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Editorial: Welcome to DRS 2024

A very warm welcome to DRS2024, a historic moment as we gather for the first DRS conference in the United States. Design research in the US is rich but distributed and we hope with this conference to not only bring together design researchers across the US, but to provide an opportunity to connect with design researchers across the globe. This milestone is a testament to the expanding reach and inclusivity of the design research community. Our journey to this conference has been one of dedication and collaboration, highlighting the resilience, adaptability, and increased reach of our field.

Boston, a city renowned for its academic traditions and historical significance, is our setting for the conference this year. And Northeastern University's College of Arts, Media, and Design is our host institution, in partnership with the Harvard University Graduate School of Design and the Massachusetts Institute of Technology Morningside Academy for Design. We are also welcomed by the City of Boston Mayor's Office of New Urban Mechanics, the Design Museum Foundation, and the Museum of Fine Arts Boston. This setting provides an inspiring backdrop for a conference that values the impact of design in a multitude of contexts and that reflects the diverse and dynamic nature of design research.

The call for papers for DRS2024 resulted in a huge response, with 1184 abstracts and 869 full paper submissions—over a 47% increase from DRS2022. Of these submissions, 78 were desk rejected and 791 papers underwent rigorous peer review. Based on this review process, we are pleased to include 386 accepted papers in our program, reflecting a 44.4% acceptance rate. This rigorous selection process ensures that we continue to uphold the highest standards of academic excellence in design research.

Our program is rich and varied, featuring 29 conversations and 38 workshops designed to foster deep engagement and lively debate. We are very pleased to welcome over 770 delegates, including more than 180 online participants and 590 participants on-site in Boston. This hybrid blend of in-person and online participation, a key feature of DRS2022 in Bilboa, enriches our conference through making it accessible.

Research papers remain at the center of the conference, and we are proud to present 28 invited theme tracks, comprising 342 of the accepted papers. These tracks cover a wide array of topics, from more-than-human design and sound design to design for policy, ethics, and pluriversal design. Themes that reflect both established and emerging areas of interest within the design research community. While many of these tracks are sponsored by

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DRS Special Interest Groups (SIGs), others represent new and exciting areas of exploration.

The diversity of our theme tracks underscores the expansive nature of design research. Our field continues to progress and evolve, integrating new perspectives from disciplines such as anthropology, politics, economics, law, and healthcare. This cross-disciplinary approach enriches our knowledge creation and pushes the boundaries of design research.

PhD and early-career researchers play a crucial role in this conference, representing the next generation of design scholars. Their fresh perspectives and innovative approaches are helping to shape the future of our field. We welcome those for whom DRS2024 is their first opportunity to participate in a conference, we hope you will have a rewarding and transformative experience.

Supporting and enabling the design research community is the DRS Digital Library, a central hub for disseminating design research with almost 1 million downloads. Since its inception in 2020, the Library has become a vital resource, facilitating connections, promoting collaboration, and communicating the scope and value of design research.

As we gather in Boston, we celebrate not only the achievements of our discipline but also the potential for future contributions. DRS2024 is a platform for new ideas, new connections, and new opportunities. We look forward to the powerful discussions and collaborations that will emerge from this conference, driving design research forward in innovative and impactful ways.

Acknowledgements

We extend our deepest gratitude to everyone who made DRS2024 possible. Special thanks to our local hosts in Boston for their support and hospitality. We also thank the 133 Theme Track Chairs and 1067 Reviewers for their incredible dedication and hard work, ensuring the high quality of this conference.

We are grateful to all the authors who submitted their work for review. Your contributions are the heart of this conference, and we hope that you will continue to engage with and grow within the design research community.

Finally, we acknowledge the invaluable efforts of our support team and volunteers. Your commitment and countless hours of work have made this conference a reality.

DRS2024 Proceedings Editors:

Colin M. Gray, Estefania Ciliotta Chehade,
Paul Hekkert, Laura Forlano, and Paolo Ciuccarelli

Open Call for Papers

Integrating Design Perspectives

Strategic Design: The integration of the two fields of Strategy and Design

Jan Michel Auernhammer
Stanford University, United States of America

This article outlines the evolution of Design in Strategy and Strategy in Design and discusses the differences and similarities. The examination of the evolutions revealed three different perspectives on integrating Strategy and Design in both fields. The article provides a nuanced understanding of Strategic Design by purposefully establishing the vocabulary of each perspective. The first perspective is a planning practice containing strategic tools and design methods to create conceptual plans. The second perspective is a learning practice through collective reflection from intent and action. The last perspective is the enablement of a comprehensive design practice in which tangible design and strategy emerge from the messiness of creative and collaborative design practice. These Strategic Design practices require different organization and design capabilities and produce distinctive outcomes. The integration of Design and Strategy is becoming increasingly imperative as there is the need to address the more complex, interrelated socio-technological and economic-environmental challenges.

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Prototyping as a translational practice within cross-organizational B2B service innovation

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This paper focuses on service prototyping in a global B2B technology company experimenting with the B2C market. We first establish the research framework with existing literature on service prototyping and then report a case in which service prototypes and prototyping approaches were used to contribute to different phases of a new service development project: a) discover and define, b) develop and deliver and c) implementation and rollout. We then reflect on the role of prototyping as a translational practice in facilitating cross-organizational collaboration and aligning and enhancing the commitment of various stakeholders. The first author, with a dual role of designer and researcher, was engaged in planning, documenting, re-constructing and examining the case project's process, activities, actors, outputs and outcomes. The results illustrate that prototypes and prototyping are translational practices in which knowledge from research and design practice becomes entangled.

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Development of a scale for measuring individual cultural capital relevant to design thinking

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This study attempts to (1) conceptualize the cultural capital of individuals who accept Design Thinking (DT) and (2) develop a scale from the level of individual values, beliefs, and mindset. Previous studies on design thinking have mainly analyzed designers and trained design thinkers. However, this capacity resource is inherently considered to lie with all employees, including non-designers. Being able to embrace DT can be paraphrased as holding beliefs, values, and attitudes related to design. As DT does not necessarily require formal education, the development of such a scale could also be useful for finding natural design thinkers in organizations. We recruited 400 respondents who had registered on a Japanese crowdsourcing platform and asked them to complete an online survey.

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Unlocking innovation through enhanced collaboration between universities and industry

Nicholas Chia, Blair Kuys
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Small and Medium Enterprises (SMEs) play a crucial role in local economic growth, representing 99.5% of all businesses in Australia. However, product development poses a challenge for SMEs due to their limited resources and barriers to readily invest in Research and Development (R&D). To overcome these constraints SMEs often outsource R&D activities to higher education institutions, emerging as vital partners. While university-industry collaboration offers mutual benefits to industry and academia, Australia is underperforming compared to other OECD countries. This research delves into the dynamics of Australian SMEs' micro-level interactions with universities, uncovering the barriers and enablers in their collaborative New Product Development (NPD) efforts. The findings offer valuable insights for universities seeking to enhance their partnerships with local SMEs, ultimately contributing to innovation-driven growth for the Australian economy.

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Creative workspaces and designer metacognition: A framework, measures, and interventions

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Well-designed workspaces have the potential to enhance a designer’s creativity if the designer knows how to make effective use of that space. ‘Metacognition’ refers to the monitoring and control of one’s thought process and could provide a theoretical basis for understanding designer-environment interactions. However, there is a lack of theory at the intersection of metacognition and workspaces. Here, we adapt Lebuda and Benedek’s Systematic Framework of Creative Metacognition to the topic of designers and creative spaces. Using this framework and empirical research about creative metacognition, we (i) identify

two roles for metacognitive processing in the context of creative spaces, (ii) propose methods for measuring the metacognitive processing, and (iii) identify training and spatial interventions that have the potential to enhance metacognition and creative performance. This provides a launchpad for empirical research about the relationship between designers and their workplaces.

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Challenges for design and designers in interdisciplinary product development: A qualitative interview study in industry

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Today's challenges in areas such as climate change, health technology, and digitization require adapted or even new products. Thus, product design gains higher importance since it defines human-centered solutions, leading to lower or higher acceptance of new design solutions. While the benefits of design seem to be compelling, previous research has shown that industry still faces challenges in prioritizing design along complex interdisciplinary development processes. In this paper, we aim to gain a deeper understanding of these challenges. Based on qualitative exploratory interviews with thirteen designers from the industry, three main and interrelated challenges were identified: A lack of knowledge about the concept of design, a lack of knowledge about the value of design, and the challenge of giving design a high priority. We also identified underlying causes and possible approaches. Based on this, we suggest possible future research directions to strengthen the role of design and designers in organizations.

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Design Cognition and Ideation

Is design delightful? An examination of design students' emotions when designing

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This research examines the emotional experiences of design students as they progress through a design project. The study presents how different emotions manifest themselves in the students' design processes, offering insights into whether the students' design experience is 'pleasurable' or otherwise, and beyond this, the spectrum of emotions that design students experience overall. Findings reveal a common positive emotional experience amongst students despite their very different backgrounds and cultures. The initial results show that positive emotions can be generated by the design project topic, which in turn has an important impact on the design process and the student's performance. The research suggests that the emotional aspect should be considered and improved as an influential factor in the design process. Also, exploring various emotions should be investigated in more detail in studies to enhance the design education experiences that support students' emotional well-being while designing.

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Three's company: Situation-problem-solution co-evolution

Luke Feast
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This paper reports the results of a study examining the co-evolution of design situations, problems, and solutions. The research method is a longitudinal study tracking the creative problem-solving processes of 4 MSc student design teams on an industrial design project. The data includes observations, interviews, field notes, and documents. Visual mapping and temporal bracketing analysis tech-niques reveal insights into the teams' design processes. The results provide evidence that integrating effectuation enabled some teams to pivot their projects by co-evolving the situation, problem, and solution spaces simultaneously. This finding suggests designers can shape situations through effectuation, rather than just passively respond to environmental cues. These exploratory results indicate the potential value of expanding design theory to consider triadic co-evolution of situation, problem, and solution. The implications highlight opportunities for design education to cultivate designer entrepreneurs skilled in strategic pivoting through situation-problem-solution co-evolution.

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How are design ideas studied over time?

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This paper provides the first systematic overview of how existing research has studied the temporal aspects of design ideas. Reviewing a corpus of research literature on design ideas, we contribute an overview of prevailing methodological approaches for studying design ideas as they emerge and evolve over time. This includes an examination of key correlations between methodological aspects such as length of study, length of object of study, methods, and data collection types. We find that prior studies a) typically examine the development of design ideas during short sessions, b) often use controlled experiment setups, and c) rarely explore the relationship between initial design ideas and design process outcomes. On this basis, we argue that current research approaches should be supplemented with new methods that address a) the temporal microscale to better understand the emergence of ideas, and b) the macroscale to illuminate how creative design ideas evolve beyond initial ideation sessions.

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Balancing cognitive load in design work: A conceptual and narrative review

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Designers address complex and even wicked problems, which requires them to deal with high levels of uncertainty and ambiguity, requiring high levels of mental effort. The cognitive load of designing is thus likely to affect design behaviours, activities and method use. However, the nature of design work presents a challenge in applying existing theory on cognitive

load to explain and predict design behaviour. Especially designers' tendency to expand the design space to increase creative potential seems to fall outside the current theories on cognitive load. Following recent calls for theory-building within design, this paper outlines a conceptual framework mapping the relationship between cognitive load and the process of framing and reframing. We examine this dynamic between cognitive load and design by drawing upon theories rooted in cognitive science and information processing. Through a narrative review and conceptual modelling, we propose a model suggesting that cognitive load can be managed.

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Designer-maker: Merging cognition and construction in practice-led design research

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In the decades since the establishment of design research, efforts to identify the nature of design knowledge have repeatedly returned to the question of design's relationship to science. The resulting debate is often framed by the opposing tenets of positivism and constructivism, and this gap continues to characterize research across the discipline. This paper challenges the paradigmatic divide between cognition and construction through an examination of practice-led design research and, more specifically, a redefinition of the designer-maker. It presents perceptual space as an active, multimodal medium where cognition and construction emerge simultaneously, as evidenced by the work of the designer-maker. This in turn supports a necessary evolution in design thinking: through the lens of making, design thinking is design doing, demonstrating the interconnectedness of practice-led design research, craft knowledge, and material-driven design, as well as their significance for the broader discipline.

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Literacies, Inclusivity, and Empowerment

Impacting literacy through the power of a font: Design research for inclusive reading experiences

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Struggling with reading can feel like navigating an endless maze of confusion and frustration for some people. It can weigh heavily on their minds, fostering a sense of inadequacy, isolation, and fear of judgment by others. In the United States, a significant portion of both young and older individuals face these challenges, with statistics showing that 37% of fourth graders and 30% of eighth graders read below basic levels. This paper will detail the development and research of a web-based reading application that leveraged typography and technology to engage struggling readers with their favorite content while improving their foundational reading abilities. In essence, we developed a beta version of this web-

based application for using typography as a supportive bridge between the written word and the reader, thus potentially creating an environment where reading becomes a more comfortable, motivating, and enjoyable experience for those who may find it challenging.

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The effect of perceived realism on the usage of pre-flight safety videos

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Prior research and studies on aviation videos suggest that the transition from hand gesture demonstration to entertainment with diverse forms may positively affect the mood but negatively on the retention and recall of the memories. However, the methods used in the studies tend to focus only on individual elements of entertainment such as humor, which prevents the results from measuring the effect of entertainment on a video as a whole. In this study, we propose to evaluate the user experience and effectiveness of airline safety videos according to the perceived realism. Four videos were selected according to the dimensions of contextual and representational realism and 81 participants were asked to fill out the survey to explore the effect of each realism on affection and cognition. The result of the research is expected to provide different points of view on what to consider when designing informative videos with entertainment elements.

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Missing the bus: A toolkit for amplifying unheard voices of women commuters in India

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Inequity in access is created when infrastructure and services are created for the de-fault 'generic user'. Mobility has long been a key factor in empowerment of women, defining how women navigate their personal and professional lives. The number of women using public buses in India has remained low. Policy formulation for large populations is driven by statistical analysis and data models that do not account for marginalized groups. The present toolkit used to develop the comprehensive mobility plan for Indian cities lacks the tools to elicit tacit needs and requirements of such citizens. To address this gap, we designed a tangible toolkit to evolve a context-sensitive participatory design research methodology for public transport that aids requirement capture of user predicaments and aspirations. This paper details the methodology followed in the development of the toolkit, including selection of design considerations, materials and processes, design iterations and refinements after pilot study.

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W3C web accessibility initiative under the microscope: Identifying assumptions of users and their involvement in digital accessibility design

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In addition to the well-known Web Content Accessibility Guidelines, Web Accessibility Initiatives (WAI) also provide additional information and best practices for web practitioners on involving users with disabilities in their projects. Given the central role that the WAI possesses in the case of web accessibility, how they perceive and what they say about user involvement is regarded as significant. This paper examines how users with disabilities are represented, and more importantly, how they are treated in the recommendations. Critical close reading was performed on text produced by WAI regarding user involvement of people with disabilities. We found a reduction in the nature of how people with disabilities are established as human equals in the design process. Based on our analysis we identified nine themes underlying the view of users with disabilities and their involvement. The themes illuminate ethical issues and hidden assumptions that need close attention in the future.

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Transitional object as empowerment tool: Workshops for Latina women to persevere in higher education

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Thackara's efforts to create spaces focused on wellbeing, and less on products, were invoked in this research. However, rather than simply abandoning the object, this work reassigns meaning to these objects—using them as empowerment tools—designed to become extensions of the body, thoughts, and experiences. This case study details the development and implementation of workshops designed to empower young Latina women persevere in higher education. The workshops brought awareness to structural barriers, coaching in self-reflective techniques, and the co-creation of transitional totemic (symbolic) objects that serve as aides-mémoires of the event. This paper highlights the workshops in three points: a) a brief history of barriers to Latinos' educational success; b) description and analysis of the IRB-approved survey and qualitative interviews; and c) the outcome of the participatory workshops designed to empower young Latina women.

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A study of student's learning experience impacted by using AIGC tools in design subjects in China

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This paper presents a qualitative study that investigates the impact of using AI-generated content (AIGC) tools on the learning experiences of design students in China. Nine bachelor students who were encouraged to use AIGC tools in their design projects participated in the study. Data were collected through semi-structured interviews, document analysis, and observation and analyzed by thematic analysis. The findings highlight the impact of AIGC tools on the efficiency and effectiveness of the students' design process and their acquisition of domain and transferable knowledge. The result shows the impacts of AIGC are perceived as either conveniences or problems. Students' attitudes towards these conveniences, their strategies for handling problems, and their motivation for using AIGC also influence their learning experiences. This study provides design educators with insights on

how students' learning experience is impacted by using AIGC tools and as a reference for future studies.

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Change and Impact

Unleashing creative ideation through stakeholder-related learning: The ripple effect with stakeholder-nexus tool

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Extensive learning and comprehensive consideration of the dynamic connections between stakeholders are the keys to tapping into novel insights, especially in service design. However, due to their lack of professional experience, novice designers usually struggle with the complicated network of stakeholders which results in incomplete design solutions. We created the Stakeholder-Nexus, a knowledge graph-based heuristic teaching tool based on reliable service design examples, to address this problem. By conducting pre-post comparison experiments, we revealed that using the tool significantly increased the effectiveness of stakeholder learning and ideation of design solutions yielded heightened creativity with increased appeal and improved feasibility. Furthermore, we discuss the impact of stimulus distance on the tool's effectiveness and the range of reflecting effects for future stakeholder-related service design education.

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How to respond to change? Evidence of cultural organizations in times of COVID-19

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The extensive impact of the COVID-19 pandemic on the cultural sector necessitated a paradigm shift, demanding organizational resilience and adaptability from organizations within this domain. In response, this study employs a mixed-methods approach to elucidate the innovative strategies implemented by Dutch cultural organizations amidst the constraints imposed by the pandemic. The study discerns three pivotal strategies: repurposing, the accelerated digitalization of cultural experiences, and the cultivation of a collaborative and experimental mindset. This research highlights the enduring implications of COVID-19-induced changes, illuminating the design strategies for sustaining organizational stability amid uncertain events posed by unprecedented external challenges.

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Visioning and managing change: analyzing strategic designers' approaches in salient podcast episodes

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Strategic design considers strategy as the core deliverable of practice, where designers are intentional about creating change. However, there is limited research that reveals change as a deliverable in these projects. The purpose of this study is to understand how experienced practitioners do strategic design and to identify their approaches for behavioral, organizational, and social change intentionally. With many experienced strategic designers invited to podcast shows, we analyzed the content of salient podcast episodes. This qualitative study uncovers themes, methods and approaches that expert strategic designers use to implement intentional change. We found that strategic designers embed themselves in particular situations for long-term collaborations while developing powerful visions of change. They develop actions around managing and creating structures to manifest those visions of change, such as facilitating multi-stakeholder participation and recruiting agents of change.

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Flexibility is key: career exploration and vocational identity status among Design students

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This study investigates processes of career exploration and vocational identity development for Design students. Establishing a professional identity is a central aspect for career construction and definition of academic, personal, and professional goals – and an essential process to promote success and accomplishment as students prepare to move from school to work.We surveyed 109 students enrolled in undergraduate design majors and minors and graduate design programs at a North-American university on career decision motivation and vocational identity status including measures of career exploration (in-breadth and in-depth), career commitment and career flexibility. Findings follow a developmental perspective suggesting that age and seniority relate to higher levels of commitment and in-depth exploration and lower levels of in-breadth exploration. Career flexibility, the ongoing consideration of alternatives and openness to change career choice as a consequence of learning and experience, emerges as a key aspect of career development in a rapidly changing environment.

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What does design research do?

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This paper examines the aims, approaches, and impact of a selection of 62 con-temporary design research projects in the UK. Whilst there is general acknowl-edgement that design research can contribute to the social, cultural, environ-mental and economic fabric of a nation, there is little evidence (to date) that ar-ticulates clearly the specific impact(s) of design research. This work, conducted over a four-year period (2017 to 2021), involved working with over 2,000 design researchers. Building, maintaining, and articulating impact is vitally important in the current research funding climate in the UK where there are significant pres-sures for governments and organisations to prioritise what are deemed to be es-sential components of a functioning society. As such, this paper aims to highlight the power

and impact of UK-based design research across social, economic, cul-tural, and environmental contexts that contribute to a diverse and rich national landscape.

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Towards just futures: A feminist approach to speculative design for policy making

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There is a call for more use of future-oriented design methods like speculative de-sign in developing policies. While these methods offer potential benefits in helping future-proof policies, they also run the risk of solidifying existing structures of pow-er if not applied critically. In this paper, we describe a case study examining smart doorbells in Amsterdam, where we created a speculative design exhibition grounded in feminist theory in order to challenge the existing power structures in the public domain. We then discuss the insights from our design process and the reaction the exhibition received in light of how feminist theory can help ensure a critical application of future-oriented design methods in policy design.

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Health and Healthcare

A tangible toolkit to uncover clinician's ethical values about AI clinical decision support systems

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Machine Learning (ML) has the potential to revolutionize healthcare by enhancing risk prediction and reducing clinical workloads. However, as it impacts risk assessment, integration of ML into clinical practice presents several ethical challenges. This study focuses on enabling clinicians to express their ethical values about ML-powered clinical decision support systems, to facilitate their consideration during the design phase. Grounded in human-centered AI and value-sensitive design, we introduce a tangible toolkit that assists clinicians in visualizing interaction stages with an AI decision support system in their daily practice, and in articulating ethical values and concerns emerging in each step. Preliminary tests with four clinicians for a cardiac risk prediction ML model case-study showcase the toolkit's potential to foster discussion on situated ethical considerations. This research provides a practical tool for designers and clinicians to influence ethical development of AI-driven healthcare solutions and demonstrates its potential for meaningful contributions to such processes.

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The challenges of involving child-patients in the development of a mobile application for their participation in pediatric brain care

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Prior research shows that involving children in the development of technology is valuable, though challenging. Involving child-patients may come with additional difficulties, but as technology is gaining importance in (pediatric) care, it is important to uncover these difficulties. This paper identifies the difficulties of involving child-patients in the development of technology. We do so by reflecting on a project at the Sophia Children's Hospital, where we involved 17 children (of which 12 child-patients) in developing a mobile application for their participation in pediatric brain care. Our identified challenges are related to the recruitment of child-patients and the need to adapt the organization and content of our design research set-up, based on who we were able to recruit and how we recruited them. By identifying these challenges, we make designers and researchers aware of issues that may arise when involving child-patients in technology development and present guidelines to deal with them.

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Exploring the relation between aesthetic experience and physical activity motivation

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Digital physical activity applications employ various motivational mechanisms to encourage exercise, yet research on the complex relationship between their visual aesthetics and motivation for physical activity is still limited. The purpose of this paper is to investigate how three different visual images, such as those representing health, fitness, and social benefits, respectively, can motivate peo-ple to engage in physical activity in a digital service environment. To investigate this, 50 participants evaluated these images in the survey. The results showed that out of the three categories, fitness images had the most significant impact on motivating physical activity, suggesting that stimuli that directly evoke thoughts of physical activity help to increase motivation. In addition, motivation for physical activity and aesthetic appeal were found to be strongly related ($r = 0.64$, $p < 0.001$, $n = 148$). These findings provide new evidence that visual aes-thetics in digital applications notably enhance physical activity motivation.

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Reimagining antibiotic delivery at home: Designing a wearable cool-infuser

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As antimicrobial resistance (AMR) intensifies, hospitals face increased pressure due to the high demand for bed spaces and the associated risks of hospital-acquired infections. Outpatient Antimicrobial Therapy (OPAT) offers a solution by enabling patients to receive life-

saving intravenous antibiotic treatments in the community rather than in hospitals. However, temperature-sensitive antibiotics can degrade when exposed to heat, creating design challenges in OPAT settings. Current antibiotic infusion devices focus on the clinical need and outcomes of treatment, leaving room to improve the holistic patient experience of living with the device. Through a human-centred design approach, this project develops a Wearable cool-infuser that reimagines antibiotic delivery to address the challenges associated with AMR treatment through OPAT. This study evaluates the trade-off between efficacy and usability by prioritising patient feedback and experience throughout the development process. The resulting prototypes reveal how a user-centric functionality can lead to improved quality of life for OPAT patients.

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Reimagining patient-centered multimedia distraction strategies in the emergency department

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This paper investigates the application of immersive multimedia tools as an effective means of distraction in Emergency Departments (ED). With a focus on ageing populations exhibiting Acute Behavioural Disturbance (ABD) and the aim of reducing the reliance on psychotropic medications and sedatives. The study explores the use of immersive multimedia for distraction using readily available technology (VR headsets, curved displays, and 360-degree video on tablets). Consumer devices were customised through co-design collaboration with experienced ED clinicians to adapt to the unique challenges of the ED environment. Thirteen participants, representing the target demographic, were engaged in usability and user-acceptance testing and further co-design culminating in a proposed design prototype. Challenges with VR headsets were highlighted, including: discomfort, intimidation, and complexity, particularly for unsupervised, long-term usage. In contrast, screen-based multimedia distraction solutions were well-received, emphasising the importance of user familiarity, content customisation, and optional interaction.

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Empathy, Care, and Bodily Perspectives

Human-material interactions as practice for care

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In this paper, we report on fields of knowledge and experiences that are accessed through Human-Material Interaction. We describe the experiences of people who worked creatively, in a process-oriented, slowly observing and exploring practice with one material for four months, and who shared these experiences and their interpretations with us in interviews. Based on references to the realities of their lives, they shared individual narratives, which testify to an appreciative and caring approach to the respective material and, beyond that, to the environment, society, and the respective self. In our analysis, we identify Human-Material Interaction as access to learnings, interpretations, relationships, and feelings which leads us to argue that this way of relating to the environment is a practice for

care. We further propose this practice as beneficial for education, sustainability, and future challenges, to promote diverse, interested, and involved perspectives.

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Questioning empathy as care in human-computer interaction design

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This paper considers the semantic function and rhetorical roles the terms “empathy” and “care” carry through the context of user experience design. By considering feminist formulations of the ethics of care, we situate a compassionate moral orientation of “care” to better interrogate implementations of the concept of “empathy” in the design of information systems. We suggest the latter term borrows on the emotive connotations of the former, while not elucidating the same moral commitment to individual contexts, relationality, and personal well-being. Empathy thus is granted a more quantifiable legitimacy than care in professional design contexts, while simultaneously reducing agency of and potential benefits to product end-users. This ideological distinction highlights the ardent need for purposeful value sensitive design processes, and focuses on the seductive illusion that simple evocation of empathy means information systems can align with the interests of human beings.

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A case study into the role of bodily expertise in somatic design ideation

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Research in tangible and embodied interaction design highlights the critical role of the human body and its movement. Various studies have explored the importance of bodily awareness (Hummels, 2007) and have further encouraged de-signers to cultivate subjective bodily skills (Schiphorst, 2011) to support and enhance design practices. These bodily considerations have led to methodological approaches, such as body storming (Schleicher, 2010), to a more holistic approach like Soma Design (Höök, 2018), emphasising the importance of bodily understanding. This paper examines the characteristics of experienced bodily movers and their potential contributions to the design ideation process. We also explore how these characteristics can be integrated into design practice. A case study of a design ideation session with four designers and four experienced movers is presented, analysing their contributions and skills.

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Knotting data as a feminist approach to data materialization

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Several researchers have been studying how working with materials such as yarn can shift how we think and theorize relations to the body and others, by bringing together feminist values at the intersection of data, technology, and hands-on making. Extending such prior work, our research, anchored in craft-based knowledge production, aims to contribute with explorations on knotting as a feminist approach to data materialization. We present a year-long process consisting of 4 workshops we conducted with participants, in which we used differ-ent forms of knotting to materialize data about bodies being part of our academic institution and the Covid-19 pandemic. Presenting the workshops and their outcomes, we discuss how knotting as an approach to materializing data can: 1. put a focus on missing data, 2. surface corporeal and affective vulnerabilities, 3. contribute to making new relations with other (non-human) bodies, and 4. trouble notions of time.

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Utopian visions or cautionary tales? Drifting through New Babylon in search of future living

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Although contemporary technologies are inherently systemic, much design still focuses on individual interactions rather than on effects of collective action across space and time. Current imaginaries of the smart city, where massive assemblages of humans and nonhumans co-perform, have largely focused on the optimization and automation made possible by new technological advances. As we humans contend with our collective earthly survival, the question of how to design desirable futures has become imperative. In this paper, we explore both possibilities and problems associated with the construction of futurist visions. Departing from a story set in the present-day, we move to examine the historical work of Constant Nieuwenhuys' New Babylon as a characteristically utopian imaginary. Looking at New Babylon's key ideas through the lens of our contemporary conditions, we reflect on the issues of play, control, and totalization, as well as the challenges and opportunities for designing future living.

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An alternative design ethics of otherness-centered: Caring for intelligent artifacts

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The advent of emerging technologies has introduced intelligent artifacts as distinctive moral agents. While care ethics has expanded to include animals, ecology, and public policy, it remains silent on the ethical dimensions of caring for intelligent artifacts. Intelligent artifacts and their digital remnants highlight uncertainties in the human-machine relationship and accentuate the "otherness" of objects. Given the inherent "otherness" of objects, there is a clear need to clarify this new ethical relationship between humans and objects. This paper advocates for otherness-centered design ethics, an extension of traditional care ethics to incorporate intelligent artifacts as non-human Others. Based on object-turn ethics, the paper proposes three strategies for caring for intelligent artifacts. This ethical approach goes beyond anthropocentrism by redefining the moral status of the object of care, expanding the "moral constituency" of human ethical responsibility.

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Augmenting Diverse Contexts through Design

Transition towards automatic Passenger Boarding Bridge: Themes of task delegation for autonomous airport operations

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Automation technology can bring numerous benefits to manual labor in organizations. However, in practice, disentangling how the evolving automated systems will transform human roles remains challenging, necessitating further exploration of task delegation regarding which tasks can (or can't) be delegated to automated systems. Building on prior research, our study investigates the perspectives of operators and decision-makers involved in automation projects, specifically focusing on Passenger Boarding Bridges in airport airside operations. By conducting six in-depth interviews, we identified twelve themes that emerged across four dimensions, highlighting practical considerations for task delegation between humans and automated systems. The empirical findings indicate that high-precision tasks are suitable for delegation to automated systems, whereas tasks involving clear communication and meticulous inspection are better suited for humans to lead. The research offers practical insights for task delegation, contributing to design research in human-centered considerations when implementing automation in practice.

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How to use service prototypes to reduce the complexity of social problems : A Case Study of Adoption Services of Public Animal Shelter.

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Stray dog population management (SDPM) poses a significant social challenge in Asia, where adoption services in animal shelters offer a resolution. However, the severity of this issue is exacerbated by high personnel and infrastructure de-mands, coupled with limited public awareness. Our application of service design strategically optimizes and enhances the quality and experience of adoption ser-vices. We recognized the pivotal role of service prototypes in navigating the complexities inherent in social problems. This study examines two animal adop-tion service cases, highlighting the diverse uses of prototypes in understanding social issues refining and evaluating designs within societal limitations. Detailed roles and two major categories are identified, illustrating how prototypes ad-dress complexities arising from the interactive influence of three core elements in service design. This study aims to equip service designers with valuable in-sights for effectively utilizing service prototypes in problem-solving, benefiting SDPM and other public service.

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Reimagining trustworthy robot fleets with animal analogies

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In the future, multi-agent robot fleets will be important for domains like agriculture, space exploration, and air combat. Trust of human-machine teams is needed to make the teams resilient to the faults of both human and robot teammates. Trust in multi-agent systems is often fragile: if any agent in the system is less reliable than the others, people will stop interacting with all of them. Studying relationships in human-animal systems can provide useful insights into designing human-robot systems. We present a method for gathering insight into how humans, working with animal systems think about the relationships between the individuals and the whole, and suggest how animal system models can be used as analogies and practical design features for the design of robot systems in order to increase trust. Using a more-than-human approach in design research phase of human-robot interaction, supports more secure collaboration between humans and robot systems.

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Story Seeds: Creating interactive narratives for visitors of outdoor heritage sites

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The lack of interpretation when considering the outdoor cultural heritage sites has the potential to limit the engagement and educational potential of these sites, as well as presenting a missed opportunity for visitor engagement. We pre-sent an approach that explores the development of interactive stories specific to users that documents their journey through a physical site via a tangible artefact – The Abbot's Book. We describe the Research through Design process, which in-cluded interviews with Museum and Heritage experts, and the creation of two design prototypes that acted as probes to explore the potential to provoke emo-tional, empathetic relationships with Intangible Cultural Heritage (ICH). Finally, we evaluated the prototypes through a reflective workshop with heritage profes-sionals. Our findings indicate that this approach offers rich potential to extend visitor engagement to reveal not only existing stories in any given heritage site, but also ask questions about untold stories.

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Creating a mess! Design strategies for managing visual complexity in second-hand shops

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Enhancing the consumer experience in second-hand shopping is essential to support the sustainable reuse of products. Up to 80% of shopping decisions are unplanned, making store design significantly important. However, knowledge of the design strategies utilized in second-hand shops is limited. Second-hand shops grapple with store design challenges due to their vast array of unique products, resulting in high visual complexity and clutter. Current literature links such visual clutter to consumers' feelings of cognitive overload but also shows it connotates creativity. This study investigated the design strategies of professional second-hand retailers through observations (n = 25) and interviews (n = 10). It identified seven design strategies divided into two: clutter-reducing and clutter-reframing strat-

egies. The research offers an overview of strategies for managing visual complexity in second-hand shops and discusses harnessing clutter's creative potential. This work enhances our understanding of design's role in sustainable consumption.

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Materials and Materiality

Unraveling the sensorial properties in material identity innovation: a study on mycelium-based composite

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Mycelium-Based Composites (MBCs) are promising bio-based materials. However, negative public perception of fungus-derived products due to fear of fungus and irregularity in surface and color remains a challenge. This paper explores the potential of MBCs in material driven design (MDD). It employs a comprehensive approach to examine the potential of sensorial properties for innovating material identity. The study utilized interviews and questionnaires conducted in a workshop setting, applying the Ma2E4 toolkit framework (Camera & Karana, 2018). The workshop had a diverse range of 27 participants from various disciplines. The research findings are used to enhance product design. The study affirms that increasing the softness and modifying odor of MBCs can provide users with positive emotions and therefore enhance their material identity. The findings offer a practical framework for applying these results to design solutions. The conclusions of the paper are consistent with the findings of related studies.

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Discovering design implications for future food experiencing artifacts

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Despite the growing number of research in Human-Food Interaction (HFI), studies mainly adopt a technology-oriented approach. The field focuses on creating foods computationally, leaving the device design neglected. This paper addresses this oversight by focusing on a prominent technology as a case study (i.e., 3D Food Printing) and exploring new forms and meanings HFI technologies may embody. We first explored domestic users' food-related dynamics, habits, and preferences in everyday life (N=19). We then present the outcomes of design workshops with 25 professional designers, resulting in 73 unique concepts aligned with the in-sights from domestic kitchen users. Overall, we extracted ten design implications and developed three final concepts. The value of the design implications for HFI research unfolds in reconsidering definitions, limitations, and resource domains when ideating new technologies, thus extending the possibilities for future artifacts.

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Material experience and user acceptance of mycelium bio-composite insulation in the construction industry through interdisciplinary co-design

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Mycelium bio-composite exhibits remarkable versatility showing properties that are useful for the construction industry, including thermal insulation and acoustic isolation. Despite its potential, mycelium remains an unfamiliar material. To enable bio-designers to successfully implement mycelium bio-composite insulation, creating an understanding of potential users' views on and experience of the material is important. To research this, an interdisciplinary co-design workshop was conducted with potential stakeholders focusing on interaction with, discovery of, and brainstorming about mycelium bio-composite insulation. The results showed that stakeholders mostly have a positive material experience with mycelium bio-composites and are open to acceptance. They predominantly viewed mycelium bio-composites as a sustainable, circular, lightweight, and bio-based alternative to fossil-based insulation. The stakeholders also indicated that acquiring recognition and certification in the European construction market is a necessity. Further acceptance could be promoted by increasing familiarity with the material through designing opportunities for interaction with and informing about mycelium bio-composites.

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Facebook Data Shield: An interactive tangible interface for user data control

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Social media platforms like Facebook utilize AI algorithms to personalize content based on user data, raising concerns about data privacy and transparency. We introduce the Facebook Data Shield (FDS), a life-sized interactive installation that empowers users to visualize and control the data shared with the platform. We deployed FDS at a public design event, to explore user data-sharing and control preferences. We conducteded an analysis of 81 user interactions, based on data logs and surveys. Our findings reveal a preference for increased data control, particularly concerning online behavior and demographics. We identify five distinct clusters for preferred data-sharing settings, which show limited correlation with demographic information. Finally, we discuss the potential for predicting preferred data-sharing settings through machine learning based on our data, and implications for social media platform design. This study contributes to the ongoing discourse on data governance and user autonomy in an era of AI-driven content curation.

https://doi.org/10.21606/drs.2024.739

Is Community Currency feasible in rural China? A field study on waste sorting improvement Via Green Passbook

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The Green Passbook is a Community Currency mechanism applied to waste sorting initiatives in rural areas of China. A field study was conducted at the Green Passbook national demonstration site to evaluate the local effectiveness of its practice. Through semi-structured interviews and qualitative research using the KJ method, the study shows that using a top-down approach to implement a Green Passbook policy in rural waste sorting reduces garbage and enhances awareness. Nevertheless, the standardized Green Passbook model is adopted in diverse ways across various social systems. The result shows the improvement in community and system attributes in three areas: perceived behavioral control, social norms, perceived benefits, which can help address institutional challenges. The findings are valuable in guiding the design practice of group behavioral change.

https://doi.org/10.21606/drs.2024.812

1 Resisting, Recovering, Reflecting, and Reimagining Design Education

Session chairs

Ehsan Baha, Naomi Jacobs, Lesley-Ann Noel, and Naureen Mumtaz

Editorial

James Corazzo, Violeta Clemente, Derek Jones, Nicole Lotz, and Lesley-Ann Noel

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Resisting Education / The Education of Resistance

Reimagining institutional design internship programs to foster Indigenous-led and community-based learning and teaching

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Across many universities in Australia, design schools are exploring new ways to integrate Indigenous knowledges, from specific course curricula to institution-wide policies. This paper examines the developmental stages of a small-scale project to support Indigenous students already enrolled across creative programs, who may be interested in learning design skills, tools, and career pathways. Specifically, we explore how a cultural and relational internship model might sup-port student learning, through partnering with an Indigenous-led design agency, to develop expertise in commercial illustration. We draw on decolonising and pluriversal design literature, while learning from Australian Indigenous design scholars who offer a counternarrative to universal design education and model ways for different knowledge systems to come together. Here, we reimagine the 'work' in work-integrated learning, to develop a more relational and culturally integrated experience. Our aim is to develop an internship model that can move design education outside of the institution, to enable culturally-led and community-based learning.

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Delinking design: Decolonialidad & Transmodernidad in future design education in Abya Yala

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The work presented here interrogates the future of design education by presenting the early development of a new curriculum in a small rural university in the Púrhepécha region, Mexico. The new undergraduate program is created drawing from the literature on decoloniality and transmodernity to reimagine design education. The interplay between this early work and a systematic inquiry of coloniality leads to new ways of thinking about design education and design at large in this context. This work contributes to a South-South dialogue seeking to undo coloniality in creative pedagogical practices and to reimagine what it means to design and to learn beyond the hegemony of modernity.

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This Class Isn't Designed For Me: Recognizing ableist trends in design education, and redesigning for an inclusive and sustainable future

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Traditional and currently-prevalent pedagogies of design perpetuate ableist and exclusionary notions of what it means to be a designer. In this paper, we trace such historically exclusionary norms of design education, and highlight modern-day instances from our own experiences as design educators in such epistemologies. Towards imagining a more inclusive and sustainable future of design education, we present three case studies from our own experience as design educators in redesigning course experiences for blind and low-vision (BLV), deaf and hard-of-hearing (DHH) students, and students with other disabilities. In documenting successful and unsuccessful practices, we imagine what a pedagogy of care in design education would look like.

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Design and Latin America: Exploring materiality and imaginary in design education

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This paper recounts the delivering of the course Design and Latin America: delinking and decolonizing, at University of Brasília. Such experience is in tune with the recent emergence of academic research on the imperativeness of addressing coloniality, and the need to sulear design practice in Latin America. Starting from a brief introduction to Latin American history and social thought, and from an understanding of design as the production of life, discussions were held on the potential of unconventional creativity for nurturing critical consciousness in the field, while acknowledging concrete and subjective power relations. For the development of virtual practical activities, literature was the main tool adopted (specifically short stories related to the Latin American context). Through this methodological framework, it was possible to identify that for reality to decolonize it is essential to know other sides of history, and to bring to light the coloniality of thought and collective imagination.

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Critical design soaps: Resisting the aesthetic hygiene of popular design methods

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Design educators often utilize methods to teach students the practices of design. Yet, these popularized methods often wash away mess and inadvertently cultivate aesthetic hygiene among designers. In response, this research explores the following question: How can we instill critical aesthetic reflexivity among designers about the ways that design methods cultivate aesthetic hygiene? In two workshops with design students and practicing designers, we worked with soaps as tangible metaphors to explore the mess that popular methods erase. Exhibited together with prompting questions, these soaps were then used to spark conversations among design educators. Through our analysis of this process, we highlight four material expressions of how design methods repress mess and critical pedagogical questions for cultivating aesthetic reflexivity.

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Making space online: Situating complex, intersectional identities

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This co-authored visual essay explores our process of making space for ourselves online within the complexity of our intersectional identities. Individually, we've appropriated mainstream social media posts to share marginalized experiences, generate meaningful connections, and merge our personal and research identities. On Facebook, Griffin shares her experiences as a cis-female, invisibly disabled, neurodivergent design educator. On Instagram, Hull shares their experiences as fat, queer, trans non-binary design student. Together, using tools with low barriers to entry, we document how design educational praxis affords our marginalized voices access, or not, within physical and virtual design education spaces. As white authors, we reflect on how our experiences have been invisibly and inequitably racialized. This essay includes captured social media posts, data visualizations both poetic and pragmatic, and captions providing thick descriptions.

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Technology & Reimagining Education

ChatGPT: mediating complex design processes

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This study explores the integration of ChatGPT as a facilitative tool in complex design processes within a project-based Transformative Design course. Student teams collaborated with external partners on projects concerning democratization of trading, democratization of local manufacturing processes, and promoting social inclusion. The inquiry observed if ChatGPT positively contributes to such processes and, if so, in what ways. We focused on its impact on teamwork, creativity, and informed decision-making. Data collection involved recording design sessions with automatic transcription, conversation logs from ChatGPT,

semi-structured team interviews, observations and an anonymized questionnaire. Our findings point to ChatGPT's ability to offer better assistance with real-life design processes - not as much in terms of creativity, but the ability to learn and get the information needed for design in complex and often novel domains. They also point to a shifting perception of human, technology, and world relationships.

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"Small" blended practices in the campus-based architectural design studio: Examining student and instructor experiences and pedagogical implications

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This paper reflects on the increasingly blended (online and in-person) nature of the traditional campus-based design studio and its pedagogical implications. Despite the widespread digitalization of learning and architectural design and construction practices and the post-COVID intensification of remote and hybrid operations, the architectural design studio is taught in predominantly in-person or campus-based mode. Post-COVID interviews of undergraduate and graduate students (N=27) and instructors (N=32) of US architecture programs indicate a continuing preference for in-person or campus-based studio teaching and learning to maximize tactile, social, and vicarious learning experiences. However, the participants also favored small but meaningful blending of online and in-person practices for office hours, lectures, group critique sessions, final juries, etc. Thematic analysis of the interviews suggests blended practices in campus-based programs deepen learning by extending students' and instructors' social, cognitive, and teaching presence and fostering relational proximity and a learning community amongst studio participants.

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Strategic Design Futures: Exploring strategy and futures to learn and practice design for intentional change

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Designers change existing situations with a focus on changing the behavior of artifacts. When designers aim to intentionally change the behaviors of individuals, organizations, or social systems, practitioners use specific approaches. Strategy (strategic design) and futures (design futures) are two alternatives for designers working on complex situations that require intentional change. This paper presents and reports three editions of a course titled Strategic Design Futures that address this type of situation. The course includes a seminar and a project component, which are structured into six design activities: sense-making, participatory visioning, designing futures, designing strategy, participatory evaluation, and design implementation. The course has ambitious goals, and students can only learn initial competencies. After three iterations, the course has focused on participatory visions and designing futures. The initial competencies the course provides are seeds for complex design situations of the real world requiring strategic and futures-oriented design skills.

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Re-imagining and reaffirming design pedagogy in response to generative AI tools

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This paper considers how we can adapt HE design pedagogies in response to the emergence of generative AI (GenAI) tools. We focus on the authors' own HE institution and describe our work through the first half of 2023 to understand the impact of these tools on how our students approach their work, and to adapt our design pedagogies in response. This paper includes accounts of student attitudes to these tools, and the outcomes of our own experimentation with contemporary GenAI tools (ChatGPT4, MidJourney5). We identify 12 challenges for design pedagogy that span assessment, student learning and teaching deliver which our design pedagogy and foreground the unique ways GenAI tools could disrupt the learning that takes place in a student design project. We respond with adaptations adopted by our institution for 2023, and speculate about how future pedagogic design projects could be structured to best support student learning augmented by GenAI.

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A design-stage-oriented framework to introduce artificial intelligence and machine learning in design education

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Artificial Intelligence (AI) and Machine Learning (ML) are technologies that impact the skills and practices of the next generation of designers, presenting the chance to reimagine 21st-century design education. Having a structured knowledge that stands as a multidisciplinary reference for design education is still a challenging aspect of this re-imagination. The paper presents a design-stage-oriented framework for introducing AI and ML into design education. The framework structures taxonomies of AI tools, data types performed by these systems, AI capabilities and the stages of a design process. It leads to an interactive user workflow, serving as a foundational component that enables teachers and students to explore the broad possibilities of co-design with AI tools. The paper discusses the potential impact and implications of the framework on design education and the initial validation in a workshop involving multidisciplinary teachers and students.

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An integrated theoretical framework for reflective teaching in Chinese design education and abroad

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As Chinese higher education adapts to the changing landscape, heavily influenced by Western paradigms, design education also undergoes significant transformation. To enhance design teaching quality, teachers should employ innovative approaches; however, existing research lacks focus on reflective teaching techniques. This study, employing surveys and in-depth interviews with design teachers, unveils several key insights: confusion

often arises between "reflective teaching" and "teaching reflection"; there's a prevalent focus on static content, neglecting dynamic teaching processes; pre- and post-lesson reflection is favored over in-action reflection; teaching methodologies are subject to various influences; teachers must acknowledge the inherent value of reflective teaching. Subsequently, drawing from Donald Schön's reflective action theory and J. W. Brubacher's theory of three-step reflection, an integrated theoretical framework for reflective teaching is proposed. This framework holds significance not only for Chinese design education but also offers insights for design teachers worldwide seeking to enhance their educational practices.

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Recovering Education / The Education of Recovery

Enacting sustainability-centered design curricula: The role of ethos in translating educational goals into pedagogy.

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The concept of sustainability ethos can be defined as a context enabling an articulated set of educational aims and values to translate into curricula and promote capabilities that empower graduates to create change towards sustainable futures. While emerging as an important factor in developing sustainability-centered design curricula, further research is required to fully comprehend its educational significance, and how it intersects with the prevailing outcome-based approach to higher education curriculum development. This paper draws from interviews with academics and graduate students from three sustainability-centered design programs internationally to explore what enabled sustainability to be integrated in the programs. The findings reveal that a common vision, shared values, and articulated goals and pedagogies are considered essential. Although these factors were clearly conveyed by the interviewees, they were not formalized, pointing to the limitations of the outcome-based approach and the significance of a sustainability ethos in translating sustainability-focused educational goals into pedagogy.

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Using contemplative approaches in education as a pathway to cultivating hope in design-driven futuring

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Amidst the challenges of our time, characterized by pervasive uncertainty and global crises, despair often overshadows hope. Within the context of design-driven futuring, where long-term futures and possibilities are envisioned and shaped, the absence of hope can leave designers feeling powerless and doubting the impact of their work on a predetermined world. Yet, hope is a human experience that can be nurtured. This research explores the inner world of design students, addressing their emotions, thoughts, and perceptions. We conducted design experiments in Master's programs in Denmark and Italy, adopting a contemplative approach during design-driven futuring processes. Contemplative practices, known for fostering inner transformation, have shown positive effects on emotional

and cognitive states in various fields. However, their potential in design remains largely unexplored. This study aims to illuminate how contemplative approaches can cultivate hope and empower designers in the face of today's challenges.

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Utilising sharing economy to address impact-centred approach in design education

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To confront the growing uncertainties and challenges on a global scale through design, this paper recommends using the sharing culture as a starting point. It establishes a connection between the sharing economy and impact-centred design by examining the components and scope of the sharing economy in existing literature. Exploring how this framework can be integrated into design education, the paper offers a comprehensive account of a course on impact-centred design, grounded on sharing economy. Throughout four years, this framework was applied to explore design solutions for addressing themes related to crisis response, disaster management, and collaborative consumption. We provide methods and deliverables to illustrate how the sharing economy and design thinking collaborate to uncover systems-level exchanges and interactions among stakeholders. Our discussions focus on the transformative influence of such design contexts on the role of the designer, the scale of the design's impact and the designer responsibility.

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Expertise profiling in design schools: A theoretical framework

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A renewed interest, propelled by the European Bauhaus initiative, has sparked a re-evaluation of design education in response to the growing complexity and interdisciplinary demands of design, encompassing both craftsmanship and academic discipline. While ongoing discussions focus on school types, curriculum development, and pedagogical approaches, there is an oversight in examining the expertise profiles of design educators. These profiles encapsulate the competencies and proficiencies of teaching staff, profoundly influencing the ethos, objectives, philosophy, and substance of education institutions. This paper proposes a theoretical framework delineating three archetypal expertise profiles for design educators: design practitioner, design researcher, and hybrid, nuanced to reflect the multifaceted nature of design expertise. Drawing insights from design history, theory, and professional experience, this framework holds promise in guiding the cultivation of expertise profiles, prioritizing proficiency enhancement, curation, and recognizing the value of hybrid profiles. Our aspiration is to elevate the quality, relevance, and adaptability of design education amidst the evolving landscape of contemporary design.

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'We're all in this together': A mixed methods randomised controlled trial exploring Cross-Pollinative Team Learning studio pedagogy's effects on Academic Resilience and Performance

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Design education's pedagogy of ambiguities and the One-on-One Master-Apprentice's Hidden Curriculum purportedly led to psychological distress and poor academic performance for beginning design students. Despite favourable social conditions, few studies have examined Social Support as positive adaptations towards students' academic resilience in design studios. This mixed methods randomised controlled trial compared One-on-One and Cross-pollinative Team Learning (CTL) students. Inferential statistics revealed that One-on-One students were more resilient ($p = .065$ & $p = .126$), but CTL students have academically outperformed significantly ($p = .0003$ & $p = .017$). Thematic Analysis of CTL students' focus group interview as they transitioned to One-on-One pedagogy during their second year revealed that ongoing peer-to-peer social support was crucial in mitigating negative experiences with the siloed pedagogy. This paper emphasises the need to cultivate a heterarchical pedagogical culture among students, where failure is seen as a learning opportunity, and criticism is taken as constructive feedback for growth.

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An inquiry into the relationships among design learning, metacognitive awareness, and academic goal orientation

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This study examines the relationship between students' metacognitive awareness, academic goal orientations, and design course grades as a design learning criterion in design education and proposes improvements for future design education. Based on the view that metacognitive awareness and academic goal orientations are important in student's academic success, this study investigates whether there is a difference among students with different metacognitive awareness levels concerning their academic goal orientations and design course grades. The study was carried out with 84 undergraduate architecture students. Students were divided into two groups: students with high and low metacognitive awareness levels using the non-hierarchical cluster analysis method. Metacognitive Awareness Inventory and Academic Goal Orientation Questionnaire were used in the study. The results indicate that there is a statistically significant difference between the two groups, and it is a large effect size. Additionally, relationships between goal orientation, grades, and metacognitive awareness were determined.

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2 Design for Longevity (D4L): Project Your Future Self through Service and Technology

Session chairs

Sheng-Hung Lee, Joseph F. Coughlin, Carla Sedini, and Sofie Hodara

Editorial

Sheng-Hung Lee, Joseph F. Coughlin, Carla Sedini, Anna Meroni, and Sofie Hodara

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D4L and Technologies

Informed adoption of smart products: A user-centered approach to privacy communications and impact on product use

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As the number of smart home products entering the market continues to grow at a rapid rate, consideration of data privacy, product design, and sustained usage becomes increasingly important. In this study, adults 50 years of age and older were interviewed to understand user preferences around data privacy communications and their relationship to the longevity of smart home product usage. Participants were presented with various designs of privacy policies to comparatively describe preferences and perceptions. Findings highlight the necessity of integrating privacy communications into the development process of smart home technologies from the beginning rather than treating it as an afterthought. This study discusses guidelines for creating data privacy communications to help designers and developers create smart home products that not only empower users to live independently in their homes as they age but also foster trust, and contribute to a more comfortable and sustainable technological ecosystem.

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Vision problems and eyewear design opportunities for the elderly

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This study addresses the challenges of an aging population due to advancements in healthcare technology that have prolonged average lifespan. The consequent growth of the elderly population necessitates enhanced focus on their well-being and self-sufficiency. Vision plays a critical role, constituting 70-80% of human perception and in-teraction with the world. However, age-related vision problems pose significant chal-lenges, diminishing their quality of life and independence. The research involves a liter-ature review, a Visual Activities Questionnaire (VAQ) survey to understand daily vision problems and challenges, and an analysis of current eyewear products to identify gaps. By integrating these findings, the study aims to propose opportunities for future eye-wear design for the elderly, offering potential for enhancing their daily experiences. The results of this study can guide future visual-assistance product development for the elderly and related research.

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Spatial distribution, characterization, and policy opportunities for Taiwan's solo elderly: a big data approach

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As Taiwan approaches super-aging by 2025, this study uses the 2022 Ministry of the Interior database combined with geospatial analysis and machine learning to examine solo elderly demographical patterns and assess current "Community Care Stations." Findings: 1. Urban areas have higher aging and solo rates closer to city centers, while rural areas show the opposite pattern; 2. "Dual aging" (elderly and old houses) is common in metropolitan areas; 3. Solo elderly are predomi-nantly urban females, suburban males, often separated, wid-owed, or divorced, with fewer children or residing in different regions; 4. Both advantaged and dis-advantaged solo elderly are identified in major metropolitan areas, requiring tai-lored policies for housing and care; 5. The idea "Aging-in-place" highlights disparities in ser-vice coverages at "Community Care Stations." A demand-driven optimization strategy was introduced to increase urban density and expand suburban coverage. This research guides policy design for Taiwan's evolving solo elderly population.

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“Another Eye For the Visually Impaired”: A study exploring the experience of using camera-based mobile assistive applications

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More and more visually impaired people rely on assistive technology to live independently, and camera-based applications are a typical technology used to capture and recognize ob-jects. While the researchers have provided ample information on this technology, more studies are needed on user experience. To explore how visually impaired people perceive and resolve the issues in daily use and what factors may affect their usage intention, we conducted semi-structured interviews with 14 visually impaired participants based in Lon-don, and all the data was transcribed through thematic analysis. We identified three main themes in the study: i) recognition, ii) encouragement, and iii) adjustment and change. These interviewees expect to improve their social attributes (identity, interpersonal com-munication, learning ability) through specific mobile applications. We suggest that the user

acceptance of the camera-based app is determined by intrinsic factors (self-ability, emotional needs) and external factors (learning behaviour, attitude).

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D4L and Aging

Design for longevity literature review in product lifecycle, financial planning, and gerontology

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This paper explores definitions of Design for Longevity (D4L) through a preliminary literature review to create an interpretation of D4L in the finance and service context. The concept of longevity has been applied to many industries and applications. this paper reviews the term D4L as it applies to three fields: product lifecycle, financial planning, and gerontology. Using specific keywords across three search engines—Web of Science, Google Scholar, and Design Research Society Digital Library—we gathered 78 academic papers and synthesized 24 academic papers. As a result, we proposed a holistic and interdisciplinary definition of D4L as a lens to identify longevity-related design opportunities, and to envision products, services, and experiences that allow people to thrive across their entire lifespan in the context of transforming age demographics. A more accurate understanding of D4L can enhance longevity-literacy, -management, and -strategy to improve quality of life.

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Intergenerational creative spaces, co-living, community: Design for longevity

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Assisting our communities with design for longevity through creating opportunities to age in place requires multiple resources. Aging and longevity are essential emerging factors for many urban neighborhoods. In partnership with the Drexel University Writers Room and Second Story Collective, the Drexel Design Research for Health Lab is creating an innovative concept space and tool for inter-generational creativity through storytelling and art-making. The interdisciplinary members of the project are developing a series of evidence-based urban spaces around Aging-in-Place. The group has received funding to conduct an age-friendly observational study of the central location for community writing activities. The current goal of this project is to develop a model for implementing age-friendly retrofits.

This paper will describe the participatory work to date and the formulation of an initial measure as a part of the changing ways we see our creative community spaces.

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Towards active aging: Investigating innovations within intelligent communities

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Intelligent communities can nurture environments conducive to fostering positive and meaningful relationships among the elderly. This systematic literature review examines the role of these communities in the aging population's social relations. Through the review of studies and interventions via the Scopus database, we investigate how some innovative approaches are positively impacting the quality of life for the elderly. We identified examples of initiatives, technological solutions, and a social project successfully implemented in communities to strengthen older adult support networks. The contributions of this article lie in providing a comprehensive view of how smart technologies are shaping support for the senior population with a potential to enhance their emotional health. Additionally, it reflects on potential approaches to promote the well-being of the elderly through design. This article offers insights for professionals and researchers interested in innovating to promote active aging.

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Mobile interfaces for caregivers and older adults: Iterative design of the LifeTomorrow Ecosystem with aesthetic and functional considerations

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As the population of older adults increases, so does the demand for technology that supports caregiving and aging in place. Smart home technology, wearable health trackers, and mobile applications have all been identified as possible methods of support. Studies on the user interfaces of these technologies have predominantly explored how well their features and functions address the complex needs of older adults and caregivers. However, many of these applications lack adequate consideration of visual design principles and aesthetics. The present study aims to illustrate the iterative design process of the LifeTomorrow Ecosystem which includes two applications: one for caregivers and one for older adult care recipients. The results include high-fidelity screens from the applications that incorporate functional and visual design principles, as well as the feedback of older adults, caregivers, and designers. Finally, we provide recommendations for designers to consider when designing applications targeted at older adults and their caregivers.

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D4L and Services

'Design Your Menopause Life' as a pathway to successful ageing

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The 'Menopause - a Pathway to successful ageing - or not?' research explores the life stage experience leading up to and following menopause. Menopause is defined as a moment in time 12 months after someone's final period, Peri menopause is a time in someone's life leading up to menopause but when symptoms or changes can be experienced. This research focusses on a time in a typical female's lifespan whereby they are managing life and career of family responsibilities bringing up children while experiencing symptoms of peri-menopause and menopause. It is well documented how exercise and health awareness can optimise and affect our health and wellbeing - our Physical, Emotional and Mental (PhEM) health can be supported through activity, exercise, social engagement, and education. The 'Design your menopause life' (DYML) solution is envisioned as a digital and physical solution to empower women as they experience peri and menopause symptoms.

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Designing future workspaces for cognitive aging

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This paper reports on a speculative design project addressing the future workspace. Based on data extrapolation, we assume that by 2048 more people of advanced age will be working in office environments. Consequently, the share of employees suffering from cognitive deficits will significantly increase. Based on this future scenario, a speculative design object has been developed: A cognitive-stimulating desk lamp that could prevent further deterioration of office workers' cognitive abilities through acoustic stimulation. We explore potential technical features of the lamp and address the avoidance of stigmatization and ageism at the workplace. The contribution of the study is twofold: First, the resulting "behaves-like" prototype represents a possible solution of the problem of cognitive aging at the future workplace. Secondly, the developed artifact "from the future" allows an in-depth discussion of the possible future context and potentially arising problems. In addition, we critically discuss lessons-learned from the applied speculative design method.

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Key-drivers to design urban mobility services for silver age and age-friendly cities

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The vision regarding ageing is often influenced by negative stereotypes, which lead to considering the over-55 user only in need of targeted assistance and care. Observing the current situation, this view should be no longer exhaustive: they are active users, capable of exercising agency, with needs and desires beyond care and assistance, and bearers of experience and knowledge. It is therefore clear that design strategies to develop services for this user group must necessarily broaden their horizons and begin to consider areas that

have been scarcely explored. The contribution focuses on the topic of urban mobility and proposes a preliminary analysis process, based on the scientific literature and on the analysis of case studies to highlight good design practices, and carried out within a joint research platform, whose structure, functions, and role is also highlighted. Lastly, it proposes a mapping of design directions to be applied to implement age-friendly solutions.

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Changing the negative narrative of aging: A case study on sexual wellness services for women in later life

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The global longevity trend requires a paradigm shift in the design of services related to later life. Traditionally centered on the negative narrative of aging, service interventions have targeted sectoral domains such as assistance and healthcare. Instead, a silver society demands services for the mainstream market, addressing the desires of individuals who lead fulfilling lives at all ages. This paper examines a case study investigating sexual wellness in women's later life. Service design elevates this marginalized topic in active aging discussions to a common concern in a cultural service as output. The methodology combines ethnographic research and participatory design: it involves interviews and co-design sessions with experts and women in later life. Emphasizing the significance of a participatory process, the study underscores the virtuous circle of learning from participants and providing them with tools for reflecting on their life experiences, positioning design as a political and empowering practice.

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Enhancing financial education for longevity through service design

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As populations live longer, the traditional sequential phases of life—learning, earning, and retiring—don’t account for the complexity of demographic shifts. To age gracefully across a multiplicity of life phases, people must develop financial literacy at younger ages. This paper proposes a redesign of financial educational services between financial advisors and first-time clients using a Service-Behavior-Engagement (SBE) framework. We propose an immersive, multisensory service design kit, Design for Longevity (D4L), which includes tangible artifacts to facilitate experimentation, vulnerable conversations, and purposeful play: Longevity Planning Blocks, cards, and an interactive canvas. To test the kit, we conducted a 30-minute demonstration, followed by the think-aloud research method for participant feedback. Key contributions include: (1) enhancing financial literacy through purposeful play, (2) integrating the game element into financial planning education and services, and (3) recognizing that designing for engagement is as critical as designing for solutions.

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3 Design for Wellbeing and Happiness

Session chairs

Anna Pohlmeyer and Leandro Miletto Tonetto

Editorial

Leandro Miletto Tonetto, Ann Petermans, Rebecca Cain, Anna Pohlmeyer, Tiiu Poldma, Deger Ozkaramanli, Pieter Desmet, Matthias Laschke, and Marc Hassenzahl

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Spatial Wellbeing

Design for office health and wellbeing: A design space exploration

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Workplaces are increasingly leveraging technological interventions to promote healthy working habits. While existing workplace health promotion designs have primarily focused on digital well-being applications and break-taking interventions, our work advocates for a broader exploration of relevant design strategies. Through an analysis of 40 unique designs, we distill seven innovative design strategies that hold the potential to foster healthier work environments. Each strategy is described, grounded in literature, and illustrated through relevant design exemplars. By delving into an array of alternative design approaches, this paper broadens the scope of workplace well-being and inspires researchers toward a more comprehensive understanding of how design strategies might be leveraged to impact office vitality.

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Workplace wellbeing and interior design: A systematic literature review

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This paper offers a systematic review of the literature on workplace wellbeing and interior design, exploring the creation and evaluation of appealing environments that enhance employee wellbeing. This paper adopts a systematic approach to review using the guidelines of Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA). Multiple

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databases were searched. The final review included 55 studies out of 472 that examined factors related to workplace wellbeing. The findings of this study suggest that background noise and open-plan workspaces negatively affect workplace wellbeing, while visual connections with plants and natural objects enhance it. This paper extends the current literature in two ways. Firstly, by highlighting key factors that impact workplace wellbeing. Secondly, it divides factors that contribute to workplace wellbeing into three categories: positives, negatives, and moderate impact factors. Design professionals and workplace managers can utilize this information to identify features that contribute most to the overall work environment.

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Designing Workplace Balance: An Exploration of Design Strategies and Interactive Innovations in Overtime Culture

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Since the pandemic, balancing work demands and employee well-being has gained prominence, especially where overtime culture intensifies. This study aims to enhance the well-being of both corporations and their employees by integrating innovation into work environments through comprehensive design strategies. It features a literature review examining historical context and opposing challenges within the workplace, focusing on design approaches that promote team participation, optimize user experience, and manage stakeholder relationships. Key findings include the adoption of a cyclical participatory design process as a framework for team organization, a familiar mode as a cue to enhance user experiences, and five innovative tool designs that integrate the appearance and functionality of common office supplies. These tools can "disguise" themselves within the work environment, preserving organizational culture and social dynamics. This research transforms insights into workplace overtime culture into comprehensive design strategies, delivering innovative concepts and tangible support for future workplace improvements.

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Exploring the design opportunities for conversational agents as reflection partners in domestic environments

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Reflection is a core element of our everyday lives for higher self-insight and better well-being. Guided conversation is one of the methods that supports reflective thinking. The increasing abilities of conversational agent systems make them potential reflection partners for the future. Home is suitable for engaging in reflective conversations with conversational agents on daily experiences since it provides a private space. We explore the user expectations and design considerations for reflection with conversational agents through a mixed-method approach with design/HCI researchers. We first explored a psychology-based reflection approach with a diary study. Then, we designed a future-oriented methodology, adapted our findings into a scenario script for a VR experience, and used it in a workshop to gather insights on using domestic agents for reflection. This paper presents user insights and design suggestions for domestic conversational agents for reflection and reflections on using a VR prototype for future-oriented research.

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Born alone, but not lonely: Rethinking public space design for Chinese one-child generation's affinity for solitude

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Understanding the psychological needs of users is crucial for public space designers and healthy city planners. However, there is currently less atten-tion paid to the need for solitude in public spaces, despite psychological re-search demonstrating the positive impact of public space use on physical and mental health. With the only-child generation becoming the main pro-ductive generation in Chinese society, it is important to determine their psychological needs regarding public space use. This study aimed to address this issue by using questionnaire studies. Participants (n=521) aged between 10 and 25 completed an online questionnaire survey. The results indicated that the young generation of only children in China has a greater affinity for solitude than non-only children. However, both groups showed considerable demand for solitary public spaces. These findings suggest that more quality public spaces are needed to foster positive solitude in China, given the sub-stantial only-child population.

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Health and Wellbeing

A Co-Design Approach to Aesthetic Customization of Prosthetics

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The symbolism of prosthetic limbs has predominantly been about restoring function. However, for prosthetic wearers, symbolism expands to include psychosocial meaning, which has been expressed in prosthetic customizations, collaborations, and artistic explorations. Therefore, an opportunity exists for designers to understand how psychosocial symbolism can be elicited and translated into pros-thetic visual and aesthetic language. The objective of the paper is to develop personalized prosthetics that reflect the principles and convictions of the individuals utilizing them. We conducted a co-design process with three Paralympian amputees to explore and visually represent the psychosocial meanings attached to their prosthetics. The results demonstrate how a collaborative process incorporating design process methods, including mood board creation and concept sketching, can elicit psychosocial meaning, which can then be applied to design. The process shows the potential that design can have for reimagining prosthetic limbs as symbolic objects for purposes of self-expression and advocacy.

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Designing for Intimate Wellbeing: Aidee, a Qualitative Approach To Urine Home Monitoring

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Despite the widespread use of self-tracking technologies for promoting personal wellbeing, there is limited research on the monitoring of intimate data, particularly urine. To shed light on the design possibilities within this unexplored domain we designed Aidee, a prototype system composed of an app and interactive device that assists users in performing urine monitoring through qualitative data expression and ambient physicalization. To evaluate our prototype we conducted an exploratory between-subjects study involving 54 participants. Our findings indicate user acceptance for qualitative data expressions in the domain of personal wellbeing. Moreover, our study underscores that the combination of an app and interactive device helped people in consulting their urine analysis results with serenity and in experiencing feelings of support and companionship. With this paper we discuss the opportunities and challenges for designing monitoring experiences to promote intimate wellbeing by combining innovative ways of representation and interaction with data.

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Designing a crossover picturebook with older adults at care homes

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Picturebooks have often been studied in the children's literature field with a focus on child readers, but recent studies have begun to discuss the cross-age aspect that embraces wider audiences. This study explores the design space for a crossover multisensory picturebook that would also engage older adults via positive design approach. In this multidisciplinary study, we aimed to nurture the positive sides of aging by transforming life-long experiences into narratives in the form of a picturebook that embodies memories and transfers heritage in an engaging way during shared reading. Within this scope, we conducted interviews and design evaluations with older adults in a care home. In this paper, we share reflections on the book-making process and discuss how picturebooks can support wellbeing. Additionally, we speculate on positive interactions that may arise from intergenerational shared reading experiences while adapting a media mainly geared towards children for older adults.

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The Future of Digital Care_drafting Design Spaces

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The paper presents the findings of a scoping review to explore the key themes within the digital care domain. The study not only encompasses the research methodology employed, which adheres to established guidelines for scoping reviews—research questions, screening, data charting, and visualization—but also explores the principal themes that emerged in the field of digital care. These themes include Distributed Care, Self-Care, and Health Booster Technologies, each of which is expounded upon in detail. The paper emphasizes

how digital technologies, such as mobile applications, wearable devices, and IoT systems, have the potential to reshape the care paradigm by improving and enhancing self-management, care delivery, self-care, and mental health, augmenting overall well-being. Furthermore, the paper places an emphasis on the pivotal role of design in shaping future directions and stresses the importance of adopting a multifocal approach, including participatory and co-design, to navigate opportunities and challenges within this evolving domain.

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Health-Promotion Information Is Not Effective: General Goals of Health and Wellbeing Conflict with Young Adults' Instant Needs in Cooking and Food Choices

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Young adults are living in an era where nutritional and health knowledge is more accessible and advanced than ever before. However, young adults' diets are still a concern. The PhD research reported on in this paper aims to suggest behavioural interventions that can align young adults' individual dietary needs and their long-term goals of eating healthily. Using the methods of diary study, semi-structured interviews and card sorting, this research investigated young adults' perceptions of their dietary behaviours and experiences of prior interventions, to understand the gap between their 'knowing' and 'doing' in terms of healthy eating. The findings indicated that 'physical health' is not a strong enough motivation for young adults to change and that young adults valued social attributes and emotional experiences built into cooking and eating. The paper concludes with possible behavioural interventions, based on the research, which may better align individual needs with long-term goals.

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Experiential Wellbeing

Design for serene textile experiences: A toolkit

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Serenity plays a pivotal role in human well-being, as it fosters an enduring sense of peace and calmness. Everyday textile artifacts, with their qualities of softness, malleability, and flexibility, hold the capacity to greatly enhance serenity in user experiences. Drawing from the foundation of materials experience and material-driven design, this paper introduces a design toolkit aimed at harnessing the potential of textiles in creating serene experiences. The toolkit was refined through two exploratory workshops involving design professionals from both academic and industrial backgrounds. By emphasizing the interplay of form, material, and time in textile experiences, this toolkit offers a vocabulary and set of techniques for discussing and designing for serene textile experiences across different material and time scales. We further explore avenues for the toolkit's employment, expansion, and adaptation for use in a wide array of material-driven design projects

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Embodied experience of exoskeletons

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The significance of occupational exoskeletons is increasing, offering relief and improving well-being for physically demanding tasks. Existing adoption frame-works reveal crucial factors for development (like wearing comfort and task fit) and implementation (such as familiarization time and organizational perspective). How-ever, physical aspects are addressed primarily through ergonomics. As exoskeleton technology inherently involves the body, the user's perception and experience are tied to bodily experiences. Further research is needed to understand the human-exo-skeleton interaction comprehensively and explore how the user experience unfolds and how the exoskeleton's and user's characteristics influence each other. Our con-tribution, a conceptual framework leveraging established frameworks of user experi-ence and the concept of body experience, addresses this gap by contextualizing the body within the exoskeleton research. We examine the nuanced dynamics of the un-folding human-exoskeleton experience and how its various aspects entangle them-selves around the user's corporeality, affecting the users' relationship with their bod-ies and self-perception.

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Design For 'Extraordinary' Well-being: An Interpretive Phenomenological Analysis To Understand The 'lived Experience' Of Women Living With A 'Dys-appearing' Body Through Materials

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This paper sets out to view disability from a medical construct to a multi-faceted approach, considering biological, psychological and social factors. This helps us understand the need for a phenomenological approach to address disability from a 'lived' perspective, acknowledging the personal experiential dimension. A perspective this research adopts to underpin an argument that aesthetics from a cultural perspective plays a role in 'Extraordinary' well-being, as the study explores how the condition Raynaud's shapes a 'dys-appearing' body through material experience. This paper presents research that investigates how women living with Raynaud's negotiate their impairment through the mediums of clothing and fashion. Data were collected via in-depth, semi-structured interviews and wardrobe studies, informed by Interpretive Phenomenological Analysis. The findings reveal the 'material experience' of ten women with 'Extraordinary' requirements and highlighted how aesthetics is fundamental to enhance wearer's pleasurable and inclusive experiences on a personal and public level.

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Harmonizing with nature: Unpacking the neurophysiological impacts of biophilic sound in virtual classroom design

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This paper presents the results of an experiment on the effects of biophilic sound on electroencephalography (EEG) activations by comparing two virtual classroom designs: one non-biophilic and one biophilic. The results reveal significant inter-hemispheric interactions in theta, alpha, and gamma frequency bands. The presence of biophilic sound in conjunction with other biophilic elements decreases beta power, compared to its absence. These findings underscore the influence of auditory biophilic experiences on neurophysiological responses, providing insights for evidence-based design strategies to enhance biophilic environments.

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'Tuning-in' To 'tune out': mediating engagement experiences with music on-the-go

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As people return to offices post pandemic, they trudge through familiar daily hassles of long commute. Music moves people. Wearable music devices like head-phones that people carry act as a mediator that allows them (listeners) to be ‘tuning-in’ to music to ‘tune out’. When engaged, people physicalize movement- tapping their feet, playing “air-piano” or imagining gestures. This paper explores the theme of Recovering in Design for Wellbeing and Happiness through the in-terplay between people, music and portable music devices including head-phones and haptics. Thematic analyses of observations and semi-structured inter-views reveal listeners’ lived experience (Presence) and wellbeing (Flow) in rela-tion to the devices used. Using timeline-based visualisations, we aggregated trends of listener’s Presence and Flow to interrogate findings. Findings suggests underlying variables inherent in the designs that enhance Presence and Flow for people ‘tuning-in’ to music to ‘tune-out’ from stresses during long commute.

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Subjective Wellbeing

Daily doses of wellbeing: How everyday technology can support positive activities

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Due to their widespread use, consumer technologies like messaging or video streaming services present a promising opportunity to disseminate wellbeing interventions, such as positive activities, to a large audience. Currently, this potential is primarily leveraged by dedicated wellbeing applications. To broaden the scope of applications, we conducted a student-led case study that explored how positive activities could also be integrated into consumer technologies that are not originally designed for wellbeing. Based on the analysis of concrete design examples, we identified three strategies for integration: 1. addition, 2. enrichment, 3. transformation. We showcase each integration strategy through a specific design example. A variety of design mechanisms were employed whereby particularly prompts to create an opportunity and self-reflection to foster motivation and capability

have been observed. Together, our findings demonstrate how positive activities and mechanisms to support behavior change can be woven seamlessly into contemporary technology through minimal redesigns.

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Tinder, I Don't Like This: Identifying Desired User Interaction Qualities to Support Intimacy Building in the Online Environment

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As internet became the primary source for relationship formation, reports have emerged of negative experiences, poorer mental health and lower wellbeing. The design of online dating services influences user behaviours and can either support or inhibit relationship formation. To foster successful online relationship formation, understanding desired interaction qualities is crucial. This exploratory study presents a survey involving 100 participants from 23 nationalities across 5 continents. It identifies five key desired interaction qualities: excitement, comfort, safety, trust, and reciprocity. While trust emerged as the most vital for intimacy building yet often lacking in the online environment, excitement and playfulness were identified as even more important qualities to foster intimacy building. The paper contributes to the under-researched field of design for relation making and guides designers and dating app companies through presenting how desired interaction qualities can support creation of positive online interactions and streamline relationship formation.

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Faculty wellbeing in corporate academia: A critical examination and reimaging of the curriculum vitae

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Faculty wellbeing is declining among US higher education faculty, and burnout is becoming increasingly common. This study examines the role of design artifacts, namely the curriculum vitae (CV), within this dynamic. The CV has succumbed to interconnected social forces, including neoliberalism and inclusive democratization, fundamentally altering its design and the connected faculty experience. To better understand if design action might improve faculty wellbeing, this study employs a transformative research design to examine how the CV might be reimagined to promote positive transformation and improved wellbeing. This mixed-method qualitative study utilizes a novel bend of interviews, participatory co-design activities, and a constructive design process to explore divergent ways the CV might evolve to benefit faculty. In the end, evaluating the designs through transformative criteria yields new insights about the nature of modern academic work and spheres of action that can lead to faculty wellbeing.

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From data points to well-being: A design framework of self-tracked data through the lens of Positive psychology

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The "Quantified Self" movement has grown, with more people using self-tracking tools to monitor everything from physical activities to emotional well-being. This study investigates the interplay between self-tracking practices and positive psychology, highlighting their collective potential to boost personal well-being. Integrating self-tracked data with principles like strengths, resilience, and personal growth allows for the transformation of mere metrics into compelling stories. The paper presents a de-sign framework that is influenced by classroom projects and the examination of data presentation in health and fitness apps. This framework manages the complete data lifecycle—from collection and organization to interpretation, presentation, and finally, harnessing data—with an aim to nurture positive emotions, acknowledge personal significance, and encourage growth. It seeks to merge the self-tracking data process with key tenets of positive psychology, turning raw data into actionable insights that foster positive behaviors and enhance the effective-ness of self-tracking tools in promoting user well-being.

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Measuring mental wellbeing – Can we measure it, and if so, what should we measure, and how? A qualitative provotyping study

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Mental wellbeing is a growing concern for many young adults today. The design of digital products and services that could support young adults is hampered by a lack of knowledge about what constitutes mental wellbeing, and what design requirements exist for interventions. This study applied a provotyping method to add to this knowledge. Results show that mental wellbeing is broader than hedonic and eudaimonic aspects, encompassing also social, psychosocial, health- and activity-related and relaxation-related aspects. Design requirements for interventions that automatically register and provide feedback on mental wellbeing include tailoring of defining aspects to personal situations, algorithms that learn from user input, continuous and unobtrusive measurement, and minimalisation of burden. This research shows that using sensors and algorithms for mental wellbeing support for young adults is still in its early stages, and offers insights to inform next steps in design research in this area.

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Connecting sustainable and well-being-enhancing behaviors: Reflections through daily practices of young adults

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An experience sampling study was conducted to further understand daily activities of young adults with implications for Environmentally Sustainable Behavior (SB) and Subjective Well-being (SWB) simultaneously. Studies on SB and SWB are present in established bodies of design research, though connection across these strands appears limited. Analysis of 209 survey responses from 27 participants showed that while many activities were reported with mutually positive outcomes for SB and SWB, when there was conflict, individuals were more likely to prioritize their own subjective well-being over environmental

sustainability. Activities that included designed products and environments that more readily supported SB and SWB without imposing an external conflict, and those that included social bonding and sharing of resources led to more mutually positive outcomes. The findings present avenues for design researchers and practitioners in developing designs that can address individuals' well-being and environmentally sustainable behavior in a more positive and complimentary manner.

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4 Reimagining Care through Evidence: Design Research, Patient Centered Solutions, and a Culture of Care for Healthy Societies

Session chairs

Diana Susan Nicholas, Isil Oygur Ilhan, and Angela Mazzi

Editorial

Diana Susan Nicholas, Minou Afzali, Ajla Aksamija, Nora Coleman, Angela Mazzi, Elizabeth Sanders, and Isil Oygur Ilhan

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Reimagining Care through Evidence: Environment

Empowering Through Design: Designing Inclusive Sheltered Workshop Environments for Trainees with Special Needs in Hong Kong

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Intellectual disability (ID) affects approximately 1% of the global population, representing diverse support needs. Sheltered workshops in Hong Kong, as elsewhere, aim to maximise the potential of individuals with ID (trainees), acknowledging their equal rights to be full members of the community, though their needs are often overlooked in design research, and space constraints pose developmental challenges. This study conducts case analyses of sheltered workshops in Hong Kong and globally, focusing on spatial layouts, interior design, and developmental goals. User personas provide insights into the experiences of trainees and supervisors. This re-search proposes a comprehensive framework featuring 3 aspects that contain 13 critical design variables for designing inclusive interior environments for sheltered workshops, emphasizing mixed-use spaces and adaptable furniture for flexible utili-ty in confined spaces. This framework guides the creation of inclusive, supportive environments for shelter workshops that respect and harness the unique abilities of trainees with special needs.

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Adopting a hospitality lens for designing mental healthcare at home

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Increasingly, there is a shift toward bringing services that were originally provided in hospitals into the home. Healthcare designers have been supporting this movement by designing medical devices and home care services. However, there is a risk that such shifts simply medicalize the home and erode the valuable informal practices of care that already occur there. Using a research through design approach, we adopted a hospitality lens to understand the rituals of hosting at home and identify potential areas of hostility as mental health consultations enter the home in Norway. This research demonstrates the value of adopting a hospitality lens when designing healthcare at home and how mapping rituals can contribute to a reflexive practice for both healthcare designers and clinicians.

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Indicators for evaluating service design inclusivity in the healthcare sector: A review of the literature

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To foster a culture of inclusive care and patients-centred solutions in the healthcare sector, being able to assess the inclusivity of services is an essential step for enhancing the design and improvement of services. What are the key indicators of inclusive service design in the healthcare sector? Based on insights from the field of the built environment, a thematic analysis of the literature on service design in the context of healthcare, psychology, and public service design is conducted. Indicators extracted from the literature are structured into four categories: physical, sensorial, cognitive, and psycho-social, and according to two phases: service design and delivery. The resulting indicators, in conjunction with indicators from the EU Accessibility Act, can be utilized by designers as a comprehensive source of aspects for designing novel and existing services, and by scholars as a catalogue of indicators for evidence-based inclusive design to reimagine the healthcare sector.

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Can Simulated Nature be as Effective as Actual Nature in Promoting Health and Wellbeing in Healthcare Settings?

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Simulated nature has been widely implemented to healthcare settings to create spaces that promote positive emotional responses and support overall health and wellbeing. The notion of indirect experience refers to the integration of natural elements into the design of built environments to allow occupants to experience nature indirectly. However, the question of whether simulated nature are satisfactory substitutes for actual nature has hardly been addressed. In this study, we examined whether the outcomes of Mindfulness-Based

Stress Reduction (MBSR) enhanced when it was carried out in simulated nature as opposed to actual one. Two focus groups provided information about participants' experiences of MBSR in both types of exposures. We found that both nature settings boosted MBSR outcomes. However, the actual nature resulted in greater increases in nature connectedness compared to the simulated nature. These findings demonstrate the potential value of both simulated and actual nature as settings for enhancing healthcare delivery.

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Step-by-step: Using low-fidelity, physical prototypes of enabling technologies to gain feedback from clinicians, prior to older patients

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Designers of enabling technologies need a deep understanding of what patients want and need. But prototypes with working sensors and actuators may be far outside the experience of the vulnerable populations (e.g., older patients) targeted and may prove harmful to them, requiring a more cautious, "step-by-step" design approach. We report on how designers gain feedback from, before older patients, clinicians, using low-fidelity, full-scale prototypes without electronics to anticipate how such patients will interact with full-functioning technologies. Three hypothetical patient-personas with varying degrees of injuries were developed with clinicians. Clinicians then offered feedback on the assistance needed from our assistive robotic furniture by their patients to complete tasks at home to maintain independence. This design step was quick and effective in gaining meaningful feedback from clinicians who can speak for a wide range of patients in anticipation of studying interactions with older patients in a step-by-step process of design.

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Exploring opportunities to design for decision-making in palliative care contexts: A rapid overview of recent literature reviews in healthcare and design fields

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When facing serious illnesses, patients and their caregivers encounter complex decisions throughout the care journey. Assisting in these decision-making pro-cesses has been a longstanding topic in palliative medicine, however, healthcare providers still face challenges in practice. Design contributions to healthcare have emerged in recent years. This overview focuses on the past decades' litera-ture reviews in healthcare and design fields, examining interventions that foster communication and enhance informed decision-making in palliative care (PC), and investigating the design impacts in this context. This review of reviews uses thematic analysis to identify future opportunities for collaboration between de-sign and healthcare researchers to develop innovative interventions that address these issues in PC. The following themes were discussed: recommended practic-es, moments of conversation and caregiving, the dearth of design work, dissemi-nation, and implementation barriers. Findings urge more collaborations and bal-anced contributions from healthcare and design researchers in designing patient decision-making aids in PC.

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Proposition of a user navigation program for an oncology clinic: Customizing patients' journey through experience-based design

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The experience-based design (EBD) approach captures, measures, and improves user experience across their journey, aiming to establish efficient and friendly healthcare systems. In this study, the goal is to propose improvements for an outpatient oncology service through EBD. Methodologically, it involves a project-based EBD approach, rooted in co-design. Its implementation comprised data collection at two stages: (i) user journey's mapping, and (ii) a codesign workshop with users. From the data analysis, we created a journey map describing users' interactions with the service, measured their experience and identified the critical points. For these points, a co-created solution was devised with the intention of enhancing the user experience within the service. We describe this solution as the "Navigation Program" and discuss how it facilitated the customization of the service's user's journey, leading to an improved overall experience. Our research addresses the gap in studies related to oncology services in developing countries.

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Reimagining Care through Evidence: Technology

Reimagining Care: Designing a Social Robot Companion for Alzheimer's Caregiving

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The global rise in Alzheimer's and dementia cases is a growing concern due to an aging population and age-related health issues. By 2025, there will be 7.2 million individuals aged 65 and older living with these conditions, an 11% increase. By 2040, the US will require a 235% increase in caregivers to meet the demand. While technology can't replace human care, it can ease the caregiving responsibilities.

To address this, an interdisciplinary team collaborated with caregivers and those living with Alzheimer's to create an affordable social robot. This paper discusses the ethical considerations, functionalities, and accessibility of the robot. The result is "FRED" (Friendly Robot to Ease Dementia), an AI-powered socially assistive robot with a dedicated caregiving app. FRED aims to alleviate the impending caregiving crisis, offering support to caregivers and improving the care quality for those with Alzheimer's and dementia.

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Virtual Reality for Assessment of Chronic Lower Back Pain in Physiotherapy - Task Selection, Design, and User Experience Evaluation

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Chronic low back pain (CLBP) presents a significant challenge in healthcare, re-quiring effective tools for rehabilitation and assessment. This study explores the use of virtual reality (VR) for assessment of physical function in patients with CLBP, and investigates how movements and tasks can be designed for assessment purposes. The focus is on physiotherapists' perceptions of using VR regarding task design, feasibility, and user experience. We conducted three design workshops with physiotherapists and HCI researchers, and designed three VR applications that we evaluated with six physiotherapy students. The study provides valuable insights into participants' perceptions and highlights promising and challenging aspects of using VR in physiotherapy assessment. We found the approach to be useful and have potential. However, additional focus is needed on task design, measures of physical function, and designing for body size diversity. This study lays the groundwork for designing physiotherapeutic assessment of patients with CLBP.

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Unified Patient Portal: engaging patients throughout the genetic testing journey

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Patient Empowerment (PE) has increasingly gained popularity in shaping the framework of healthcare systems. We present a case study at Natera, where we designed a patient-centric portal aimed at fostering patient engagement throughout the genetic testing journey. Through a patient-centric approach, we present the design process of creating a portal for patients to take control over their genetic tests. This is followed by the user research we conducted utilizing cognitive walkthrough and think-aloud methodologies. This is then followed by analyzing the data gathered through the user research conducted with organ health patients. We then conclude by presenting findings and outlining preliminary design implications. This research aims to shed light into the needs of patients for engaging with digital technology in the context of genetic testing.

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Preventing Diabetic Foot Ulcers With eHealth: Rethinking Digital CareInCo-design

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The number of people with diabetes is projected to increase over the upcoming years, putting pressure on care systems. Many patients with diabetes are at high risk of developing foot ulcers. These patients often struggle to relate to and monitor the health of their feet in everyday life. While eHealth technologies show promise in supporting self-management of

diabetes, their use is still limited in the context of diabetic feet. By following a design process using co-design practices, we developed a suitable eHealth application that supports people in preventing diabetic foot complications. Through a participatory design approach, we uncovered 11 design requirements highlighting the importance of offering digital support when possible but enabling physical care when needed. We argue for a technology-supported culture of care through simplified self-monitoring and direct contact with care professionals. Finally, we discuss implications for designing eHealth solutions by involving all relevant stakeholders.

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Exploring app-based affective interactions for people with rheumatoid arthritis

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The mental and emotional burden of living with a chronic disease, such as Rheumatoid Arthritis (RA), calls for a better understanding of how we can support people in coping through affectively designed healthcare technologies. This paper presents findings from an ongoing research project concerned with redesigning an existing self-tracking app towards better supporting affective dimensions of living with RA. On the basis of an exploratory, intervention-based design study, we present three overall affective needs feeding into three design opportunities for cultivating affective and emotional dimensions in the redesign of the app; 1) creating a digital room for emotional response, 2) offering a space for mindfulness and 3) helping people to own their RA story. Our results emphasize the need for HCI and design researchers to approach the design of healthcare technology holistically, which includes exploring affective interactions that empower people to develop more sustainable coping strategies.

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Co-Design of a Loneliness Monitoring System with Older People and Stakeholders

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Loneliness in later life has been associated with frailty and earlier mortality. Sensor-based monitoring systems aim to help identify and prevent more severe forms of social isolation and loneliness at old age. The technological development requires an understanding how to reach acceptance and usefulness of the proposed technology in the wider system by involving those it affects. In this co-design study, we engage people that experienced loneliness after the age of 65 and stakeholders to collaboratively design a loneliness monitoring system that is embedded in wearables and smart home furniture. Such involvement will help inform the technology design at early stages. This paper contributes to literature on loneliness monitoring systems for older people that has lacked people and stakeholder involvement and a human-centered approach to design. We present found requirements for the positioning of sensors, symptoms and objects associated with loneliness, and recommendations for greater detection accuracy.

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Reimagining Care through Evidence: Culture and Strategy

Mapping patient-centered design practices and actors within stakeholder networks to reimagine healthcare

Estefania Ciliotta Chehade[1], Michael Arnold Mages[1], Heni Govindbhai Bhungalia[1], Shannon Haley[1], Uri Seitz[1], Miso Kim[1], Paolo Ciuccarelli[1], Stefano Maffei[2], Beatrice Villari[2], Massimo Bianchini[2]
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Patient-centeredness is advocated as a key ethical factor when designing healthcare artifacts, practices, and systems. Centeredness is constructed within particular cultural contexts and co-produced through performance by various actors within the encompassing system. In this paper, we seek to identify "patient-centeredness" by comparing two different ecosystems, the US and Italy, by systematically mapping cases and projects that claim to have been designed through a patient-centered approach. By systematically mapping the projects and their network of stakeholders, we developed a set of ecosystem categorizations that allowed for comparison between locations, distilling patient-centered values, projects, actors and organizations that seem to be leading patient-centered innovation. We describe how patient-centered values are embedded in real-life projects in the healthcare industry identifying exemplary cases and gaps for reimagining the future of care.

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Fostering a Patient-led Culture of Care Through Data Physicalization: A Design Approach to Create Awareness and Promote Data Collection on Antimicrobial Resistance

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The paradigm shift in healthcare delivery models is leading to individuals assuming greater responsibilities and control, as the agency is moving from doctor-centric to patient-centric. To foster a patient-led culture of care, health and data literacy are essential, especially in the context of global challenges, where citizen awareness is fundamental to play actively in co-creating knowledge. This paper outlines a methodological approach and the outcomes of a design research project focused on promoting engagement and literacy to facilitate citizen and patient participation in addressing the antimicrobial resistance threat. The approach is tested in the format of an experimental workshop, inspired by the procedure of the antibiogram. Data physicalization modalities are considered to promote literacy in healthcare and involve citizens in data collection practices to explain the scientific phenomenon of AMR, engage non-experts in understanding antibiotic functionalities and share personal information related to consumption behaviours.

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Embedding Ethics in Practice: Preempting Ethical Issues in the Field by Reflecting on the Methodology of Shadowing Within Cancer Care Services.

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Designers have been conducting research within healthcare with a limited ethical reflections, only considering aspects to get the approval from the corresponding ethics committee. That fails to reflect on the issues that may arise during fieldwork (ethics in the field), especially since designs involvement is precisely to understand intangible aspects such as personal values and experiences. In view of this and responding to the DRS 2022 conversation on Design+Ethics, we explore the knowledge gap in the intersection of ethics, design and healthcare, and present a case study in the context of service design within oncology carepath. Upon reviewing the existing literature, we identify a set of ethical principles and use them to redefine the tools and protocols we plan to use in our service exploration, during shadowing specifically. Our paper responds to the need of bridging procedural ethics in the field, by anticipating and reflecting on ethical dilemmas and issues.

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Co-diagnosed: A multi-disciplinary workshop reimagining cultures of care for medical and mental health

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This paper focuses on places of healing for co-diagnosed patients who suffer from both mental and medical illnesses. Comorbidity is recognized as a growing concern yet there is little prece-dent in the healthcare industry for designing spaces that respond to needs of patients who re-quire hospitalization for medical conditions, and who simultaneously suffer mental health disor-ders. To explore this problem, we created a workshop to engage healthcare providers, adminis-trators and healthcare architects with undergraduate and graduate students in art, architecture, visual communications and urban design. Our goal was to identify issues that must be ad-dressed through the lens of patients and providers, and to generate design concepts for this largely unprecedented space type. Lived experiences of doctors, nurses and healthcare designers were central to guiding the design investigation. Insights from the workshop create pathways for future research and industry application that prioritize cultures of care for co-diagnosed pa-tients and caregivers.

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Enhancing healthcare experiences for people with visual impairments: A systematic literature review on the benefits of user-centered design

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The pursuit of equity in access to healthcare services for people with visual impairments has been a persistent challenge attributed to comorbidities, as well as physical and attitudinal barriers. The incompatibility of guidelines and practices within health systems leads

to complex interactions between users and services. Through this systematic literature review, we aimed to explore the potential of User-Centered Design to enhance user experiences for the visually impaired within health systems. We surveyed peer-reviewed journal papers published between 2013 and 2023 on Pubmed, Science Direct, Scopus, and Web of Science. We identified fourteen studies, primarily focusing on projects aimed at understanding the challenges faced by individuals with visual impairments to improve accessibility and usability. User involvement is a pivotal aspect of most projects. The studies clearly demonstrate the potential of User-Centered Design to provide better experiences for these users.

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A Systematic Review of People-centred Healthcare Services for People with Arthritis

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The aim of this paper is to explore the practice of people-centred design using design thinking in healthcare for people with arthritis. People-centred design has significantly progressed in the healthcare industry, including the management of arthritis. This paper reports a systematic review following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Framework. It explores the research and practice in the person-centred design of healthcare services for people with arthritis. Six databases were searched: Scopus, Web of Science, Medline, PubMed, Psych info, and Cinahl. Inclusion criteria included service for the management of arthritis, written in English and published between 2011 and 2023. A total of 27 articles were included in the review. This is part of a dual-disciplinary doctoral study illustrating healthcare services for people with arthritis and potential improvements in people-centred design guided by design thinking.

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5 Liveable Cities: Reimagining Design for Healthy Cities and Communities

Session chair

Emmanuel Tsekleves

Editorial

Emmanuel Tsekleves, Jen Ballie, Cláudia de Souza Libânio, Blaise Nguedo-Yongsi, Marilyz Soto Hormazábal, Juan Montalvan, and Leigh-Ann Hepburn Hepburn

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Digital Tools for Healthy Cities

Developing A Tool To Empower The Disempowered: The Components Of The Feeling Of Home

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The rate of homelessness is rising, resulting in a need for better-designed services to support those affected. Building on the sector's acknowledgement that personalised support is needed to reverse this trend and based on the psychological concept of the emotional home, we propose a tool that helps those experiencing housing issues feel empowered to better express their housing needs to support teams. The tool breaks down the complex concept of 'home' into tangible components of the feeling of home, developed through qualitative studies. Here, we discuss the process of working in partnership with a local charitable service provider to refine the components, and we present the tool's initial assessment and potential to mitigate the inherited power dynamics in a situation where help is provided for vulnerable individuals. This research will be helpful to those involved in the design of services to support vulnerable people affected.

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How Can We Measure Human Cognition and Emotion for Human Centric Design in Interior Urban Spaces?

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Understanding the impact on individuals and the socio-psychological effects of residing in continuously developed high-rise and densely populated urban areas is a crucial part of assessing the quality of interior spaces, particularly in how this may feed into a human-centred urban design process. This research offers a novel, neuro-scientific research approach using functional magnetic resonance imaging (fMRI) to establish a connection between emotions and the spatial conditions of urban environments. The study utilises data collected through fMRI to shed light on the intricate relationship between urban design and psychological well-being, underscoring the value of incorporating neuroscientific approaches into urban studies. By unraveling cognition patterns associated with different emotions, the findings advocate for the leveraging of these insights to improve urban livability and ensure that design practices are centered around human experiences.

https://doi.org/10.21606/drs.2024.293

Show me what you mean: The case for easy-to-use 3D visualizations of the built environment

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Visual communication, particularly realistic visualization, has been found to be effective for facilitating constructive discussion on issues related to the built environment. Here, we make the case that a browser-based, intuitively designed 3D visualization interface could widen access to such approaches increasing opportunities for co-creation. Using this type of easy-to-access tool could allow community members to own the process of creating a shared vision for their city.

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Exploring travel demands in vertical cities: A collaborative design and user behavior experiment using Minecraft

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The rapid expansion of modern cities has created an urgent need to explore innovative approaches to development to address sustainability challenges. Vertical cities are one of the potential solutions to optimize the lives of residents by using space efficiently and introducing advanced transportation. Leveraging Minecraft's multiplayer online game, we constructed a prototype multi-level city and conducted a behavioral simulation experiment. In this experiment, 30 participants devoted over 5,000 hours to creation, experience, and observation. This study investigates the viability of Minecraft as a collaborative design and behavioral research platform, focusing on constructing vertical cities and exploring their travel needs. It represents a novel approach in multi-user collaborative experimentation through a gaming platform, marks a new attempt in the field of collaborative design and behavioral analysis.

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Issues in future autonomous public transport solu-tions for children with intellectual disabilities

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Public transportation in urban environments should be inclusive and accessible to offer this service for all people. This research aims to identify issues in the devel-opment of autonomous shuttle services in future public transportation systems for children with intellectual disabilities. An issue-based information system (IBIS) anal-ysis was retrospectively conducted based on a concept generation phase. Four con-cepts were evaluated by five experts. The findings show that the main tensions in this context can be categorized as interaction, physical, and independence. Interac-tive elements can both create value and lead to confusion for the target group. The physical design of concepts affects feasibility, viability, and perception. Independ-ence is a desired quality for the target group but often comes at a price of less in-dependence for other stakeholders such as family members. Finally, the study sug-gests that there are tensions between the qualities of integrity, cognition, and user experience.

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Healthy Cities & Communities

Using Living Labs To Engage Communities And Stakeholders In The Development And Knowledge Exchange Of Urban Health And Sanitation Solutions In The Global South

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Engaging communities and stakeholders in developing user-centred urban health solutions, whilst linking the research to their own development, pose major challenges for design researchers working in the Global South. In a number of circular sanitation projects in a community school in Ghana, we co-designed and installed an anaerobic digester delivering electricity and sanitation improvements. To enhance impact we developed and pilot-tested a Living and physical Lab design approach. One project focussed on hand hygiene. We introduced students to ‘making the invisible visible’ by visualising microbes from their hands and assessing handwashing effects. Our findings suggest that visualisation of microbes not normally apparent to school children raised their awareness and prompted communication to peers and family. Building change agent capacity through community engagement like Living Labs can promote sustainable development in the community. Design researchers should further explore schoolchildren’s potential as home and community change agents.

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Empowering urban wellbeing and biodiversity through design-driven citymaking

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This paper presents a practice-based account of the roles that design can play in the realization of a biodiversity-driven approach to citymaking, specifically as part of urban regeneration. The authors first retrace the evolving relationship between design and citymaking in light of contemporary urban regeneration challenges, to identify the potential roles design can play in these contexts. Urban biodiversity is then explored as a factor relevant to urban well-being, ecosystem services, and proactive citizenship, clustering the types of actions that can support a biodiversity-sensitive urban regeneration. Following these premises, a portfolio of initiatives centered on urban biodiversity within a large-scale urban regeneration project in Milan (Italy) is presented to exemplify how design-led interventions can favor the urban natural environment. From these insights, the authors reflect on how designers can work with urban biodiversity to drive sustainable practices while re-establishing people's relationship with nature and empowering communities' participation in urban transformation.

https://doi.org/10.21606/drs.2024.814

Speculative design positions on future liveable cities

Leigh-Anne Hepburn, Emrah Baki Ulas, Densil Cabrera, Clare Cooper, Phillip Gough, Kazjon Grace, Luke Hespanhol, Marius Hoggenmueller, Wenye Hu, Kiran Ijaz, Yaron Meron, Andres Pinilla, Callum Parker, Ricardo Sosa, Yasemin Tekmen Araci, Jody Watts, Bow Wu, Mariana Zafeirakopoulos, Rohan Lulham
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Designing for future liveable cities demands a spectrum of perspectives, each responding in some way to global and local challenges, from climate change to safe housing. However, enabling spaces for often juxtaposed, contradictory and cooperative voices, both hopeful and cautionary, can be challenging. This paper is a first step in harnessing pluralistic expression through design fiction as an approach to speculating on design's role in future liveable cities. In presenting individual speculative positions, authors attempt to reconcile their personal experiences, disciplinary expertise, and vision. This collective voice represents disciplinary diversity including – but not limited to – artificial intelligence, co-design, interaction design, strategic design, life-centred design, and industrial and graphic design. In presenting each position and a subsequent discussion of emerging themes, we seek to invite conversations on future design practice, education, and research, and encourage the design community to consider new approaches to for collaboratively imagining future liveable cities.

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If This Street Was Ours: Provoking the Reimagination of the City as a Democratic Space

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This paper revisits the event ‘se essa rua fosse nossa’ (if this street was ours) held in 2014, in Curitiba, Brazil, that aimed to provoke, discuss, and propose new ways of thinking and designing the public spaces in the city so they can be more open, accessible, inclusive, and democratic. With the perspective of a decade, the goal is to analyze its positive outcomes in the city, then, and in the present moment. The event consisted of a series of critical and creative activities. Its closure was a pop-up parklet that occupied half a block using urban furniture resulting from one of the workshops. We discuss the event and its outcomes through the light of design activism and critical design. Beyond the local impact, we believe that sharing our results of reimagining public spaces can contribute to the theoretical discussions around the topic, additionally inspiring people to take action.

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Research on the relationship between urban green spaces, perceptual dimensions, and psychological restoration among students: A case study of different landscape types

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With the rapid development of society and the increasing pressure on education, campus psychological issues have become more prominent. Previous studies have demonstrated the positive effects of natural environments on mental health. However, research on campus landscape environments has primarily focused on the impact of campus facilities on student health, neglecting the degree of openness of natural land-scape spaces. This study utilized virtual reality technology to simulate campus green landscape spaces with different degrees of openness and explored the influence of these different spaces on individual psychological recovery. The results indicate that the degree of openness of campus green spaces significantly affects people's prefer-ences and perceptions of psychological recovery. Additionally, people's preferences are influenced by serene, species, and natural elements. Therefore, promoting psycho-logical recovery among students can be facilitated by creating scenic viewing and rest areas in campus environments, introducing beloved natural elements, and creating semi-open landscape spaces.

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6 Design for Balance: Reimagining Processes and Competences for Sustainable Futures

Session chairs

Luca Simeone, Silvia Maria Gramegna, Carmen Bruno, and Erminia D'Itria,

Editorial

Paola Bertola, Erminia D'Itria, Silvia Maria Gramegna, Carmen Bruno, Ruta Valusyte, Luca Simeone, and Rike Neuhoff Neuhoff

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Re-imagining Design Approaches for Balance

Exploring the role of design in the new product development process towards circular business innovation: Systematic literature review and future directions

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To safeguard our planet from the threats of resource depletion, pollution and climate change, a fundamental change in our production, consumption and lifestyle choices is required. Companies and designers play a central role in this transformation and are called to action by implementing New Product Development (NPD) processes for sustainable innovation.

This systematic literature review investigates the intersection between product design, new product development process and sustainability, addressing critical questions: How does design influence the NPD process, driving companies towards circular innovation? What circular design practices have been integrated into NPD processes and how?

The study provides a comprehensive examination of circular design techniques, exploring their strengths, limitations and obstacles to widespread adoption. Furthermore, the analysis charts a path for future research efforts, outlining directions that seek to harmonise NPD design processes with the circular economy, ensuring a balanced and sustainable approach to business innovation.

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Learning from Circularity Manifestos. Crafting designerly circular approaches for the upholstered furniture sector

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Product innovation progressively embraces a sustainable and systemic approach, known as Design for Sustainability, driven by economic, environmental, socio-cultural, and behavioral insights. Nevertheless, transitioning to circularity within upholstered furniture Product-Service Systems and fostering cultural awareness remains a complex endeavor. The paper focuses on the role of Circularity Manifestos as cultural drivers in creating public awareness and behavioral change. It begins by analyzing existing cases to uncover the manifestos' underlying meaning, logic, and communication strategies for promoting and implementing circular innovation practices. These findings are subsequently compared with established theories and approaches through a comprehensive literature review and case analysis, revealing potential links between conceptual frameworks and practical circular strategies. This investigation targets the upholstered furniture sector, characterized by significant circularity challenges. It demands a comprehensive design approach guided by designers' expertise in balancing proactive behavioral change with a systemic Design for Sustainability approach.

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Learning from the past: How to apply the circular economy practices of Japan's Edo period to modern society

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Japan's Edo society (1603-1868) is often referred to as the 'ultimate circular society' and even offers valuable lessons for the modern circular economy. However, Edo practices cannot be directly applied to the modern world due to differences in past and present social conditions. This research aimed to apply Edo practices to modern society through the following steps. First, we constructed a hypothetical model of the Edo circular economy to show how social factors fostered Edo people's mentalities and behaviors for recycling and reusing. Second, using this model as an analytical framework, we examined modern circular economy practices to understand the differences and similarities between the past and the present. Third, based on this understanding, we developed a pattern language to help reproduce Edo's circular model in modern society. The patterns were used in a workshop and validated as effective for generating ideas to improve the circularity of modern products.

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Repositioning design as the new attractor in sustainability

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Design's increasing participation in sustainability raises questions on what sustainability it serves and how. Contextualized in a cartography of sustainability discourse and its four typologies, we establish that design's efforts on sustainability to date are largely affiliated to

the mainstream socio-technological pathway, a continuation of the modernization project deepening the crises. This affiliation, while granting design access to the increasingly active field of sustainability, risks reducing its versatile epistemology to amusing representation. Drawing from Human-Nature Relationships (HNR) research, we propose the utilization of the "sustainability space" as an analytical tool. The processual, embodied, and affective qualities inherent in design are evident in the reconfigured "sustainability space". This analytical lens highlights the unique potential design practice and research holds in becoming a new attractor for an alternative path of sustainability transformation. We offer three research directions and provide key theoretical repertoires for this emerging research agenda.

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Should we re-frame Sustainable Interaction Design? Towards a more holistic sustainability "in designing"

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This essay presents the findings of an exploratory literature review on the evo-lution of Sustainable Interaction Design (SID). Historically, SID has referred to Blevis's principles of "sustainability through design", related to behavioural change, and "sustainability in design" with a predominant focus on environmental sustainability. However, a significant paradigm shift in the field urges to encompass a third "sustainability in designing" dimension, related more to the design process as emphasised by scholars, now offering methodological guidelines to create sustainable interactions. The study proposes an updated frame of SID starting from its first definitions. Secondly, if environmental sustainability remains crucial, it is no longer considered - by scholars - sufficient to advance sustainable development goals without incorporating the social-economic dimensions. By bridging the gap between SID's principles, this paper reflects upon how holistically involving these additional dimensions in multiple design process stages will contribute to addressing environmental quality alongside social equity and economic prosperity.

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Reframing radical innovation in pursuit of sustainable futures

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Innovation affords us modern lifestyles filled with advanced technology and social structures; however, such development comes at a significant cost to the planet, posing an existential threat to humanity. In our highly complex and networked world, there is an urgency to achieve more sustainable, just and resilient futures. As design seeks to drive sustainable and systemic change, what is the role of radical innovation? And what do we want it to be? This study revisits and reframes the somewhat ambiguous concept of 'radical innovation' to broaden our understanding of its role, impact, and potential. We present a machine-learning-enabled literature review of top-ranking design journals over the past 10 years, examining radical innovation across 37 design research papers. While literature frames radical innovation through a technical and process-orientated lens, we advocate for embracing radical innovation as a deeply human endeavor. Our results highlight opportunities to enable more radical transformations through innovation.

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Re-imagining Design Practices for Balance

Reflections on the Usefulness and Limitations of Tools for Life-Centred Design

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Life-centred design decenters humans and considers all life and the far-reaching impacts of design decisions. However, little is known about the application of life-centred design tools in practice and their usefulness and limitations for considering more-than-human perspectives. To address this gap, we carried out a series of workshops, reporting on findings from a first-person study involving one design academic and three design practitioners. Using a popular flat-pack chair as a case study, we generatively identified and applied four tools: systems maps, actant maps, product lifecycle maps and behavioural impact canvas. We found that the tools provided a structured approach for practising systems thinking, identifying human and non-human actors, understanding their interconnectedness, and surfacing gaps in the team's knowledge. Based on the findings, the paper proposes a process for implementing life-centred design tools in design projects.

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A Theory Instrument for reimagining embodied practices

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Embodied Sensemaking Theory describes how people make sense in ongoing interactions with the social and material world. It has potential in projects aimed at changing embodied practices. However, designers often find it challenging to use this complex theory. We build on recent research on tangible 'Theory Instruments' for designers. We designed a Theory Instrument for embodied sensemaking with design students who design for social interactions and with young people who investigate their energy consumption. Our analysis of 12 experimental sessions shows how Embodied Sensemaking Theory helps reimagine human practices towards more sustainable futures. Our contribution is two-fold: We show that experiential actions (e.g. weaving lines, shaping textiles, wearing bodybands), rather than the tangible things as such, can represent theory key-aspects in use. We develop a logic of how to disentangle the complexity of lifeworld, socially situated practices, skills and affordances, action-perception couplings, rules and signs.

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Activating key principles of systemic design through exploratory prototyping

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Working towards sustainable futures demands competencies and methodologies that support system thinking and action. While prototyping has been designated as a promising method to facilitate complex systemic design processes, studies proving this potential are scarce, and scholars call for a shift in the definition and use of traditional prototyping when applied in design processes targeting complex systems. This paper describes the observed contributions of exploratory prototyping in the emergence of systemic design principles. Results from three systemic design workshops illustrate the role that exploratory prototyping played in the understanding and framing stages of design processes targeting complex systems, particularly in the appreciation of the systems' complexity, the recognition of interdependence relationships among its elements, and the framing of the system's boundaries to set the systems' new vision. Our findings contribute to envisioning new definitions and uses of prototyping to respond to the demands of the systemic design practice.

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Transitions to Multispecies Futures in the Design Classroom

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Sustainability Transitions and Futures is a mandatory course of the Creative Sus-tainability master's program in the Department of Design of Aalto University de-livered jointly by the co-authors. It aims to provide a basic understanding of how sustainability transitions projects unfold in practice and the ways through which designers can contribute to these projects as part of interdisciplinary teams. For two consecutive years, we focused on multispecies sustainability. We have pro-vided the students with the necessary theoretical and critical lenses through a curated selection of guest lectures from fields including law, philosophy, urban ecology and planning. For the practical part, the students in groups reimagined the Aalto University campus in the year 2050 as a multispecies campus and developed pathways to demonstrate how their visions can become anchors for re-directing campus development plans. This paper reflects on our experience and provides pointers for systems change-related courses to engage with post-anthropocentric future-making.

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Starting from scraps: Design reuse assessment of waste materials

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Material waste from manufacturing poses substantial challenges. European companies generate more than 2.2 billion tons of waste annually. The utilization of already circulating resources plays a vital part in reducing the use of raw materials. The state-of-the-art methodology for designing from waste outlines a linear process with three phases: optimization, analysis, and design. However, there is limited understanding of the critical leap from analysis to designing with waste. Considering the co-evolutionary nature of design activity, it may not be efficient to separate these stages. In fact, research states design outcome is improved when problem-solution co-evolve. This study examines the process of design material assessment performed by industrial designers and technical experts. Through observations and participatory questioning of 13 cases of waste assessment from different industries, we examine and identify four modes of inquiry: 1) primary material sorting, 2)

understanding material potentials, 3) identifying areas of application, and 4) value-ranking utilizations.

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7 Co-design towards Positive Change

Session chairs

Gubing Wang and Haiou Zhu

Editorial

Gubing Wang and Haiou Zhu

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Co-design for Behavior Change I: Communities & Public Space

Transforming food waste into natural pigments: Raising community school awareness of food waste recycling opportunities through co-design methods

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In a world grappling with ongoing food scarcity, the issue of food waste in US school cafeterias remains a pressing concern, often without sufficient attention given to recycling. School communities play a pivotal role in shaping behaviors, as individuals are significantly influenced by their peers' actions and opinions, making them more open to positive reinforcement. This research explores design opportunity to raise awareness and encourage food waste recycling behaviors through a co-design approach. Students are invited to participate in the interactive exhibitions, where they learn and provide feedback about the pigment-making process from food waste using a toolkit for art painting. Through sharing their experiences, students help spread awareness and foster a commitment to recycling behaviors among their peers. Engaging students as active participants in these activities shows promise as a strategy to increase awareness of food waste recycling opportunities and empower school communities to support circular food systems.

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Towards Empowering Cohousing Communities: Finding Balance with a Group of Users-clients Throughout the Architectural Process

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This paper explores the evolving role of architects in cohousing projects in response to environmental, economic, and social challenges. This research incorporates insights from semi-structured interviews in three Belgian case studies. The foundations and values of cohousing communities are tackled, highlighting shifts in architects' roles and challenges in working with groups of user-clients. In these cohousing processes, we found that the representatives of these user-client groups may not always share the full breadth of their negotiations with architects. Architects seem to miss out on some of the nuances, and some participants found that this approach left their voices unheard. Amidst pragmatic concerns and other value-based issues, this paper reimagines some aspects of the ar-chitects' role in cohousing projects. This paper aims to help architects balance stakeholders' viewpoints within budget, timeline, practicality, and values constraints.

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A third place as a space to foster citizen participation and their empowerment: The case of "La Ruche à Projets"

Louise Masciarelli, Maxim Lamirande, Isabelle Dalimier, Audrey Mertens, Catherine Elsen, Clémentine Schelings
University of Liège

This exploratory qualitative research underlines architectural properties of a res-idential house that was repurposed as a temporary creative space. Findings were compared against existing theory on third places (particularly creative spaces) and their relationship with citizen participation, empowerment, and social change. Overall, the "homey" character creates a sense of belonging and occu-pants seem eager to decorate and furnish with personal effects. Findings reveal tensions between large open and smaller closed spaces to reflect on how flow, accessibility, occupancy, and intimacy are affected. Occupant behaviors lead to wonder about the tensions between community, codesign, empowerment, and ownership. Findings help question how temporary third places could play a role in the design of new creative spaces. Further insights could lead to explore be-yond interior architectural properties and consider how the outer shell and loca-tion of a building influence community participation, or how successful recruit-ment is impacted by the community's personal social networks.

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Co-design under the Bauhaus of the Seas Light-house Project: a New European Bauhaus case study in Lisbon and Oeiras

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The Bauhaus of the Seas (BoS) is one of the Lighthouse projects of the New European Bauhaus initiative (NEB). The project promotes the application of the NEB values – sustainable,

beautiful, together – to develop locally grounded Demonstrator Pilots and focus cities' attention on the future of the oceans. A co-design approach is being applied in a series of participatory sessions with stake-holders, including nature/ecosystem experts, cultural institutions, local authorities and civic organizations, aiming at a consolidated collaborative approach. In this report we present the results from the co-design processes under development in Oeiras and Lisbon – two coastal territories involved in the BoS. Our findings reveal that co-designing in a multi-stakeholder participatory process presents challenges, ranging from the discomfort of working in bottom-up decision-making settings to the difficulty of amplifying underrepresented voices, as well as the ethical, philosophical and practical challenges of involving other-than-human beings.

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New interest-based social action as a design approach for youth community reconfiguring in the post-pandemic era

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The pandemic has led to increased social distancing and feelings of depression among youth, a significant shift from their previous engagement in activities that enhanced their social skills and community involvement. With the easing of the pandemic, youth re-engaged with their social contacts and skills by participating in new interest-based activities, such as urban camping and frisbee sports. However, the process of how these activities foster youth social behavior changes remains under-explored. This study investigates how emerging interest-based activities facilitate youth social behav-ior and community identity, providing guidance for youth community design. Through a cross-disciplinary sociology-design framework, the "Youth Social Action Reconfigura-tion Framework," implemented via co-design, this study reveals that youth with new in-terests can establish new community connections under the prolonged impact of COVID-19. This study suggests an interest group service system as a community build-ing scheme that can motivate youth social action and community engagement.

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Sharing instead of being infringed: How to build a responsible community for online artwork sharing?

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The development of internet and artificial intelligence technology promotes the dissemination of artworks but also increases the possibility of infringement. Designers who selflessly share their work risk having it stolen, plagiarized, sold, used directly as NFT, or used for AI training. In this paper, we conducted an exploratory study to investigate desingers' needs and solutions when faced with online artwork-sharing infringement. We held two workshops to discuss design plagiarism and illegal AI-art data training. Ultimately, the team arrived at seven solutions for addressing potential infringement issues that arise when sharing artwork online. Synthesizing the participants' evaluations and related research, we propose an ideal path for safeguarding copyright. We hope this path will help designers and platforms protect intellectual property rights and foster a positive network-sharing environment.

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Co-design for Behavior Change II: Theories, Reflections, & Frameworks

Co-design for change: Propositions and dilemmas

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Co-design has been widely applied to develop interventions supporting behavior change. While numerous co-design propositions have been developed, applying these in practice often leads to difficulties and tensions. This study aims to review the co-design propositions and understand the dilemmas when applying them. A literature review was conducted, and twelve co-design propositions were identified after qualitative analysis. The study found that some co-design propositions conflict because they align with an idealistic versus a realistic perspective. By studying these conflicts in-depth, seven dilemmas were identified at the intersection of realist and idealist propositions. Implications of the findings on design for behavior change were discussed, and this paper serves as a starting point to help researchers and practitioners identify, articulate, and navigate these dilemmas to achieve successful co-design outcomes.

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A participatory approach to healthcare service improvement focused on staff behavior change

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Healthcare systems are complex social systems wherein improvements related to staff practice and behavior can be difficult to implement. Knowledge and practice can be uneven between various specializations, hierarchical imbalances limit the degree of agency of different professionals, and evidence-based guidelines may be interpreted or implemented according to context-specific factors. When changes are imposed from a top-down perspective, invaluable insight and know-how from frontline staff are usually left out, making it further difficult (if not altogether impractical) to implement interventions. The current paper presents a case study focused on improving urinary tract infection diagnosis and treatment, in the emergency department of a hospital within the National Health Service of England. The empirical research addresses identified gaps in the literature by proposing an original framework for healthcare staff practice and behavior change that integrates participatory design and behavior change methods.

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It really touches me: How to design Empathic Journeys with Virtual Reality in societal challenges

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Designers are increasingly collaborating with various stakeholders to address complex societal challenges. These challenges often require a codesign approach, where different actors with diverse perspectives and experiences unite to explore innovative avenues for change. Such collaboration requires empathy between the actors to under-stand each other's perspective better in their interactions. This paper aims to assist social designers in orchestrating such empathic codesign processes by introducing an Em-pathic Journey framework. This conceptual and practical framework is based on empathic design theory and three design cases which used Virtual Reality for perspective exchange between actors. The framework addresses the importance of integrating an emotional spark through immersion and the necessity of embedding immersive experiences in a larger journey.

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Expanding participatory design: Reflections on current epistemological framework in dark time

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Participatory design is a quintessential representation of human-centeredness. The recent climate crisis and threats to survival have pushed designers to consider the well-being of non-human entities. Many designers have already attempted to incorporate non-human entities (including animals, forests, and rivers) into the design process. They have strived to refine and readjust design thinking and practice within the participatory design framework. However, most practices resemble the 'pseudo-participation' of human subjective imagination. This study raises ethical and ontological epistemological issues based on Latour's profound philosophical insights. Specifically, in the case of non-human entities participating in our future becoming, how will the role of design and designers change? This study re-explores the relationship between human and non-human entities in participatory design through cases to expand the boundaries of participatory design and make the design process more inclusive.

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Co-creating the spectacle: Identifying design dimensions of opening ceremonies to embed participatory approaches

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Opening Ceremonies of mega-events captivate a global audience and have the potential of nurturing a sense of community belonging among the population of the host country. From the visual identity to the stage design and its live media broadcast, such ceremonies unite

different design practices. The underlying design processes usually depart from a top-down perspective, often prompted by specific social and political realities. As a result, inhabitants may experience a diminished sense of belonging. Participatory approaches are able to challenge oppressive power relations, and are increasingly deployed in mainstream media, yet the scale and complexity of the design of opening ceremonies demand a thorough understanding. Through a narrative analysis of the Opening Ceremony of the Beijing Olympics, and through interviews and co-creation sessions with 18 Chinese inhabitants that recalled their experience watching this event, we were able to extract a number of design dimensions to open up the opening ceremony.

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8 Past, Present, and Future: Understanding the Expanse of Design for Policy And Governance

Session chairs

Scott Schmidt and Marzia Mortati

Editorial

Scott Schmidt and Marzia Mortati

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Design for Policy and Governance Futures

Future in Place: Participatory Future Scenario Planning for Place-based Local Policymaking

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An increasing body of evidence suggests that the global emergence of Policy Innovation Labs over the last twenty years has marked a significant milestone in promoting-facilitating design-driven innovation in policymaking. However, the challenges associated with confining design expertise to the periphery of labs, and the focus of Policy Innovation Labs on national government, leaves regional and local policymaking in the trenches of legacy systems, processes, and skills. This limitation is problematic as it hinders the adaptation of local policies to address the unique challenges they face. Learning from, and moving beyond Policy Innovation Labs (considering their low cost-effectiveness), this paper explores how design can be integrated into place-based, local policymaking to support innovation. We address this by analysing a case study where participatory future scenario planning methods are deployed/adopted/adapted in informing local policy on sustainable transport in the context of the Eden Morecambe project in the North-West of England.

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Policy Design, Lived Experience, and Speculative Futures

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Good policy design calls for analysis of problems, how they might be addressed, and likely outcomes. Policy scholars and practitioners have devised methods that bring rigor to policy design through problem framing, assessment of potential interventions, and prediction of outcomes of those interventions. This pursuit of analytical and predictive rigor has often given short shrift to the insights of people whose lives are affected by current challenges and who will be impacted by policy change. We consider how lived experience might effectively inform policy design. Our theory of change is that creative engagement with citizens can generate insights of high value to the process of policy design. We introduce the Tomorrow Party – a design method for generating novel stakeholder insights regarding desirable future states. Initial findings from a series of pilots suggest the Tomorrow Party is a broadly applicable creative tool for advancing policy design.

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Reframing Design Maturity: a New Perspective on the Development of Design in Public Organizations

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Although design is a core activity of public organizations, the dominant perspective to this day is that public organizations are void of design. Existing design maturity models based on this perspective thus do not reflect, nor do justice to the practice of design in public organizations. In this conceptual paper we therefore propose to reframe design maturity as a matter of versatility and alignment - i.e. as an organization's ability to tailor their design activities to the different design tasks it faces, while establishing productive interactions with other concurrent design activities. This offers a new perspective on how design can be fostered in public organizations. This paper proposes four ways in which this can be done. As such, it contributes to the evolving discourse on design in public organizations.

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Governance in Silico: Experimental Sandbox for Policymaking over AI Agents

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The concept of 'governance in silico' summarizes and questions the design and policy experiments with synthetic data and content in public policy, such as synthetic data simulations, AI agents, and digital twins. While it acknowledges the risks of hallucinations, errors, and biases, often reflected in the parameters and weights of the ML models, it focuses on the prompts. Prompts enable stakeholder negotiation and representation of diverse agendas and perspectives that support experimental and inclusive policymaking. To explore the prompts' engagement qualities, we conducted a pilot study on co-designing AI agents for negotiating contested aspects of the EU Artificial Intelligence Act (EU AI Act). The experiments highlight the value of an 'exploratory sandbox' approach, which fosters political agency through direct representation over AI agent simulations. We conclude that 'governance in silico' exploratory approach enhances public consultation and engagement and

presents a valuable alternative to the frequently overstated promises of evidence-based policy.

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Design x Non-Profits: Towards an understanding of design integration in the Australian Non-Profit Sector

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Design has long demonstrated an interest in shaping society and the world for good. In Australia, there are 59,747 non-profit organisations that seek to do the same. Surprisingly, there is little research situated at the intersection of these fields. This research explores the potential remit of design in non-profit organisations and provides insight into where and how design practices may be beneficial to non-profit partners. This paper first thematically analyses the responses of 140 Australian non-profit organisations as they reflect on their strategic position and core activities. Drawing on these insights, we outline five thematic notions of value as it pertains to non-profits, their stakeholders and beneficiaries. Finally, we contribute a preliminary map of the Australian non-profit value ecosystem and speculate on design's potential for integration.

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Design for Policy and Governance Theory

Transformational Practices; Aligning Governance and Design.

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This paper introduces the concept of 'Transformational Practises' as a prospective design-led integrative space to conduct multidisciplinary research aiming at ex-ceptionally innovative and/or unconventional research aiming for a high trans-formational impact. Based on a range of selected examples, the authors underpin the fundamental principles of this new framework to propose a criteria to assess prospective and multidisciplinary design-led transformations. In the process, it places design as a distinctive and fundamental activity to develop transforma-tional impact in research that aligns the applied arts (arts and design), with the prospective sciences (e.g., AI and synthetic biology), and prospective sociology (e.g., economics and policy). Finally, it combines the concepts of structured ad-versarial collaborations, knowledge vectors, and transformational practises met-rics to integrate this area into established models of academic assessment.

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Navigating complexity: design facilitation for collaborative solutions to urban challenges

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As urban policy and governance challenges become increasingly complex, inter-disciplinary approaches and participatory methodologies are essential. The evolv-ing role of design affects the way it is practiced in these contexts. Instead of sole-ly providing solutions, designers are now expected to connect, navigate, and fa-cilitate collaboration between stakeholders from different public sector organi-zations. This paper aims to explore how multi-organizational design facilitation can contribute to addressing complex urban challenges, fostering and accelerat-ing adoption of sustainable solutions. We delve into three concepts that under-pin the creative facilitation process: the design mindset, futures thinking and ex-perimental attitude. The context of this study is a big European project in which 12 cities collaborate and experiment aiming to solve specific urban challenges. The paper argues for design facilitation to bridge gaps between diverse stake-holders, encourage co-creation, and facilitate the development of innovative so-lutions across various parties.

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What Do Designers Bring To The Table? Identifying Key Design Competencies When Designing For Societal Challenges In The Public Sector

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There is an increasing interest in the public sector for the repertoire of designers and the value it can bring when working on complex societal challenges. However, what constitutes this repertoire is often not articulated clearly, or it is explained in such generic terms that it is hard to draw disciplinary boundaries. Drawing from literature, we identify four competencies—integrating, reframing, formgiving and orchestrating—as distinctive for the discipline of design. Through several examples we show how these competencies feature in the design process, and how these competencies drive different design practices. Although these competencies have to a certain extent always been part of the design discipline, they need to be adapted to the context of complex societal challenges. Hence, we conclude this paper by discussing how these competencies are to be developed and adapted to strengthen the value of the design repertoire when dealing with complex issues in the public sector.

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Using space and knowledge to confront power in design

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This paper considers the disputes and questions arising from a systematic review of the social design literature and establishes three prominent contestations relating to the ideas of ‘power’, ‘systems thinking’ and ‘criticality’. These ideas are tightly connected, with systems thinking and criticality emerging in response to the omnipresence of power relations in social design. With the acceptance that social design is inherently political, and the provision that both ‘space’ and the ‘uncovering of knowledge’ can work to confront such power and enable social innovation, we see the need for both an expansion and nuance of future social design efforts. Our analysis suggests this is possible through the enacting of mechanisms that work to unveil and confront notions of power directly in design. We see these opportunities through acts including employing systematic design practices; practicing reflexive and situated design; and pursuing prototyping and infrastructuring in design.

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Design for Policy and Governance Practice

Critical service design for government innovation

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This paper contributes to the discussion on the roles and pedagogy of design, based on a case study of collaboration between government and academia. The authors are design practice researchers and civil servants and present a collaborative case study from Spring 2023 that aimed at developing anticipatory innovation capability in the UK's Government Digital Service, involving postgraduate service design students and exploring critical service design (Salinas, 2022, 2023) as an alternative way of contributing to the formulation of public policies and services. The collaboration led to new competencies in public design for those involved and resulted in the creation of a new in-house anticipatory innovation unit in government. The authors draw on the student proposal 'Ministry of Biodiversity' as an exemplar to contextualize and illustrate their collaborative practice. The paper concludes with a discussion of the insights gained from this collaboration regarding the roles and pedagogy of design in government.

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Why we failed: Exploring the context of establishing a living lab in Korea

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Living lab is widely adopted for renewing public services and policy. In establishing living labs, however, practitioners face the realities of the locale that influences the formation and operation of living labs. This paper reports on a single case-study, in which a group of design researchers attempted to set up a smart mobility living lab in Korea. By thematically analyzing meeting notes and a workshop, we uncover the challenges faced during preject phase. Our findings suggest that, while the uncertain and iterative nature of living lab is incompatible with the operational model of the public-sector in Korea, its name and participatory aspect are being enforced upon by ministries in distributing funds for grass-root actions and R&D projects albeit mostly on the surface level. The limited engagements predetermined by the funding schemes may impair learning and evolution – the key benefits of living labs as an open and participatory innovation process.

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Unleashing collective imagination through controversies: lessons from a smart city project

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We explore the role of futures-oriented design interventions in leveraging socio-technical controversies to foster collective imagination. We elaborate on a practical application of a speculative and scenario-based design tool called Future Frictions. Our study focuses on the use of Future Frictions to engage citizens in the development of an assessment framework for implementing sensors in Amsterdam. By employing the "controversing" framework to operationalize controversies through design, we explore how Future Frictions provides an interface that bridges speculative and real-life urban contexts. This interface facilitates recontextualizing controversies in daily life, fostering sensemaking, and making space for collective agency. This, we argue, nurtures collective imagination to generate counter-narratives that open alternative smart city futures. In addition to contributing to responsible smart city developments, we offer inspiration for utilizing design to reimagine and deploy creative forms of engagement to inform decision-making and policy-making addressing societal challenges in different domains.

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Qualitative mapping and design strategies for taking care of marginal areas.

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The study targets the municipality of Quero Vas (Belluno, Italia), an area characterized by historical heritage and demographic decline. Employing a qualitative mapping from Raffaella Fagnoni methodology (Traces, Stories, Actions, Events, Imaginary) the researchers identified that the environmental heritage is one of the main strategic local contexts on which the designers can operate.

This heritage is locally considered by two perspectives: the governance, committed to regeneration, frames the landscape as a resource for economic growth through tourism; the communities of hikers and climbers, frame the landscape as a resource for sharing experiences. The two perspectives currently don’t engage citizens, who are excluded from a relationship with both. In this context of territorial design and marginal area enhancement, the study proposes a project centered on providing cultural enrichment for citizens. It aims to bridge the gap between economic and recreational values while promoting the collective care and preservation of the territory.

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9 Designing for Just and Sustainable Policies in the Space between Institutions and Experimental Government Practices

Session chairs

Sofía Bosch Gómez and Federico Vaz

Editorial

Francesco Leoni, Diana Pamela Villa Alvarez, Sofía Bosch Gómez, Federico Vaz, Luis Garcia, and Natalia Villaman

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Designing Policies across Institutional Boundaries

New European Bauhaus: A designer's retrospective.

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In this paper, the former lead designer of the New European Bauhaus Unit at the European Commission offers a retrospective on how design has helped to shape the initiative, from the definition of its visual identity, through the development of the co-design phase, to the establishment of the New European Bauhaus Prizes, the Community and the NEB Lab.

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Designing as Infrastructuring to Impact Policy

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Design for policy discourse is often focused on how design supports policy making in central government. And yet, there are other design practices that are contributing to policy development. We frame our work as designing for policy, design work that is happening outside formal policy space, aimed at impacting policy. This paper presents learnings based on a series of co-design interventions with young people in four English local authorities to a) design age-appropriate Holiday Activities and Food (HAF) programmes and b) impact national policy. In expanding what might be considered 'design for policy', we hope to

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draw attention to considerations required when trying to influence policy through the designing of public services. We adopt an infrastructuring approach to help us learn about and influence policy whilst also delivering value at local and national levels. This paper contributes to ongoing work to understand how designers contribute to policy making.

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Exploring the role of design for organizational learning in community interactions

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This paper explores the lessons learned from the COVID-19 pandemic regarding organizational learning between communities and public bodies by reviewing current literature and research studies. Public institutions interacted with a number of different communities, demographics and cultures during the pandemic. What used to be considered inclusive approaches to engagement fell short of reaching those communities most exposed to the health risks associated with working in a pandemic. This working paper presents research into different thematic spaces that explore organizational learning between institutions and communities, and the role design might play in stimulating or inhibiting trans-formation in these relationships. Informed by two pilot studies, this paper presents ongoing research into the concepts and theories of organizational learning in the context of institution-community engagement. The paper concludes by identifying potential foci for further exploration and highlights possible future directions for design research and organizational practice that span interdisciplinary frameworks.

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Relational workshopping: co-designing a placemaking approach to urban governance

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Participatory Placemaking is increasingly implemented by European cities as a methodological framework to achieve more sustainable ways for urban development. However, there is a clash between the flexible, dynamic, and communicative nature of participatory placemaking and the static, slow, and bureaucratic nature of the implementing institutions. The starting point of this study where two research questions: What communicational challenges arise when participatory placemaking is implemented by city officials in specific urban contexts? And how can design tools play a role contributing to the relational dynamics of placemaking? This article explores these, while simultaneously discussing the role design tools can play in contributing to the transition from a traditional planning scheme to a systematized placemaking approach to planning. Designers have a potential role to play in energizing these transitions; and one trajectory would be to introduce and develop design tools that can help negotiate relational power.

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Exploring if organisational transformation enhances policy and public sector innovation labs their impact potential: A case study on Zet

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As experimental spaces, design-led Policy and Public Sector Innovation labs employ design and participatory practices to help governments innovate. However, their short-lived nature is often detrimental to informing policy processes and government practices systematically. A year-long case study on Zet, a Dutch PPSI lab, including 29 interviews and 2 workshops, explored how organisational transformation from a government-enabled to an independently-run lab acts as a sustaining strategy. This article focuses on how Zet's organisational transformation affected their potential to inform policy and government practice. Findings reveal that Zet started to prefer long-term client partnerships over short-term assignments. In addition, knowledge of government dynamics increased, supporting the integration of lab outcomes into policy-processes. Nevertheless, barriers to translating and integrating project outcomes remain. These findings place the use of design for just policies in the broader context of organisational sustainability with implications for labs seeking to enhance their impact through increasing their resilience.

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Fostering Design Research Labs for Public Sector Innovation

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The public sector's digital transformation fosters collaboration and experimentation, integrating design practices like design thinking, service design, and system design, notably in public innovation labs. Despite progress, these labs face challenges in effecting change, transferring knowledge, and gaining cultural acceptance. Public Innovation Labs (PIL) prioritize the common good, unlike profit-centric private counterparts. Design Research Labs (DRL), rooted in arts and de-sign, share this mission, offering a unique perspective on public sector innovation. Exploring the potential of DRLs in supporting public labs, this paper outlines criteria based on five DRLs in the German academic design context. It provides a new perspective on public lab characteristics, aiming to enhance understanding of their role in fostering innovation within the public sector.

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10 Systemic Citizens: Equity, Power, and Relational Autonomy

Session chairs

Cecilia Landa-Avila and Sine Celik

Editorial

Cecilia Landa-Avila, Shichao Zhao, Sine Celik, Pushpi Bagchi, and Nicolai Brodersen Hansen

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Systemic Citizens I

MakIN'Rome living lab. A case study of design-driven approach for the development of urban community-based projects

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Designing for social innovation in urban context prompts a re-evaluation of urban sociability (dos Santos et al., 2021). This contribution delves into the outcomes of a living lab initiative that tackled the growing prevalence of urban manufacturing (Fasoli & Tassinari, 2017) in Rome's landscape. Eight laboratories have been engaged in a co-design experiment, through a systemic approach guided by a hyper-local tool offering an exemplary case study of how Design can effectively foster community building and introduce novel urban production models (Rietveld, 022). This network encompasses a blend of services, technologies, and skills, aligning with the principles of the 15-minute city (Manzini, 2021) ultimately encouraging both technological and social innovations. While the findings show how Design can advocate for sustainable urban development and vibrant neighbourhoods, the insights, derived by the systemic approach applied, hold value for policymakers, urban planners, and other decision-makers, reflecting the potential for empowered citizenship.

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Asset based architectural design with a systemic perspective in vulnerable community- participatory action research in Iraq Bersive 2 refugee camp

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Vulnerable communities often lack of basic housing and facilities. However, with more understanding, they not only face housing problem but also with social, economic, environmental, political issues and so on. Traditional building approach often focuses on material needs while the underlying causes could be neglected. In fact, vulnerability is often more in the intangibles: relationships with self, others and environment. With this regard, how could designers develop efficient systemic design strategies responding to the complexity of social systems and empower vulnerable groups to recognize themselves as interrelated actors in community development? Asset based design approach under the community capital framework is an alternative method that possible to provide us with a systemic perspective in community development. In this study, asset based approach is adopted under a systemic perspective for architectural design and construction in Iraq Bersive 2 refugee camp as participatory action research to evaluate the social and material outcome.

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Designing Systemic Resilience in the Face of Looming Black Swans through a Seminar-Style Wargame

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Black Swans have become the norm rather than the exception. These unimaginable events with massive consequences seem to be a by-product of our society ruled by complex systems. As more Black Swans are looming, an interest in becoming more resilient is rising. However, achieving resilience against Black Swans remains an ambiguous endeavour. Looking into academic literature, “wargaming” Black Swans is often proposed as an antidote since it explores decision-making in an adversarial and unimaginable context. However, how these Black Swan-focused wargames can take shape is unclear. In response, this paper proposes a design of a wargame addressing systemic resilience in the face of looming Black Swans consisting of four modules. The paper presents the iterative design process based on four playtesting workshops with 52 researchers and practitioners in design, crisis management, aviation, healthcare, and serious gaming. The paper concludes with recommendations and directions for future research.

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Historical evolution of age-friendly transitions in the Yangfangdian community in Beijing: A multi-level perspective

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The issue of transition and transformation of communities has a long history. Particularly in today's context of increasing aging trends, cities and communities are facing unprecedented multiple challenges that drive the transition to a more inclusive and sustainable future to enable community stakeholders to have a higher quality of life experience and to fulfil their visions for the future. This paper systemically reveals insights from the past of the ageing issue in the Yangfangdian community in Beijing through a multi- level perspective (MLP) framework created with local residents, a museum and design students to under-

stand the historical foundations of the issue and its multiple dimensions (landscape, regime, and niche) to inform community residents' long-term visions of the future and systemic design interventions for the present day.

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Systemic Citizens II

Acts of interfacing in an entangled life

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Digital interfaces are becoming increasingly simple and intuitive. However, beneath the surface, the technological infrastructures underlying these interfaces are growing more complex and elusive. This paper draws on theories from human-computer interaction, software studies, and social practice to revisit the notion of the interface as a site of representation and control. By briefly tracing the historical development of digital interfaces, we propose to shift from ideas of representation and control towards a notion of co-performance and negotiation. Through this lens, we reconceptualize the interface as acts of interfacing—a new concept that captures the contested, constructive, and performative character of interaction within large-scale digital systems.

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Empowering Stakeholders to Address Gentrification's Impact on Urban Schooling

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Residential stratification has long governed American cities, as has the under-achievement of children living in urban areas (Sandy & Duncan, 2010). Policymakers, administrators, and educators working to address these systemic inefficacies need to consider intersectional factors to redesign urban schooling carefully. Gentrification often leads to more significant gaps between the socioeconomic classes, increasing the chasm between the needs of residents. How can we enable policymakers, educators, and parents to (1) track socio, cultural, and environmental conditions, (2) learn from the lived experience of underrepresented groups, and (3) design more equitable urban schooling policies? In this paper, the authors share the process of developing a participatory tool, Connect.Ed, which leverages qualitative and quantitative data to make interdependencies visible to improve urban schooling. Resulting in increased accountability among stakeholders, equitable engagement in under-invested neighborhoods, and a collaborative space for community engagement.

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Cultural transition by digital technologies: invasion or empowerment?

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With the growing influence of digital transformation on global communities, critically examining the interaction between digital technologies and traditional cultures is becoming more pressing, especially in minority groups. This paper explores the complex relationships between digital technologies and cultural landscape in Eastern Tibet based on a 34-day ethnography study by photographic materials from 28 counties and cities. Through looking into these visual materials, also including observations and interviews, the tension surrounding commercialization, public relations, creative expressions, and the environment are uncovered. We discuss the unintended and pervasive consequences of modernization, including cultural homogenization and the rise of individualism, imagining possible future ways and resilient future.The paper emphasized the significant role of design in shaping these outcomes and advocates for a more inclusive and collective approach to design practices. By understanding and highlighting these dynamics, this paper aims to provide guidance to designers in promoting a resilient and sustainable digital transformation.

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Benefitting systemic citizens and sustainable knowledge heritage: Building a digital platform ecosystem and community for knowledge co-creation

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Advancing collective capacities relies on innumerable small 'nano'-actions by individuals which govern, if effectively combined, any institutional (knowledge economy) and societal performance (knowledge society). In this endeavor, scaling people and knowledge connectedness present a key systemic strategy. Successive evolutionary ceilings have been overcome by general-purpose technologies such as language, toolmaking, writing, printing, computerization, and the web. But, as digitization is spreading, digital dividends are not. Facing widening opportunity divides, the elephants in the room are the entropy caused and the attention squandered by today's ever-accelerating abundance of replicated, fragmented, outdated, and unvetted content. Any solution to this unsustainable wicked state ought to mitigate these constraints by affording systemic citizens the ease of utilizing and contributing to the transdisciplinary knowledge heritage. Using the 'citizen-led design approach' theme as a macroscope, the concept and mission of a longitudinal research and start-up project is presented for building a digital platform ecosystem and community for knowledge co-creation.

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Analyzing user experience with a smart product-service system: Children-owned wearables

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Contemporary smart product-service systems increasingly enable multiple users to interact with multiple touchpoints of the same system simultaneously. We looked deeper into the use practice of one such smart product-service system, children-owned wearables. Our data comes from a short-term auto-ethnography and a user review analysis of 9 children-owned wearables. Experiences designed for children assume they have limited

agency, leading parents to switch roles between being the end and mediating users. As mediating users, parents become service providers for their children. These user dynamics can hinder children's experience with wearables and their interaction with other wearable users. Our findings extend the theoretical understanding of human-centered design and service design by depicting the significance of multiple and shifting user roles and users as service providers during the use practice of children-owned wearables.

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11 Joyful Complexity: Queering, intersecting, and navigating alternate futures

Session chairs

Jess Paris Westbrook and Coraline Ada Ehmke

Editorial

Jess Paris Westbrook and Coraline Ada Ehmke

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Joyful Complexity: People, Power, Positionalities

Queer Futures: Correlations between queer identity and imagination literacy

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Futures thinking, and doing, has been the domain of the privileged majority for centuries. The very idea of 'the future' (singular) was fundamental to the crea-tion and maintenance of imperial domination and technological modernity. To this day, mainstream media readily emits the narrow and repetitive science fic-tion tropes void of (realistic, fair) representation of a wider inclusive society, specifically absent of queerness. This paper builds on the work of Alexis Lothian's 'Old Futures: speculative fiction and queer possibility' in which she ex-plores the forces queer people (and other marginalised communities) invoke when they dream up alternative futures as a way of transforming the present. To do so, the author pre-sents findings from an anonymized global study of the correlations be-tween queer identity and imagination literacy. Addressing the questions - how does identity inform our ability to imagine the future and the content of those imagined futures?

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Through the Megascope: Reimagining Design Education

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Addressing global challenges like racial tension and health inequalities, this paper urges a reimagining of design education's core principles. Four educators from diverse, often mar-

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ginalized backgrounds collaboratively investigate design education's future, moving beyond mere reflection. Their insights fuel a broader initiative to envision inclusive design education. Drawing inspiration from W.E.B. Du Bois' 'Megascope', this concept resists conventional paradigms, sheds light on overlooked narratives, and challenges ingrained epistemologies. The Megascope acts as a dynamic discourse tool, pushing the boundaries of design education. The educators, influenced by the Megascope's principles and their backgrounds, emphasize their dedication to anti-racist, equity-driven education, underscoring the impact of diverse, intersectional academic voices. Through the reflexive process inherent to Design-Based Research this paper weaves Megascope principles with educators' unique experiences, offering a scaffold of anti-racist principles for equitable design education, providing theoretical and practical insights for ongoing critical reassessment and reimagining of pedagogical practice and design education.

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Empathy From Within: User-Enacted Design With Autistic Young Adults

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The 'double empathy problem' highlights the challenge of mutual empathy between autistic and non-autistic individuals. In applying this concept to supportive technology design, it has been argued that designers cannot accurately imagine the unique experiences and needs of autistic users. We explain that co-design, suggested to bridge the gap, falls victim to the same criticism. We decided to start from the opposite point of view, which we call 'user-enacted design'. Instead of creating conventional co-design tools that enable designers to empathise and design with end users, we developed tools with which autistic individuals can design their own supportive interventions. We present five such tools and show how they helped autistic young adults design supportive devices that made sense to them, but of which others may not fully understand the rationale and underlying design decisions. Additionally, we reflect on and reframe the contemporary role of the professional designer in this process.

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Insert here: Unpacking tensions in designing technologies for the vagina

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From sex toys to fertility trackers to vaginal fitness, the design of vaginally inserted technologies often mirrors gendered norms and societal taboos. These norms perpetuate the vagina as an obscure and mystified area, making it difficult for designers to find their way amidst a web of technical, material, and ethical concerns. In this paper, we present a mingling of our experiences as designers, together with feminist and posthuman literature, to discuss the challenges and tensions arising when designing in this space. We provide alternative framings and reflect on how the case of designing for the vagina creates blurry definitions of the inside/outside of the body and of medical/non-medical devices. We offer

future directions on how we might demystify and destigmatize designing for vaginas, calling for more queer and feminist approaches to intimate design.

https://doi.org/10.21606/drs.2024.389

Joyful Complexity: Methodological (Dis/Re)Orientations

Reimagining Temporality: Exploring the Intersection of Time and Trauma in Design Research

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Time plays a central role in design research, influencing how people complete daily tasks, plan for the future, and interact with technology. Designers employ various methods, such as journey maps, diary studies, temporal probes, and storytelling, to articulate their conceptualizations of time. They use time to ground findings and envision future possibilities through tools like systems maps and the futures cone. This paper critically examines the use of time-based techniques in design research, highlighting their limitations and capabilities. It explores the intersection of time and trauma, acknowledging trauma's impact on an individual's perception and experience of time. The paper advocates for alternative framings of time, such as feminist temporality and Crip time, to better accommodate complex and nonlinear experiences like trauma. By doing so, it encourages designers to engage with messy temporal experiences to create more inclusive and appropriate design solutions.

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Counterism and Trust; From Critical to Tactical Design

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In this paper we explore the emerging qualities of Counteristic Design practises as they depart from Discursive models. In this process, Counterism is under-pinned as an emerging field of study that seeks to design trust. Counterism offers a way of resistance by creating systems of autonomy, accountability and repara-tion that values difference and creativity. The two projects analysed vary in ap-proach, with some developing new methods by incorporating new technologies, while others reimagine existing methods. These approaches can offer interesting ways towards a new future for citizens at the intersection of social justice, and technology. Counteristic practises operate within the system with the aim to shape its directionality in a particular direction in which social justice is para-mount. In this process the critical becomes tactical in which the main aim is to restore trust rather than build engagement.

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love. The forgotten dimension for just and democratic AI Futures

Meike Hardt, Nazli Cila, Pieter Desmet
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Addressing the widespread use of AI-driven decision-making systems in public spheres, in this paper we advocate for the integration of love as both a virtue and an affection within the discourse of participatory practices in AI design and development. Based on an analysis of justice, the need to shift the focus to love will be highlighted. Furthermore, we introduce two directions love could play during AI design: (1) love as an epistemological design inquiry to question the conventional knowledge structures in design by integrating embodied and experiential knowledge, and (2) love as a political design inquiry to challenge unjust systems in AI. We underscore the necessity for critical inquiry, recognizing both love's potential to nurture relationships and its potential for perpetuating inequalities. By proposing love as a foundational perspective in AI design and development, we encourage a paradigm shift and challenge exclusionary mechanisms, to cultivate just and democratic AI futures.

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Felt Experiences, exploring non-heteronormative pleasure

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We tend to sexualize everything around us, yet we find it hard to address sexuality in our research. At the same time, there is growing interest in considering the social, emotional, and bodily aspects of the human-computer experience. The subject of sex itself is an elephant in the room - present, but under-researched. In this pictorial, we present a project aimed at making sexual experience available for conversation in a design process. Our project explores how soma-aesthetics can con-tribute to designing objects that challenge standard heteronormative sex toys and attitudes towards pleasure. To do this, we combine a 1st person research approach with a 2nd perspective involving users in soma-design practices that encourage self-discovery towards non-genital sexual pleasure. We analyze the out-comes and argue for a broadening of HCI to include and encourage design for pleasure and pleasure activism.

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Expecting the unexpected: A review of surprise in design processes

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Surprise is integral to driving creativity and innovation in design. While design research has mainly adopted a product-centered perspective to explore surprise as an emotional user response, the intricate involvement of surprise in the design process itself remains underexplored. Studies in cognitive psychology show that a comprehensive understanding of surprise must also encompass its detection, management, potential for errors, and influence on the behavior of individuals and groups. On this basis, this paper contributes a state-of-the-art literature review of two decades of design research to explore the complex functions of surprise in design processes. The paper discusses key emergent themes, including the continued relevance of Schön's work, surprise-related error, the entwinement of process

and product, and surprise in creativity support tools (CSTs). The paper ends by suggesting future research to enhance our limited understanding of the functions of surprise in design processes.

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12 Design For Empowerment

Session chairs

Laura Santamaria and Ksenija Kuzmina

Editorial

Laura Santamaria and Ksenija Kuzmina

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Design for Empowerment I: Approaches and Understandings

Empowerment through participation? Three Case Studies of Social Design Projects with Disadvantaged Female Communities in Hungary

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Participatory methods are widely used in design, but it's important to take a critical stance towards how they impact vulnerable communities in the context of today's societal crisis (Juarez et al., 2008). This paper presents recent findings from the comparison of three social design research projects conducted in Hungary, which point towards evidence that empowerment by design can be beneficial for underprivileged women. This notion of empowerment is defined through developing embodied expertise, problem-solving skills, and agency in a design context. In order to understand how design can contribute to building such notions in participants, the author contextualizes the community's barriers, and analyzes case studies of varying participation levels based on Healey's engagement model (Healey et al., 2014). The author examines the cases from an intersectional viewpoint (Crenshaw, 1989), examining the barriers they highlight, resulting in a nuanced recommendation on establishing an effective level of participation within vulnerable communities.

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Towards a design methodology against oppression

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This article aims to present a methodology that has been developed in design projects that combat oppression. The proposal emerged from work led by the Brazilian Design and Oppression Network in partnership with social movements and oppressed communities. The

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methodology has six guiding axes: popular assembly, dialogues, generating themes, unveiling, collective praxis, and systematization of experience. These axes bring together principles and practices stemming from critical pedagogy and militant research which can help designers and researchers with the particularities of conducting projects engaged in struggles against oppression.

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The road to cooptation is paved with good intentions: an anarchafeminist critique of empowerment ambiguity in DSI

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This theoretical paper critically examines the relationship between design for social innovation and the concept of empowerment. It questions to what extent current empowerment discourses in design genuinely amplify marginalized voices or rather reinforce and hide existing structural inequalities. With the aim of unveiling the emptiness of signifiers, such as empowerment, much like the contested concept of 'social innovation', this contribution aims to encourage a critical reflection on power dynamics through an anarchafeminist lens. Rather than striving for definite answers or providing blueprints, this lens aims to be an open and dynamic invitation to scholars and practitioners to continue exploring (self)critical spaces and interrogate design for social innovation to reveal and confront the complexities, over-sights and potential challenges of contemporary design discourses.

https://doi.org/10.21606/drs.2024.942

Sensemaking about power in anti-oppressive design practice

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The concept of power can be an effective discursive tool to wield when designing against oppression and designing for joy, desire, and flourishing. While power is a critical concept in oppression, it is underdeveloped in most design methods and practices. This paper makes the case that designers interested in social justice can explore dimensions of power to uncover and redirect bias and inequities in both design processes and outcomes. I summarize the conceptual debates about power's meaning and survey how designers are currently engaging with the concept. I then offer a loose anti-oppressive framework for sensemaking around power in professional and community-based contexts. Designers increasingly committing to social justice can utilize this framework to develop new forms of agency and empower people to mobilize and take action.

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Design for Empowerment II: Methods & communities

The co-design participatory power pyramid

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This paper presents an innovative co-design participatory power pyramid, which foregrounds how people living with dementia (PLWD) are (and can be) involved in co-design projects. The pyramid provides a scale of participant involvement in co-design activities based on the premise that design is a process that encom-passes a series of interlinked activities, actions, and thinking that, when com-bined, result in a designed outcome. The co-design participatory power pyramid has been created to define and better understand the spectrum of co-design projects when working with PLWD. However, it is anticipated that the frame-work will be applicable to other co-design research practices. The pyramid makes explicit the differences between co-design projects labelled as 'to', 'for', 'with' and 'by'. The paper provides examples to highlight how the framework is an appropriate tool as it encourages self-empowerment in collaboration and inde-pendence in action that are perceived to be aspirational in co-design activities.

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A bottom-up transformation: Design empowering chronic disease management types and strategies

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As the population ages, chronic disease management (CDM) has become a challenge for current public health services. Previously, designing for patients with chronic diseases often saw them as passive objects of design, hindering their agency. Understanding patients' agency is very important for health management, but the empowerment approach in the health field is often a disguised paternalism. This study aims to use the empowerment theory to reframe the possibility of the design empowering CDM and propose corresponding means of empowerment. We identified four types of design empowerment in CDM and articulated specific empowerment strategies through case studies. Our study therefore enriches the theoretical landscape regarding the role of design empowerment within CDM, offering insights for amplifying the voice of design at the crossroads of empowerment and CDM.

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Empowerment of people with disabilities through collaborative making: Exploring user involvement in designing and adapting assistive products

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This study investigates the extent of the empowering effects of making and collective production activities on people with disabilities and the assistive products they use. The universal and participatory design approaches intend to empower people with disabilities, but how a person with a disability can be empowered, and the requirements for it are highly dependent on the individual and the context. The research utilizes the elements of The Empowerment Theory to assess the resulting empowerment of participants' making-related experiences. Semi-structured interviews and participant observations were conducted to understand the role of making and collective production activities in enabling the participation of people with disabilities in designing, adapting, and making their own assistive

products. Analyzing the disability-related making activities through the lens of a social empowerment theory allows this study to contribute to empowering people with disabilities by defining the current barriers on their participation and understanding the effect of making.

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Power Signifiers: the subtle forms of power in design practice with marginalized craft communities

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This paper discusses how craft practice may offer empowerment strategies for critically reflective spaces, that allow for social transformation, using the case of traditional textile communities of women in rural Pakistan where development opportunities are limited. It uses the reflective practice of its design researcher, to explore established power relations, and search for new dialogues that build meaningful relationships for creating new forms of power in interrelated social, development and design contexts. This practice-based discussion contends with the embedded layers of power arising from social constructs and those extending beyond. A combined methodology, 'Power Signifiers' is presented as a critically reflective approach for social and design practice, building on the social sciences discourse of power analysis and power relations frameworks through forms of non-obvious power in developing contexts. Theories of power and empowerment provide a platform that designers can build on in examining agencies of making in design collaborations.

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13 Pluriversal Design as a Paradigm

Session chairs

Renata M. Leitao and Lesley-Ann Noel

Editorial

Renata M. Leitao, Lesley-Ann Noel, Maria Rogal, Nicholas B. Torretta, Juan Montalvan, Sucharita Beniwal, Mariana Fonseca Braga, Dimeji Onafuwa, and Maria Cristina Ibarra

https://doi.org/10.21606/drs.2024.169

Pluriversal Design as a Paradigm I

Designing in Argentina with Indigenous Groups

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Indigeneity in Argentina has historically been oppressed. The project presented here is a collaboration between design researchers and students from Buenos Aires and Indigenous groups in Northern Argentina that combines anthropological and design methods. Participatory experiences are at the core of the proposal. Interactions within the communities led to various lines of work. The topics varied from textile production, natural coloring, traditional nourishment, and construction to didactic materials for schools within intercultural bilingual education. The results show not only material outcomes, but also how the project moved its participants. In light of the widely differing worldviews, the learning process became an exchange. Is it possible that design education in Argentina will change its predominant practices, as the result of dialogical collaborations with Indigenous peoples? What challenges would this lead to? The project aims to be an example of a dialogue between worlds, in a pluriversal context.

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Colombia-Brazil dialogues. In search of a Latin American epistemology for design.

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The construction of a situated epistemology for design was the key issue that emerged from the Colombian—Brazilian dialogue during the last Congress of Design Research held in Bo-

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gotá in 2023. Design from the South is the expression of a new epistemology. An epistemology in which the designing is oriented to social transformation, applying the ancestral knowledge in search of social equity and sustaina-bility, and paving the way to design justice. This article presents examples of the way in which this epistemology of design sprouts from the community itself. Designers are part of these communities. Therefore, the design activity here is a form of activism, since the privations and internal conflict make the design solutions a political statement.

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Training designers in the Pluriverse: The experience of Studio Wudé with leather crafts in Senegal

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This article reflects on design and the training of designers from a West African perspective, based on the experience of Studio Wudé, a workshop which has been working in Senegal since 2006 to transmit endogenous knowledge about leather transformation. Through an analysis of the Studio's pedagogical design approach, the aim is to question in West African contexts the relevance of the historical dissociation between thinking and doing, at the genesis of a Western industrial capitalist design culture whose spread in West Africa has accelerated over the past five years via the emergence of higher design education based on a Western model in crisis. Studio Wudé adopts an unprecedented position by embracing within a single reflexive space the dual challenge of training designers and craftsmen in Africa : it advocates the singularity of an African design trajectory within the Pluriverse, conveying a different relationship to the world.

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Shanzhai as a Pluriversal Praxis: Challenging Western Design and Innovation Paradigm

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This paper explores the concept of Shanzhai ('fake' in Chinese), a Chinese practice often associated with imitation and design plagiarism, this study uses Shan-zhai to critique dominant forms of innovation, framed by a discussion of pluriversal design. Through a comprehensive literature review and empirical research, this study explores Shanzhai's evolution from a response to globalisation and de-sign colonisation to a reflection of identity. Shanzhai's unique approach challenges dominant design narratives, but in its own way emphasises inclusiveness and innovation. The study concludes that Shanzhai transcends its initial role as a design and manufacturing practice, evolving into a cultural phenomenon symbolising Chinese identity and resistance to Western dominance in design and innovation. Through its journey, Shanzhai raises essential questions about ethics, identity, and the dynamics of design paradigms. This research contributes to the discourse on pluriversal design by showcasing Shanzhai's capacity to challenge pre-conceived notions and foster inclusivity.

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Participatory design research, documenting the experience of Gainesville local drag performers.

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This case study documents the process of research, identification, and co-creation —with members of the drag community— a visual ethnography of Gainesville's drag culture. This study documented drag performance as an integral element of public-facing queer communities and took place during 2021 and 2022. Drag GNV aim is to contextualize the importance and nuance of drag as an activity supporting LGBTQ+ individuals and communities and as a publicly visible format for sharing elements of LGBTQ+ community identity with broader audiences. This research focused on conversations with the queer community (performers and allies) and centered reflections on drag venues as safe spaces, to build on the oral and visual history and promote the drag art form. The project weaves together past and present stories and contributes to the collective creation of safe spaces for queer people.

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Lost in translation: Decontextualising, decentering and diluting India's jugaad practices

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Academia and corporate capitalism show increasing interest in grassroots practices as useful to product development for low-income markets and relevant to sustainable innovation models. Captured in this interest is jugaad, an Indian problem-solving practice rooted in everyday life, which emphasises practicality, resource efficiency and an elastic approach to rules. Interest from the Global North in grassroots practices risks their decontextualisation, decentering and dilution in a power-knowledge play that principally serves the needs of hegemonic Euro-USA design. Drawing on Arturo Escobar's idea of pluriversal design, which holds that everyone designs, creating a multiplicity of sociocultural formations, we examine jugaad as a distinct and situated practice counter to the affinity effects necessary for the appropriation of the practices of others. Our paper explores the logic of jugaad through its expression in Delhi's markets at a time when resource-intensive, socially divisive modern retail formats are threatening India's culture of markets.

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Pluriversal Design as a Paradigm II

Design principles of the pluriversal design paradigm

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When scientists embrace a different paradigm, this naturally leads to a shift in aca-demic behavior. While the importance and necessity of the pluriversal design framework are evident, understanding how this paradigm influences academic conduct is less clear. Through

a systematic literature review of 103 academic papers on the pluriversal approach, it is deducted what it is that researchers do or suggest to do when shaping their research and design practice through the pluriversal de-sign paradigm. In this study, the pluriversal design paradigm is distilled into a set of foundational prerequisites and design principles. These design principles can be applied by both scholars and practitioners across various design contexts. Since behavior and ethics are intertwined, this study also delves into the ethical considerations of pluriversal design.

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Paradigm shifts in research assessment for scientific publishing: emerging models in a pluriverse perspectives

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In the realm of design, research publication undergoes a transformative shift in evaluation and emerging forms that prompt investigation into the distortive impact of the current assessment framework on publication diversity. The complexity of assessing research quality within institutional frameworks and career metrics hinders innovation, and globally, debates on impact factors drive a shift to qualitative, responsible evaluation. The article explores how collaborative methodologies enable new assessment practices for design communities in the Global South, challenging Western-centric peer-review norms to adopt a more pluriversal perspective. It includes an introduction problematising the status of publication assessment in the general scientific domain. The paradigm of pluriversality is then introduced as a background framework to discuss and nurture new opportunities in the assessment of scientific research and publication in the design field and adopted as a reference in two proposals, shown in the case studies.

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Anticolonial prospects for overcoming the coloniality of making in design

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Design has been instrumental in preserving the coloniality of making – a set of ideological, cultural, political, market and relational processes that operate to identify, categorise and hierarchise different making practices that benefit the metropolises at globalised production structures. This paper presents a theoretical examination of the coloniality of making based on the anticolonial scholarship of the Design & Oppression Network. The examination proceeds with three prospective studies to overcome this form of coloniality in fashion, interaction, and graphic design. The first part of each study denounces how design reproduces the hierarchy between intellectual and manual labour and justifies class, gender, race, technology, international geopolitics and further oppressive hierarchies. The second part announces the possibilities for reconnecting manual and intellectual labour while designing alter/native ways of being and living together.

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Pluriversal Design in One Situated Place: An Approach Rooted in the interface between the Local and the Global

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This essay posits that a Place-Based approach is the prerequisite for fostering fruitful and mutually-respectful form of social design in the emerging paradigm of pluriversality – contextualized within the contemporary global order. The concept of "Place" serves as the nexus between the Local and the Global: it's where intermediaries reside, translation unfolds, and power dynamics intensify. By examining four historical phases from the pre-colonial period through post-modernity, this work looks into the evolution of the concept of Place and its role in the construction of power. This discussion encourages designers to ground themselves in the local, embedded within communities, while connecting with the global, recognizing and navigating inherent conflicts. From grassroots organizing to trans-local collaborations, place-based design embraces pluriversality across various dimensions, interweaving tales of revolution and innovation. The paper highlights the potential of indigenous philosophy as theoretical frameworks to nurture global alliances in design practices, aimed at societal transformation.

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14 Polyphonic Speculations

Session chairs

Fernando Galdon and Nuri Kwon

Editorial

David Philip Green, Spyros Bofylatos, Enrique Encinas, and Mayane Dore

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Potentials for Polyphonic Speculations

Research through Designers: A Pictorial Reflection on Engagements, Encounters, and Environments at a Design Research Jamboree

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We picture design researchers' engagement with the task of capturing the value of Research through Design during a week-long event. The images are selected to document set and setting, hands-on activities, human and more-than-human encounters, and material engagements with the theories, methods, and practices of design research. The text is deliberately minimal, offering contextualization from the photographer and the organizer of the event, as well as commentary from attendees on material outcomes and bodily presences; context and environment, disciplinary esthetics; and social commentary from two non-attendees. We offer this record of process to inspire design researchers to further engage with practical, hands-on, personal, bodily reflective engagements of what it means to do design research. We also aim to advance further the form of primarily photographic pictorials in design research.

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Exploring the 'Defining-Finding Dilemma' in Design Research: Insights from a Series of Speculative Co-Design Workshops

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This paper shares the results of a series of speculative co-design workshops that employed sketches and visual metaphors to facilitate collective discussions about a hypothetical Design Research database. The primary objective of these workshops was to explore the challenges related to documenting, sharing, searching, and discovering Design Research examples while simultaneously addressing underlying questions surrounding knowledge-making in the field. Following this approach, we identify six distinctive qualities that characterize Design Research, shedding light on what is referred to as the defining-finding dilemma. The paper finally suggests potential pathways for interaction design to navigate this issue through alternative modes of interaction.

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Landscape of agency of objects in public space: a collective expression

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In this research human relationships with objects were traced through 25 participant documentations in 7 different cities. 25 different participant documentation portray the variety of the experiences emerging around objects in public space. The textual part of participants' documentation was analyzed with thematic analysis. With thematic analysis, new themes were identified. This new themes illustrate a landscape of the agency of objects in public space. I asked participants to report a personal account of an everyday object in public space with text and photography. The collected material consisting of texts and photographs were analysed with thematic analysis inspired by grounded theory (GT). Here based on evidence from participant reflections, I convey a landscape of agency of industrial objects in public space, besides a priori agency of these objects which are their function and efficiency in the modernist design literature. From participants' documentation, a landscape of agency in public space was formed.

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Towards a mapping of empathic design methods

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Empathic design methods support designers in developing an empathic understanding of the people they design for. While researchers and designers use many of these methods, the literature falls short in providing an overview of these methods and what they contribute to the innovation process. We conducted two iterative workshops with 5 researchers in empathic design to define and map the properties of 10 selected empathic methods. By providing an overview, a mapping of empathic methods can support the deployment of empathic interventions. This mapping acts as a guiding tool to support designers in choosing the empathic methods that are the most relevant to their industrial context and audience needs. This work paves the way for further empirical research, inviting the design community to challenge these empathic properties and document how empathic design methods work in a variety of contexts for different audiences.

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Designing With The Challenges Of The Anthropocene

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The Anthropocene is a concept that has been stimulating several initiatives among theorists and practitioners in Design. This paper explores how Design has been coping with this concept. It builds from a literature review to elaborate three challenges with themes related to the Anthropocene. They are: unsettling Modernity; noticing neglected multiplicity and creating new imaginaries. We share 12 projects related to these challenges were selected. The projects were analyzed considering how they address the theme they were attached to, and how they elaborate tactics and mechanisms to cope with the challenges. Based on such analyzes, the paper presents a matrix on how the relation between the themes, tactics, and mechanism can be considered. Finally, it attempts to suggest a means for mapping the situation regarding the relation between design and Anthropocene. The paper aimed at contributing to the discussion on design's role in these turbulent times.

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Engaging the public in technological futures: a participatory speculative design approach to polyphonic representational spaces

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This paper explores the concept of polyphonic representational space as technological imaginaries of multiple individuals regarding public space. The context of this research relates to implementing digital technologies, such as the Internet of Things and AI, in the public realm and their impact and challenges on policymaking, everyday practices and spatial experiences. Speculative design offers a way of creating multiple scenarios for the future and provoking conversations regarding technological futures. This research adopts a participatory speculative design (PSD) approach to engage with people, not necessarily designers or technology experts, in the future prototyping process. We introduce a study conducted in three stages: two speculative prototyping workshops, two public exhibitions and a workshop with policymakers. The paper concludes by reflecting on how PSD can gather polyphonic views about technological futures in places, including opportunities and challenges and potential applications in policymaking processes.

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Polyphonic Speculation in Practice

Fostering Pluriversal Perspectives in Theory of Change: A Case of an Urban Regeneration Project

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This paper chronicles how we used a Theory of Change visual map to support pluriversal perspectives in urban regeneration projects. The map was tested in four cities under regeneration as part of the T-Factor project. Unlike most Theory of Change maps, it supported city stakeholders in three main aspects: 1) planning interventions to operate within multiple time horizons, 2) considering multiple actors, both human and non-human, in the decision-making process, and 3) reflecting on planned interventions to ensure a long-term impact beyond project scope. In addition, the Theory of Change map led towards a new approach for portfolio-based interventions in urban regeneration projects, emphasising long-term thinking and prioritising care activities over tangible hard ends. The map supplements the classic evaluation-based Theory of Change model, expanding the logic of how a polyphonic change process in the urban realm could occur through collaborative design practice.

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Vovousa 2048: a Design Fiction workshop imagining the future in a rural and remote area in Greece

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Independent Design Researcher

In July 2023, the author carried out a design fiction workshop over a 4-day span in Vovousa, a village of 132 inhabitants by the banks of the wild river Aoos/Vjosa, in the heart of the Pindus range, in the area of Epirus, Greece. In a location with a history of tensions regarding the creation of hydroelectric dams, the workshop participants were invited as a group to consider and discuss different scenarios for the future of the settlement, set in the year 2048. As a group, they publicly presented artefacts from one selected future with the discussions following indicating that the polyphony generated by the proposals ought to be a given in any community inquiring their preferred future. Such investigations on futures ought to be a constant and continuous endeavor, since, as this short workshop illustrates, even the best outcome today is no panacea for living a preferable future tomorrow.

https://doi.org/10.21606/drs.2024.915

Contextualizing Comedy Techniques for Speculative Design: Unraveling Futures Cone from Sketch Comedy Series, '2032/2033 Futures'

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Speculative design stretches the boundaries of future plausibility, enabling creators to engage audiences by evoking empathy and provoking debate. Designers often use satire and humor, techniques that comedians have employed for centuries, to engage the public. We examined the popular YouTube comedy series '2032/2033 Futures', which depicts near futures, to understand how comedy can broaden future plausibility and challenge viewers to think critically about preferred futures. To this end, we conducted semi-structured interviews with the creators to contextualize their comedic techniques, such as humor, satire, irony, and wit, within future-oriented narratives and prototypes. Our findings illustrate how comedy can revitalize speculation as an experimental approach: a) to the notion that boundaries of future plausibility are shaped by collective empathy and can expand through speculation, b) to the unearthed significance of notions once considered preposterous,

and c) to crafting scenarios that break from linear time, showcasing a polyphonic temporal and spatial narrative.

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“Bejay (water) is our sister”: Wearable speculations to entangle collectively.

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Inspired by the feeling-thinking-making of the tšombiach, a traditional belt or sash woven by the Kamëntŝa people (authors 2023) this paper explores the potential of a collection of wearable speculations to entangle collectively in matters of care (Puig de la Bella Casa 2017) relating to water in a territory. Through five speculative, hand-woven garments we (2 Kamëntŝa and 2 sñená/foreign women) open dialogues on how wrapping/involving, in a tšombiach logic, can be a practice of care: of the body and of the territory. The pieces are speculative in the sense that they are not actual garments, nor are they tšombiachs, instead they are pieces woven to feel-think-make with. Through them we invite each other, and other people, to physically engage with situated stories of bejay -water- our sister; to wear these pieces as a call to care, but also to be involved and entangled in the stories.

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Co-creating pluralistic futures: A systematic literature review on participatory speculative design

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In an increasingly uncertain future context, participatory speculative design be-come a future probe for exploring complex socio-technical issues and a diverse world. Compared to speculative design, the focus of participatory speculative de-sign shifts from artifacts to process, empowering the public through multi-stakeholder participation. Building upon future prototypes and scenarios, participants and designers co-create potential pluralistic futures, and democratize imagination. This paper, based on a literature review of recent research in this field, outlines three practical pathways of participatory speculative design, which are characterized as "technical speculation," "social speculation," and "integrated speculation," along with seven participatory methods that can be used in the de-sign process. Finally, the study proposed a framework for participatory specula-tive design flow, delineating four phases to guide the practice of participatory speculative design.

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15 Spatial Justice in Design Research: A Trans-disciplinary Discourse

Session chairs

Miriam Tedeschi and Jules Rochielle Sievert

Editorial

Miriam Tedeschi and Jules Rochielle Sievert

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Spatial Justice in Design Research: A Transdisciplinary Discourse

Coastliners Lab: Mapping for Environmental Spatial Justice at the Water's Edge

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Coastliners Lab is a trans-media critical mapping practice that focuses on the border conditions of bodies of water and how they shape socio-material processes of human and environmental relations in urban and extra-urban settings. The lab works with a deep cartographic layering of aerial photographs, historical maps, news reports, video footage, field notes, interviews, and more to explore embodied map-making methods that define new roles for design toward spatial justice. It highlights agencies and political ecologies underlying the contested anthropogenic impacts on the margins of transforming landscapes. Istanbul's political and ecological struggles with the surrounding bodies of water have been the birthplace of the lab. This paper will introduce the initial context of Istanbul, theories, cartographic experiments, and ongoing practices of the Lab to discuss emergent mapping methodologies as a design medium to engage with spatial justice.

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Spatial justice through immersive art: an interdisciplinary approach

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This paper explores spatial justice in urban environments through immersive art and design, focusing on Amsterdam and Houston. It presents a case study from the Venice Biennale 2023, showcasing art's potential in fostering inclusive urban spaces. The study delves into the socio-political complexities of urban areas, highlighting often-ignored liminal spaces and their tensions and possibilities. Immersive art emerges as a transformative medium, capable of challenging and reshaping perceptions of space and addressing systemic socio-economic disparities. Adopting a transdisciplinary approach, the research combines insights from various fields to enrich discussions on spatial justice and inspire urban transformation. By examining liminal spaces and the 'phygital' nexus, the paper challenges conventional urban narratives and advocates for more inclusive and equitable urban strategies.

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Reimagining public spaces through translating cultural & heritage narratives into public art-Lessons from Roxbury's Black Panther commemoration community garden & art mural project

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The topic of spatial justice offers a good platform to examine socio-economic imbalances that still exist in some Boston neighborhoods, such as Roxbury, which has a history of underdevelopment, redlining, food insecurity, and other socio-economic challenges. It also presents a chance for the execution and examination of community-led projects and initiatives that can show how locally owned projects can strengthen community ownership, underpin the preservation of cultural heritage and identity, and offer fresh examples of social participation in community development. The Black Panther Commemoration Installation at the Winthrop Gardens in Roxbury, which was conceptualized and created through the local community social participation, will be the subject of this case study's critical analysis. The author, students at Northeastern University, local fabricators, community neighborhood association, local municipal funders and nonprofit organizations collaborated to create the Winthrop Garden installation, which celebrates the work of the Black Panthers of the Boston chapter.

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Adelaide's graphic heritage: The quintessential "contested" colonial city

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Adelaide, the state capital of South Australia, is a quintessential colonial city. However, in the land colonial settlers called Australia, colonialism demeaned notions of Country in a physically and politically contested space. New approaches have been called for to reconsider Australia as a shared space that places high value on indigenous identity. From within a context that challenges us to think about how Country and culture might be envisioned, designed, planned, and implemented, this paper reports on a hypothesis about how the concept of graphic heritage can be applied to enhance sustainable development in this South Australian setting. Building on recommendations from a collaboration between academic research with the United Kingdom National Commission for UNESCO, the imprecise relationship between heritage interpretation, presentation, and representation is exposed

to reveal how graphic heritage can function as an enabling tool for disparate partners to provide a focus for discussion and joint purpose.

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The heritage language and graphic landscape of London's Chinatown

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The preservation of minority heritage through language is widely recognised as an important means for safeguarding ethnic identity within multicultural settings. This paper investigates the visibility of "heritage language" through the lens of graphic heritage within the distinctive ethnic enclave of London's Chinatown. Located in the City of Westminster, Chinese identity is officially designated on street nameplates that demarcate geographic boundaries as well as depict a shift in the cultural influence of this migrant community. In this study, the visual analysis of 209 retail signs displays 313 instances of language. The research findings indicate the extent of retention of heritage languages within the area, providing the basis for a case study that maps the linguistic codes and spatial distribution of graphic devices. From this, new insights are gained into the design literacy of Chinese migrants in London to provide a framework for thinking about how Chinese ‘designscapes’ have developed worldwide.

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16 Turn by Turn: Language and Design

Session chairs

Senthil Chandrasegaran and Sara Queen

Editorial

Peter Lloyd, Senthil Chandrasegaran, Arlene Oak, Colin M. Gray, and Ben Matthews

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Language in Design Process

Modelling Reflection in Descriptions of Design Practice using Linguistic Inquiry

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Reflection plays a vital role in the development of designers, enabling them to evaluate their experiences, enhance their learning, and foster professional growth. This research analyzed reflections of 56 design students, as part of graded coursework, using content and dictionary-based approaches (LIWC). Building on an existing model of reflection with eight components (experience, belief, difficulty, perspective, feeling, learning, intention, and descriptive) we identify, using descriptive statistics, the linguistic features associated with each component and correlate these to grades achieved. We distinguish two types of reflections associated with higher grades: those emphasizing personal experiences that we term holistic narrators, and those that focus on critical self-evaluation that we term in-depth explorers. Our results provide insights for design educators, guiding interventions to enhance critical thinking and self-reflection among design students. They also inform the development of automated tools to assess and enhance reflective practice in educational and design settings.

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Leveraging LLMs for Reflection 🤔: Approaches to Mitigate Assumptions within the Design Process

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In an increasingly complex landscape, designers grapple with unprecedented uncertainty, often exacerbated by inherent biases and implicit assumptions. Utilizing Large Language Models (LLMs), our formative study introduces "Anticipate," a tool designed to interrogate these hidden presumptions and mitigate uncertainty. A subsequent study demonstrates that LLMs can critically challenge design ideas, elucidate underlying thought patterns, and expose biases, thereby preempting undesirable outcomes. Importantly, we employ specific input framing techniques to minimize the risk of LLM-induced biases and hallucinations in decision-making. Collectively, these methodologies aim to attenuate both designer and algorithmic biases, thereby mitigating the perpetuation of adverse societal trends.

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Exploring human-centered design method selection strategies with large language models

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In human-centered design (HCD) projects, designers select and use a variety of design methods in pursuit of a desired outcome. Given the prominence of method selection in designer behavior, what distinguishes a design team's method selections from design method selection based on frequency or probability? To explore this question, we compare HCD methods suggested by the publicly-available large-language model, GPT-3.5, to 402 novice design team method selections over five offerings of a design project based learning course at a large public university. We observe that GPT-3.5 appears to represent design method knowledge held in method repositories like theDesignExchange well. We also observe that GPT-3.5's method selection recommendations appear to poorly distinguish between HCD phases, and appear limited to highly specific aspects of HCD phases. These findings highlight the unique contribution of human design cognition in design decision-making relative to LLM's, and herald the promise of human-AI teaming in design method selection.

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Significance of everyday group conversations in defining design problems: Affordances of group chat room for discursivity in design process

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This paper explores the ongoing and nonlinear nature of everyday group conversations afforded by a mobile messaging app. Understanding such interactions can facilitate the awareness of different viewpoints and the emergence of group decisions on elucidating design problems. The exploration is done by analyzing stakeholders' group chat conversations through the lens of small stories, which acknowledges overlooked aspects of everyday communication. Communicative interactions are increasingly relevant to participatory processes of coordinating knowledge, needs, and goals among multiple stakeholders in

designing. Meanwhile, communication in goal-oriented workshops and interviews aims for an effective sense-making process and compels the definition of problem and solution. Such an arrangement for communication could constrain the stakeholder's agency to re-define the design problem upon ideating alternative solutions. Therefore, this paper aims to scrutinize a less structured and mundane communication setting and its significance on stakeholder agency to iteratively reconceive the problem at hand.

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Revealing user tacit knowledge: Generative-Image-AI helps create better design conversation

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In new product development, engaging users in co-creation provides valuable opportunities for innovation by uncovering their latent needs. However, user knowledge is often tacit and difficult to express. This study considers Generative-Image-AI as a tool to facilitate communication between users and designers, and explores how it intervenes in the design process to facilitate meaningful design conversations. We proposed the conceptual design iteration process model for Generative-Image-AI intervention in the product conceptual design phase and conducted a workshop with six designer-user dyads. The results demonstrated the positive impact of Generative-Image-AI on design conversations by fostering continuous communication, expanding possibilities, and encouraging reflection and iteration. We also discussed the new challenges that Generative-Image-AI brought to design conversations. Overall, Generative-Image-AI enriches the co-creation design conversations. Our research contributes to the integration of AI in human-human collaboration processes and provides a new perspective and foundation for AI-supported participatory design conversations.

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Metaphor Gardening: Experiential engagements for designing AI interactions

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Designers deploy metaphors in various constructive ways but there is a challenge in noticing and selecting helpful metaphors to describe AI systems. Metaphors serve to highlight certain aspects of AI but their influence can be so potent that envisioning or discussing AI in alternative ways becomes challenging, with unwanted expectations, lazy tropes and hidden biases. Alternative metaphors help designers grasp distinctive qualities of AI and move past hidden assumptions. Hence, it is key to support designers in precise, plural and intentional metaphor use to grasp unique qualities of AI and explore its relationalities. We illustrate this through a selection of prototyping journeys in which metaphors directly shaped students' design trajectories and allowed them to explore the relational, entangled complexities of AI systems. Finally, 'metaphor gardening,' provides a series of recommendations for designers when designing AI with metaphors, which we hope can ultimately support a generative and responsible approach to AI technologies.

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Language in Design Practice

A Designer's Lexicon: An Ethnographic Exploration of Language in Design Practice

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Although a visual language often takes precedence as the main communicator in design, text can act as a fundamental medium of developing ideas. Writing not only has similar capabilities as sketching in order to externalize concepts, but also when developing cognitive thinking and communicate with others. Using instructional, social and reflective lenses, this ethnographic study catalogues and analyzes examples of written language present across several design studios at The Ohio State University. Artifacts presented include writing prompted by design instructors, written interactions between peers and student self-awareness delivered through reflective writing. Acting as a purveyor of language, writing serves a method for understanding how students develop a sense of professional practice, communicate with others in the field and build a sense of self as emerging designers.

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Grand narratives of Value and their relationship with design

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We all use value speak in our everyday conversations. Within the field of design, the implications of value are even more integral: we expose and negotiate value in order to create "desirable" experiences and avoid "bad" products, and our respective ideas of value guide our actions and judgements of what is "worthwhile" or "important". Yet despite its prevalence, our understanding of each respective value referent is often ambiguous and subjective. In this research, we examine three grand narratives of value and ascertain how each representation relates to design. We argue that the strengths and limitations inherent in theories of sociological, economic, and linguistic value are mirrored in their related design praxes. We propose that this holistic awareness enables a more critical and expansive assessment of design methods and practices.

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The mentor archetype: Female character design trends in contemporary feature film animation

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Archetypal images transcend cultures and time, being easily recognized, and absorbed by worldwide audiences. Thus, understanding how archetypal meaning is conveyed through design is undoubtedly a useful tool for character designers in the animation industry. Because popular animated films often target culturally diverse audiences worldwide, stereotypes and archetypes are often used to communicate a character's identity and narrative

role quickly and effectively. This paper presents trends of representation of the Mentor archetype found in female character design, from thirty popular and contemporary animated feature films. These trends emerged through a process of data collection and analysis. By mapping the current paradigm of female character design in this context, we aim at contributing to the understanding of design practices in animation, while fostering critical thinking around gender representation in mainstream media, and ultimately contributing to a more just representation of women.

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A LLM-augmented Morphological Analysis Approach for Conceptual Design

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Morphological analysis is often used in the conceptual design process because it provides a structured and systematic approach to decompose design problems, improving the completeness and diversity of creative solutions. However, it still relies heavily on designers' professional knowledge and experience when decomposing design problems and proposing solutions, which is a challenge for designers. In this study, we propose an LLMs-augmented morphological analysis approach for conceptual design. We refine the design process as three main stages: decomposition, generation, and combination, offering targeted guidance and support to designers when applying morphological analysis. In addition, we introduced a feedback mechanism to develop more appropriate solutions to specific problems. Experimental results show that our approach improves the quality of innovative conceptual designs and reduces cognitive load. Furthermore, it augments the interactive experience between the designer and LLMs.

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Synergizing human expertise with AI: The role of LLMs in user research

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Traditional design practice primarily relies on human designers' skills and knowledge for problem solving. With the advent of Large Language Models (LLMs), there is a significant possibility of leveraging the language processing capabilities to assist designers in increasing the speed, rigor, and effectiveness of various design activities. In the context of service design projects, we embarked on an investigation of utilizing LLMs to streamline labor-intensive tasks such as analyzing user research data more effectively. Through our investigation, we propose a mixed LLM-human approach in the Design Process, especially for qualitative data analysis. This paper discusses our observations from the investigation of leveraging LLMs for qualitative data analysis in a service design project and elaborates the proposed approach. We believe that these learnings hold broader relevance for the design discipline, empowering designers to delegate tedious design tasks to AI (LLMs), thus optimizing their workflow and productivity.

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17 More-Than-Human Design in Practice

Session chairs

Joseph Lindley, Arne Berger, Laura Forlano, Cristina Zaga, and Elisa Giaccardi

Editorial

Iohanna Nicenboim, Joseph Lindley, Cristina Zaga, Arne Berger, Laura Forlano, and Elisa Giaccardi

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More-Than-Human: Becoming With the More-Than-Human

'Does Phosphorus Want to Sound Like That?': Experiencing More-Than-Human Futures

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The paper explores the learning possible from including the public in explora-tions of more-than-human future visions. We presented an installation at a de-sign festival of a speculative scenario that emerged from ethnographic research with urban permaculture farmers, using sounds to represent concentrations of nutrients in soil. We studied how visitors wearing a sensor ring experienced the playing of these sounds upon insertion of a finger in the installation's soil. Re-sponses underscore the importance of cultivating the skill of noticing through deep listening, alongside the profound connection thus established between humans and the more-than-human world. In a further contribution to more-than-human design, the paper examines implications for practices of noticing and pre-sents four principles for problematising and reimagining how data pertaining to the more-than-human world may be sensed and represented.

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Designing from the plants' perspective. A field case study in urban forest of "La Goccia"

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Designing by engaging more-than-human agents such as plants is a complex challenge, as they have long been regarded as "ontologically inferior" resources primarily serving human

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needs. Emerging studies in the field of Plant Neurobiology are now breaking down knowledge barriers, gathering extraordinary data that recognize plant actions and behaviors guided by a distinct form of intelligence. Considering this breakthrough findings, this paper describes a 10-day workshop involving 52 international design students from Politecnico di Milano University that focused on experiencing plants in a former industrial area within the city borders. Through the years, this area has gone from desolation to a vibrant urban forest where plants and other life forms have flourished without human re-striction. With the contribution of botanists and local forest experts, the workshop was conceived as a journey with the ambition of providing participants with an opportunity to design for plants as active stakeholders.

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Learning in place: Reimagining design practice as ecological literacy

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What does it mean to practice design in a world without human beings at its center? How can designers take meaningful action in a world in crisis? In this paper, I present initial findings from an experimental month-long immersion in a place humans and more-than-humans meet—a coastal wildlife refuge in the northeastern United States. I report on my experience in the field (notes, observations, and photos), reflections on my trajectory as a designer and researcher in the refuge, my evolving understanding of what it means to design with a more-than-human lens, and how my search for meaningful action led me toward ecological literacy as an approach to practice. In doing so, I offer three contributions: four vignettes demonstrating how entangled more-than-human webs reshape an experience of place, five interconnected considerations for more-than-human design, and a model for grounding design practice in cultivating ecological literacy.

https://doi.org/10.21606/drs.2024.1118

Exploring more-than-human worlds and becoming with living and non-living entities through play

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In recent years, we have observed the emergence of a variety of video games that allow their players to temporarily exist entangled in more-than-human worlds, becoming with other species and things. Informed and inspired by posthuman philosophies, this article examines three video games: Everything (2017), Stray (2022), and Endling - Extinction is Forever (2022). This analysis focuses on three key questions: 1) How are these games enabling players to become with non-human characters representing real-life organisms? 2) What kinds of knowledge do players gain about these worlds? 3) How to define a more-than-human playful experience? The article concludes by introducing an initial draft of guidelines intended to facilitate the development of more-than-human games.

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Becoming microbes: An approach to cultivating microbial sensibilities in biodesign

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Microbes assume an indispensable role in design, given their inherent adaptability, functional diversity, and abundance. Yet, designing with microbes presents notable challenges for biodesigners, stemming from, for example, the distinct temporalities and scales of microbes. Conversely, cultivating microbial sensibilities—reflecting human comprehension and alignment with the distinctive characteristics of microbes—stands out as a unique potential of biodesign for fostering a deep connection between humans and other living entities. In response, we present the concept of "becoming microbes", a philosophically grounded approach advocating for a non-anthropocentric stance in biodesign, aiming at immersing biodesigners in the realms of microbes with a fresh perspective for imagining the world through the lens of a microbe. By harnessing diverse microbial qualities, including motility and communication, we present various design avenues to explore the notion of becoming microbes. We reflect on the role of merging the biological with the immersive digital systems in this context.

https://doi.org/10.21606/drs.2024.950

More-Than-Human: Designing With and Through Technologies

Embodying the Driving Experience Through AI Driving Assistants as a Means of Noticing the More-than-Human

Olga Barbara Lackner
Chalmers University of Technology, Sweden

On the road, a shift of agency away from human drivers is taking place with AI-based roadside monitoring and driving assistants. This changes interaction both within the car and with the environment outside of it, mediated by driving assistant algorithms. It also changes encounters with the non-human, framing and evaluating them from a technological lens. This paper aims to show how the human experience of their environment during a car ride is shifted through AI, where encounters with non-human entities are observed and logged by technology, and how this can be used to remediate passengers' experience of their environment during a car drive. The AI becomes a mediator which makes visible the agency of the non-humans in our environment and allows an immersion into the outside from inside the car by linking the driving assistant's detection to sensual – auditory and olfactory – cues changing the car interior.

https://doi.org/10.21606/drs.2024.343

Beyond human-centered empathy: tools and techniques to engage curiosity

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Empathy has long held a central role in design. However, when exploring more-than-human design, empathy has definite limits. We feel empathy primarily toward humans. Our empathy may also extend to certain animals and few, if any, objects. This paper will explore the limits of empathy and argue that cultivating curiosity is a necessary first step in a more-than-human design approach. It introduces techniques to develop curiosity and offers ways to make our curiosity more durable. It will then trace the linguistic roots of care, an etymological ancestor to curiosity, and argue that care is also necessary. Because care is fostered differently than curiosity (although curiosity may be a catalyst), this paper will offer techniques on how to cultivate care. Finally, it offers reflective remarks on how design may re-conceptualize itself to more closely embrace care and curiosity through practices and processes.

https://doi.org/10.21606/drs.2024.1124

More-than-human Design and AI: Exploring the Space between Theory and Practice

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While design is turning to more-than-human (MTH) approaches, integrating posthumanist theory into design practices remains challenging. We argue that making MTH thinking "actionable" demands moving beyond the idea that there is a gap to bridge. Instead, we propose that the space between theory and practice could offer an interesting starting point for experimentation. Exploring that liminal space, we designed two generative AI tools – Oblique and MoTH. Using ChatGPT-4, these tools create design strategies based on diverse MTH texts. Reflecting on the process of making and using these tools, we offer two contributions: First, we explain how designers can use the tools (and create their own variants) to walk through design concepts from multiple perspectives. Then, we provide a critical discussion on the opportunities and limitations of using AI for MTH design, including how to situate MTH knowledge(s) and avoid extractivist relations.

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Hybrid Ecologies of artificial intelligence: prototyping terrestrial practices through a design installation

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If AI is usually represented as an immaterial and deterritorialized agency, this paper seeks to rematerialize the development of this technology, making visible water consumption in AI model generation. Drawing on studies of post-anthropocentric design and the notion of more-than-human interdependencies, we describe Hybrid Ecologies, an installation that problematizes the relationship between AI and the more-than-human agency of water. The installation is a design exploration to overcome the dichotomy between nature and technology, evidencing how AI inhabits a hybrid ecology, made of interdependent relationships between human agencies and terrestrial ecosystems. We try to move the reflection on AI from a human-centered-design approach to a planet-centered design based on the idea of interdependence and more-than-human futures. Hybrid Ecologies is an experimental effort to open the discussion of the terrestrial condition of AI, urging design to use its capacities to generate better alliances with the more-than-human worlds we inhabit.

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Contours in Blurred Design Spaces: More-than-Human Participation of Artifacts in Design-in-Use

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Contemporary design practice requires a more-than-human orientation to deal with computational artifacts. In this paper I discuss how the participation of artifacts in design activities during use time blurs categories of design, use and artifact. I use the analytical concept of design space, informed by a framework of co-performance to highlight some contours in this blurred situation. To do so I adopt a critical design approach, and present three conceptual smart thermostats based on the concepts of framing, tinkering and scripts. This contributes to awareness and discussions of design-in-use and the role of artifacts in an increasingly automated and connected everyday. I articulate some emerging implications for design and research.

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More-Than-Human: Thinking with Care

When a tree says no: Towards a more-than-human consent notion for design

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A growing body of more-than-human approaches in design reconsider and re-articulate design's relationship to the natural world through relational frameworks. However, such endeavours do not come without difficulties and may even reproduce the very logics they seek to overcome. Despite the prolific efforts within the design community, overcoming the modern/colonial legacies of design and its anthropocentric paradigm remains a formidable challenge. Departing from the Quebracho Colorado tree as a guiding example, this paper delves into a gender and decolonial analysis of the notion of consent that underscores design's role in reproducing extractive approaches to nature. It then goes on to propose the concept of more-than-human consent as an approach for design capable of articulating sustainable, less prescriptive, and more just ways of relating to and with nature that attend to the historical and ongoing power dynamics at play within these relations.

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Gulls on the move? Synanthropic design in the Dutch Delta

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This article develops a synanthropic design approach. The Port of Rotterdam currently houses one of Europe's largest colonies of the synanthropic species of Lesser Black-

backed Gulls. The thriving of this particular colony is entangled with human interventions and economic activities in the larger Dutch Delta. We map the managerial, legal, political, and economic interrelations and dependencies that animate the human and more-than-human contact zone. By including a gull's perspective on the Dutch delta environment, this study aims to support the facilitated coexistence of humans and Lesser Black-backed Gulls in the Port of Rotterdam – now and in the future. The synanthropic design interventions and new governance model proposed in this study show how the Port of Rotterdam can be re-imagined as "Land of Gulls and Humans."

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Designing with more-than-human temporalities

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Time is a crucial element in design, and even more so when it comes to designing for sustainability. Many designers approach sustainability from a problem-solving perspective, according to which time is linear (and therefore quantifiable) and the future is predictable (and therefore designable). Designerly time appears quintessentially modern and human. A welcome antidote can be found in more-than-human design perspectives, where a multitude of actants and agencies and their appropriate temporalities are given consideration and space. In this paper we add to such approaches by suggesting two ways to engage with more-than-human temporalities: noticing and care. We illustrate how these approaches may give way to new design practices by discussing the conceptualization and construction of a music festival stage in France. We argue that such design practices integrate ecological care into the design process by attuning the designer to the different scales and rhythms of ecosystems and their more-than-human members.

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Healing our Designing: Practices of Care for Human and More-than-Human Relations

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Ongoing socio-ecological damages stem from dominant design practices rooted in modernist, capitalist ideologies that exploit nature. If we, designers, aim to contribute to healing the web of life, our practices also need healing. Seeking an alternative paradigm to problem-driven design, this article narrates my journey to embrace a paradigm of relation-caring that encompasses humans and more-than-humans. Drawing upon experiences with fellow embroiderers in Hermosillo, Mexico, I present two everyday design practices that explore women-plant relations in the desert: 1) cultivating relationships by embroidery of memories, presents, and futures with plants; and 2) infusing diálogo de saberes (wisdom dialogues) with embodied and affective encounters with plants. These practices advocate for a profound shift in design tendencies, urging designers to attend to relations as much, if not more, than our intent to make worlds.

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Generosity in More-than-human Design

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Generosity in more-than-human design suggests an openness to change in grappling with human exceptionalism and nonhuman entanglements. Yet the risks of generosity in design practice are largely unarticulated, and it is unclear how designers might practically encounter and navigate them. In response, I first position generosity within feminist theory as an open dispossession and material exchange that is pre-reflective and asymmetrical. This articulation accounts for nonhuman organisms, objects, and agencies as inseparable from what it means to be a person. I then present three design cases that situate generosity in design practice. This includes specifying the relations explored, presence of openness, risks encountered, and applied findings. From these, I discuss the deliberate centering of the human designer and how practically engaging with generosity problematizes some more-than-human relations as more more-than-human than others.

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Using a Mutualistic Design Methodology to Exhibit the Benefits of "Suboptimal" Product Design

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Human-centred design has evolved to the point where much of what is considered optimal is projected as a result of the anthropocentric design process itself. To investigate what unexpected and beneficial outcomes might be produced by intentionally equating the needs of humans and nonhumans, a "Mutualistic Design" methodology was created. This paper discusses the process and results of an exhibition guided by this method, and how it encouraged a dialogue for professionals and academics regarding more-than-human and "suboptimal" design principles. Artefacts included in the exhibition were sitting furniture, coffee tables, walls, a piece of literature, and a card game. Each item was created to help designers and non-designers explore what sacrifices and benefits could come from escaping the threshold of "optimal" human-centred design. Additionally, this paper discusses a framework for translating similar methods to other contexts, as well as Mutualistic Design's place among other related philosophies and practices.

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18 Data as Design Research: Mediating Processes, Protocols, and Precedent in Practice

Session chairs

Elizabeth Christoforetti and Andrew Witt

Editorial

Elizabeth Christoforetti and Andrew Witt

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Generative AI in Practice

Generating user personas with AI: Reflecting on its implications for design

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The aim of this research is to analyze and expose risks associated with using AI tools such as Large Language Models and Text to Image Models to create user personas, and initiate a discussion about their application in design practice. First, a model is presented comparing the traditional user research approach with an AI persona generation method. Through a case study involving the creation of personas within the context of Mexico City, a critical analysis is conducted, revealing biases. Possible causes and risks for design practice and education are discussed, as well as potential benefits. Finally, a model for scalability of AI personas and generation of design ideas is presented. The significance of these findings shows the importance for design research to question how AI tools work.

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An LLM-based Concept Generation Method for Solution-driven Bio-inspired Design

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Bio-inspired design (BID) is a design methodology that employs biological analogies for engineering design, encompassing problem-driven and solution-driven BID. Solution-driven

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BID starts with knowledge of a specific biological system for technical design. Despite the proven benefits of solution-driven BID, the gap between biological solutions and engineering problems hinders its effective application, with designers frequently encountering misaligned problem-solution pairs and facing multidisciplinary knowledge gaps in the analogical transfer process. Therefore, this research proposes a large language model (LLM)-based concept generation method, designed to automatically search for problems, transfer biological analogy, and generate solution-driven BID concepts in the form of natural language. A concept generator and two evaluators are identified and fine-tuned from the LLM. The method is evaluated by an ablation study, machine-based quantitative assessments, and human subjective evaluations. The results show our method can generate solution-driven BID concepts with high quality.

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Advancing Design With Generative AI: A Case of Automotive Design Process Transformation

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Generative AI has greatly enhanced the production of digital content and has had a significant impact on the creative activities of designers. However, generalized generative AI falls short of designers' expectations in semantic understanding and image generation, and thus been poorly used in specific design domains (e.g., automotive design). This paper aims to explore the integration of generative AI into the design process, focusing on the generation of automotive design. We deconstructed the process of automotive design through user research, extracted the needs and pain points of designers, and transformed them into fine-tuning tasks for generative models. We trained three models in different styles based on Stable Diffusion: abstract forms, digital painting, and realistic rendering, and integrated them into the design workflow for practical automotive design. Performance evaluations and user studies indicate that our auxiliary models and generative design process can produce satisfactory automotive design and enhance efficiency.

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Cultural Product Design Concept Generation with Symbolic Semantic Information Expression Using GPT

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Products imbued with traditional cultural semantic information hold significance in commerce, culture, and the dissemination of information. However, the integration of implicit cultural semantics into the design process of cultural products poses a significant challenge. Key issues include the inaccurate expression of implicit semantics and the inadequacy of semantic information retrieval and inspiration. Therefore, we adopt a data-driven

approach to achieve symbolic semantic expression in generating and inspiring design concepts for cultural products. In this paper, we utilize the generative pretrained transformer (GPT-3.5) as the base language model (PLM). By analyzing semantic information features in layers and mapping, we identify two design concept generators, fine-tuning them for the automatic retrieval and expression of semantic information. This is undertaken to generate cultural product designs in a natural language form. The method under-goes experimental evaluation, and the results demonstrate that our approach can generate cultural product design concepts containing accurate cultural information.

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Data as Design Method

Intimate Data as Design Material: Designing Tracking Practices for Menstruating Athletes

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There is a significant knowledge gap concerning the female body in sports partly due to research in sports physiology narrowly focusing on male athletes. It means hormonal changes around the menstrual cycle have been disregarded from critical considerations and recommendations about training and planning. Similarly, digital tracking technologies, which play an increasingly important role in sports, often overlook the menstrual cycle or invite athletes to reduce a situated and embodied experience into a discrete data point. In this paper, we use intimate data as material to design tracking practices for menstruating athletes. Specifically, we use the principles of Data Feminism of examining and challenging power to (1) underline current issues and practices of menstruating athletes through a large-scale survey, and (2) propose an alternative tracking solution through a participatory co-creation session with athletes and their intimate data. We reflect on the process of designing with and for intimate data.

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Exploring the role of data in designing smart products: A survey of Chinese product designers

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With rapid advancements in information technology, data has emerged as a crucial material that broadens the scope of design. Product designers urgently need to develop a comprehensive understanding of the role of data in design and how data can effectively shape and guide the creative design process. In this study, we identified different types of data in design by using bibliometric analysis and conducted semi-structured interviews using qualitative analysis with 12 experienced smart product designers, aiming to understand how product designers in various fields practically apply data in their design process. We have developed a taxonomy to leverage data in design, clarifying its impact and illuminating common challenges in data-driven decision-making throughout the design stages. This study aims to promote a shift toward a data-driven design paradigm, highlighted by a nuanced understanding of data's role in the design process.

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Revisiting the Uncanny Valley Effect: A data-driven analysis with curve fitting perspective

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The Uncanny Valley (UV) is a vital part of design research because it directly affects users' emotional responses and acceptance of anthropomorphic technical products. Traditional research relies on curve fitting to measure UV effects. However, these works often overlook the impact of data quality including scale and distribution on the accuracy and stability of fitting results. This study places a strong emphasis on the mediating role of data in UV, revisiting UV using a dataset comprising 1,000 static facial images of humanoid entities, evenly spanning the entire human likeness spectrum. The results reveal a different UV shape than Mori's original curve, especially for humanoid entities with moderate to low human likeness. Additionally, this paper explores how data quality affects UV effect curve fitting results by using sampling technologies to construct subsets. We highlight the importance of data-driven design research and provide a new perspective on avoiding and alleviating UV effects.

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Bridging the Gap: Data-Driven Design for Smart Cities

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The concept of smart cities encompasses not just technological advancement but also citizen well-being and sustainability. However, the increasing data availability often leads to a technology-centric focus, neglecting integration with citizen participation. The design could bridge this gap by facilitating data translation and accessibility. Therefore, this study aimed to test a process for co-analyzing mixed data through collaborative activities and data visualization tools, immersing participants in the impact of weather on urban mobility. The data sources included quantitative data from the transport providers, social networks, and qualitative data from a diary study. The process revealed significant potential, with participants reporting ease in analyzing substantial data volumes and finding the proposal innovative and enjoyable. Future steps may involve enhancing interactive visualizations and automating data-narrative integration for broader adaptability. The contribution of this study lies in a co-design process with data storytelling tools, for any project with a large volume of information.

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The Role of Data an Intuition in UX Design

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This paper explores the role of intuition in the adoption of data-driven approaches in design within the broad domain of user experience design. To better understand the relationship between intuition and data-driven approaches, we conducted a mixed methods study en-

tailing a qualitative exploration (n=10) of the challenges and opportunities professional designers face when working with data-driven methods, such as potential creativity constraints, knowledge gaps, tool deficiencies, collaboration difficulties, and ethical concerns. We then question whether these challenges stem from the intuitive nature of design work and the types of individuals it attracts and investigate this question using a quantitative online study (n=110). Contributions include a review of current practices in data-driven design and an analysis of how predispositions for intuition predict the use of data-driven approaches. This research could provide insights into why designers may resist data-driven methods.

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Social Dimensions of Data and Research

Conversations, Intra-views and Diffractions as Tools for Analysis: Design Research when Conducted by a Team

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Design researchers develop methods that blend design expertise and theoretical knowledge. Hence, design research emphasizes the importance of explicating intuitive knowledge and hands-on experience. Collective research that relies on more than one designer's endeavors has also been expanding. In this paper, we discuss how to make sense of data when collected by two design researchers in separate spaces, under different conditions. Our project centered on the materiality of repair and involved data collection in two contexts. One researcher facilitated repair workshops, engaging in repairs and consulting with participants, while the other conducted individual repair work. Through biweekly meetings and conversations, we scrutinized our personal experiences and insights to generate research findings. This paper introduces a duo-ethnographic research through practice approach harnessing both researchers' experiences to conduct in-depth analyses. We advocate for the use of diffracting and intra-viewing as tools to systemically study conversations and validate the subjective experiences of practitioner-researchers.

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Precedent Knowledge in Multiple Domains of Design: A Review and Analysis of Literature

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This systematic literature review study explores how precedent knowledge, as a form of design knowledge, is understood across multiple domains of design (architecture, engineering, fashion, game, graphic, HCI, human performance technology, interior, public planning,

product/industrial, production/movie/stage and general design theory). Analysis of 96 published sources was conducted, and a construct map was created to identify how authors define and discuss what precedent is, where precedent comes from, how precedent is collected and stored, when precedent is used, and how precedent works in the design process. While precedent knowledge appears to be prevalent across multiple domains of design, variation in understanding of the construct and use of language to describe it is wide. Against the initial construct map drawn from general design theory, additions were placed in the areas of sources of precedent and use of precedent.

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Precedent Knowledge: Practicing Designers' Perspectives and Experiences

Elizabeth Boling[1], Victoria Abramenka-Lachheb[2], Meize Guo[3], Merve Basdogan[4], Zixi Li[1], Hamid Nadir[5], Dilnoza Kadirova[1], Taufik Slamet[1], Grant Chartrand[1], Parama Chaudhuri[6], Yichuan Yan[1], Raj Sankaranarayanan[7], Ahmed Lachheb[2]
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This basic qualitative study informed by a hermeneutics approach presents how practicing designers across multiple domains of design define the construct of precedent knowledge, a form of design knowledge, and how they collect and use it in their design work. Interviews were conducted with 18 practicing designers across multiple domains of design, including fashion, product, graphic, game, instructional, and media design. Whether they used the specific term "precedent" or not, the study participants were able to address and discuss their precedent knowledge. They also reported multiple and varied sources of precedent, as well as multiple and varied practices in gathering and using precedent. The findings from this study verify, extend, and refine the construct map (included in this manuscript) resulting from a prior systematic literature review. Extensions to the construct map are use of precedent to assess innovation, and understanding of precedent as pre-schematized knowledge.

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Penumbra of privacy: A people-centered and place-centered approach to data privacy for smart workspaces

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Data privacy is a complex subject where current approaches primarily focus on computing-centric narratives. These approaches have proven inadequate, yet they have established the status quo for emerging technologies including IoT in workspaces, or 'smart' workspaces, disregarding the sociocultural and behavioral dimensions of privacy within spatial contexts. This paper presents two key ideas 1) advocating a theory of change that complements the computing-focused approach (the umbra), with a broader approach based on human-centered experience and values, (the penumbra); and 2) embedding this holistic privacy approach in the early stages of smart workspace innovation through a generative design process involving multidisciplinary stakeholders. The outcome of this work is the

‘Designing with Privacy’ toolkit for collaboration among architects, designers, IoT engineers, privacy professionals, and other relevant stakeholders. The toolkit offers 14 value-based privacy prompts for creating and refining a collectively agreed-upon privacy brief to guide the design and development of smart workspaces.

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Mapping the evolution of design research: a data-driven analysis of interdisciplinary trends and intellectual landscape

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Due to its interdisciplinary nature, research in design, more so than other disciplines, has to develop self-awareness to adapt to the inherent complexity of the contemporary world. This requires the use of big data as comprehensive self-descriptors, along with tools borrowed from the field of Artificial Intelligence (AI) to generate knowledge that researchers in this field can integrate with their own expertise to guide their research activities.

We consider a large-scale set of about 170000 design-related scientific publications and leverage natural language processing, machine learning, and data visualization to explore and capture the evolution of the design community. We identify and visualize recurring themes and discussions that helped shape the field. Our findings suggest that research in design is becoming increasingly interdisciplinary and interconnected and that AI-driven approaches can shed light on the future of the discipline and provide valuable insights for researchers and practitioners in the field

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How Maps Shape Information in Design Research: A Study of Five Method Collections

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Maps have a rich history in design and design research. However, to date, their use and application have not been systematically studied. This paper proposes a model that classifies maps into four main types depending on how they help designers to visualize information: arranging entities on a plane, organizing content, synthesizing content and making sense. We use the model to systematically analyze and categorize maps from five design methods collections. Out of 399 methods in these collections, we identified 65 methods that were based on mapping. We found that the primary use of maps in design is to organize content on a two-dimensional plane. Through the proposed model, the paper provides designers with a tool to choose the right methods for their specific design situation and to scaffold designers towards more complex thinking.

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19 Translational Design: Enabling Impact in Complex, Multi-Stakeholder Research Projects Through Design

Session chairs

Rowan Christopher Page and Rosie Hornbuckle

Editorial

Rowan Christopher Page, Rosie Hornbuckle, Leah Heiss, and André Nogueira

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Translational Design I

Translation as an Explicit Practice in Design Research

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Translation as a practice, has many applications and histories. In a research context, the translation of knowledge from one domain to another brings scientific knowledge and critical ideas to people and industries. Translation between different forms of knowledge can enable collaboration between research, industry, policy and society to enable systemic knowledge co-production and impact. This paper explores the ways that design is intrinsically translational, and why translation is now becoming an expanded and explicit practice in design research. As the complexity of multidisciplinary and multistakeholder collaborative research increases, the translational nature of design could play a vital role in convening knowledge and creating impact through synthesis and interpretation into tangible artefacts and interventions. This raises the question: how might design explicitly define its role as a translator in new contexts of research and practice?

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Design for social prescribing: bridging silos for health promotion

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Social prescribing (SP) refers patients to community and social services that sup-port the individual's social needs and that can bolster their overall health and well-being. SP offers

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a promising approach to addressing wide-spread mental health issues, social determinants of health, and growing social isolation. While SP is integrated into the national health systems of countries such as the United Kingdom, Canada, Australia, and Japan, it has only recently begun to take root in the United States (US). This paper presents "Design for Social Prescribing", a re-search project led by the Design Laboratory at the Harvard T.H. Chan School of Public Health that explored how the structured use of design could help expand and accelerate the SP in the US. The research was structured on advanced design models to support multi-stakeholder collaboration in three phases. This paper outlines key learnings from these phases, including their processes, approaches, and outcomes.

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Collaborative translation from and into Practice

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This paper explores how collaborative design methods can facilitate the translation of situated knowledge embodied in expert practice. We draw on a long-term collaborative research project with a major national museum in the UK aimed at catalysing sustained transformation in the practice of staff members. We describe two interdependent generative modalities of our collaborative design research intervention. Firstly, a mode of collaborative translation from staff member's existing practice into shared language, prototypes and tools. Secondly, a mode of collaborative translation into the situated practice of staff, resulting in new shared behaviours and capabilities. We describe the methods used in this work, the outputs produced and the unfolding impact on practice that resulted from these interventions. We discuss the potential of collaborative design methods to facilitate translational research that treats impact on practice as a means and measure of success.

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Tapestries of trust: using interdisciplinary design research to weave in multi-stakeholder perspectives in the public sector

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In complex contexts involving stakeholders including public sector actors and vulnerable groups, design can help in untangling disciplinary perspectives and translating research to create shared knowledge. This paper explores the role of design research in understanding trust between civil servants and migrants in Espoo. Employing a multi-method qualitative approach, we conducted semi-structured interviews, ethnographic studies and participatory workshops to investigate the diverse dimensions of trust. Through this paper, we aim to demonstrate the value of methodological diversity in translating research findings into actionable outcomes and influencing collaborative, interdisciplinary knowledge creation. We examine the suitability of the used methods in terms of 1) facilitation of interdisciplinary research, 2) participation of stakeholders, and 3) accessibility and adaptation of process and findings. By reflecting on our disciplinary configurations and their engagement with external stakeholders, we hope to reduce the gap between research and societal impact.

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Research-Through-Design and Chemistry: Reflections On A Multi-Disciplinary Workflow Process Of UV Sensing Wearables For Sun Safety

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This paper documents the design research, concept design and digital fabrication process of UV Wear - a collection of smart non-digital 3D printed accessories developed by a multi-disciplinary team of designers, materials scientists, and digital fabrication technicians. The project utilised the multi-disciplinary expertise of the team to create UV responsive accessories that embed interactive capability with aesthetically appealing and customisable designs. This was achieved through integrating diarylethene photoswitch material into the 3D printing process. Through the documentation of our multi-disciplinary Research-through-Design (RtD) workflow process, which fuses work across the chemistry lab, design studio, and design fabrication lab, the contributions of this paper are: 1) We present our multidisciplinary RtD workflow model as a case study, providing detailed descriptions of the design research phases conducted within this model; 2) We reflect on challenges that multi-disciplinary RtD projects face, and offer prompts for future translational design work.

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Shifting between boundaries: 'Contextual Examples' as boundary objects in a Jeweller - Visual Artist distributed collaboration

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Cross-disciplinary collaborations are prevalent in craft and design, during which artists draw from or apply knowledge from outside their primary field. In such creative processes, boundary objects are often present. This paper proposes 'Contextual Examples' as a new type of boundary object and traces its emergence through the analysis of data from the 'Data-Music-Jewellery' project - a distributed collaboration between a UK-based jeweller and a US-based visual artist. Through an initial review, 37 boundary objects, clustered into 8 types, were identified. This paper focuses on how 'Contextual Examples' as a novel type of boundary object seemed to support the emergence of cross-disciplinary jewellery practice. By offering a nuanced perspective on the roles of 'Contextual Examples' in this project, the paper contributes to the understanding of communication, knowledge flow, and the evolution of cross-disciplinary jewellery in collaborative settings, expanding the concept of boundary objects within design and creative practice.

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Translational Design II

Materials designers and the translational approach: a case from a product design company

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Design professionals are inherently translators due to the multi-faceted nature of the design process that often encompasses considerations of technologies, manufacturing, materials, etc. In investigating the emerging practice of 'materials designers', it has been found that they must develop strong 'translational design skills' to address a material-driven design process when collaborations with diverse stakeholders exist. Especially to create new materials and products or to obtain exclusive material features and experiences. Through a real-life case study on developing a circularity-oriented material from waste, this paper articulates translational design practice in materials design, highlighting its relevance in the design process. The study was unfolded through observations and participation in a product design company and by interviewing the design manager within the project. Based on the results, translational design skills in materials design practice are emphasized, and translational design recommendations are proposed for accelerating the successful materials design process in complex collaborations.

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Harnessing information visualization as a vehicle for translational design

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Designers are often positioned as mediators or interpreters, working between disciplines and stakeholders to frame and address problems. This quality is particularly desired when a product transitions from one implementation to another. Translational designers assist this process through critical activities such as navigating differing domain knowledge and balancing conflicting values or cultures between stakeholders. We argue the primary outcome of translational design is not necessarily an artifact but the translation of knowledge across disciplines for decision-making. Our research explains and shows how information visualization can translate meaning within a group of experts familiar with the same topic and between a group of experts with differing expertise. In collaboration with Intesa Sanpaolo SpA - Innovation & Process team, we present Processes Map, an interactive information visualization that assists users with better understanding the distribution of activities and associated risks across an organization to contribute to the developing literature on ‘translational design practices.’

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Toward mutual understanding: Constructing the designer-developer collaboration in designing gesture interaction

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In design-driven research and development projects, one of the biggest challenges is to make the different roles speak the same language. In this paper, along with a real project concerning the UX enhancement of smartphone touch-based gestures, we found designers and developers possessed their familiar skills and tools, but lacked understanding of each other's work, especially when designers encountered developers' work. Therefore, we propose the 5Fs model, elucidating how touch-based gesture interaction is constructed through different roles' involvement. The 5Fs layer was identified, relating work content to

UX, including Hardware Feature, Coding Frame, Function Matching, Visual Feedforward, and Modal Feedback. The evaluation interviews showed the model could foster mutual understanding, by helping to build framework perceptions and clarify responsibilities and workflows, also indicating the potential to develop a practical translation approach to support collaboration.

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Three Challenges in Practising Research Through Design in the Context of PhD Design Research

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Research through Design (RtD) is a maturing research methodology in Design and Human-Computer Interaction (HCI), in which design actions are used as a means to conduct research. This way of doing research holds promise for creating transdisciplinary results but it comes with challenges. Research and design are similar in that both aim to create something new. However, depending on a project's context, there may be different expectations about what that something new is, spanning from generalized knowledge to localized solutions. In this paper we discuss two PhD projects in the healthcare sector and reflect on three challenges encountered by the PhD researchers: (1) navigating the dual aim of designing interventions and generating academic knowledge, (2) balancing the creation of prototypes as products for use and objects of inquiry, and (3) effectively collaborating with stakeholders in complex and sensitive settings.

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Shaping Public Sector Digital Transformation through Design. Translation approaches on training programs as multi-stakeholder ecosystems

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In the evolving landscape of public sector digital transformation, the integration of design thinking and stakeholder engagement presents a pressing challenge and a valuable opportunity. As a response to this challenge, there is a growing interest in the implementation of training programs within the theoretical framework of translational practices. This study adopts an organisational lens and an analytical framework to look into three instances of design translation in multi-stakeholder ecosystems. Drawing insights from a three-year exploration, it examines the dynamics within two ecosystems: the multidisciplinary and multi-operational partners responsible for designing and executing the training program, and the program participants. By investigating these instances, this study sheds light on favourable or hindering circumstances in the transition of design to the public sector digital transformation within collaborative, multi-stakeholder environments.

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Webbing Clothes Moths from pest to opportunity: a reflective case study in interdisciplinary design-biology collaborations

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Abstract: This manuscript presents the first set of insights from the reflection on a case study which involved early-stage design-biology interactions in a collaboration between two PhD candidates - a designer and a biochemist - investigating the potential of the Webbing Clothes Moth enzymes to support novel approaches for the deconstruction of wool in the context of bio-based processing for the circular economy. From the interview and reflective practice on the collaboration a novel concept emerged, common sedimented ways of knowing, which we define as shared approaches that have been acquired independently through previous experiences during the lifetime of an individual. This concept enabled proximity between the two collaborators, here taking the form of visualisations to support the dialogue on complex discipline-specific content and its delivery to a public audience.This paper demonstrates that a translational dimension can emerge in early stage design-biology collaborations despite the infancy of the PhD candidates research.

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20 Designing Resilient Food Futures: Food Commons, Transitions, and Sovereignty

Session chairs

Chun Zheng and Silvani Juri

Editorial

Chun Zheng and Francis Carter

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Food Cultures and Transitions

Food choices: What is on our plates?

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This study investigates the pivotal role of professional chefs as food designers, emphasizing informed decision-making, community engagement, and strategic partnerships in pursuing regenerative practices within food systems. Through participant observation in southeast Brazilian food service venues, we examine chefs' views and actions regarding the socio-political-environmental ramifications of their choices, including labor practices and ingredient sourcing. Businesses were selected based on their commitment to sustainable or regenerative ideals. Findings underscore the chefs' influence in thoughtfully selecting ingredients, suppliers, and labor, impacting territory health, community well-being, cultural preservation, and economic prosperity. This research contributes with practical insights for building a more equitable and sustainable food system in Brazil based on systemic design principles, global food systems trends, and local experiences.

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MealSense: A Fiction About Datafication and Algorithms in Commoning Food

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Commoning is on the rise as a socio-economic practice advancing the outlook of more just food systems. While smaller commoning operations can predominantly rely on informal

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arrangements, tracking and monitoring the conditions of the use of resources becomes vital for larger operations. This paper explores the datafication of hunger, pleasure, ingredients, cooking and spoiled food for crafting imaginaries of commoning-based algorithmic food futures. To address not only frictions around datafication but also gainful proposals, the paper mobilizes concepts of 'unwieldy data', 'good enough data', and 'minimal feasible datafication'. It uses fiction writing as a method to amalgamate scholarly references in the field of citizen sensing and smart city critique with preliminary learnings from a speculative city-making project into an infrastructural proposal. The text aims to prompt a wider debate about the potentials and pitfalls of algorithmic governance and datafication in infrastructures for the urban-scale distribution of material resources, such as food.

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Enhancing traditional food experience: A Food Ritual Design Framework

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Cultural globalisation threatens some traditional foods, as foreign food cultures can make local foods less popular. While food-related rituals play a crucial role in enhancing cultural identity and the overall experience of traditional food, there remains limited research on the successful design of these rituals. This study aims to propose a Food Ritual Design Framework that inspires the design of traditional food. The framework was applied in a case study on Sugar Painting, and its applicability and effectiveness were evaluated through a questionnaire survey (n = 133). The survey revealed the successful integration of 47 diverse traditional foods into the framework. Design researchers and practitioners rated the framework highly, giving it an average score of 4.02. This framework provides valuable guidance for designing traditional foods, enabling them to align with their inherent rituals and adapt to the dynamic landscape of future food systems.

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Community empowerment and identity assimilation: Social innovation design practice through food resources

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Food possesses inherent cultural attributes and serves as a natural medium of connection. This paper introduces a design project for social innovation using food resources: "From Tree to Table" (FTTT). The project is the product of a social innovation course at an art school and lasted for three months. The focus of the project is on the relationship between soft food sovereignty and community transformative change. The Peach Lake Community (PLC) is rich in ecological resources, and a government-level change resulted in differentiation within the community between indigenous residents and recent migrants. FTTT explores the possibility of using the seasonal food, sour jujubes, from the PLC for social innovation. The study found that food, as a medium, can facilitate community transformative change in the non-violent assimilation guided by soft food sovereignty. We propose an implementation model for food co-creation workshops in community educational spaces (5W1H+OE).

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Innovative Food Systems: Networks and Partnerships

Urban and peri-urban food systems: exploring proximity and care in alternative food networks

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Basing on the European and Milanese context, the paper develops and presents a preliminary reflection on urban food systems, specifically related to local Alternative Food Networks (ANFs) and how their relational and geographical proximity, that might facilitate or prevent forms of care through collaboration. The authors introduce the Food System Matrix that analyses 16 case studies to investigate the main issues connected to the territorial scope and the purpose of the selected cases. Finally, the paper proposes the concepts of 'proximity' and 'care' as a framework for understanding systemic and sustainable change in food-related services, emphasizing relationships, inclusiveness, and resilience. This work lays the foundation for future investigations into AFNs for sustainable food systems, highlighting the role of design and collaboration in promoting positive social impact.

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Accessible Food Networks: case studies' insights for impacting systemic and socio-cultural transformations of university campuses as urban players.

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In recent decades, there has been a growing momentum in adopting public and private food procurement initiatives as policy instruments to improve the quality and affordability of the food provided in public and private sectors to reach so-cial and environmental sustainability. This includes logistics, service innovation and multi-stakeholder involvement in designing solutions. This paper examines the influence of food systems on facilitating future systemic transition in urban neighbourhoods and peri-urban areas. It does so by analysing case studies and building upon the objectives of an ongoing national research project that will test alternative food networks on university campuses. The article examines al-ternative systems that can serve as catalysts for communities by establishing in-terconnected service-provider sites. Cases have been examined through design lenses, including design for social innovation and spatial and service design.

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Infrastructuring Sustainable Food Futures: A Case Study In Collaborative Innovation For Circular Seafood

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Transitioning to a circular economy requires transforming practices across the Ready-to-cook product value chains through shared knowledge. However, generalised solutions rarely succeed, but must be tailored to each context. This study explores using participatory design-informed "infrastructuring" to collaboratively develop novel methods tailored

to stakeholders' existing practices. The Seafood AGE project serves as a case study. We developed two remote, distributed facilitation methods using accessible digital platforms. These engage stakeholders in mapping current practices, analysing responses to speculative fish products, and exploring feasibility of prototypical circular approaches. Key findings demonstrate the potential of co-creative infrastructuring to bridge design research and industry. This enables customised transitions aligned with diverse real-world con-texts. This has implications for design researchers seeking to employ participatory methods that enable stakeholders to co-create context-specific knowledge food systems and futures aligned with circular principles.

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Situated partnerships to face food waste within a neighborhood-based food redistribution Service: the case of "SOSpesa"

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Neighborhoods can be seen as experimental hubs where innovative design strat-egies are tested within local communities, addressing the social and environ-mental issues that impact global cities and promoting more equitable futures. In current times of crisis, amid substantial food waste, urban areas are witnessing a growing phenomenon of vulnerable groups suffering from food poverty, often coupled with limited access to fresh food. This scenario has led to a proliferation of diverse charitable initiatives, concurrently fueling researchers' exploration of sustainable food commons and circular systems. However, to foster community-driven development of such models, it becomes imperative to structure services around local, proactive, and situated stakeholder networks. This paper delves into the core insights concerning inventive design solutions to establish situated partnerships with the double aim of fighting food waste and supporting a neigh-borhood-centric circular food redistribution service for vulnerable residents, en-acted by Off Campus Nolo (Polimi DESIS Lab) within Nolo neighborhood in Milan, Italy.

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21 Designing (for) Transitions and Transformations: Imagination, Climate Futures, and Everyday Lives

Session chairs

Marysol Ortega Pallanez, İdil Gaziulusoy, Joanna Boehnert, and Femke Coops

Editorial

Femke Coops, Dan Lockton, İdil Gaziulusoy, Cameron Tonkinwise, Joanna Boehnert, Marysol Ortega Pallanez, Anja Overdiek, Ida Nilstad Pettersen, Alma Leora Leora Culén, and Silvana Juri

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Futuring in Transitions

What Kind of Futuring Is Transition-Oriented Futuring? Conceptualising And Expanding Notions of Futuring in Transition Design

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Transition design employs futuring to navigate change towards more sustainable and just futures. Although the development of transition design has been informed by futures studies, it could benefit from more detailed investigation of its futuring practices in relation to established concepts and approaches. A further exploration of, and integration with, futures studies offers opportunities to develop more conceptual and practical guidance. This paper aligns transition-oriented futuring with Slaughter's levels of futures work (1996b, 2002), and Amara's (1981) and Björeson et al.'s (2006) scenario typology to better understand what kind of futuring transition design engages in. An expanded applied approach is proposed to support a more rigorous and comprehensive practice to transition-oriented futuring by learning from established knowledge in its neighbouring field.

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Experiential futures through immersive design fiction

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A key political challenge of addressing climate change has been that, despite its deep involvement with so many aspects of our society, its threat can at times feel abstracted from our daily lives— a gap futurists lament as the “experiential gulf” between our ability to imagine the future and our capacity to experience it. Immersive Design Fiction Experiences (IDFEs) use virtual reality as a way of bridging this experiential gulf by positioning participants as embodied subjects within a virtual storyworld. With IDFEs designers can explore a rich palette of experiential phenomena—such as speculative social rituals, embodied interactions with objects, and explorations of environments. Drawing from a range of pedagogical examples teaching IDFEs in the design classroom, the paper argues that IDFEs enable participants and creators alike to activate their imagination with and through body, unlocking new kinds of inferential activity and new pathways for critically unpacking social implications.

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Rethinking design: Prototyping sustainable futures in everyday life

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To support sustainability transitions, several different design approaches are required. In a series of Designerly Living Labs, we have prototyped possible sustainable futures in the context of people’s everyday lives to explore the complexities of lifestyle changes and socio-technical system shifts. Together with us-ers engaged as reflexive co-researchers, we have explored potential new practices and uncovered system-level tensions and deficiencies. System changes have been initiated by engaging relevant actors in learning processes and by bridging learning to decision-makers. However, the approach requires some rethinking of design as a practice. Instead of supporting people’s current needs and lifestyles, we design for sustainable futures that users do not yet request. This emerging design practice challenges traditional co-design and user participation methods, leading to new ethical considerations.

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Reimagining sustainable mobility Futures: exploring design imaginariums for city-wide challenges

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This exploratory paper presents an approach known as 'Design Imaginariums,' pop-up spaces based on speculative design principles and community driven creative problem-solving to address systemic city-wide challenges. Drawing inspiration and insights from a one-day design sprint and a real-world prototype that focused on mobility urban futures, these pop-up spaces serve as platforms to actively involve citizens in the design process, prompting responsive ideas and recommendations from city stakeholders. The paper begins by discussing the background and motivations to initiate the research, elaborating on the City of Dundee’s aspirations for creating ecologically vibrant and socially inclusive urban spaces. It then outlines the research protocol and explores how Design Imaginariums can harness speculative thinking and community engagement to reimagine sustainable mobility. Finally, it discusses the capacity of imaginative scenarios to inform and influence

policymaking and transformative change, emphasizing how Design Imaginariums might have something useful to offer the wider design re-search community.

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Preferable, Contextual and Sustainable... Climate Futures for Ecological Citizens.

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The responsibility for sustainable futures extends beyond individual disciplines, necessitating the adoption of diverse approaches across various fields. Water pollution is at epidemic levels, valuable materials go to landfill, ocean detritus grows, many people are disconnected from green space, and biodiversity is plummeting. We need new modes of climate futures, championing citizen agency. Societies require cross-collaborative, inclusive approaches to navigate climate future challenges. We seek to foresee 'climate futures' that signpost challenges, unpicking (appropriate) opportunities, benefits, and pitfalls. Through an Ecological Citizenship lens, the authors traverse situations, through preferable futures. It is an entry point for transition design, creating climate tangibility surrounding our everyday lives. The article unpicks and communicates 'preferable futures', conceptualising how Ecological Citizenship could be deployed. We report on workshops which yielded insights from different organisational perspectives. Insights were illustrated for public audiences. Narratives navigate ecologically engaged forms of citizenship.

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Ecologies and Regeneration in Transitions

Designing Temporal Ecologies: Reframing Multispecies Temporalities Through Design

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In Western industrialised societies, the times of humans and of other species are often considered as belonging to different realms. While human life is regarded as progressive and accelerated, other species are seen as following cyclical, slow changing timescales. These narratives neglect the multiple interconnections between human and other-than-human times and contribute to increasing temporal mismatches across species, with consequences for environmental and biodiversity loss. In this paper, we use design examples generated through an interdisciplinary workshop to discuss opportunities for design to expand notions of time in more-than-human ecologies. Drawing from the Temporal Design framework and the notion of Designing for Temporal Cohabitation, we discuss how these examples incorporate a call for designers to a) draw attention to multiple ways human and other-than-human temporalities are intrinsically connected, b) expose temporal power asymmetries across ecologies, and c) design interventions that foster care-full ways of reducing impact and promoting temporal reattunements.

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Enabling Regenerative Transitions: What Can Design Offer?

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Transition design first emerged as a provocation to designers to apply design theory and practice to enable societal transitions, including transitions toward sustainability. This raises questions around the roles that transition design can play in sustainability transitions and the specific capabilities that designers can draw on. This paper seeks to answer these questions via a transition design case study project in agricultural sustainability. Specifically, the project focuses on the growing interest in regenerative agriculture in New South Wales, Australia from 2017 through 2023. Within the case study, the researcher as designer-practitioner works as a change agent, taking part in collaborative initiatives. Through semi-structured interviews, ethnographic immersion and involvement in multiple working groups, the researcher-designer-practitioner tests design-based practices, identifies acupuncture points across the agriculture sector, and co-develops initiatives to address these. This research into practice yields a set of capabilities and methods, as well as key roles for design in transitions.

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Framing Transitions: Scenarios and Design for the Strategic Redirection of Companies within Planetary Boundaries

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This paper provides experience feedback from a French consortium gathering academic and industrial partners, to produce quantified scenarios for 2060 that will serve to redirect companies within the frame of planetary boundaries. This setup constitutes a field for action research in design, together with strategic foresight, sustainability, and human and social sciences. Our paper presents the epistemological and methodological choices made, reports on the first year of the project (qualitative scenario-building), and the issues met. We propose in particular to discuss the tension between global societal evolutions driven by macro trends, and the situated processes of transformation initiated by the participants. Discrepancy between those scales challenge our cross-disciplinary reading grids, but also the role of design for systemic change in our approach. This paper analyzes the challenges met, and the initiatives taken to bridge design, engineering, and strategic foresight approaches.

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Design Terroir: An Eco-social, Relational, Bioregional Approach to Design

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Design practices grounded in the modernist yearning for universalism have often been oblivious to forms of local knowledge, and the situated webs of relations, among humans

and with other species, they emerge from. In response to the destructive effects of this inattention, growing research has established that ecology and society must be considered together to ensure fair and resilient development. Here, we develop the concept of 'design terroir' to describe existing forms of eco-social design and help designers theorise and realise work that contributes to a relational bioregionalist approach. To inform this description, we extend considerations within the food domain to design, including relation to territory, craft knowledge, multisensory aesthetics, and multispecies relationships. Drawing on examples, we review common epistemological qualities between vernacular architecture and food terroirs. We then illustrate how design terroir can inform contemporary design practice and conclude with considerations of how the concept can be used.

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SeaWeaver: Integrating Cultural Craft and Materials Innovation for Artificial Reef Conservation Strategies

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Coastal reef environments foster biodiversity through their complex topographies, which offer substrate and diverse habitats across trophic levels. While artificial reefs can mimic these functions and results, implementation barriers have historically limited their ability to address coastal habitat loss at scale. This research presents a novel method for artificial reef construction that combines hand craft weaving practices with artificial reef construction innovations. The design framework, dubbed "SeaWeaver," meets the ecological criteria for reef topography through complex geometries inherent to woven forms while retaining the cost-efficiency, material simplicity and parametric variability of weaving crafts. The integration of simple electrochemical processes presents a variety of corrosion resistance strategies for long-term structural durability. Three years of successful pilot testing underscore the promise of this approach in overcoming historical conservation barriers and fostering positive transformation in coastal ecosystems through a low-barrier and accessible design framework.

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Developing a Methodological Framework for Sustainability Transitions in the Built Environment

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Transitions towards sustainability involving technological, social, behavioural, institutional, and organisational change are urgently needed to address the complex environmental and societal challenges. While the built environment has a considerable environmental and social impact, design scope for sustainable architecture has been primarily limited to reducing the environmental impacts of individual buildings. To achieve net-positive natural and social outcomes for the built environment there is a need for more systemic approaches and design methodology that allows to reframe the task of design from solving isolated problems to contributing to system transformation. The article reviews transformational, systems-oriented process models and associated tools developed in the fields of regenerative design, systemic design and sustainability transitions, with the aim to de-

fine a methodological framework for sustainability transitions relevant for the built environment. A case study from a practice-led research is used to illustrate and discuss how such a process could be integrated in architectural practice.

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Perspectives and Pedagogies in Transitions

Transforming Design Museums for Redesigning Design

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There is a need for spaces that can support reflecting on and reimagining design, and redirecting it toward sustainment and justice. Such spaces would necessarily operate with the understanding that design is ontological and has political consequences. We might think of such spaces as metabolic design museums. In this paper, we imagine how metabolic museums might help to redesign design through keeping process at their heart and critically unpacking design's involvement in urgencies as well as possibilities to envision and move towards more just futures. To do this, we build on intersectional feminist analysis of existing design museums through museum visits and participatory workshops, as well as inspiration from activist spaces; and we speculate about how feminist tactics applied by para-museums could catalyze transformational processes. If those processes were successful, a design museum would then enter into a state of continuous metabolization and become able to contribute to transforming design.

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Design Principles For Co-creating Feminist Imaginaries

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This paper advocates for the potential of feminist participatory practices to create conditions for inclusive and equitable futures. It addresses the need to design for transformative feminist futures and challenges normative innovation spaces. The authors reflect on their experiences organising two feminist hackathons, emphasising intersectionality, equity, and collaboration. They present 11 design principles that guided their efforts, highlighting the importance of centring local grassroots organisations. The paper discusses the potential of these design principles as tools for community engagement, nurturing collective imagination, and normalising feminist practices in collaborative spaces. It emphasises the importance of moving from embodied knowledge to embodying knowledge and integrating values and experiences into the infrastructure of innovation events. The authors acknowledge the challenges in operationalising principles, such as valuing labour and expertise, and raise questions about commitment and responsibility in inclusive, feminist events. This work contributes to the discourse on designing conditions for co-creating feminist imaginaries.

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Transitioning to a Circular Economy: a Gender- Sensitive Exploration of Circular Consumption in Denmark and Southern Sweden

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The dominant model of a resource-intensive linear economy has resulted in excessive production and consumption, leading to the depletion of natural resources and significant waste generation. Transitioning to a circular economy (CE) is crucial for achieving more sustainable production-consumption systems. However, the CE discourses have been dominated by technological and manufacturing solutions, with relatively less attention to developing circular consumption practices and establishing pathways for everyday participation. This article presents the findings of a Master's thesis that explored the gendered aspects of circular consumption and its challenges for individuals in Denmark and Southern Sweden. The research shows that a gender-sensitive approach is necessary to address these challenges. However, designer practitioners encounter systemic barriers to integrating gender sensitivity in design processes and teams, including lacking involvement in user research, insufficient funding for gender-sensitive participant recruitment, or feeling intimidated to discuss gender in front of other team members and decision-makers.

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Reimagining the Printing Press as a Collaborative Public Pedagogy and a Site for Nurturing a Creative Community's Potential for Transition

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In this article we examine Commoners Press, an experimental letterpress in Australia, from the perspectives of public pedagogy, transition design, and pluriversalism. Since 2017 the press has re-activated its anachronistic 70–100-year-old letterpress machines, bringing them back into play in the community through participatory workshops. Participants collaborate while producing visual images and set type that respond to their current community with articulations of 'everyday life' as fundamental precursors to sustainable transition (Irwin et al., 2015). This work brings participants together in a collaborative, materially augmented conversation, and collective imagining of possible futures, all different, all together (Escobar, 2017). Positioned as 'public pedagogy' (Charman & Dixon, 2021), it utilises 'warm data' (Bateson, 2017) to facilitate 'interpretive communities' (Santos, 2017) through 'counterfactual actions' (Forlano & Halpern, 2023). The discussion explores how projects like this might allow us to understand what it means to design for 'human scale' in the age of the Anthropocene.

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Design and Transdisciplinary Learning in Community-University Collaborations for a Just Transition: The Case of the Action Learning Course in Valencia, Spain

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The Action Learning (AL) master course at the Universitat Politècnica de València endorses during 3 months the collaboration of the students and professors with community leaders from the vulnerable district of Orriols. By combining the diverse backgrounds of the students and the community leaders, it fosters a deeper and collaborative understanding of complex societal issues of the district. Through systems thinking and design thinking tools, they diagnose the context, envision a desired future, and take action to realize it in a transformative and creative way. It creates a bidirectional learning environment, engaging with real-world challenges and breaking down barriers between the university and the local community. This transformative learning experience is underpinned by a commitment to just transitions, emphasizing procedural, recognition, and epistemic justice. By embracing these principles, the course empowers participants to contribute to positive change in their communities and fosters a more inclusive, sustainable city and university.

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Systems and Services in Transitions

Prospective design: A structuralist design aesthetic founded on relational qualities

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Prospective design is a research program founded on critical dialogues between Global South and Global North philosophies of design. Prospective design expands the current work on designing sociotechnical transitions by including the contradiction between “forces of nature” and “human forces” as a structural feature of Western society, which generates patriarchal and feminist worldviews, colonies and metropolises, and capitalist and socialist economic systems. In prospective design, contradictions are sensed, expressed, and worked out through a structuralist design aesthetic founded on the concept of existential structures, i.e. an accumulated set of relationships needed to reproduce human life. Instead of changing them directly, this design aesthetic guides designers to prospect thriving relationships in their metastructures and infrastructures through a poetics of resensitization that reunites our bodies and minds.

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Systemic Design Reasoning for Societal Transitions

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One of the emergent approaches towards designing (for) transitions and transformations is the application of systemic design: the integration of systems theories and practice with design theories and practices. Within this field we identified two dominant perspectives and associate practices: using systemic visualisations as a sense-making tool of complex

challenges, and ‘designing from within’ by means of collective designing by system stakeholders. In this paper we introduce a third perspective and practice that we call ‘systemic design reasoning’. This perspective combines the abductive reasoning logic of design with various systems theories and practices to develop ‘systemic design rationales’. We developed six systemic design principles to support this reasoning practice. Each principle is based on a specific systems theory and practice. We illustrate the principles with examples of their application in research and in education. We conclude with a research agenda to further the practice of systemic design reasoning.

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From Crisis to Transformation: The Role of Creative Practices in Organisational Transitions

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Organizational transitions can evoke a range of reactions and emotions among employees, departments, stakeholders, and leaders. To effectively manage the transition, it is crucial to comprehend how organizations experience and design change to navigate the various challenges of the transition process. This study investigates how changes in the working environment of the catering staff of a convention centre in the Netherlands led to the formation of a close-knit community that not only embraced the change but also developed innovative approaches for addressing local and social challenges. We draw on interviews with 16 individuals from the organization and use social practice theory to show the interconnected elements of practices that collectively constitute a creative approach to change. The study reveals that leadership and support are crucial competencies for promoting the participation and engagement needed to turn a crisis into an opportunity for both the organization and its stakeholders.

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Rethinking 'Terms of Service' through programmatic time travel

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The contexts of design are constantly changing, sometimes to the extent that once a ‘good’ designerly response to an issue, over time becomes increasingly problematic. Therefore, there is often a need to rethink design and its concepts. Programmatic design research may provide an exploratory space for inquiry through specific examples in relation to certain theoretical and conceptual framings. In this paper, we explore [dis/re]orientations towards design histories for creating alternative programmatic research spaces. We work through an everyday challenge, ‘Terms of Service’ (ToS), a regulatory mechanism amplifying power asymmetries in relating to data-intensive things. Disorienting design by making an odd association between today’s ToS and the ‘ornament’ in early industrial design, we explore resulting reorientations to rethink designing in this domain. Finally, we outline how [dis/re]orientations could be considered a speculative method for making a kind of ‘Programmatic Time Travel’, using reflections of pasts to reimagine designing for just futures.

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Universities Undergoing Climate Transition: Developing MLP tools from a context- specific and critical standpoint

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Knowledge gaps persist in the emerging field ‘Design for Transitions’ (DfT). Our research builds on the ‘multi-level perspective’ (MLP), a core concept in DfT and the wider Transition Studies field, and we address critiques of the MLP in terms of social practices, agency and power. Grounded in a ‘Research through Design’ approach and learning from our prior work, we have carefully adapted and designed MLP tools. We elucidate design considerations for MLP tools from within our 'live' climate transition of a UK university – research conducted within a university about the university. Contributing to DfT, we present six ‘design criteria’ for MLP tools, which are critically discussed in terms of context-specificity and general MLP critiques. Towards advancing DfT, this paper addresses the question: What are some key design considerations in adapting the MLP in ways that are theoretically-grounded and widely applicable yet responsive to a particular context?

https://doi.org/10.21606/drs.2024.1119

22 Design for Manufacturing: Rehumanising Digital Manufacturing

Session chairs

Mersha Aftab, Rebecca Grant, and Mey Goh

Editorial

Mersha Aftab, Rebecca Grant, Mey Goh, and Iryna Yesseyeva

https://doi.org/10.21606/drs.2024.136

Design for Manufacturing: Rehumanising Digital Manufacturing

Developing factors of trust for the design of trustworthy Human - Product interactions

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Trust is fundamental in our acceptance and decision-making of that which we surround ourselves with. This paper reviews existing frameworks and discourse around types of trust and identifies key factors for trust formation, maintenance and ongoing use. It establishes a need for a framework focusing on the design of trustworthy objects, especially those that are technology-embedded. It identifies a series of factors and recommendations when designing for trust. Stemming from a creative practice-based PhD from Aotearoa, New Zealand, the project seeks to design a product for the horticultural industry that enables more efficient data collection around fruit size. When yield correlates with financial outcomes, growers distrust data from the packhouse not matching estimations. Using digital technologies generates richer datasets safely and efficiently, allowing for a greater understanding of the state of the orchard at a given time. The factors found have relevance and application across a broad range of industries.

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Frame journey: A complementary approach at understanding well-being in factory environments for labor workers

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With a diversifying workforce well-being is an increasingly important topic to be addressed in manufacturing. Whereas mental well-being has been well studied in the HCI community for knowledge workers, well-being for factory workers has been mainly assessed in terms of ergonomics and task optimization. Concerns are about safety and accident prevention, but not about the tacit experience of the workers themselves. In this paper, we analyze an assembly line from two viewpoints: the HCI/Design, and the industrial engineering. We show the differences and commonalities in methods and identify both sides limitations. We present four themes of well-being which emerge from the combined understanding of both sides and identify the gains of a combined approach. This paper presents a first step towards a human-centered understanding of well-being in factory environments and towards design opportunities for digital interactive support systems.

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Design for Manufacturing: Learning Processes of a New Product Development Design Team

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This research examines how a New Product Development (NPD) design team incorporated multidisciplinary knowledge to redesign a modular cab. Design teams that implement digital innovation often use cutting edge techniques, such artificial intelligence and big data, to inform their design decisions. However, these techniques are often managed by other teams with different knowledge backgrounds. Therefore, optimising learning processes between multidisciplinary teams is crucial to design new products effectively. This research reviews existing team learning processes, then conducted a case study to examine how a NPD design team learn from an interaction team to integrate knowledge into their design process. Aside from the information processes established in the literature review, we found that design teams working in interdisciplinary projects also translated and contextualised their information to ensure knowledge accuracy.

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Extremes: On How the Study of Appropriation Might Inform Inclusive Workplace Design in Manufacturing

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Disabled people, from younger to older adults, are at comparative disadvantage regarding work. Design for inclusion at work tends to focus on individual adaptations (often stigmatising) or general accessibility guidelines (often insufficient). Furthermore, there is a tendency to focus on inability rather than on extreme abilities, which seem to be the ones enabling workers to appropriate existing products and create their own designs. Therefore, design research requires more input from diverse workers as users to inform the design inclusive industrial workstations. Departing from theory and ending with analyses of workers'

designs, this paper argues that the articulation of the concept of ‘extremes’, as used in inclusive design theory, with the study of appropriation in industrial shopfloors can be a source of information, inquiry and inspiration for new design research towards worker inclusion.

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Proposing a tangible interaction framework for the design of industrial robot teaching systems: Enhancing user efficiency in learning operations

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In the industrial robotics field, mastering the operation of traditional industrial robot teaching systems requires operators to undergo intricate training, hindering production efficiency. To address this challenge, we proposed an interaction design framework for industrial robot teaching systems based on tangible interaction theory. This study outlined how our proposed framework, anchored in tangible interaction paradigms, provided architectural direction for the design of these teaching systems, markedly enhancing operators' efficiency in learning operations. We utilized this framework to direct the interaction design of a welding robot teaching system and validated the framework's feasibility through experimentation. Experimental results revealed a notable enhancement in operator learning efficiency with the implementation of the new system compared to the traditional teaching system. This study provides theoretical and practical evidence for the reduction of operational complexity in industrial robot teaching systems, enhancement of production efficiency, and optimization of the working experience for operators.

https://doi.org/10.21606/drs.2024.823

Design for Manufacturing: Rehumanising Digital Manufacturing

Flatfold3D: 3D printing structures on fabric to facilitate folding of pattern into wearable shoes.

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This research paper introduces the FlatFold approach, a novel method for local footwear production that leverages Additive Manufacturing and 3D pattern design. The proposed approach presents a new method that simplifies the footwear production process from around fourteen into five steps, applying Additive Manufacturing to enhance efficiency and minimise waste. The approach also explores the use of printed patterns on fabrics, facilitating and guiding manual folding of planar patterns into shoes and allowing for detailed and customizable designs. Furthermore, the research explores different filament attachment techniques to ensure reliable integration with textiles, promoting the creation of complex shapes in footwear manufacturing. The proposed approach is validated through consultations with industry experts, highlighting its potential impact on the footwear industry. Overall, the FlatFold3D approach presents an solution for localised and efficient footwear production, with advancements in customisation.

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Strategy Design of AI-generated Customization for Streetwear Fashion Brands Based on the Big Five Personality Test

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This research aims to revolutionize streetwear fashion brands' customization services by incorporating the Big Five personality psychology test and AI-generated content (AIGC) technology. Focus group discussions with professionals and designers explored integrating AIGC technology into customization services. An analysis of 200 questionnaires examined consumers' preferences for visual styles and image types in customized streetwear fashion brands. An experimental test matched AI-generated elements with personality dimensions, leading to personalized AI image-generation rules. This research identifies personalized needs and favored design elements, develops rules for data visualization, and offers insights into utilizing AI technology for data visualization. It presents a fresh approach to the future of customization services in streetwear fashion brands, combining AI technology with innovative psychological experiments. The study contributes to understanding the demand for customization services in the streetwear fashion industry, involving consumers and industry professionals.

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Narrative Design Framework for Intelligent Cabin Development: Enhancing User-Centric Interaction in the Digital Manufacturing Era

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In the digital manufacturing era of the automotive industry, high-level intelligent cabins are leading the shift towards software-defined cabins, driven by rapid advancements in in-cabin hardware. For the product development process of the future intelligent cabin, there is a lack of a humanized cabin design framework to help designers clarify user motivation and interaction process for design and development. This paper introduces an intelligent cabin narrative design framework and a tool named Spatio-Temporal Canvas , which provides guiding ideas for the design of Intelligent Cabins. The framework and the Spatio-Temporal Canvas are applied to a case study, providing a detailed illustration of the narrative process within intelligent cabin scenes. The paper concludes by discussing the current outcomes for this research, case study shows that intelligent cabin narrative design framework and the Spatio-Temporal Canvas can help designers gain insights into user behavior for interaction design activities.

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A Review of the Integration of Additive Manufacturing in Design Education

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The modern world of design is one of constant change and technological progress. One emerging technology that has the potential to revolutionize the design is additive manufacturing. This innovative technology challenges existing manufacturing processes to reflect and enable the efficient production of complex and customized objects through reimagination. Design education for additive manufacturing plays a crucial role in educating future designers to resist the adherence to conventional processes and to promote the recovery of innovative thinking. Therefore, it is significant to explore the integration of this emerging technology in academic education and identify the associated chances and challenges to ensure effective knowledge transfer to students. This paper explores how the integration of additive manufacturing into design education is being implemented in the fields of design and architecture worldwide. Thus, the courses offered in academic curricula in universities and by libraries are analyzed and the expected benefits are determined.

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Proximity-based urban planning models as the inter-face between governments and makers, designers, and citizens towards distributed economies

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Standard urban planning models are nowadays being redefined with a renewed focus on reducing mobility times: proximity, walkability, self-sufficiency. Recon-figuring how cities, their flows, and services are organized also requires designers and citizens, with a potential role for the Maker Movement and Distributed Economies. We focus here on how urban creative communities and maker labor-atories could become public empowerment services by, for and with citizens within proximity of urban planning models. We propose a framework for such Proximity-based Making and Community Services based on 1) defining them as connecting makers, designers, citizens, and maker laboratories, 2) via digital technologies network into Distributed Economies, 3) interacting with Govern-ments through the interface of proximity-based urban models, governances, and policies. The framework has a descriptive model and an assessment indicator based on people, organizations, and policies for a) understanding current urban making, b) planning new services or c) developing new policies for them.

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Using User Persona and Work Domain Analysis to Elicit Information for a Product-Service Digital Twin

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Product-Service Digital Twins are an emerging field about which little information is available. To overcome this deficit personas were utilized to elicit domain and user information requirements. As no user data exists for this domain, persona profiles were developed for the domain based on types of decision maker. Control task analysis was applied to the personas as a means of applying a people-centered approach to information gathering. A description is provided of how the control task analysis methodology is modified for use with the personas. Examples of the personas developed and the information gathered are given.

This approach is shown to be an effective method for understanding human requirements for a Digital Twin.

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23 Making in the Digital Era

Session chairs

Camilla Groth and Hazal Gumus Ciftci

Editorial

Nithikul Nimkulrat and Camilla Groth

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Making in the Digital Era

Workshopping the Textile Hand: Reimagining Subjective Assessment of Textile Materials with Digital Technologies

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Designers continuously move between analog and digital spaces in order to assess sensory qualities of materials to build comprehensive references when sourcing and selecting them. Material decision making in contemporary design practice is increasingly collaborative. However, traditionally, subjective assessment of textiles has been studied at the individual level, focusing less on group workshops. This paper analyses two workshops where participants assessed sensory properties of textile materials, one individually, and one in groups, to show: 1. the difference of subjective material collection between individuals or groups. 2. improvements to the subjective assessment process, comparing physical and digital tools. 3. validation of the subjective differences among various material properties, contributing valuable insights for the assessment process in digital environments. This paper contributes references for the implementation of subjective assessments using digital platforms, ultimately improving the user experience for future designer-researcher digital tools.

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Beyond braiding: Transcending artifact-centered conceptions of craft in digital fabrication

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Craft traditions have motivated recent scholarship and projects by practices and pedagogies with diverse research agendas in digital fabrication. In this work, the technical complexity of a traditional craft is explored through a conceptual lens such as automation, software development, or knowledge encapsulation. Despite the varied research landscape, many of these projects focus on the craft artifact itself and disengage from the broader ecologies in which it is traditionally creat-ed. In this paper, we establish a positioning framework for craft-based digital work and introduce new terminology to define its theoretical boundaries and to disambiguate the increasingly crowded space of "digital crafts." We present and apply our framework to an architectural scale project based on bobbin lace that demonstrates an alternative to the artifact-centered approach to using tradition-al crafts in contemporary digital practices.

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Decoding the banana fiber craft of Kerala using a shape grammar

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The craft heritage of Kerala is situated in the usage of natural materials such as banana fiber. Due to the abundant availability of banana plants in Kerala, local craftspeople use the fibers to make products such as baskets, bags, and coasters. However, the number of banana fiber craft persons is acutely declining, posing a threat to this heritage and crafting knowledge. The customary knowledge transfer method, of working in close proximity with the master craftsperson for a significant period, has become impractical and limited now. Thus, we attempt to decode this crafting knowledge using a shape grammar, as a step towards its preservation, transmission, and design development. The methodology involved gaining insights through contextual inquiry and artifact analysis. The resultant shape grammar presents the material vocabulary, the rules for creating patterned units, as well as the function corresponding to different configurations of the units.

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Co-creation framework to develop and situate e-textiles with indigenous crafts

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This study is part of an ongoing project in the domain of craft and technology called Anuvad. This paper discusses the value and challenges of collaborating with traditional indigenous artisans as co-designers and technical collaborators. After establishing a premise, this paper discusses the findings of a study conducted in person with the artisans in a remote village in India called Bhujodi. This paper discusses the power of creating interactive artifacts through craft by closely collaborating with artisans. The outcome is an interactive textile art

frame that works as a music synthesizer. Through this study, we tried to develop experimental e-textile artifacts by collaborating with seemingly unrepresented communities. These artifacts were showcased at two large-scale events, and audience responses were noted. We discuss the context, the process, and eventually, the impact of such collaboration as a successful case study. Here, 'human' relates to a product or technology with emotive, affective properties.

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Parametric design for machine knitted patterns

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This paper explores the integration of parametric design principles with knitted pattern designs. The study aims to propose a process of how parametric design can be applied to generate dynamic patterns for manual knitting machine fabrication. Using Grasshopper in Rhino3D as a computational tool to develop knitting patterns, the study investigates the possibilities of creating customizability. The designs are translated from a Grasshopper to a knitting pattern that can be knit on a domestic kitting machine. The study demonstrates the development of a workflow between digital and physical making and design. The use of computational tools offers de-signers greater exploration of a wide range of design possibilities while ultimately using human tacit knowledge and control during the fabrication process. The project demonstrates the blending computational design with manual design development through fabrication. Building the relationships between physical and digital production as a means for new architectural design elements.

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Designing 3D Printed Ceramics from a Clay with Tunable Shrinkage

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Clay 3D printing is a rapidly growing hybrid craft practice in which physical ceramic artifacts are designed and fabricated with digital technologies. In this work, we bring attention to the material element of this hybrid practice by presenting a collection of 3D printable clay materials with tunable shrinkage called clay-dough. Clay-dough materials are made up of varying ratios of stoneware clay to bio-based dough. As we fire these materials in a kiln, the dough burns away, resulting in the remaining clay shrinking dramatically as it chemically transitions into a ceramic. We leverage our ability to control the shrinkage properties of clay-dough materials to design a collection of 3D-printed ceramic artifacts in which the form and size are determined by shrinkage. Through this, we reflect on how human and machine work in correspondence with clay-dough to drive the creation of ceramics; ultimately, calling for material-oriented design approaches in hybrid craft practices.

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Algorithmic lace: Leveraging mathematics in design for craft resistance

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The mathematics of craft have created rich and diverse material cultures. Through craft, humans have shared a common language of patterns, proportions, and expressions inspired by the complexity of the natural world. We pass this knowledge on through generations, each time making things more complex and techniques more robust. This passing on of generational knowledge is one of the things that creates our individual cultural identities, however many crafts across the world are in decline. By analyzing the structure of crafts computationally, we can create a hybrid approach that lays a foundation for use in the 21st century. This paper uses bobbin lace, a historic technique used to make decorative textiles, to look at the process of using visual scripting and algorithmic modeling, demonstrating how the mathematics of design can contribute to the many skill-based crafts that embody our cultures and histories.

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24 Ethics in/of/for Design

Session chairs

Laura F. Ferrarello, Colin M. Gray, and Linda N. Laursen

Editorial

Deger Ozkaramanli, Laura F. Ferrarello, and Linda N. Laursen

https://doi.org/10.21606/drs.2024.159

Ethics in Design: Practices

With great power comes great responsibility: The discourse of conduct and ethics in professional design

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Knowledge of professional design is (re)produced through discourse and its culture of use: from the language used, interactions with others and objects created, to the techniques and procedures that connect and distribute professional design knowledge. Here, discourse both shapes and is shaped by social practices and communicated through structures such as codes of conduct and codes of ethics. This paper explores the discourse of codes of conduct and codes of ethics for professional design developed by peak design organisations. We argue that such codes serve as forms of industry self-regulation encapsulating designers' responsibilities and the ethics of their practices. However, codes of conduct and codes of ethics are conflated and reduce ethics and the responsibility of design(ers) to instruments and procedures which, though well-intended, without governance, are flawed. The paper proposes recommendations for revising these codes to better nurture ethical awareness and accountability in professional design practices.

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Gender Code – A Narrative Ethical Glance At Women Developers In Finnish Information Technology

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The Information Technology (IT) sector is the current Athens of all industry. It is no longer geeky, but chic, defining the modes and limits of modern civilization. IT in its numerous forms provides the vehicle of expression and citizenship in contemporary times. While

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more women designers and developers enter the field are they experienc-ing a stronger sense of equality? This paper reports a narrative inquiry that probed the experiences of women professionals in the IT field. Particular attention was placed on how females entered the field, the roles and tasks that they often found themselves undertaking, and social factors in organizational communication that were specific to being female in the field. The results indicate biased conditions. Historical discourse promoting men as creative and intellectual (I.e., technical) still thrives and women are seen as administrators (crafts people). The paper ponders how these social dynamics affect the cognitive-affective processes of women developers.

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Envisioning transformation structures to support ethical mediation practices

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Ethics is complex and situated, involving many stakeholders that impact the design of technology systems. Numerous methods and tools have been proposed to enable practitioners to address ethical issues in the workplace. However, little work has described how designers themselves understand and seek to respond to that ethical complexity. In this short paper, we present five transformation structures that visually and relationally depict how ethics might be addressed in a workplace setting. We base these structures on analysis of plans that 39 practitioners and students created in a co-design workshop to address an ethical concern in their job role. We evaluated the diagrams of these workshop plans and identified five different types of structures that could lead to potential transformation of ethical practices: parallel, linear, top-down, loopy, and gordian. We identify how these transformation structures differently inscribe expectations of ethical mediation and action, leading to opportunities for further support of ethical practices by practitioners.

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Communicating the use of generative AI to design students: Fostering ethics rather than teaching it

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This paper presents a means of communicating to design students the appropriate use of generative artificial intelligence (GenAI) in their studies. It underscores the need to consider broader aspects such as individual student identity and ethical considerations, given the emerging popularity of GenAI. The paper explores the necessity for students to acknowledge their use of GenAI. It draws parallels between GenAI and traditional design resources, likening the use of GenAI to leveraging other designers' work and assistance received during projects. This analogy is employed as a strategy to link the decision to disclose the use of GenAI with the students' designer identity. The delineation between contexts in which students are permitted to use GenAI and those in which they are encouraged to do so is tied to their intended learning outcomes. Several case studies, both hypothetical and real, are discussed and analyzed to support the points raised in this paper.

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Relationality in design: What can be understood?

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This paper addresses the inclusion of relationality as a concept in design. Relational-ity is primarily brought into design from adjacent disciplines in the humanities and social sciences, where the concept helps understand aspects of kinship, care, and belonging. The concept is also infused with elements of associative thinking. The paper narratively reviews examples of relationality in literature from design-related scholarly discourse. The literature sample covers papers addressing relationality through case studies or conceptual calls for practice change. The results from this review provide three understandings of relationality: 1) The utilitarian that unpacks social relations as an epistemic and functional source for designing objects. 2) The communitarian that unpacks the designer's situation and context as part of world-making communities. 3) The associative that unpacks opportunities to condition new –social– relations through interventions. The paper concludes by reflecting on the potential of relationality to promote positive transformations.

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Trauma responsiveness by design: Towards an ethic of care and accountability in design research

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Design research can help us understand, dismantle, and transform unjust systems and the material realities that they create, while guiding us towards transformative, radical futures yet to be designed. However, design research can also be a site of harm and trauma. We argue that a “do no harm” guiding principle to ethics in design research is insufficient. Rather, design researchers need to reckon with and prepare for the likelihood that they will cause harm to the people and communities they engage in their design processes. We draw from the ethics of care and accountability theorized and explored by feminist thought in order to delineate a trauma-responsive design research model. This model can help design researchers take accountability as they work to minimize, acknowledge, and repair harm. Moreover, establishing a praxis of trauma responsiveness as an ethical imperative in design work can help design researchers amplify the liberatory potential of their practice.

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Ethics of Design: Theories and Methods

Past, present and future of design ethics

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With the ever-more present climate crisis, resource shortage and the expansion of AI, the core question of the ethical aspects of our development of new products and solutions becomes unavoidable. But which topics are commonly discussed in design ethics literature

and how has it evolved? To answer this question and to understand the existing underpinnings and foundation of ethics in design, we adopted a structured literature review searching literature across 42 renowned scientific design journals. A systematic search revealed 1177 academic publications relating to the topic. After filtering and reviewing the titles, abstracts and keywords of these publications, a total of 121 sources were singled out as qualified to constitute the foundation of this review. From these, 8 central themes in past and present design ethics research were identified: Design processes and practices, design education, participatory/co-creation, responsible design, social design, sustainability, technology, and human-centred design This opens a discussion of future research, what are we missing?

https://doi.org/10.21606/drs.2024.844

Quant-Ethico: An Approach to Quantifying and Interpreting Ethical Decision Making

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Design researchers have previously sought to describe, model, and represent the cognitive processes of designers. In parallel, researchers in HCI and STS have identified a range of frameworks to describe the ethical and value-related char-acter of design activity. We have identified a productive gap between these two sets of literature—namely, the role of analytic methods in describing ethical de-cision-making as one aspect of design complexity. In this paper, we describe and explore an approach for quantifying the ethical character of design decision-making, building upon existing critical approaches from HCI and STS literature. Through a series of visualizations at varying temporal scales and numbers of interlocutors, we seek to describe the ethical complexity of design activity, grounded in a set of ethically focused lab protocol studies. We describe the implications of our approach for mixed methods researchers, including the role of quantitative methods in describing temporal aspects of ethical design complexity.

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Navigating ethics-informed methods at the intersection of design and philosophy of technology

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The idea that technologies influence society—both positively and negatively—is not new. This is mainly the terrain of the philosophy and the ethics of technology research. Similarly, design research aims to help create new technologies in line with individual, social, and societal needs and values. Against this backdrop, it seems essential to expose relations between design and philosophy of technology research, particularly from a methodological perspective. The main goal of this paper is to suggest a preliminary overview of methods and approaches that can inspire and inform interdisciplinary collaboration and, with that, systematic engagement with ethics in design processes. Through interdisciplinary exchange, we propose a preliminary typology of ethics-informed methods and approaches

based on two main dimensions, namely theory-grounded approaches to theoretically-flexible techniques and assessment to accompaniment. This mapping intends to help navigate the ethical qualities of selected methods from both disciplines, and it aims to create a platform for fruitful interdisciplinary conversations.

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Head and heart — An ethical tightrope

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Navigating ethical considerations in participatory design is complex and ever-changing. The Co-production Project explores the use of co-production methods (co-discover, co-plan, co-design, co-deliver, co-evaluate) via a case study of women's health in Aotearoa New Zealand. Based in an Arts and Design University, 'academic ethics' influence the project in tangible ways that are often procedural and prescriptive, with a focus on productivity. However, co-production methods — underpinned by principles of power-sharing and prioritisation of relationships — call for softer and less tangible considerations aligned with an ethics of care. These tangible and intangible ethical considerations are frequently in tension with each other while also being responsive to indigenous cultural requirements. Through our practice-based project we'll demonstrate how taking time to create conditions conducive to participatory approaches gives us cause for early and cautious optimism.

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Situating Imaginaries of Ethics in / of / through Design

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Within the last decade a large corpus of work in HCI as well as the commercial design practice has focused on systematically addressing questions of ethics, values and moral considerations embedded in the design of digital technology. Recent critiques have highlighted that these efforts fall short of actual transformative impact. We use the sociological concept of imaginaries to argue that value and ethics work needs to be considered within the larger context of socially shared visions of a desirable future and outline how existing sociotechnical imaginaries pre-frame contexts in which value work is deployed. We demonstrate that imaginaries provide the language and conceptual framework necessary to address underlying ethical worldviews before ethics driven design methods and toolkits can be successfully employed. Finally we suggest how to engage imaginaries to facilitate a broader shift towards a more politically sensitive approach to designerly value work.

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Ethics for Design: Positions & Relations

The space between procedural and situated ethics: Reflecting on the use of existing materials in design research on children affected by stroke

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Conducting design research in hard-to-enter care environments with children affected by stroke poses important ethical questions. Research focuses on procedural ethics or on situated ethics, emphasizing a hard-cut between research practices be-fore and during fieldwork. This paper explores this duality through an investigation of publicly available existing materials (i.e., biographies and YouTube videos). What was intended as a preparatory step before 'entering the field' becomes the primary way to better understand the role of the built environment in everyday lives of families affected by childhood stroke. In this paper we reflect on the shared space the investigation creates within a research consortium. We highlight how this exploration invites thinking differently about research practices in terms of ethics related to using existing materials as data, developing sensitivity to the research context, and opportunities for allowing differences between collaborating researchers.

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Speculative ethics, design, philosophy & education

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Designing requires great social and moral responsibility as we are surrounded by products and services that shape -and simultaneously get shaped by- the way we live. This asks for active reflection on ethical issues. However, with the classical top-down approach, ethics may be perceived as restrictive, setting boundaries for what is allowed and what not. Within philosophy of technology, ethical reflection is moving towards a more constructive approach, accompanying technological development with careful considerations. This paper takes a step further and proposes something that could be called 'creative ethics', where a bottom-up approach in dealing with ethical issues fosters inspiration and imagination for desirable futures. This is illustrated with a case study on designing gender-neutral toilet facilities with students from the University of Antwerp and Saxion University of Applied Sciences. The resulting speculative designs open up the discussion about human values, personal identity and how we relate to each other.

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Thought Experiments In The Ethics Of Designing For Future People.

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The Non-Identity Problem (NIP) is a philosophical puzzle which challenges our intuitive assumptions and reasoning around the question of our moral obligations towards 'future people'. This paper explores the significance of the NIP for design, an activity which is necessarily both future-oriented and ethical in nature. Through examination of two thought experiments proposed by philosopher Derek Parfit, this paper makes two contributions to the field of design ethics. Firstly, it raises the profile of the NIP as a topic of interest and for further study in design ethics research. The second is to propose that philosophical thought experiments can play a practical role in equipping designers for real-world challenges.

When employed as thinking devices to disrupt our existing ways of thinking, thought experiments open up spaces of creative disequilibrium in which to nurture, exercise, and strengthen mental capacities for approaching the ethically complex challenges of future-oriented design practice.

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Design anthropology for ethics of care and emergence: Reflections from an energy transition project

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This paper describes a design anthropology approach toward design ethics, which understands design ethics in a relational and emergent manner. We characterize how ethical issues and judgments emerge from the continuous stream of social interactions, collaborations, and relations that constitute the design process. The approach recognizes that there is a fundamental uncertainty in how social engagements and associated ethical issues in a design process unfold. Design anthropology aims to remain open to such emergent understandings, and fosters a sense of empathy and practice of care towards collaborators. The approach is illustrated by reflecting on empirical findings from an interdisciplinary energy transition project in Amsterdam South-East. The findings show how unexpected ethical issues emerged in the design process that challenged the authors to navigate, with care and empathy, between the opposing needs of project collaborators.

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Cultivating Future-Oriented Responsibility in Design with Care

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Design futures—as a subfield and as an approach—responds directly to the precarity and uncertainty of our present. Within this context, the notion that "there will be no future" becomes the dominant vision. This paper argues that design, as a future-making praxis, should embrace ‘care’ to be able to respond to precarity. This paper draws on feminist care ethics and the concept of ‘matters of care’ to explore the theoretical foundations for a care-informed approach to cultivate future-oriented responsibility in design. Care is situated, responsive and relational, and it resists reduction to step-by-step methods or toolkits. Thus, while there is a growing body of work around care ethics in the field of design, application of such concepts in design remains challenging. We draw on examples from ethnographic field work to understand current future-making practices and trace possibilities for fostering care in design.

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25 Design Sketching and Visualization, Futures & Research

Session chairs

Jan Willem Hofftjzer, Jason O'Neill, Bryan Howell, and Mauricio Novoa Munoz

Editorial

Bryan Howell, Jan Willem Hofftjzer, and Mauricio Novoa Munoz

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AI's Impact on Sketching & Workflow

Empirical Study of Problem-solution Co-evolution in Human-GAI Collaborative Conceptual Design

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The problem-solution co-evolution model is a foundational framework for under-standing the emergence of creativity in both individuals and teams. With the ad-vent of Generative Artificial Intelligence (GAI), a new paradigm of co-creation in conceptual design has arisen. However, the dynamics inherent to human-GAI col-laborations remain largely unknown. In our investigation of the co-evolution dy-namics of human-GAI interaction, we employed retrospective protocol analysis to examine the verbal reasoning processes of twenty novice designers co-designing with GAI (text-to-text and text-to-image models). Drawing from the outcomes of our creativity assessments, a key revelation emerged: GAI has the potential to amplify team creativity by fostering human abductive reasoning. In further discourse, we introduce a novel human-GAI co-evolution model, which elucidates the significant role of GAI in aiding human problem-framing explora-tion. Central to our exploration, we spotlight "introspection" and "retrospection" as pivotal constructs in probing human-GAI collabora-tions.

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Is pen-to-paper the buggy whip of design? Assessing the use of ai tools for design sketching

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Sketching is quick and effective, however with the advent of generative AI, do the current generation of novice designers have an alternative? This paper compares the use of sketching and text-to-image generative AI tools to produce initial concept images ("sketches") by novice designers. This will identify the viability and potential adoption of AI as a replacement, and gauge the adoption willingness of novice designers, replacing sketching. This study compares conventional sketching and AI image generation using first year product design students to record brainstormed initial concepts using both sketching and generative AI tools, this study compares various attributes of both, including ability to represent designer's intentions. The findings of this study suggest that at present, novice designers continue to prefer conventional sketching with 75% believing that it is more accurate to designers' intentions and 59.62% believing that it is easier to use.

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Design for AI-Integrated Design Team Collaboration ：A Strategy and Exploration Using Node Flow in Establishing a Reusable Representation of Knowledge in the Collaborative Process

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Artificial Intelligence Generated Content (AIGC) introduces a new collaborative design paradigm where words, sentences, and images circulate within the team as new design knowledge. However, due to the limited controllability and inter-pretability of current AIGC models, collaboration between designers and AI de-mands continuous iterations and experimentation. How to establish a reusable representation for the knowledge of the collaborative process is an open prob-lem. Our comprehensive approach, including focused interviews, case studies, and workshops, revealed transmission patterns of design concepts during both divergent and convergent phases. To represent the interaction between designers, we propose a novel node-based design strategy, where each node is an AI operation with its prompts and outputs and each link denotes the data flow to the next node. Implementing this strategy, we crafted a design system that en-hances synergy between the design team and AIGC.

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AI as a Catalyst for Creativity: Exploring the Use of Generative Approach in Fashion Design for Improving Their Inspiration

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The emergence of generative AI sparked thoughts on how it can be helpful across the stages of fashion design practice and creativity. We investigated the potential impact of prompt engineering using stable diffusion and Midjourney on understanding the relationship between the prompt and outcome, and how it influences the final process, thinking, or result. Our study provides guidelines for designers to use specific formats and words to describe the garments to generate clothing designs even if they are not familiar with text prompt engineering. We found fashion designers more likely to focus on the clothes and the overall feeling that the images evoke, meaning that anatomical accuracy is not their concern. This research is a rare exploration that combines prompts engineering with fashion, providing insights and recommendations on how to better utilize AI as a tool in industry.

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Imagination meets algorithm: redefining design practices in the coming AI age

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The summer of 2022 marked the advent of accessible text-to-image tools, revolutionizing image rendering with distinctive styles swiftly. This generated a creative shift among designers, generally addressed as “prompt design”, although this expression scarcely captures the profound interaction between design and digital tools. This paper elucidates the potential synergy between designers and AI through two pragmatic exercises engaged by university students. Our approaches were polarized: in one exercise we fostered a rich imaginative process before the text-to-image creation; secondly we asked students to elaborate a possible user interface over an artifact drawn by AI, following a very simple textual description. The result is a framework that combines both the relevance of structured imaginative process and the capabilities of generative AI technologies, supporting an enriched dialogic interaction between design and dataset-based imagery.

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The Evolving Roles of Modern Designers: Through the Lens of Design Behavioral Patterns within Work Environments Enhanced by Generative AI

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In the rapidly advancing landscape of generative AI, the role of designers is constantly being reshaped amidst the choice between traditional tools and emerging technologies. To comprehend this transformation, we developed a platform integrating multiple generative AI models and allowed for unrestricted search and sketching to emulate a realistic working scenario. Within this setting, we analyzed the design behavioral patterns exhibited by experienced designers: through both quantitative and qualitative analyses, we examined the cause and effect of generation patterns and iteration patterns. This exploration inspired insights into the designer's evolving role, transitioning to a continuous learner and being more than a curator when incorporating generative AI.

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Research and practice of digital narrative design method of cultural relics based on AIGC

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Digital narrative has great potential in the field of cultural relics. This visual paper proposes an AI-based digital narrative design method for cultural relics and visualizes their contexts. Based on the study, this method constructed the narrative by taking cultural relics as the main body and referencing historical materials such as literature, ancient paintings, film,

and television works. Midjourney was used to generate contextual images, and digital narrative scenes were constructed using mental canvas. Added sketch notes in post-synthesis to complete the work. Finally, in the design practice of "The Silk Road around Chang'an", feedback was collected through the Likert scale to verify the effectiveness of visual narratives and sketch notes in understanding cultural relics. Overall, this study redefines the cooperative relationship between designers and AI in the digital age and provides new perspectives and methods for digital humanities in the future.

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Analogue Sketching Research

Hand postures: an analysis of patterns in novice design drawing

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In the realm of design drawing, extensive research and professional expertise have been dedicated to identifying the techniques and specific methods employed by designers. However, limited knowledge has been captured as to the potential in-fluence of human biomechanics on the act of design drawing. This research en-deavors to scrutinize the specific hand postures adopted by a diverse group of de-signers, particularly those who are at the early stages of their design training, name-ly second-year design students. This exploration extends to investigating how these postures are influenced by prior exposure to design or art drawing instruction and, most crucially, how they impact factors such as pain, strain, and contribute to changes over time. To accomplish this, we gathered and analyzed a dataset of 284 images featuring a group of novice design drawing participants (n=71). The results indicate that certain postures may lend themselves to design drawing and reduce hand strain.

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A Distributed Approach to Design Sketching

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There has been much work towards understanding design sketching, its role and utility for design thinking. However, there remains little explanatory theory to structure our discussion of sketching and its importance. Drawing upon reflective practice as design paradigm and adopting a distributed theory of mind, I position sketching as distribution of design thinking. I provide an operational definition of the design sketch as particular type of design representation that includes sketch as articulation of future solution opportunities, variation in the expression of design intent through representational ambiguity, and the sketch as iconic representation. I locate the design sketch through a distributed lens to better illustrate its relation to design thinking in practice. The article contributes as framework and thesis argument for a distributed approach to understand design thinking through sketching. The paper concludes by providing a theoretical foundation and departure point for future studies of distributed design thinking through sketching.

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The Power Of The Pen/Pencil: Developing A Design Sketching Syllabus To Help 1st Year Product Design Students Communicate Effectively

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Digital, immersive, and artificial intelligence (AI) technologies have propelled technology-focused design to the fore. Due to our technology-driven society and growing demand for technology literacy, the perceived need for traditional/analogue skills is being overlooked/underappreciated. Within product design (PD) education, students are increasingly embracing digital design tools to communicate, overlooking traditional/analogue tools. Subsequently, students are increasingly designing within the remits/restrictions of digital tools. This presents numerous challenges, including overreliance on computer aided design tools, perfectionism through corrective tools available with digital sketching platforms, and the complete disregard of quick concept generation in favor of AI. The power of the pen/pencil is being lost affecting the learning/appreciation of fundamental principles of design sketching/communication, a core skill required of every product designer. This paper presents our philosophical standpoint on design sketching and the development of a 24-week design sketching syllabus for product design 1st-year students focused on fundamental/traditional skills.

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A framework for the agency of sketching

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Previous scholars have advocated the significant value of sketching in design process-es. This paper first explores how design sketching functions as an agent for design, building on insights derived from both theory and practice. Interviews with professional designers in the field reaffirm the functions and importance of sketching. Not only for designers themselves, but also for their clients and consumers. Given the value of sketching and the variety of stakeholders involved, this paper then aims to structure the affordances of design sketching in a practical framework. Considering that af-fordances must be discoverable and perceivable in order to be effective, this paper subsequently proposes ideas for transforming the framework into a tool that will help designers to discover design sketching and unlock its benefits.

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Drawing-philosophy correspondence: Towards transforming from within

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The global call for transformation towards a more just, sustainable and pluriverse world has also materialised within the design field, asking for new design practices that embrace open-ended and relational processes. Several approaches emerged over the last decades, built on different values, and investigating ontological, epistemological, ethical, and practical dimensions. In this pictorial, I explore what these new practices can be and do, through embarking on a drawing-philosophy correspondence journey. This pictorial shows

my three-year quest to explore the role of drawing for researching design for societal transformation. By visually researching philosophical concepts such as correspondence, commoning, minor key, and human-technology-world relationships, this work aims to contribute to design-philosophy correspondence, by imagining, questioning, and researching philosophical concepts underlying alternative socio-material practices, and through this support the transformation of the everyday sociomaterial practices of organisation that are addressing the grand societal challenges.

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Life At The Riverfront: Drawing Histories, Drawing Narratives, Drawing Entanglements

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Rivers worldwide are increasingly modified due to climate change, urbanization, and shifting land use patterns. This visual paper demonstrates how various drawing modes drive design research to uncover everyday practices along the modified riverfronts of the Citarum and Gombak Rivers in Indonesia and Malaysia, respectively. Three drawing approaches are employed to investigate different timelines, capture residents' lived experiences, and illustrate riverfronts' complex, socio-economic, spatial, and environmental attributes. Drawing histories involves using historical mapping and visual ethnographic methods to gain in-depth insights into the localities. Drawing narratives entails gathering and overlaying narratives, stories, and everyday activities within river corridors. Lastly, drawing entanglements involves exploring and revealing multi-layered relationships, connections, and patterns. Drawings have contributed to a spatial investigation and representation of the dynamic and complex status of the modified riverfronts, demonstrating a gap between the lived and planned and aiming to foster a dialogue into how this gap can be narrowed.

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Sketching Futures with XR and AI

Embodied prototyping in VR: Ideation and bodystorming within a custom VR sandbox

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Social virtual reality platforms present new opportunities for embodied design processes. This paper illustrates a range of embodied design techniques made possible through social engagement with VR/XR technology. Drawing from a case study involving the prototyping of a conversation visualization system for VR meetings, we present several novel embodied design methods in VR (also applicable to XR). These include: new techniques for supporting embodied ideation; new ways of acting out and improvising scenarios together; and new opportunities for preparing and manipulating assets, environments, and lo fi interactions for embodied design processes. These novel techniques and approaches point to exciting new opportunities for expanding the repertoire of embodied design practice more broadly.

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Passageways and portals: a comparative analysisof transition spaces in physical, digital, and virtual environments

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This study explores transition spaces across physical, digital, and virtual environments. From hallways to digital loading screens and virtual portals, these spaces serve as cognitive buffers, aiding users in navigating environmental shifts. Our comparative analysis reveals consistent human experiences across diverse environments, while also identifying distinct attributes of each transition space. We identify two main categories: transition-focused spaces, which emphasize efficient movement, and experience-focused spaces, which offer richer, immersive experiences. We also identify four core transition types: Environmental, Perspective, Identity, and Sensory transitions. Experience-focused spaces, such as lobbies and VR gathering areas, play a pivotal role in facilitating identity transitions. Sensory transitions are present in physical and virtual spaces, but often absent in digital spaces. Our findings highlight the potential of well-designed VR transition spaces, emphasizing their significant influence on immersion, user experience, and virtual social interactions.

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Isolating and Addressing Theoretically-Grounded Limitations from the Rapid Translation of Interaction Design across Media Platforms

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Designers must frequently work rapidly under deadlines to produce minimum viable products (MVPs) in collaboration with other disciplinary experts. While results may be good enough for now, it is important that limitations of hasty work are not codified as permanently acceptable design solutions. A method called function mapping has previously been shown to aid in the translation of theoretically-derived functions across media platforms, where functionally equivalent products may need to appear superficially dissimilar, thus complicating true equivalency. Here we demonstrate function mapping's efficacy at the threshold between MVPs and revisions. We use function mapping to explain the process of translating a virtual environment for a VR headset into an exhibition gallery with 90 feet of touchscreens, which raised fundamental issues about the nature of graphic design in the interaction of environment and surface. We then revisit function mapping to isolate solution shortcomings and strategize next steps.

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AI Art Perceptions with GenFrame – an Image Generating Picture Frame

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Image-generation models are changing how we express ourselves in visual art. However, what people think of AI-generated art is still largely unexplored, especially compared to traditional art. In this paper, we present the design of an interactive research product, GenFrame – an image-generating picture frame that appears as a traditional painting but

offers the viewer the agency to modify the depicted painting. In the current paper, we report on a study where we deployed the GenFrame in a traditional art museum and interviewed visitors about their views on AI art. When provoked by AI-generated art, people need more of the artist's backstory and emotional journey to make the artwork commensurate with traditional art. However, generative AI-enabled interactive experiences open new ways of engaging with art when a turn of a dial can modify art styles or motifs on a painting.

A demo can be seen here: https://youtu.be/1rhW4fazaBY.

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Design in dialogue: AI as an aid of imagination for future scenarios

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Generative AI tools foreshadow fundamental changes in the dynamics of creative work. Albeit controlling the output is still challenging, the rapid conceptual development and visualization can be particularly helpful in the exploratory phase, facilitating approaches such as design fiction. The contribution aims at providing an overview of how AI can fit in various steps, demonstrating in particular how the AI-enabled visualization from text and sketches allows imagining and iterating quickly on future scenarios. Starting from a benchmarking of over sixty AI tools according to the Design Thinking process, the efficacy of a human-AI collaboration has been experimented through workshops with over hundred and fifty students. These activities have demonstrated the efficacy of following a well-defined dialogue protocol of Human Intelligence "framing" Artificial Intelligence, which serves as an AI skill-building tool, as well as a creative icebreaker, leading to vivid representations of speculative scenarios as foundation for the forward-thinking design process.

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Transformative sketching: Unveiling character identity in two dimensions

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We understand this world through our sense perceptions and past associations. The main objective of the study was to sketch the face of a character with a specific identity, so that it aligns with its intended description, thus ensuring it is perceived as intended. The use of shapes and features of animals have helped to derive characters that represent an archetype. The digital representations of these characters find their place along two distinct axes: (i) transitioning from elaborate to minimal and (ii) shifting between animalistic and human features. The methodology harmoniously merges diverse character appearances, eliminating fragmentation. We place significant emphasis on symmetry, streamlined line reduction, and the incorporation of compound shapes, facilitating the seamless shift from elaborate portrayals to minimal representations while retaining elements reminiscent of the initial elaborate stage. This study can offer insights into game and character design, cross-disciplinary studies of psychology and perception, anthropology and semiotics.

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26 How Do You Sound Design? Articulating Experiences and Cultures via Listening

Session chairs

Nicolas Misdariis, Stefano Delle Monache, and Elif Özcan

Editorial

Stefano Delle Monache, Nicolas Misdariis, Elif Özcan, Daniel Hug, Sara Lenzi, Sandra Pauletto, Davide Rocchesso, and Simone Spagnol

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Sound-Driven Design: Foundations

Designing [The, With, Against] Sound [For]: Towards A Semantic-oriented Coding Scheme For Protocol Studies In Sound-driven Design

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Sound-driven design is a collaborative and multidisciplinary design activity which uses sound as catalyst of the design approach. We present a semantic-oriented methodology and coding system to capture the diversity of sound-driven concepts that support the design process. We evaluate the methodology in a protocol study of a design team, composed of one sound designer, one acoustic engineer, one designer, and one expert user, engaged in exploring the listening dimension in the caregiving experience. We use linkographic analysis to integrate and evaluate our coding scheme. The methodology proves to be effective in revealing the semantic models of the participants and representing their semantic contribution to the design process. Two protocol studies in the same context are in progress to iterate the methodology and the coding scheme. The results are expected to provide a solid ground to devise methods and boundary tools to facilitate participation and co-creation in sound-driven design.

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Augmenting soundscapes of ICUs: A Collaborative approach

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In this study we investigated characteristics for designing soundscape augmentations within Intensive Care Units (ICUs). We introduced soundscape perception and fundamental needs as the basis of design strategies for augmenting sound-scapes experienced by critically ill patients. We used results of a previous study, where in interviews regarding current ICU soundscapes, patients revealed four concerns and underlying needs. They found that ICU soundscapes were alienating, unvaried, unfamiliar, and disruptive. These insights were used as contextual inputs in a collaborative workshop with ICU nurses, resident doctors, and researchers. In separate groups, they developed three system concepts named Smart Environmental Assistant, Patient Soundscape Dashboard, and Familiar Wake-ups. Based on qualities of these concepts, we found five characteristics for designing effective soundscape augmentation systems for ICUs: personalized, user-friendly, integrated, humanized, and familiar. These characteristics, rooted in perspectives of various ICU experts, are essential for reshaping the ICU soundscape into a more positive listening experience.

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Guiding design students to sound-driven design from the base camp of semiotics

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The lack of knowledge in the field of sound-driven design lags our educational efforts to teach BSc students about the role of sound in current design process methodologies. Teaching programs rarely include subjects dedicated to creating a coherent experience using data-to-sound strategies, sound informativeness, or the interactions that users have with product sounds. Understanding sound at the same level as other sensory cues prepares students to enrich the usability, attractiveness, and communicative qualities of products, services, and systems. This contribution aims to provide an integrative and multidisciplinary perspective of sound-driven design through the adaptation and application of the 'Design Framework for Audible Alarms' as a conceptual design tool in semiotics. The framework is exemplified through several design cases carried out in the sessions of the subject 'Semiotics in design' during two academic years, as part of the BSc in Industrial Design and Product Development Engineering.

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It sounds sustainable: practices in designing sound for sustainability

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Design for sustainability has received significant attention in the past years. Start-ing from green design, the focus gradually shifted towards eco-design, the circu-lar economy, and sustainable development. Meanwhile, design for pro-environmental behavior highlighted the importance of designing for a sustaina-ble use phase of products. Sound design encompasses several practices such as in sound for film, radio and podcasting, sound for interaction and games, and prod-uct sound design. Sound is an important element of any

experience and can con-vey several emotional and aesthetic product qualities. The relationship between designing sound and designing for sustainability, however, has not received much attention. Motivated by this, we review here situations in which sound design has been used when designing for sustainability or sustainable behavior. Subse-quently, we relate this to the broader perspectives offered by design for sustain-ability and identify opportunities for cross-fertilization between the two fields.

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Towards a Definition of Autographic Sonifications: Listening as an Act of Knowledge

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In recent years, sonification as a method to analyze, represent and communicate data through sound has grown significantly showing a diversity of purposes, users, and topics. In data journalism, education, art, or data monitoring, sound is used to both support and engage experts, researchers, and the general public with a broad range of scientific and social phenomena. As the field is moving towards shared design and evaluation processes, new practices seem to emerge that put the listener at the center. By analyzing recent cases from the Data Sonification Archive, the paper proposes a definition of autographic sonification as a self-encoding process in which the act of listening becomes central to making sense of complex phenomena.

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Sound-Driven Design in Action

ICU alarm management reimagined: Sound-driven design and the role of acoustic biotope

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Staff well-being and patient safety are undermined by false alarms in the ICU. This study focuses on enhancing the effectiveness of sound-induced actions in the ICU by assessing the distinctness and informativeness of alarm sound events as perceived by nursing staff. We investigated the alarm load in an adult ICU, with an emphasis on alarm durations and their impact on actionability. As a strategy to mitigate false alarms, we simulated the introduction of alarm delays and examined how this affected alarm characteristics across various vital parameters. Results demonstrate that the introduction of alarm delays reduce the number of alarms remarkably, with a 10-second delay eliminating more than half of the alarms. Our results indicate that delays should be tailored to each specific vital parameter and medical context. We further address key considerations for implementing alarm delays in alarm management practice.

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Designing tools for designers: The Data Sonification Canvas

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Although data sonification i.e., the use of sound to represent data is gaining momentum, its impact is still limited. The lack of shared design methods and tools is seen as an obstacle for the expansion of sonification from a scientific method to a mass-medium for better human-data interaction. The Data Sonification Canvas is a design tool that supports authors during the creative process. Our paper first describes the genesis of the Canvas, grounded in expert interviews and literature from sound design for film, human-computer interaction, and data visualization. We then present an evaluation study with 20 participants that measured the pragmatic and hedonic quality of the Canvas. Results show that users consider it a valuable, self-oriented, and practical tool that meets their needs in a structured, yet straightforward manner. Areas of improvement include uniform the terminology; increase accessibility; include multi-media content and customize the spatial organization of the components.

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Designing Sound for Public Spaces Through a Research-Creation Collaboration Framework

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When designing a sound installation in public spaces, creators consider a wide range of factors related to the site where it will be deployed as part of the artistic statement. However, anticipating the impact of the sound installation on user experience is difficult in the absence of established methods to inform the design and evaluate the outcomes. Based on three case studies involving sound artists and soundscape researchers, we propose a research-creation collaboration framework through four stages: 1) field recordings of pre-existing sound environments; 2) diagnosis of pre-existing sound environments and public space usage; 3) sound installation prototyping in laboratory settings; 4) evaluation after deployment. These stages, alone or in combination, can systematically inform – or eventually drive – the design and evaluation of new sound installations in public spaces.

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Designing through ecological soundscape to foster human-nature interaction

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Sense of hearing provides an effective, immersive and empathetic way to observe, map and explore places with a more-than-human approach. In our contemporary mediascape inundated by visual stimuli, the rediscovery of sound offers a different understanding of the world. By discussing two research-based sound design projects, this study discusses 1) the potential of using soundscape as an empathetic research tool in multispecies ethnography and 2) how soundscape as a communication media could stimulate more-than-human exploration and empathy. Such design outcomes develop an empathic and conscious understanding of human-nature interaction, even in an urban context. Intersecting science, research and creative practices, the projects use soundscape for ecological exploration and narratives. The projects contribute to how ecological soundscape plays a significant role in the sound-driven design process to re-establish kinship between humans and more-than-humans, thereby nurturing urban-nature re-discovery and coexistence.

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Acoustic patterns for urban attractors

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This study proposes the use of forms of entrainment as an interaction design principle for social computing. Entrainment could be used to design computational artifacts that produce socially beneficial effects, suitable for design projects that promote collaborative action. This study explores acoustic entrainment to gather cyclists into groups to reduce carbon-intensive urban commuting. The system uses visual cues and rhythmic patterns to gather riders with similar routes around mobile GPS signals. Preliminary results from a small empirical study (n=8) show how pattern phasing can encourage riders to accelerate. This method has limitations in communicating negative acceleration and proximity. Adjusting pattern tempo and volume may compensate for this shortcoming. Conclusions are drawn concerning the effects of acoustic entrainment on cyclist's engagement with others and with the environment.

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27 Play Design: Initiating Transformation through Imagination

Session chairs

Helle Marie Skovbjerg and Sofie Kinch

Editorial

Helle Marie Skovbjerg, Sofie Kinch, Sune Gudiksen, Shanti Sumartojo, Lisa Grocott, and Colleen Macklin

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Play Design I

The Uses Of Enchantment: Playful Design Tools That Evoke 'The Unsayable' For Teenagers With Lived Experience Of Loneliness.

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This project introduces tools that involve teenagers, with relevant lived experiences, in co-creating a social-purpose advertising campaign as a way of meaningfully engaging young audiences. Many co-creation methods rely on direct, text-based, or individual spoken contribution methods. These disregard young people's unconscious knowledges and collective ways of knowing. The research was conducted through ethnographic methods alongside semi-structured interviews with the participants of a co-created campaign workshop. The result is a suite of novel playful tools which generate collective insight and creative ideas by engaging teenagers' collective, embodied and imaginative ways of knowing. The key concept of 'enchantment' is used to make sense of the overall process in combination with three key insights, pertaining to saying "the unsayable", seeing with an expanded perceptive range, and attunement to collective knowledges.

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Designing for playful learning in formal education: a case study of virtual reality field trips

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Despite the benefits of playful learning experiences to increase students' motivation and learning, traditional classrooms lack opportunities to learn through play. Virtual reality (VR)

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is a promising tool to bring rich, playful contexts into classrooms, but designing instructional models that make the most of its affordances remains challenging. This paper describes a multi-year design process implementing VR field trips in high school engineering classrooms to highlight the benefits and challenges of using VR to promote playful learning in schools. In both remote and in-person classes we developed virtual field trip lessons using immersive videos and videogame-like environments. Over time, learning goals, activities, and assessments were adjusted to meet students' needs as part of an iterative design process. The benefits of VR for playful learning are discussed, along with the importance of post-VR reflection and discussion, and the persistent challenges of educational content and class time.

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"Feelings about the other body:" Caring through and forward in design for play

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This paper considers designers' embodied engagements while designing for play from the lens of "care." We consider such engagements as socio-material rela-tions of care, following recent theorizations of care within care studies. Relying on observations from a variety of activities undertaken by students during a two-week design workshop on embodied play design, we present a theoretical model that identifies two orders of care in design activities: First order, "care through," indexes the immediate objects that designers attend to in the here-and-now while implementing procedures, practices and tools provided by diverse design methods. Second order, "care forward," indicates the future beneficiaries of de-signed things, who are typically, though not necessarily, the projected users of design. The paper contributes to design literature by providing a model for in-vestigating the affective and practical relations of care in design practice, with implications for how specific design activities and methods frame care.

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Playful Speculative Design: Crafting Preposterous Futures Through Playful Tension

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This paper explores the imaginative borderland of speculative design, often referred to as 'preposterous futures,' and presents a framework for playful speculative design building upon carnivalesque play theory. To operationalize the framework, the concept of 'playful tensions' employs three continuums of relevance: Firstly, designers should address the 'purpose' by navigating the interplay between 'concern and provocation.' Secondly, the 'concept' should be crafted to straddle the boundary between the 'serious and ridiculous,' and thirdly, integrating both 'believable and absurd' elements to scaffold the 'formgiving' process. To demonstrate the practical efficacy of the framework, three projects by established artists and designers are analyzed and discussed. The paper contends that playful speculative design not only nurtures the broader field of speculative de-sign, but also

serves as a valuable analytical tool for discerning the playful quali-ties embedded in speculative designs, and finally, contributes to qualifying the transformative power of play design research.

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Play Design II

Playful Prototyping In Speculative Design Practices

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Prototyping is a fundamental part of the design process. The iterative as-semblage and manipulation of shapes, textures, colors, and volumes generate re-flections not only about formal qualities but also about possible affordances, functionalities, and meanings. Prototypical artifacts emerge from the negotiation between the informed rational thinking coming from research, the mechanical behavior of the material, the human body ergonomics and dexterity, and the serendipitous discoveries happening in the process. Analyzing the creative dy-namics happening during prototyping, it is possible to observe similarities between model-making and play. Such dynamics of reflection in action have the creative potential to foster speculative inquiry. The aim of this contribution is to present, through a case study workshop, playful prototyping as a speculative de-sign methodology: a playful approach that can generate extreme, thought-provoking, and radical outputs in the form of diegetic prototypes of speculative design and design fiction.

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Transforming futures together: Time travelling with the Tomorrow Party

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We need new methods for generating policy insights that ensure people's lived experiences are not flattened and fixed to a moment in time and that visions of possible futures are not curtailed by a 'crisis of imagination'. In response to this challenge, we have developed a creative, play-based method called the Tomorrow Party, which invites participants to travel forward in time and share co-created stories of the desirable futures they find themselves living in. As a future story-making process, the Tomorrow Party generates novel ways of sharing affective perspectives on possible futures so we can collectively anticipate what is at stake and work out what policy responses would contribute to the futures we want. We present the method as well as key findings and insights from a series of Tomorrow Parties commissioned by the Policy Lab at the Wellcome Trust, spanning locations across Australia, New Zealand and the United Kingdom.

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Leveraging play and Rube Goldberg machines to teach 21st century + design skills

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In an AI-dominated landscape, creative, collaborative, and open-ended problem solving are increasingly critical skills. Traditional science and design toys pair stepwise instructions with single-configuration forms, while pixel-based building systems become an extension of the user's existing capacity. By requiring creative re-imagination of everyday objects, chain reaction (rube goldberg) machines are a promising concept for practicing and expanding creative design skills through play. We calibrated formal and instructional constraints across two major design iterations, utilizing ethnographic interviewing, behavioral observation, and documentation of creative output to understand, quantify, and react to the impact of design changes. Paired with appropriate creative restraints, a chain reaction-based play experience led children to intuitively, independently, and successfully engage with the design process from problem identification to functional solution, expanding and enhancing their design abilities. This product and the play experience it creates are significant in proving play as a vehicle to develop 21st century skills.

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Drifting by friction: Playing with ontologies of design

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In this paper, I will trace the 'drift' that has happened in my PhD project, 'De-signing for Playful Democratic Frictions'. I argue that it has been driven primarily by the friction that emerged between the diverse components in my 'research-assemblage'. The aim is not to resolve the friction, but rather to enhance and fol-low it as far as I can. I suggest that a playful attitude is helpful for lingering with this friction, and that such a stance can allow us to see things otherwise ob-scured by tales of historical necessity. This notion of drifting by friction may in-spire strategies for design research that allow us to question the ontologies of design, potentially generating small openings for different conceptions of design to emerge.

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28 Retail, Hospitality, and Service Design Futures

Session chairs

Mia B. Münster, Bethan Alexander, Rebekah Matheny, and Katelijn Quartier,

Editorial

Katelijn Quartier, Mia Münster, and Rebekah Matheny

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Sustainability in Retail, Hospitality and Service Design

Service Design and Circular Economy in hybrid retail design

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This paper serves as a pilot study exploring hybrid (physical and digital) retail design within the context of the circular economy, and it examines the prerequisite of the hy-brid retail environment in facilitating customer engagement with circular economy practices. Utilizing an exploratory qualitative approach, we collect primary data through semi-structured interviews with an SME retail brand and ten of its customers. Additionally, we conducted observations of both the physical store and its social me-dia. This contributes to the limited existing literature on hybrid retail design within the context of the circular economy, particularly in the fashion industry. By bridging two theory domains – Circular Economy and Service Design – this study emphasizes the suitability of the Service Design approach in retail design to promote mainstreaming of the circular economy.

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Rendering Soil Care Across Hotel, Retailer, And Farm With A Mutuality Service Blueprint

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Food retailers and hoteliers aiming at eco-social transitions struggle to show tangible impact on the ground. Since sustainable food systems necessitate internal reconfigurations of service structure, exploring value creation concerning the local environment and com-

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munity is essential. Design management tools are challenged to deliver mutualist conditions that respond to the needs of soils and humans. We explore what an eco-social Mutuality Service Blueprint entails based on an empirical pilot case. Here, 13 hoteliers and 17 retail customers in Hong Kong became soil care service providers over 43 weeks by diverting 4800 liters of food waste for composting and growing 1500 kg of organic crops that provided food assistance to families in need. Our redesigned blueprint helps clarify the pragmatics of care practices and prompts the redefinition of success parameters and fail points. It calls for forging cross-sectoral partnerships, practical experimentation, and organizational diversity while subordinating service performances to eco-social conditions.

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'Worn once': A call to re-imagine the problematic lexicon of pre-loved clothing in fashion retail

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This paper explores the potential for perceptions of the worn clothing resale space to evolve into a proactive and positive space of engagement through changing the associated lexicon in messaging across retail and wider culture. Employing theories of language and symbolic power, I dissect current modes of consumer value in 'new vs old' dichotomies in second-hand clothing consumption. I offer that dissolving hierarchies associated with the new is essential in achieving change in value perception for worn clothing. Utilising ideas of pleasure activism and emotional storytelling in worn clothing communications to engage and educate the consumer is proposed. Using a qualitative approach, research was conducted using secondary sources and primary data constituting a survey of 102 participants and 5 semi-structured expert interviews collected for this inquiry. The research aims to add momentum to the discussion around communications and marketing for meaningful engagement in the pre-loved sector in fashion retail.

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Dissecting Innovation Drivers in Business Design: A Sustainable System Transformation Theory-Based Approach and Visualization Tool

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In the domain of business design, innovation driver components are frequently characterized by their high complexity and dynamic interactions, rendering their extraction and analysis a challenging endeavor. This paper, leveraging the integrated theoretical framework of Design for System Innovations and Transitions (DfSIT framework), iteratively proposes an analytical approach to dissecting innovation drivers. This approach results in the development of a corresponding visualization and analysis tool through four rounds of academic and industrial expert workshops, extensive literature review, and in-depth case studies. The approach facilitates the systematic extraction, validation, structural localization, and in-depth analysis of innovation drivers in business de-sign. This not only provides an analytical advantage in the context of complex system innovation but also offers valuable insights for

understanding the mechanisms, devising strategies, and managing the practice of innovation. Furthermore, this paper meticulously demonstrates and validates the approach through a detailed case study of China's 'Pop-up retail' business innovation.

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User Experiences in Retail, Hospitality and Service Design

Customer-Centric Luxury Fashion Store Experiences: A Case Study Approach

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This paper explores current approaches to customer-centric experiential strategies in a luxury fashion context, through an analysis of two UK luxury retailer case studies: Anya Hindmarch and MatchesFashion. While earlier studies have shown the importance of the physical luxury store, emphasis on customer experience (CX) and aspects related to service interactions that lead to pleasurable experiences remain nascent. Underpinned by interrelated theoretical constructs – customer experience, store atmospherics and retail design – and taking an exploratory, qualitative approach (including documents, expert interviews and store observation), the research promulgates the dimensions comprising customer-centric physical store experiences in luxury fashion. In doing so, it is the first known study to offer a conceptual framework to advance scholarly and practitioner luxury customer experience research.

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Establishing an experience design management framework through a literature review

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Since Pine & Gilmore (1999) introduced the concept of Experience Economy two decades ago, both academic and practical worlds have embraced the idea, with various frameworks and applications built and evolved around related concepts, design, and management. However, the concept of managing artifacts, which directly impact experiences, has received limited development. Through a literature review approach, this study defines experience design management as "the management of artifacts that can influence the perceived customer experience, to achieve business strategic objectives, balancing the resource capabilities of service providers with the value propositions of service recipients." Besides, this study summarizes the framework, processes, and key factors of XDM, to help designers conduct experience design practice and innovation with a clear overview. The results shed light on future directions of research and development of experience design management, with implications for both business success and academic significance.

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An Eye-tracking Experimental Study on the Influence of Background Visual Effects on Consumer Purchase Behavior in Live Streaming Sales

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Live streaming sales have emerged as a prominent trend in global retail, following the COVID-19 pandemic. This study aims to investigate the influence of different forms of background in live streaming sales on consumer purchase behavior through eye-tracking experiments. The study involved 25 participants (15 males). Four distinct background conditions were implemented. The obtained results were analyzed and discussed based on the affordance theory and context effect theory. The findings revealed that under the original background condition, participants tended to primarily focus their attention on the product. In the absence of a background, participants exhibited the longest gaze duration on the product and facial features of individuals. A background consistent with the theme of the product not only enhanced participants' overall attention towards the product but also significantly increased their revisit frequency to the background. A background inconsistent with the theme of the product attracted considerable attention from participants.

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Eye-tracking: Understanding the WHY behind shopping behavior

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This paper discusses a mixed method study in which we combine eye-tracking with semi-structured in-depth interviews, conducted at two similar stores of a re- tailer in the cosmetics sector. With this study the retailer wanted to investigate, on the one hand, how customers navigate and move around the store and, on the other hand, what they think of the design and experience of the two stores. Through this qualitative research method, you get a very rich set of information that mainly provides insights into the "why" behind shopping behavior. The results concerning shop- ping behavior indicate that in this store customers mainly navigate at eye level through product recognition. On the evaluation of the shopping experience, customers fairly unanimously recognize which elements are positive and which are more likely to be disruptive in a store design.

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Designing New Phygital Service Experiences for Hospitality

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This qualitative case study explores the blending of physical and digital as phygital experience at the Rovaniemi Local Heritage Museum in the very specific context of periferal Arctic Lapland. The case study builds on participatory design and provides findings and discussions on how to utilize mobile head-mounted eye tracking sensor technology and empathy map as methods in researching phygital customer experiences during the tourism customer journeys in peripheral, remotely situated micro and small-scale organisations. The findings provide tourism, service and experience design researchers, developers, and service providers with relevant information about the future challenge of phygital touchpoint

design. The case study worked as a test bed for experimenting, developing and introducing a hospitality service in fragile local context for the larger tourism audience and simultaneously paying attention and care for local community, Sustainable Development Goals and future developments in hospitality context.

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Technology in Retail, Hospitality and Service Design

Bridging reality and the reel: An AR-Enhanced Application Model for Memorable Tourist Experiences

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Over the past decade, the convergence of technology and entertainment has opened new avenues for improving the experiences of film enthusiasts and tourists alike. Focusing on merging reality and reel to enhance memorable tourist experiences, this paper introduces a comprehensive design model for developing smart film tourism applications. A qualitative approach was employed to explore the expectations and potential issues faced by film tourists throughout their journeys. Subsequently, insights are generated and translated into four key design aspects and corresponding features, integrating augmented reality technology. The convergence of elements within the model aims to facilitate a deeper connection between tourists and film-based destinations, fostering increased interactivity and immersion. Furthermore, a utility test was conducted on a prototype application, and the positive results validate the model's potential for designing memorable film tourism experiences, offering a reference path for experience design in the tourism industry.

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Designing onboarding for wearable payment: Connecting passive tangibles to online service

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This study explores the design challenges of connecting passive NFC wearables such as fobs, rings, and bracelets, to online services such as payment and access. Through field studies, co-design workshops, and auto-ethnographic design work, we investigate how physical action and online media could be coupled, allowing for more considerate onboarding experiences. Our main contribution is four de-sign concepts specific to this domain: using media to link experience to new concepts, supporting physical practice, giving feedback on physical success, and providing interactive function through physical form. In sum, the work highlights media content as a fundamental element in the design of passive tangibles, to support embodied understanding of the manipulations involved.

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Product creative content generation based on speech recognition in e-commerce

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Electronic commerce has significantly transformed the modern economy, efficiently connecting production and consumption while altering people's consumption patterns. While artificial intelligence has found extensive application in creative production, its application in creating innovative content for e-commerce is still in its early stages. The progressively refined e-commerce industry demands a significant amount of creative content to attract consumers, thus increasing the demand for designers and further elevating the operational costs for businesses. This paper focuses on creating creative content for products in an e-commerce context. It proposes a design paradigm integrating speech recognition and image generation technology, supplementing existing design theories and methods. Additionally, systematic design and empirical research are conducted in e-commerce, effectively addressing real-world issues such as a shortage of designers and a lack of creativity in the e-commerce industry.

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AI-designed Creative Products: Consumption, Creativity, and Consumer Value

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Artificial intelligence (AI) is widely employed to empower creative industries. Many enterprises have adopted AI to design creative products (CPs). This study investigates the determinants of purchase behavior and consumer attitudes towards AI-design CPs. Two studies were conducted. Study 1, with 764 participants, aims to determine if consumers have a positive view of AI design. Results indicate recognition of AI's creative abilities, with the designer's identity significantly affecting creativity evaluation. Study 2, based on 328 surveys, explores consumer evaluations of AI-designed products, purchase intentions, and attitudes. The result indicates that the impact of social relationship value on consumer purchase intention is the highest. These findings suggest practitioners should highlight the advanced nature of AI-generated design, enhance the cultural significance of the product, and emphasize its social value. Addressing consumer aesthetic preferences and leveraging technology, such as AI-customized services, is crucial for enhancing emotional value and the overall consumer experience.

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Discovering service insights through data-driven user analytics process: Studies based on the social media platform Instagram

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A critical goal when designing commercial services is the discovery of customer insights. In the digital transformation era, customer discussions of brands on social media have become indispensable for brands to explore service insights. The use of data-driven approaches for exploring service insights from the vast range of customer online data merits research. This study proposes a data-driven user analysis process to help brands explore service insights from massive amounts of data using data-mining techniques based on the social media platform Instagram. Using the proposed data-driven user analysis process, service designers can gain brand service insights from a large amount of customer social media data, thereby providing a reference for data-driven service design in terms of methodology and case practices.

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