts like China, where linear design thinking remains dominant, can not only enhance individual student development but also contribute to the evolution of more adaptive, critical, and future-responsive pedagogical models.

**Limitations and Future Research**

This study's design experiment, conducted through the form of workshops within a one-semester course, faced several limitations. First, the integration of speculative and systemic design represents one possible expansion of critical futures thinking and systems thinking. As such, the interdisciplinary approaches/methods introduced remain open to further development, alignment, and integration. Notably, if the introduced approaches also have design properties, some of the methods/tools may partially overlap with those of service design. In such cases, translating them into a shared language could facilitate more effective integration.

Another limitation concerned the participants' varying levels of familiarity with service design techniques, due to recruitment constraints, which may have introduced bias. Future research should involve participants with prior knowledge of service design to assess the impact of integrated approaches more robustly. A further limitation lies in the expert interviews. Given the emerging status of speculative and systemic design in China, fewer experts specialize in both areas and service design compared to Western contexts, introducing potential bias in the interview data.

Design researchers are continuously exploring how to explicitly integrate systemic, critical, and future-oriented perspectives into service design. For example, Irwin (2015) introduces the transition design framework, which seeks to catalyse systems-level change in response to "wicked problems" and to support more sustainable and equitable futures; Kueh et al. (2022) experiment with applying speculative methods in the service design process within healthcare contexts; Lin et al. (2025) outline the conceptual framework for integrating long-term, future-oriented, and systemic perspectives into service design, while Lin and Villari (2025) propose corresponding design principles to operationalize such integration for organizational transformation. Future studies of this topic on design education could further investigate the comprehensive integration of these approaches, drawing on evolved theoretical knowledge and developing practical experience. Empirical testing of integrated design approaches in educational contexts could contribute to informing service design education, cultivating students' capabilities, and reinforcing theoretical research in the field.

**Conclusion**

This study explored how integrating speculative and systemic design approaches into service design education can respond to issues identified in the Chinese context: its development remains in an early stage, but both pedagogical strategies and student mindsets lack non-linear thinking. Through literature review, expert interviews, and workshop experiments, we explored how these two design approaches might not only enhance students' individual design capacities but also inform and probe alternative pedagogical pathways toward more adaptive and future-oriented service design educational models.

The findings suggest that embedding speculative and systemic design methods helped students reframe their approach to service design: shifting from isolated, solution-oriented thinking toward more relational, reflective, and future-oriented design reasoning; and moving from delivering fixed outcomes to envisioning enabling conditions for ongoing transformation.

These shifts in thinking did not occur immediately; rather, they often emerged through moments of discomfort and friction. While these unfamiliar approaches initially caused confusion, when supported by guided reflection, they became productive spaces for learning. As this study shows, students often do not resist change, but instead require scaffolding and meaningful prompts to move beyond habitual thinking.

Finally, although the speculative design approaches used in this study are more commonly associated with the design field than with futures studies, their integration into educational practice offers clear value for cultivating critical futures thinking—not by predicting the future, but by enabling students to critically and designerly imagine and question alternative futures.

**Author Note**

This paper is the result of joint work. The first phase of the research was conducted while all authors were affiliated with Politecnico di Milano. The latter phase was completed under the authors' current affiliations: Zijun Lin at the Guangdong University of Technology, Beatrice Villari at the Politecnico di Milano, and Ming Yan at the Xiamen University.

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