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PhD Yearbook | 2025

DOCTORAL PROGRAM IN DESIGN

Chair:
Prof. Lucia Rosa Elena Rampino

Field of study
The Politecnico di Milano established a PhD programme in the field of design already in 1990. Based on this tradition, the current PhD programme in Design was established in 2008, resulting from a substantial review of how design was researched at a doctoral level.
The overall aim of the PhD programme in Design is to develop skills to carry out high quality research, reflecting on the overall nature of design, with its aesthetic, performance and meaning values as well as its capability of being an agent of social change.

The PhD programme in Design deals with various research strands, each of them carried out by a given research team within the Department of Design. All the teams cluster around three Sections:
- Design and Cultures
- Products, Strategies and Services
- Design for Environments, Landscape and Mobility

The programme aims at educating researchers who will contribute original knowledge to the field of design as an established academic field by tackling the problems and identifying the potential of contemporary society. Their contribution may be brought to bear in:
- creating designs, visions, and proposals (research through design);
- developing tools and methods for putting these into practice (research for design);
- developing critical analysis of design and its application domain (research on design).

The Programme develops project and analytical abilities, proposes different methodologies of research, promotes the attitude to collaborate, and offers working opportunities in universities and research centres, design enterprises and public corporate bodies.

Mission and goals
The programme develops design skills and analytical abilities, proposes various research methodologies and promotes a collaborative disposition.

The main academic field is Design. Other academic fields partially covered are: Philosophy; Language Theory; Sociology of Cultural Processes; History of Art; Science and Technology of Materials; Industrial Engineering.
The achievement of the PhD qualification in Design requires a study and research activity equivalent to at least three years of full-time study. During this period, both educational and research activities are provided.
At the beginning of the programme, candidates become effective members of a research team, within which they develop an original research topic: this activity is the core of the learning process.
Parallel to this, candidates are involved in training and specialist activities.
Moreover, the activities of the PhD in Design include participation in conferences (as listeners or speakers) and writing of research papers and/or journal articles.
The programme offers doctoral candidates the following opportunities:
- to develop an original theme of research, becoming an effective member of a research team;
- to attend courses and seminars on design research and on research in general, developing skills concerning the discipline of design and the profession of the researcher;
- to attend courses and seminars referred to a specific field of research, developing high-level specialist skills and acquiring knowledge and tools for the development of their own research;
- to develop the ability to clearly and effectively present the contents of their own work;
- to spend a period abroad as visiting researcher in a research centre to verify the assumptions, the methodologies and the results of their doctoral work.

Qualifications
The PhD program in Design intends to educate a flexible figure: a designer who knows how to carry out research and a researcher who uses design tools. At the same time, she is also an expert in knowledge management, in constructive interaction among different actors and in the sharing of ideas and proposals.
The combination of these skills is useful in a variety of work environments. Specifically: in institutions expressly dedicated to the development of design research, such as universities and research centres; in design agencies and in design-oriented companies; in public corporate bodies and in organizations for territorial development which, increasingly, are faced with complex problems, which the designer-researcher can effectively address, analyse and contribute to resolve.

DOCTORAL PROGRAM BOARD

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HIGH JEWELRY MEETS SUSTAINABILITY.
DESIGNING GUIDELINES TO PROMOTE TRACEABILITY IN THE HIGH JEWELRY SUPPLY CHAIN.

Francesca Antinarelli Freitas – Supervisor: Alba Cappellieri

The jewelry industry, along with its supply chain, represents a complex system that has contributed positively to the global economy, while also posing potential environmental and social risks due to the exploitation of natural resources. As consumer demand for sustainable practices increases, with an emphasis on traceability from extraction to manufacturing, the ongoing wave of globalization has led to a fragmented supply chain, making it even more challenging to ensure the traceability of raw materials. As a result, providing accurate information about the origin of raw materials and ensuring full product traceability remains a significant challenge.

In particular, the high jewelry sector, which relies on limited natural resources and is often associated with poor working conditions, requires responsible and transparent sourcing of raw materials. On one hand, the environmental impacts of mining rare, precious resources are considerable, with large areas of land being severely affected by mining activities and pollution from heavy metals and mercury vapors contaminating water and air, disrupting local ecosystems. On the other hand, while mining for the high jewelry industry provides essential raw materials and sustains millions of livelihoods, the social impacts on communities living near mining sites are profound and complex. The environmental degradation caused by mining severely compromises the well-being and livelihoods of these communities. Therefore, the aim of this research is to develop guidelines for the high jewelry industry, presenting and evaluating both existing and innovative solutions for raw material traceability, and advocating for a transparent and responsible sourcing strategy.

First, the research investigates the context in which sustainability is applied to the fashion and jewelry industries, identifying the main challenges and research gaps. Focusing primarily on the high jewelry sector and its precious raw materials, such as gold, diamonds, and colored gemstones (rubies, emeralds, and sapphires), it highlights the fragmentation of the high jewelry supply chain and the challenges in achieving transparent sourcing through a design methodology. The global high jewelry industry comprises publicly traded corporations, thousands of small privately held companies, and government entities that collaborate through a complex supply chain to transform raw minerals into consumer-ready jewelry. This intricate process involves multiple stages, including extraction, transport, handling, trading, processing, smelting, refining, alloying, manufacturing, and retail. These stages collectively struggle with issues related to transparency and ethics.

Subsequently, the research explores existing and innovative tools and technologies that offer superior alternatives to paper-based methods in terms of verifiability, traceability, and security, including:

- Modern identification technologies such as Quick Response (QR) codes, Radio Frequency Identification (RFID), Near-field Communication (NFC), and Non-fungible Tokens (NFTs);
- Blockchain technology, which enables data to be validated and stored as unchangeable blocks, creating an immutable ledger;
- Gemological methods such as the Paternity DNA test used on emeralds and the emission coefficient of Lab-grown diamonds;
- The digital passport, a crucial tool of the EU Green Deal, with mandatory implementation expected by 2030 and initial applications likely beginning around 2026 in sectors such as consumer electronics, batteries, textiles, and construction products, with plans to eventually expand to other industries, including jewelry; and
- Artificial intelligence technology, which holds significant potential for enhancing traceability throughout the high jewelry supply chain while improving the environmental and social impacts of the production process. AI-based supply chain management solutions are expected to be powerful tools to help organizations tackle traceability challenges.

To this end, the research provides detailed guidelines for implementing these innovative tools and technologies to ensure raw material traceability. Before adopting new technologies, high jewelry companies aiming to enhance their traceability systems must first ensure compliance with the latest sustainability regulations, legislative requirements, and global standards for ethical and sustainable practices, such as the Corporate Sustainability Reporting Directive (CSRD) and the Corporate Sustainability Due Diligence Directive (CSDDD). Pilot projects at mining sites and supplier diversification through AI-driven risk assessment audits are two innovative strategies that could help achieve a more efficient traceability system. Additionally, the guidelines recommend integrating a permanent record within the jewelry itself to fully leverage these technologies. This could involve combining ID codes, blockchain, artificial intelligence, and digital passports. As a result, this research presents a prototype of a digital jewel passport, which, through laser marking, explores the possibility of inscribing ID codes into gemstones or metal components of jewelry and linking them to a blockchain-supported digital platform, serving as the jewelry's passport. This passport would act as an online repository of information, allowing customers easy access to details about the jewelry's journey, including its social and environmental impacts.
In conclusion, the research underscores both the opportunities and challenges in enhancing traceability within the jewelry industry while presenting future research directions and applications. The evolving landscape of sustainability in the high jewelry sector requires the integration of various technologies. By adopting these tools, companies can develop a more robust, efficient, and secure traceability strategy that supports sustainable practices throughout the jewelry supply chain. However, given the uncertainty surrounding emerging technologies and the evolving regulatory landscape, such as the rapid emergence of artificial intelligence and its difficult and costly practical applications, the high jewelry industry must proactively focus on several key trends that will play a pivotal role in shaping its future. The journey toward a more sustainable high jewelry industry begins with a commitment to digital innovation, and its future success will depend on the ability to adapt to these emerging technologies, which will transform the industry's operations. Other key trends include a commitment to fostering education within the industry, both for internal teams, external stakeholders, and consumers, and standardizing regulations, with key regulatory bodies shaping new certification systems and industry standards. Finally, ensuring collaboration between jewelry companies, technology providers, sustainability experts, and regulatory bodies is critical to achieving long-term sustainability in the sector.

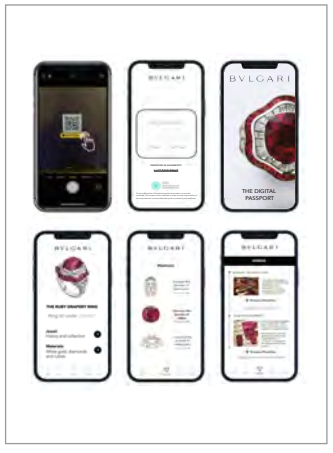

Fig. 1 - Sample Extract from the Digital Jewel Passport

DESIGNING FOR THE SYSTEMIC PROXIMITY: AN INVESTIGATION INTO THE RELATIONAL AND SYSTEMIC ROLE OF DESIGN FOR THE CITY OF PROXIMITY TO ENABLE POSITIVE SOCIAL CHANGE.

Silvia D'Ambrosio - Supervisor: Francesco Zurlo

Co-Supervisor: Carla Sedini

The increasing complexity of contemporary urban challenges demands a fundamental shift in how cities are designed, governed, and experienced. In recent years, the City of Proximity has emerged as a response to these challenges, advocating for a more localized and sustainable urban model where services, work, and social life are accessible within short distances. Among these models, the 15-Minute City has gained significant attention, offering a framework that seeks to reduce urban sprawl, enhance quality of life, and support environmentally conscious urban planning. While this model has been widely adopted in policy and design discourse, it remains primarily spatial in its approach, focusing on accessibility and infrastructure rather than the relational and systemic aspects that define urban life. This doctoral research challenges this spatial determinism, introducing Systemic Proximity as a way to rethink urban proximity beyond mere geography. It explores how design can foster meaningful relationships, participatory processes, and interdependent networks, positioning cities not only as efficient and accessible environments but as relational and systemic ecosystems where human and more-than-human interactions shape urban experiences. Developed in collaboration with NTT DATA Tangity, this research responds to growing interest in urban innovation, social responsibility, and systemic design approaches to urban transformation.

To address these challenges, the study explores three central research questions: **What is the City of Proximity within the context of the 15-Minute City model? What constitutes Systemic Proximity, and how can it be applied to design proximity-based systems? What are the design implications of Systemic Proximity, and how can design contribute relationally and systemically to its development?** These questions guide an in-depth investigation into the theoretical foundations, practical applications, and design implications of Systemic Proximity, providing insights into how design can serve as a catalyst for urban transformations that go beyond spatial planning to incorporate relational and systemic perspectives. The research employs a mixed-methods approach, combining literature reviews, case studies, expert interviews, and participatory workshops. Through comparative case study analysis, the study examines real-world applications of proximity-based models, identifying key strengths and gaps in existing approaches. Expert interviews with scholars and practitioners in systemic design, service design, and urban innovation provide diverse perspectives on the evolving role of design in urban systems. Additionally, participatory workshops serve as a key methodological tool, facilitating collaborative exploration of Systemic Proximity and engaging multi-actor networks in the development of proximity-based urban strategies. This iterative and transdisciplinary methodology ensures that findings are grounded in both theoretical reflection and practical experimentation.

Fig. 1 - Close-up shot from the Sense-Making workshop with NTT DATA Tangity, March 2023.

The outcome of this research is the Systemic Proximity Framework, a compass for designing proximity-based urban services that integrates relational and systemic design principles. The framework provides a multi-layered perspective on urban proximity, emphasizing economic, social, and ecological interdependencies. It offers strategic guidelines for designing multi-actor, participatory urban systems that foster inclusivity, resilience, and well-being, providing policymakers, urban planners, and designers with an approach to navigate urban complexity.

The framework is structured around four key dimensions: Why design for proximity? What do we design? With whom and for whom do we design? How do we design? These dimensions address the systemic implications of proximity, recognizing urban services not as isolated solutions but as relational, multi-actor ecosystems of care. The research also highlights the designer's evolving role, emphasizing reflexivity, positionality, and interdependence as fundamental principles for addressing the challenges of urban complexity.

By reframing proximity as a multidimensional and interdependent phenomenon, this research contributes to contemporary discourse on urban innovation, systemic thinking, and design for social change.

It argues that urban services should not be designed as fixed and rigid infrastructures, but as adaptive and evolving ecosystems that respond to the dynamic and relational nature of cities.

This study provides actionable insights for navigating urban complexity and shaping cities that are not only efficient and accessible but also socially connected, participatory, and relationally sustainable. Through its theoretical contributions, methodological innovations, and practical applications, this research offers a new lens for understanding and designing urban proximity, positioning Systemic Proximity as a key concept for rethinking urban transformation in the 21st century.

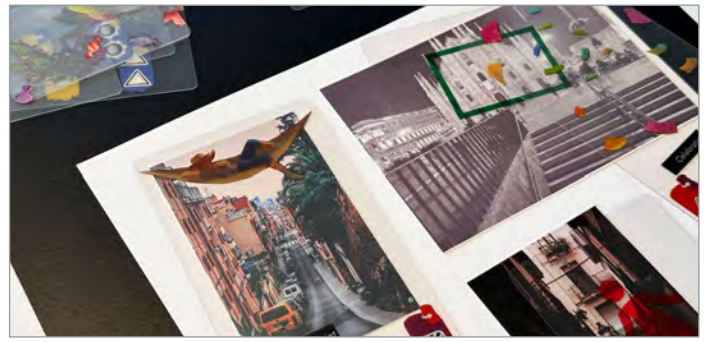

Fig. 2 - Photograph of prototype ideas for grounding the PhD results, shared at the final Co-Design Workshop with NTT DATA Tangity, July 2024.

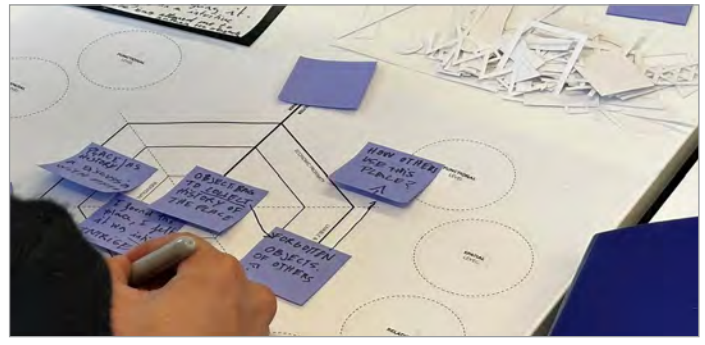

Fig. 3 - Photo taken during the workshop Designing for the Systemic Proximity: Positioning and Placemaking at RSD13 in Oslo, October 2024.

A META-DESIGN FRAMEWORK FOR TRANSDISCIPLINARY, ITERATIVE, SITUATED PHYGITAL FASHION RETAIL EXPERIENCE DESIGN PROCESS

Mariagiovanna Di Iorio – Supervisor: Valeria Maria Iannilli

In the fashion industry, digital and sustainability transformations are leading to experimentation from product to retail and communication design.
Fashion is one of the creative industries experimenting with the possibilities of technologies, creating virtual products and worlds, bringing shopping experience personalization to the next level, and considering sustainable lifestyles and consequent service offerings.
In this context, the evolution of consumer practices and the relationship brand-consumer are radically transforming retail experience design. The above-mentioned changes are facilitated by technological integration possibilities at all levels of the relationship brand-consumers and have been boosted by the COVID-19 pandemic events, as brands were forced to move from experimentation with digital strategies to full reliance on them.
Following the pandemic, while consumers expressed a desire to return to brick-and-mortar stores, their shopping behaviors had evolved toward digital solutions and seamless cross-channel interactions. Consequently, omnichannel integration emerged as the baseline expectation for brands, with the *phygital* retail experience representing the next stage of advancement.
The word *phygital*, which fuses "digital" and "physical", was created in 2007 by an Australian marketing consulting agency, and only afterwards entered the academic literature (Del Vecchio et al., 2023).
This research positions *phygital* retail experience within the context of omnichannel integration in the retail experience and focuses specifically on the blending of digital and physical experience in the retail spaces.
Technological solutions in the retail space enable customers to become active users during their purchasing experience (Moravcikova and Kliestikova, 2017).
Hence, in this research, consumer-facing technology is considered as one of the core features characterising *phygital* retail customer experience, being the media (with physical and digital components) through which the experience is shaped and delivered, influencing how possibilities and constraints of the design project change.
In the concept phase of the design process of the *phygital* retail experience, actors with different roles and backgrounds work together toward the accomplishment of complex projects merging consumers' needs and expectations, operational needs and technological requirements, with the final scope to put together a designed solution which not only needs to be efficient, but also engaging for consumers and strongly related to brand values and representation. The role of design, here, is not just linked to spatial design but also to the integration of technological potential with functionality and imagination. Professionals in the retail experience need to manage the complex entanglement of stakeholders' needs and technological integration in customer experience, through the collaboration with professionals from different fields that integrate each other competencies and knowledge.
With the integration of goods, services, and experiences, the interaction among branding, marketing, and design is becoming more and more intricate. Accordingly, in the path toward *phygital* evolution of retail experience, new roles in charge of managing and shaping the retail transformation are being introduced in fashion companies.
The competency domains involved in the retail system are numerous and continuously redefine their responsibilities, hierarchies, and intervention models. The intertwining of knowledge brought into the process by the different participants to the project is responsible for its unique interpretation, demonstrating the importance of the contributions from every participant in the process. According to (Fischer, 2000) the predominant activity in designing complex systems, as phygital retail experience can be considered, is that participants teach and instruct each other.
Because complex problems require more knowledge than any single person possesses, communication and collaboration among all the involved stakeholders are necessary. The intermediatory function of the tools among the stakeholders collaborating in the *phygital* retail design process is central in this study, indeed according to Schmidt and Wagner (2002) in cooperative work, tools' main function is not informative, but coordinative: they contribute to an almost effortless and fluent coordination and integration of individual activities in coordinative practices.
Within this scenario, from a design perspective, this research positions the *phygital* retail experience as an evolution of the omnichannel approach, where physical and digital dimensions are not merely connected but fully hybridized. As a result, *phygital* retail design encompasses a wide range of possible configurations, characterized by significant technical and conceptual complexity. Since digital and physical dimensions overlap, the design process of the *phygital* retail experience must integrate tools and practices from both domains, which is what this research is investiganting.
Three main research gaps have been addressed in this research: (i) understanding the features of *phygital* retail experience with a specific focus on how the integration of business functions matches technological possibilities; (ii) understanding the intersections of professionals with different knowledge backgrounds participating in the retail design process, who lead fashion retail experience transformation, and how they relate to each other; (iii) understanding which design approaches and tools allow the management of the complexity of *phygital* retail experience design.
The research plan and methodology put into action to fill the above-mentioned gaps are summarized in the following scheme (fig1).
The contribution proposed as the result of this work, is a framework addressing the need to define which design approaches allow the designing of the integration of business functions with technological possibilities in the retail physical space in a fast-evolving scenario.
The framework proposes a theorisation for the designing of the phygital retail experience, with a specific focus on the concept design phase of the phygital retail experience design process, based on three main pillars, namely: transdisciplinarity, iterativeness and situatedness and an accordingly systematized toolkit built on existing and newly designed tools.

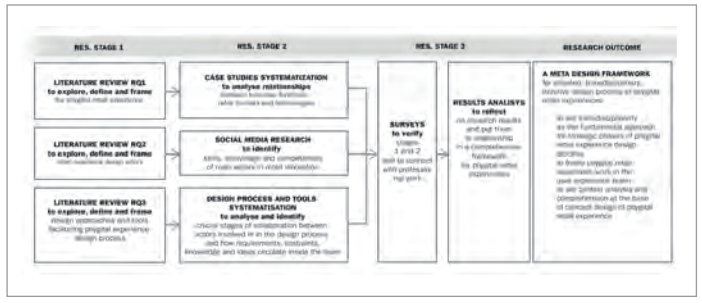

Fig. 1 - Research Plan and methodology

AI SURFACES FOR DATA PRIVACY THE ROLE OF THE TEXTILE DESIGNER

Rachele Didero - Supervisor: Giovanni Maria Conti
Co-Supervisor: Martina Motta

The pervasiveness of surveillance in the Big Data era represents a critical issue, raising significant concerns about privacy and autonomy. This research explores how design can address these challenges by merging fashion, technology, and ethics to create privacy-protecting textiles.
Anchored in the academic milieu of Politecnico di Milano's KnitLab and MIT's Tangible Media Group, the study investigates knitwear and textile design as aesthetic expressions and as functional innovations enhancing the relationship between humans and on-body interfaces.
The research aims to achieve three primary objectives:

1) **Objective 1:** Develop a detailed understanding of the technical, ethical, and legal requirements for privacy-protecting fashion textiles. This involves integrating machine learning, textile engineering, and legal compliance to produce textiles that are functionally effective, ethically grounded, and scalable for industrial reproduction.
2) **Objective 2:** Redefine the role of the fashion textile designer within an interdisciplinary framework. This objective explores how designers mediate between technological demands (machine learning and textile engineering) and ethical considerations (privacy, human rights, legal frameworks) to create scalable, responsible, and aesthetically appealing privacy-protecting clothing.
3) **Objective 3:** Investigate how the intersection of ethics and technology can guide the development of **Critical Design Tech Products**, demonstrating how interdisciplinary collaboration can lead to fashion textiles that not only disrupt surveillance technologies but also promote social awareness and ethical responsibility.

Two key hypotheses guide the study:

1) **RH1:** Privacy-protecting fashion textiles must integrate technical innovation with ethical design principles, ensuring functional protection and scalability.
2) **RH2:** The role of the fashion textile designer is evolving within interdisciplinary research, mediating between machine learning, textile engineering, and legal frameworks to create ethically sound fashion textiles.

The research adopts the **Research through Design (RtD)** approach, guiding the study through three iterative phases:

1) **Core Methodology:** RtD drives all research activities through iterative design, testing, and refinement.
2) **Preliminary Phase:** Desk research, case studies, expert interviews, and technical training provide foundational insights.
3) **Experimental Phase:** Iterative prototyping, user feedback, and expert evaluation ensure alignment with privacy, ethical, and technical standards.

The RtD framework is reinforced by **Privacy by Design** and **Critical Design** principles, embedding privacy considerations into each iteration while provoking societal reflections on surveillance.
This approach ensures that the resulting textiles shield individuals from invasive surveillance and empower them to reclaim their privacy and identity while addressing broader ethical concerns.
The research validated both hypotheses, demonstrating that fashion textiles can be functional, reproducible, and ethically grounded while emphasizing the designer's pivotal role in interdisciplinary collaboration.
A key result of the research is the development of a **Design Iteration Framework**, a scalable, interdisciplinary methodology for adversarial textile development. This framework integrates machine learning, textile engineering, and critical design principles, facilitating the transition from conceptualization to industrial production while ensuring privacy protection and societal relevance. It emphasizes interdisciplinary collaboration and iterative refinement across two primary phases:

1) **Prototype Development:** Designers collaborate with machine learning specialists, textile engineers, and legal experts to create and refine adversarial patterns that can be effectively transferred into textiles.
2) **Industrial Production:** Material specialists, industrial technicians, and production experts ensure that the adversarial patterns are scalable for mass production without compromising functionality or aesthetic appeal.

The primary outputs of the research include:

1) **Manifesto Collection:** The development of AI Camouflage through Cap_*able, the pilot project for this study, serves both as a research tool for RtD and as an output. The Manifesto Collection by Cap_*able is a series of garments demonstrating the feasibility of adversarial textiles in real-world applications. These garments protect privacy and act as critical design artifacts, sparking public discourse on surveillance and autonomy.
2) **Patents:** The research resulted in three patents for innovative adversarial textile production methods, ensuring the reproducibility and transferability of the findings.

The study's impact extends beyond academia, influencing industry practices and public awareness. Exhibitions, workshops, and partnerships with organizations like the International Association for Privacy Professionals (IAPP) and the European Union Fundamental Rights Agency amplified the societal relevance of the work.
The Manifesto Collection transformed abstract concepts like privacy and surveillance protection into tangible experiences, engaging diverse audiences and fostering critical discussions about technology's role in society.
This research bridges academic inquiry and practical application, establishing a comprehensive framework for privacy-protecting textiles that adhere to technical, legal, and ethical standards. It redefines the designer's role as a mediator between technology and society, demonstrating how design can counteract surveillance while promoting ethical innovation. The resulting adversarial textiles exemplify how interdisciplinary collaboration can transform critical societal challenges into scalable, impactful solutions.

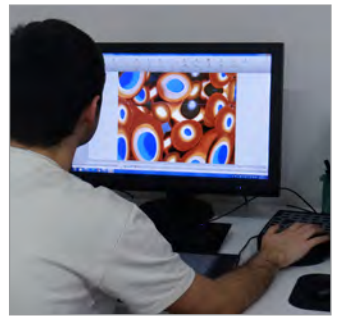

Fig. 1 - Generation of the jacquard, programming computerized knitting machines. Maglificio Pozzebon. Photo by A. Alves Santos.

Fig. 2 - Jacquard fabric produced by the Shima Seiki knitting machine. Maglificio Pozzebon. Photo by A. Alves Santos.

Fig. 3 - Technology test with YOLO. The person wearing Cap_able is not classified as a person by Artificial Intelligence. Photo by Rachele Didero.

KEY PERFORMANCE INDICATORS FOR ASSESSING SUBJECTIVE SENSORY PERCEPTIONS AND EXPERIENCES IN DESIGN STUDIO SPACES WITHIN HIGHER EDUCATION

Reejy Atef Abdelatty Mikhail - Supervisor: Anna Barbara

Co-Supervisor: Peter Scupelli

Design studio environments in higher education serve as essential spaces for fostering creativity, collaboration, and learning among design students. Unlike traditional classrooms, design studios must accommodate various activities, including individual work, peer discussions, and critique sessions. However, existing research on learning environments often neglects the sensory dimensions of studio spaces despite their significant impact on students' experiences and behaviors. This study aims to bridge this gap by developing Key Performance Indicators (KPIs) to evaluate and enhance sensory experiences in design studio environments. Conducted as a comparative study between Politecnico di Milano (PoliMi) and Carnegie Mellon University (CMU), the research employs Evidence-Based Design (EBD) principles and the Qualistic Research Approach (QRA) to examine the relationships between sensory stimuli—such as lighting, acoustics, spatial configurations, and material textures—and students' cognitive performance, creativity, and well-being.

The research questions guiding this study were designed to explore the multifaceted relationship between sensory elements and student experiences in design studios. These include: (1) How do different sensory elements within design studio environments influence design students' and educators' perceptions and behaviors? (2) What are the specific sensory needs and preferences of design students and educators, and how do these vary across different cultural and individual backgrounds? (3) What KPIs can be developed to assess and enhance sensory perceptions and behaviors in design studio environments? (4) How can EBD principles and the QRA be applied to improve the design and functionality of studio spaces in higher education? (5) What are the emotional and psychological impacts of sensory experiences on students' learning outcomes and well-being?

The research identifies two fundamental gaps in the current literature (Figure 1). First, it highlights the specificity of design education, where conventional classroom-based pedagogical models do not align with the interactive, hands-on learning methods required in design studios. Second, it addresses the subjectivity of sensory experiences, emphasizing how individual differences, cultural backgrounds, and emotional responses influence students' perceptions of studio environments. To investigate these aspects, the study employs a mixed-method approach comprising field observations of student interactions within studio spaces, interviews with students and educators to gather qualitative insights, and surveys measuring sensory satisfaction, cognitive load, and creativity levels. These methods provide a comprehensive understanding of sensory influences on learning experiences while allowing for the development of targeted KPIs that assess studio design effectiveness.

A key contribution of this research is the development of both general and model-specific KPIs through data triangulation, integrating themes derived from observations, interviews, and surveys. This process ensures a multi-layered assessment of sensory influences, capturing both subjective experiences and quantifiable patterns. General KPIs provide a broad framework applicable across various learning environments, while model-specific KPIs address the distinct needs of integrated classroom studios and hybrid studio models. These KPIs serve as a structured means to evaluate sensory adaptability, environmental satisfaction, and emotional engagement, offering a new way to assess and improve the design of studio spaces.

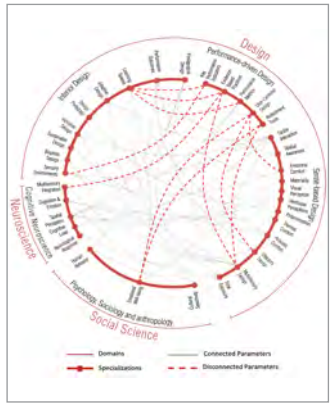

Fig. 1 - Positioning map showing the connected and disconnected parameters in the scope of the research. Source: figure created by the author.

The research methodology follows a structured, four-phase process (Figure 2). The first phase involves exploratory research and data collection, where sensory elements within design studios are systematically documented through observations, surveys, and interviews. In the second phase, the collected data is analyzed to identify patterns, leading to the development of general and model-specific KPIs for sensory adaptability. The third phase involves the validation and testing of KPIs by applying them to different studio models to evaluate their impact on design studio functionality. Finally, in the fourth phase, the study translates its findings into frameworks and recommendations that guide educators, designers, and policymakers in optimizing studio spaces to enhance learning, engagement, and psychological well-being.

Findings from the study indicate that sensory-conscious design in studio environments positively affects students' cognitive performance, engagement, and emotional well-being. Adaptive lighting and spatial flexibility were found to enhance concentration and support creativity, while optimized acoustic environments contributed to reduced cognitive overload and improved collaboration. The study also revealed that tactile materials and environmental factors play a significant role in fostering a sense of comfort and reducing stress among students. Furthermore, findings demonstrate that customizable and inclusive studio spaces contribute to a stronger sense of belonging, thereby enhancing students' motivation and academic performance.

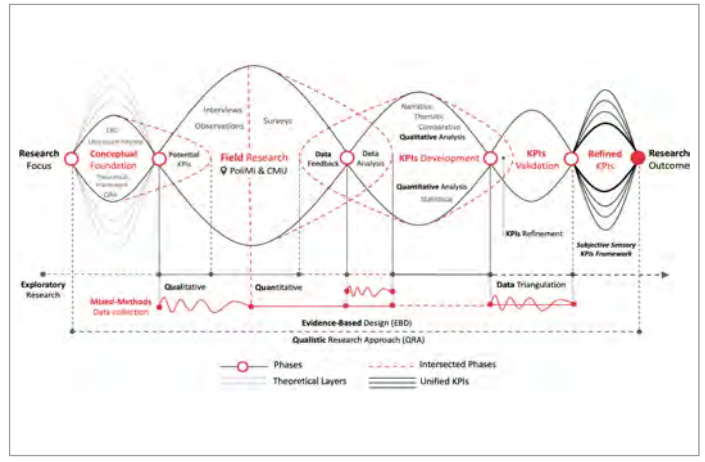

Fig. 2- Research methodology phases arranged in a chronological order. Source: figure created by the author.

These insights underscore the importance of integrating sensory considerations into studio design, ensuring that learning environments are both functional and responsive to students' diverse needs.

In conclusion, this research presents a comprehensive framework for assessing and optimizing sensory environments in design studios, proposing KPIs that serve as measurable indicators of spatial adaptability, sensory satisfaction, and learning effectiveness. These KPIs offer a valuable assessment tool for institutions to enhance the quality of studio spaces, ensuring they support both pedagogical objectives and student well-being. The findings contribute to the broader discourse on design education, learning space optimization, and the role of sensory environments in academic success. By applying these insights, design educators and institutions can create more inclusive, dynamic, and user-centered studio spaces, ultimately fostering an environment that optimizes creativity, cognitive performance, and student engagement in higher education.

UX SUSTAINABILITY: ASSESSING AI-INFUSED OBJECTS

Alice Paracolli - Supervisor: Venanzio Arquilla

This research explores how User Experience (UX) can contribute to the environmental sustainability of AI-infused products, particularly by assessing and mitigating their impact during the use phase. The rapid proliferation of AI-infused objects makes it essential to critically reassess design practices and sustainability considerations, in order to address their growing energy demands and environmental impact. This study aims to bridge the gap between UX design and sustainability by providing designers with a structured approach to assessing and reducing energy consumption without compromising user experience. By adopting a 'systems thinking' perspective, this research situates AI-infused products within broader digital ecosystems and investigates how user behaviors, design decisions, and system interdependencies shape their environmental impact.
Adopting a Research through Design (RtD) methodology with a constructivist epistemology, the study develops a toolkit that enables UX designers to identify key sustainability challenges.
By integrating environmental impact considerations into UX design processes, the research translates complex interdisciplinary knowledge into practical applications. The outcomes include a systematic framework for evaluating the energy consumption of AI-infused products and actionable insights for optimizing UX while reducing ecological footprints.
The research defines AI-infused objects as ecosystems, emphasizing their systemic role in generating environmental impact. It situates these objects within the Internet of Things (IoT) landscape and explores how design choices related to physical, digital, and usage components influence sustainability. The study traces the evolution of sustainability strategies in design, moving from product-centered approaches to holistic frameworks that consider entire lifecycles, including the use phase, where user behaviors and interactions play a crucial role in determining environmental impact. A comprehensive assessment of AI-infused object ecosystems requires examining three core dimensions: the physical components (the tangible structure of the object), the digital infrastructure (connectivity and computational capacity), and the human interaction aspect (how users engage with the object).
This research explores how these dimensions collectively contribute to sustainability challenges.
A significant contribution of this work is the framing of AI-infused object ecosystems, detailing their operational characteristics and the interplay between hardware, software, and user interactions. The research analyses "rebound effects," illustrating how user behaviors can amplify or mitigate environmental impact. The study further investigates the evolution of UX, positioning sustainability as a critical dimension within UX practices. A systematic review of existing UX design tools for sustainability in IoT contexts reveals existing gaps and proposes new approaches to align UX with ecological considerations.
The empirical phase of the research focuses on the development and validation of a toolkit designed for UX designers. The toolkit facilitates sustainability assessments by helping identify which aspects of AI-infused products should be redesigned to enhance user experience and reduce environmental impact. Through industry collaborations, focus groups, and workshops with students, the toolkit undergoes iterative testing and refinement. Key empirical results confirm its utility, its ability to raise designers' environmental awareness in digital products, and its integration into professional workflows. The research defines a structured four-step method for assessment: (1) **Map the ecosystem**: analyze the physical and digital components, user touchpoints, and data flows. (2) **User context study**: identify first and second users, analyse variations in usage patterns that may lead to excessive energy consumption. (3) **Identify use impacts**: examine user interactions to pinpoint areas requiring design interventions. (4) **Strike a balance**: iterate to optimize both UX and environmental sustainability. The toolkit's corporate applications demonstrate its capacity to support decision-making within product development cycles, while its educational use fosters sustainability literacy among design students. The study acknowledges that while the toolkit effectively identifies which aspects of the product should be redesigned to improve UX and reduce environmental impact, it does not address the redesign phase itself. Further refinement is needed to make the process more agile and support designers in managing the subsequent stages of development.The conclusions of the research emphasize three major contributions:

1) **Understanding key aspects of environmental impact in AI-Infused Object Ecosystems**: defining AI-infused objects as interconnected systems with sustainability challenges to trace cause- effects environmental impacts. This research enhances designers' understanding of environmental impact factors by identifying the specific components that contribute most significantly to environmental degradation.
2) **Identifying existing design approaches for UX and sustainability in IoT**: through a systematic literature review, the research traces the historical evolution and theoretical foundations of sustainable UX design. It specifically analyzes design tools and methodologies used in both academia and industry to integrate sustainability into UX practices for IoT products. Based on these insights, the study defines a method that translates best practices into a structured approach for UX designers.
3) **Knowledge translation for environmental sustainability assessment**: offering a practical toolkit for integrating sustainability into UX practices. This toolkit equips designers with actionable insights to assess and mitigate environmental impacts, enabling them to critically refine their designs. Developed through expert validation, case studies, and workshops, the toolkit serves as a bridge between theoretical knowledge and practical application.
It offers a transformative experience by shifting designers' perspectives, making them aware that even digital products—and especially their use phase—have significant environmental impacts. By making the invisible visible, the toolkit reinforces environmental awareness and provides structured assessment methodologies to support incremental improvements in both UX and sustainability in AI-infused products.

This research does not aim to restrict technology use; instead, it highlights that reducing environmental impact without ensuring user value risks unnecessary design interventions. The toolkit promotes both environmental and UX assessments to guide redesign decisions effectively. Future research directions include investigating rebound effects in greater depth, refining methods for embedding sustainability in design education, and extending the toolkit's applicability to emerging digital technologies. The study highlights the interdisciplinary nature of sustainable UX design and the need for ongoing collaboration between designers, engineers, and policymakers to enhance the environmental performance of AI-infused ecosystems. The toolkit serves as an assessment tool, it can actively support decision-making in balancing UX and sustainability. By making environmental impact assessment more accessible to UX professionals, this research advances the integration of sustainability into AI-infused product ecosystem design. The proposed methodologies provide a foundation for future explorations into responsible design practices, reinforcing the role of UX in shaping environmentally conscious digital ecosystems.

TOWARDS A PLURIVERSAL APPROACH TO TREND RESEARCH IN DESIGN FUTURES

Victoria Rodriguez Schon - Supervisor: Manuela Celi
Co-Supervisor: Chiara Colombi

This doctoral research arises from the recognition that the future is actively being colonized. Through hegemonic systems of knowledge production, narrow and market-driven imaginaries of what is possible have become dominant, restricting the futures we are able to imagine and enact. Following Fry's concept of defuturing, which describes the processes through which futures are systematically erased by unsustainable practices and dominant ideologies, this dissertation contends that design, as a futures-oriented discipline, carries both responsibility and agency. Design does not merely intervene in material realities but actively participates in worldmaking, shaping social, cultural, and environmental conditions of the future.
Therefore, how designers imagine, interpret, and work with futures must be questioned, particularly when such imaginaries reproduce the legacies of coloniality and modernity.
Emerging from my positionality as a designer trained in both Buenos Aires and Milan, this research is deeply informed by the tension between peripheral and central design practices. These dual contexts exposed the limitations of design education and practice that often center Global North methodologies, frameworks, and aesthetics while overlooking local and Indigenous knowledges. Reflecting on this positionality, this research embraces auto-ethnographic methods to navigate the epistemic and cultural divides between different design geographies, making the personal an explicit site of inquiry and critique. The central question driving this work is whether it is possible to apply pluriversal values to trend research, a discipline that has become increasingly influential in design practice yet remains critically underexplored in academic literature. Trend research and its identification and interpretation of weak signals and cultural shifts to anticipate change, operates as an anticipatory tool within design, informing products, services, and experiences that consolidate possible futures.
However, trend research is often conducted from within hegemonic frameworks, privileging market-driven goals, consumerist logics, and Eurocentric worldviews, thus participating in defuturing by foreclosing alternative futures.
In response, this dissertation develops an understanding of trend research as both a methodological and conceptual intervention, it critiques conventional models of trend research that reduce social and cultural complexity to commodifiable insights, proposing instead an approach grounded in pluriversal and decolonial thinking. A pluriversal perspective challenges the singularity of modernity's one-world ontology by emphasizing the coexistence of many worlds, knowledges, and temporalities. Applied to trend research, pluriversality demands that we not only diversify the futures we imagine but also question who is allowed to imagine them and from which epistemic positions. To investigate these questions, the research adopts an interdisciplinary and post-qualitative approach, embracing research as an ongoing, entangled, and relational process. Rather than treating methods as fixed instruments for data extraction, the research is structured through recursive engagements with theory, fieldwork, and reflection, allowing the research program to evolve in response to its contexts and findings. Activities such as interviews, case studies, ethnographic research, and experimental workshops such as Trends in Language and Weak Signal Extempore, are integrated into the process, not as discrete stages but as overlapping and interwoven acts of inquiry. These engagements aim to identify whether pluriversal values can be operationalized within trend research and to understand the epistemic and ontological shifts required to do so.
An important element of this research is the practice of unlearning, which functions as a methodological and ethical stance. Unlearning involves critically detaching from inherited knowledge structures and assumptions, creating space for alternative ways of knowing and being. For trend research, unlearning means questioning the taken-for-granted methods and aims of the discipline, particularly its complicity in reinforcing capitalist, colonial, and extractive paradigms. This process also necessitates a sustained engagement with positionality, acknowledging the researcher's own location within these structures and the influence of personal biases, privileges, and cultural histories on the research itself. A significant part of this research involved ethnographic fieldwork carried out in the provinces of Salta and Jujuy, in Northwest Argentina, where I engaged with members of the Wichí and Coya communities through informal interviews, shared activities, and material explorations. This journey unfolded as a deep encounter with alternative ways of understanding time, creativity, and futures. The reflections are presented as fragments, inviting the reader to navigate through the insights with the same openness and curiosity that guided the fieldwork itself.
Design emerged as a relational practice rooted in reciprocity, care, and continuity. Creation processes in these communities are embedded within cyclical and situated temporalities, where making is inseparable from living. Futures are not forecasted but lived, woven through daily gestures, ancestral techniques, and ongoing dialogues with materials, something cultivated through attention, repetition, and adaptation. The fieldwork revealed that there is an ongoing negotiation between preserving the integrity of cultural expressions and adapting to external demands. This balance becomes a site of both tension and creativity, where the act of making becomes not only about producing objects for sale but also about sustaining ways of being and knowing that resist homogenization, when practiced without critical reflection, trend research risks becoming a vehicle for epistemic dominance, reinforcing narrow, universalized futures at the expense of pluriversal realities.
This requires an ontological shift towards practices of attunement, relationality, and care.
The contributions of this dissertation are both conceptual and methodological. Conceptually, the research proposes the undefinition of trend research—an ongoing refusal to stabilize the field within rigid boundaries or prescriptive frameworks. Instead of offering a new definition of what trend research "is," the work invites constant questioning of its purposes, methods, and implications, thereby maintaining openness to diverse epistemologies and practices.
Methodologically, the dissertation advances a blended approach combining post-qualitative inquiry with decolonial design research, demonstrating how experimental, reflexive, and situated methods can support the development of more responsible and inclusive futures. A significant output of the research is the creation of a digital dissertation artifact, an interactive platform designed to complement the written text by incorporating non-textual knowledges—such as visual material, audio recordings, and poetry—and offering a more embodied and dialogic experience. This artifact aligns with the research's commitment to pluriversality, providing a space where complexity and multiplicity are not only acknowledged but actively cultivated. By inviting users to navigate the material and draw their own connections, the artifact enacts the very principles of open-endedness and co-construction that the dissertation advocates.
In conclusion, this research does not aim to provide definitive solutions or universal methodologies. Rather, it opens a space for reimagining how trend research might operate within design futures if informed by pluriversal and decolonial commitments. By critically examining the epistemic foundations of trend research and experimenting with ways to trend otherwise, this dissertation contributes to ongoing discussions about decolonizing design futures, foregrounding the need for plurality, reflexivity, and unlearning in the ways we anticipate and materialize the imaginations of futures.

STRATEGISING DIGITAL TRANSFORMATION THROUGH DESIGN. DESIGN-LED PARTICIPATORY ASSESSMENT IN THREE ITALIAN CULTURAL INSTITUTIONS

Federica Rubino - Supervisors: Davide Spallazzo, Deborah Agostino

The cultural sector is increasingly engaging with digital transformation as a means of enhancing institutional strategies, visitor engagement, and operational efficiency. Museums, as key public cultural institutions, face challenges in integrating digital technologies while maintaining their institutional missions and ensuring participatory decision-making. While digital transformation is often framed as a technological issue, this research positions it as an organizational and strategic challenge that requires innovative interdisciplinary approaches. This dissertation explores how design-driven methodologies can contribute to strategic development and participatory assessment in digital transformation, positioning design as both a methodological approach and a strategic enabler. This research focuses on the role of design-led methodologies in facilitating participatory strategic development within museums. Specifically, it examines how participatory design and strategic design approaches can contribute to digital transformation efforts by fostering collaboration among stakeholders and embedding reflexive assessment processes. The study integrates perspectives from design research, cultural management, and digital strategy to construct a framework that aligns digital transformation with institutional goals.

The dissertation is guided by the following research questions: how can design knowledge be formalised to foster strategic development and participatory assessment for museums' digital transformation? What learning processes are activated among museum practitioners during participatory strategic planning and assessment? How do these processes contribute to digital confidence? How do cultural contextual factors, including governance structures, influence the facilitation and challenges of design-led strategic development? The primary objectives of this research are to develop a methodological contribution that integrates design-led approaches with cultural performance management and participatory assessment frameworks, to conceptualize participatory assessment as a design activity that enhances digital strategic development in museums, to test and refine an ex-ante assessment tool for digital readiness in cultural institutions, and to provide practical insights for museum professionals on how to embed design-driven approaches within strategic decision-making processes. This research investigates a phenomenon relevant to both academic debate and practitioners in cultural organisations. To generate meaningful knowledge, it integrates interdisciplinary knowledge across disciplinary boundaries. The research follows a transdisciplinary and reflexive approach by involving museum professionals in the co-creation of strategies for digital transformation. The epistemological position is hybrid evolving from pragmatism to constructivism. Initially, pragmatism allows for a flexible methodological approach, integrating theories and methods from multiple research traditions. Later, a constructivist stance is adopted, acknowledging that knowledge is co-constructed with participants through iterative interactions in action research. The research follows a Participatory Action Research methodology, which aims to both generate knowledge and enact change. It recognizes that the researcher's involvement in practice is crucial for theory development. The participatory nature of action research ensures that the strategies and assessment frameworks developed are contextually relevant and applicable. The study employs a mixed-methods approach, integrating iterative co-design sessions with museum professionals and stakeholders, reflexive assessment methodologies incorporating feedback loops into strategic decision-making, qualitative case studies to examine institutional adoption of digital initiatives, workshops and interviews to collect experiential insights from practitioners, and ex-ante participatory assessment tools developed and tested through a structured framework. The empirical research is based on three case studies: Pirelli Hangar Bicocca, a contemporary art foundation; Museo Civico di Storia Naturale di Milano, a public museum focusing on community engagement; and Museo Diocesano di Mantova, a cultural institution employing blockchain technology. The selection of these institutions ensures diversity in governance models, enabling a comparative analysis of how participatory design methods operate in different cultural settings. The research follows three iterative phases within the Action Research framework: a sensitising phase to understand contextual needs through initial engagement with museum professionals, a developing phase to co-create digital strategies and participatory assessment methodologies, and a testing phase to implement and evaluate the participatory assessment tool within real-world museum settings. Data collection includes workshop transcripts, audio and video recordings, deliverables produced by museum professionals during sessions, observation notes from the researcher and team members, and self-assessment questionnaires to track practitioners' learning processes. The methodological framework integrates participatory design approaches with strategic assessment methodologies, ensuring both practical applicability and academic rigour. The findings of this research indicate that participatory approaches foster more inclusive, adaptive, and strategically aligned digital initiatives within museums. The involvement of multiple stakeholders in digital strategy development enhances institutional resilience and responsiveness to technological change. Museums face significant challenges in institutionalizing co-design practices due to resource constraints and governance structures. The introduction of an ex-ante participatory assessment framework supports reflexive learning, allowing institutions to align digital initiatives with broader strategic objectives. Digital confidence among museum professionals can be enhanced through structured learning processes, iterative testing, and collaborative strategy development.

This research aims to contribute to multiple academic fields: in design research, by formalizing design knowledge within strategic development, this study advances the discourse on design as an enabler of institutional innovation; in cultural management, the integration of participatory design into cultural institutions' strategic planning contributes to debates on digital transformation and cultural governance; and in evaluation and assessment studies, the development and testing of the ex-ante assessment framework bridge the gap between participatory design and performance evaluation in museums. For museum professionals, the study offers actionable insights for embedding design-led approaches into strategic planning, including building a participatory culture by enhancing collaborative decision-making, fostering digital confidence through training initiatives, hands-on digital experimentation, and iterative design processes, and implementing reflexive assessment through the adoption of participatory ex-ante assessment tools that enable institutions to track digital readiness and adapt their strategies accordingly. This dissertation underscores the necessity for cultural institutions to embrace a systemic and participatory approach to digital innovation. By positioning design as both a strategic tool and a methodological framework, the study provides a roadmap for museums to navigate digital transformation effectively. The research demonstrates that a design-driven approach can enhance inclusivity, adaptability, and strategic thinking within cultural institutions, ensuring that digital initiatives align with institutional missions and audience needs.

NEW CHINESE ENVIRONMENTAL DESIGN EDUCATION: A PARADIGM INTEGRATING CHINESE TRADITIONS WITH WESTERN DESIGN THINKING

Yang Yeqiu – Supervisor: Lucia Rosa Elena Rampino

Within China's rapidly evolving design education landscape, this doctoral dissertation investigates the transformative integration of traditional Chinese "Three-Jing" theory with Western design thinking methodologies in environmental design education. This investigation gains particular significance following the 2022 reclassification of design as an interdisciplinary field by China's Ministry of Education, marking a pivotal shift from its traditional categorization under arts. Such a paradigm shift necessitates a comprehensive reconsideration of how environmental design is conceptualized, taught, and practiced in Chinese educational institutions. Additionally, as environmental design expands beyond traditional physical spaces to encompass experiences, services, and strategic planning, new educational approaches must effectively prepare future designers for these multifaceted challenges. The research's urgency is further emphasized by critical reflections from leading institutions like Tsinghua University and Tongji University since 2018, as documented in academic journals including "Zhuangshi," "Design," and "Design Issues."

The "Shanghai Design Manifesto", issued at the 2024 World Design Cities Conference, presents a visionary expansion of design competencies, repositioning environmental designers from spatial design professionals to interdisciplinary innovators addressing the United Nations' Sustainable Development Goals. This evolution requires designers to integrate advanced technologies, biophilic principles, and data-driven insights to develop inclusive spaces addressing complex emotional and social needs.

Literature review and field research reveal three significant challenges in current Chinese environmental design education. From an epistemological perspective, environmental design represents an interdisciplinary field spanning natural sciences, social sciences, and humanities. The first challenge involves some conceptual ambiguity at the ontological level, where disciplinary boundaries and core connotations might benefit from further clarification. As Pallasmaa (2024) suggests, environment is not merely a collection of physical entities but a complex system carrying human experiences, emotions, and memories. The second challenge relates to opportunities for methodological innovation in teaching practices; while design practice in China shows active development, there appear to be opportunities to strengthen systematic methodological guidance for practice. The third challenge concerns certain gaps between educational outcomes and industry requirements in the post-industrial era, where many environmental design graduates face challenges in effectively applying their academic knowledge to real-world practice. These observations emerge within China's unique developmental trajectory, suggesting the possibility of exploring bridges between Eastern and Western approaches while maintaining cultural authenticity.

The research adopts a qualitative methodology structured across three progressive phases to explore this complex educational landscape. The first phase focuses on theoretical foundation development through systematic literature review and documentary analysis, examining both the philosophical connotations of traditional Chinese "jing" concepts and the evolution of Western design thinking principles over the past 70 years. This includes analyzing historical texts on Chinese aesthetics and environmental philosophy, as well as contemporary Western design thinking frameworks. The second phase conducts a multi-case analysis studying 36 instances of design thinking applications in environmental design education, with particular attention to three representative cases - Shanghai Siping Community Micro-renewal demonstrating community engagement methods, Beijing Digua Community Renovation highlighting cultural preservation approaches, and Milan Arnold Community illustrating international collaborative practices. These cases examine factors such as teaching spaces, time management, and stakeholder engagement, identifying potential success factors including integration of physical and non-physical spaces and use of real-world projects.

Building on these investigations, the study proposes a preliminary "Three-Layer Environmental Design Thinking Framework" that attempts to combine aspects of Chinese aesthetic philosophy with contemporary design methodology. This framework suggests possible interpretations of the Chinese concept of "Jing" through three interconnected dimensions: Wu-jing (physical entity) addressing tangible spatial elements and material considerations, Qing-jing (emotional resonance) exploring psychological and experiential aspects of environmental design, and Yi-jing (spiritual culture) examining deeper cultural and philosophical implications for design practice. The framework aims to provide a structured approach for integrating traditional wisdom with modern design methods, though further research would be valuable to validate and refine these concepts.

To explore the framework's potential applications, three pilot studies were conducted across different scales and contexts. A five-hour Cumulus workshop examining physical form engaged international students in rapid prototyping exercises, while a two-week Design Marathon considering emotional connections explored user experience and community engagement. The most extensive pilot, a month-long studio at Sichuan Fine Arts Institute, investigated philosophical dimensions through in-depth project work. Each pilot included pre- and post-assessments, student interviews, and expert evaluations, offering preliminary insights while suggesting areas for further investigation.

The research findings suggest possible directions for exploring environmental design education through cultural integration. Comparative observation of institutional approaches reveals significant variations in educational outcomes. Tongji University's curriculum, developed in collaboration with Western scholars, emphasizes thought training and practical problem-solving, while Sichuan Fine Arts Institute's traditional approach focuses more on visual effects and technical skills. These differences highlight opportunities for balanced integration of different educational philosophies.

While aiming to make contributions to ongoing discussions, this research suggests several potential implications. At the theoretical level, it proposes a framework that might help bridge certain aspects of Eastern and Western design approaches by providing structured methods for incorporating traditional wisdom into contemporary design education. Practical outputs include preliminary teaching models, assessment rubrics, and curriculum guidelines that could be further developed through additional research and practice. The case studies and pilot results might offer reference points for future investigations in this field, particularly regarding the integration of cultural elements into design education.

The research concludes by suggesting potential areas for future research and development, particularly regarding the balance between technological innovation and cultural preservation in environmental design education. These preliminary recommendations address curriculum refinement, faculty development programs, and opportunities for international collaboration. While acknowledging the limitations of this initial exploration, the research hopes to contribute to ongoing discussions about integrating Eastern and Western design education approaches while offering possible considerations for future developments in Chinese environmental design education.

Keywords: Chinese Environmental Design Education; New paradigm; Chinese Traditions; Three-Jing theory; Design Thinking Integration

SYSTEMIC AND SPECULATIVE DIMENSIONS INTO SERVICE ECOSYSTEM DESIGN: EXPLORING EXTENSION PATTERNS FOR SUPPORTING SERVICE ECOSYSTEM

Lin Zijun - Supervisor: Beatrice Villari

Context

Service Design is increasingly recognized as an intentional pathway for facilitating the transformation of complex service (eco)systems. Its scale, paradigm, and processes are evolving to address the rising complexity and uncertainty of transformative challenges. To navigate the systemic complexity and uncertain future dynamics in designing for service (eco) system transformation, a broader scope, including systemic and speculative dimensions, is essential.

In the design field, Systemic Design and Speculative Design are viewed as capable of addressing systemic complexity and critically exploring future uncertainties. While these perspectives have been embedded into Service Design separately to varying extents, the current extension of these two dimensions is not explicit on how to integrate these approaches jointly and leverage their potential to reinforce Service Design's transformative capacity.

This thesis adopts the latest conceptualization of Service Design, known as Service Ecosystem Design, as its foundational theoretical framework. It aims to explore how Systemic Design and Speculative Design can extend the systemic and speculative dimensions into Service Ecosystem Design, and how these theoretical extensions can be operationalized to support facilitating service (eco)system transformation.

Research Questions

The overarching research question is: **How might Systemic Design and Speculative Design expand Service Design to support service ecosystem transformation?**

Three sub-questions structure the inquiry:

SRQ1. What are the relationships between Service Design, Systemic Design, and Speculative Design at the theoretical and operational levels?

SRQ2. 1) How are the Systemic and Speculative Design approaches employed in Service Design practices for service (eco)system transformation?
2) How might the Systemic and Speculative Design approaches extend the Systemic and Speculative dimensions of Service Ecosystem Design to support service ecosystem transformation?

SRQ3. How can service designers intentionally employ the Systemic and Speculative extended Service Ecosystem Design to support service ecosystem transformation practices?

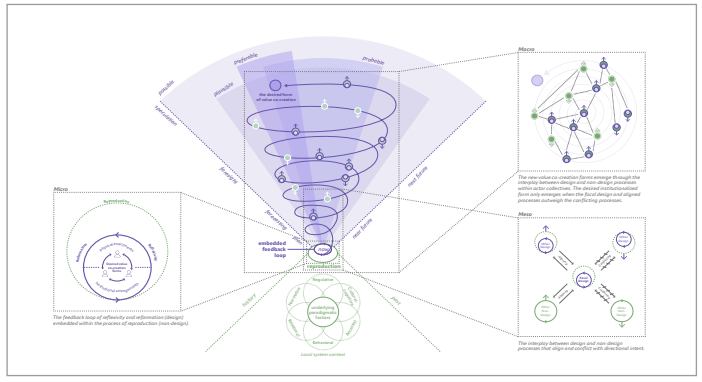

Fig. 1 - The double-cone spiraling structure of Systemic and Speculative extended Service Ecosystem Design process model in supporting Service Ecosystem Transformation.

Methodology

Given that the integration of Systemic and Speculative Design approaches into Service Design is evolving and not yet explicitly established in the theoretical realm, the research requires investigation of both theoretical and phenomenological aspects. For this purpose, an abductive reasoning approach is employed to go back and forth between theories and empirical observations. From the theoretical perspective, this research explores the evolution of Service Design and the relationships between Service (Ecosystem) Design, Systemic Design, and Speculative Design in theory and operation to propose a theoretical hypothesis. From the phenomenological perspective, the research uses a comparative case study analysis approach to investigate how academic experts have employed Systemic and Speculative extended Service Ecosystem Design approaches to address research practices concerning service (eco) system transformation. This phenomenological investigation of six case studies seeks to uncover patterns of these extensions and their implications, in turn, to verify the theoretical hypothesis.

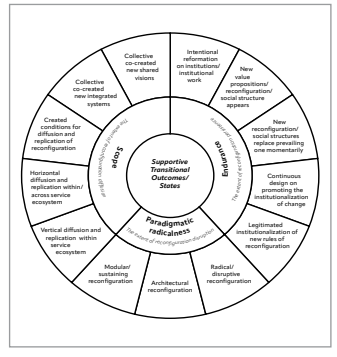

Fig. 2 - The compass framework of supportive transitional outcomes in the three analytical dimensions.

Research Findings and Contributions

This thesis summarizes theoretical insights about relationships between the three design approaches, and operational opportunities of potential systemic and speculative extensions as research findings, and proposes the following research outcomes:

First, Five WHAT design principles are synthesized to describe the fundamental patterns and truths that service ecosystems will follow in their transformation and development:

- Operating in a continuously changing, dynamic, emergent service (eco)system
- Shuttling between service systems of different scales and levels of interaction
- Combining visible and invisible factors to constitute pluralistic service (eco)systems
- Integrating resources by actors in either collectively reproducing existing arrangements or co-creating new value
- Starting with the local contexts/ systems/resources, exploring the futures multiplicity

Second, Five HOW design principles are proposed as operational strategies that inform designers and innovators on how they might be mindful of their design mindsets and shape more co-creative design processes when making intentional Service Ecosystem Design interventions on the meta-level:

- Visioning shared and adaptive directional intent to initiate transformation
- Leveraging dynamic and spiraling portfolios to foster transformation
- Discovering and questioning underlying and interdependent paradigmatic factors to deepen transformation
- Engaging multi-directional actors' efforts to negotiate and synergize transformation
- Reflecting on whether plurality is considered during transformation

Along with these design principles, a double-cone spiraling structure framework of Systemic and Speculative extended Service Ecosystem Design supporting service ecosystem transformation (Fig. 1) and a compass framework of supportive transitional outcomes in the three analytical dimensions (Fig. 2) is proposed.

The implications of this study are to: 1) enhance the existing theoretical framework of Service Ecosystem Design by addressing its under-discussed aspects; 2) translate Service Ecosystem Design from an abstract theoretical concept into more narrative operational guidance, thereby making this design approach more practical and accessible; and 3) indirectly broaden the scope of the Service Design narrative, calling for the innovation of other alternative expansions for the future.