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Bilbao 25th June — 3rd July

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Bilbao, Spain,
25 June – 1 July 2022

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Contents

Editorial: Welcome to DRS2022 1

1 Designing with bodily materials 5

2 Ethics as creativity in design 7

3 Wellbeing, happiness, and health (SIGWELL) 9

4 Biodesign 15

5 Graphics and spirituality 18

6 Tangible and embedded objects and practices (TENT SIG & OPEN SIG) 20

7 Schön's design inquiry: Pragmatist epistemology of practice 23

8 Design methods for sensing and experience 26

9 Sound and design 28

10 Design methods and transdisciplinary practices 33

11 Healthcare experience 40

12 Embodying experiential knowledge (Experiential SIG) 43

13 Design for behaviour change: Taking the long view fast (Behaviour SIG) 46

14 Linking human and planetary health (Global Health SIG) 49

15 Rethinking design for a complex world 52

16 What Legal Design could be: Towards an expanded practice of inquiry, critique, and action 60

17 Healthcare systems 65

18 Doing and undoing post-anthropocentric design 67

19 Design innovation and strategy 70

20 Curation, museums, and exhibition design 73

21 Design process / design theory 76

22 Design strategies for resilient organisations 78

23 Culture-sensitive design 81

24 Heritage and memorialisation 84

25 Meta-design in the complexity of global challenges 86

26 Sustainable design 90

27 Retail and brand design: Service futures, innovation, and intelligence (DRSF SIG) 93

28 Futures of design education (Pluriversal Design SIG and Education SIG) 96

29 Inclusive design practice and healthy ageing (Inclusive SIG) 103

30 Understanding play: Designing for emergence 109

31 Valuing the qualitative in design and data 114

32 Exploring online collaboration 120

33 Ageing 123

34 Design dematerialisation: Opportunities through reduction 126

35 Designing neighbourhoods: From the domestic to the community 129

36 Studio matters in design education (Education SIG) 132

37 Bias in design 135

38 User-centred design 137

39 Designing new financial transactions: Theories, case studies, methods, practice, and futures 139

40 Designing public organisations 142

41 Design education 145

42 Practice research in social design as a form of inquiry 147

43 Designing dialogue: Human-AI collaboration in design processes 151

44 Perspectives on climate change 154

45 Design for policy and governance (PoGo SIG) 157

46 Pasts, presents, and possible futures of design literacies 163

47 AI and the conditions of design: Towards a new set of design ideals 166

48 Framing practices in design 169

49 Creating connections: Social research of, for, and with design 172

50 Speculative design and futuring 175

51 Designing proximities 177

52 Food + design: Transformations via transversal and transdisciplinary approaches 180

Editorial: Welcome to DRS2022

DRS2022 has been a labour of love and an article of faith. The long process of preparing for the conference started in February 2020, as the pandemic began to take hold and change our world forever. Throughout the following two and a half years we have held our breath and had many doubts. We hoped that there would be a window of time in summer 2022 where design researchers could once again reconnect in-person. But we also wanted to learn the lessons that both coronavirus and climate change have taught us. Academic conferences bring with them large environmental footprints and we must either justify this or change, with our emphasis firmly on the latter. Early in our planning, we decided to hold the conference in a hybrid format, where in-person and online participants were valued equally, and with the corresponding benefits of accessibility on the one hand, and a decreased environmental footprint on the other. Our reasoning was that if any discipline could develop a workable format for hybrid conferences, it should be design research. Our experiences with both DRS2020—intended for Brisbane but held online—and the innovative DRS Festival of Emergence—held in 2021—have allowed us to prototype new approaches and shown us the way forward. With nearly 800 participants, online and in-person, DRS2022 is the biggest and most ambitious DRS conference to date. The technical challenge of treating all participants equally has been difficult and we are not sure that we have succeeded, but we have certainly made a step in the right direction.

DRS conferences have until now been hosted by a selected University but for DRS2022 our host is the City of Bilbao, represented by the organization Bilbao Ekintza, and in partnership with the local universities, led by the University of the Basque Country UPV/EHU. Bilbao is a UNESCO City of Design and the city saw the benefit, as did the DRS, of holding a design research conference in an environment that values design in all kinds of contexts; values aligned to those of the DRS. Design research, of course, is not identical to design, and a central question in our early meetings was what impact and legacy the conference could have on Bilbao and the Basque region. Shouldn't conferences be more than just a bunch of academics flying across the world to a location where they present papers to each other, and then leaving? We talked about how we could discuss and work on local issues that affect

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the Bilbao region but that also resonated globally; we talked about how to involve local professionals and organisations in design research; and we talked about how to raise awareness about the importance of design research. Both the new DRS Labs and the keynote debates engage directly with these issues. The design of this conference has been considered from many angles and in its final form we hope that we have struck a good balance.

A central focus on academic quality in design research remains, with the paper presentation once again forming the core of the conference. We started in July 2021 with a call for theme tracks, receiving 41 proposals, and selecting 31. Many were familiar subject areas, but a significant number of new subjects have emerged. It seems to us that design research is extending further outwards, bringing new perspectives to disciplines such as anthropology, politics, economics, healthcare, and others. The field continues to develop its core subject areas, with new methods, approaches, technologies, and philosophies all evident in these proceedings. Also emerging is a focus on how to deal with our uncertain futures, for example through societal transitions, transdisciplinarity, transformations, and pluriversality. The themes that have emerged for DRS2022 represent a rich snapshot of the current state of the art in world design research.

The richness of content presented another problem, however. How do we prevent so many interesting sub-disciplines from fragmenting the field of design research? There is a real danger that we end up in small, specialised communities of researchers talking to ourselves. That may be necessary and desirable in some cases, but the risk is that we lose the shape and understanding of the discipline as a whole. At this point, with the hoped-for return to (pre-Covid) 'normality' imminent we felt that something different, as a conference format, was needed. Our solution has been to extend the conference over a longer period of time and have fewer parallel tracks. Previous conferences have had up to ten parallel tracks with participants effectively experiencing very different conferences, in terms of content, depending on which stream of tracks they selected. Taking more time with fewer parallel tracks means that sessions at DRS2022 may be better attended, with more people exposed to ideas that they might not have come across with more tracks. Holding the conference over a longer period of time allows for more coherence, discussion, and learning, while also creating opportunities for the informal networking where future research partnerships and initiatives are forged.

Our call for papers resulted in 588 full paper submissions which all received at least two peer reviews (and with a large proportion receiving three peer reviews, which helped to further drive-up the quality of final papers). In total 1308 reviews were written by the international board of reviewers. All authors were able to provide feedback and rate their peer reviews. An average score of 6/10 (for both accepted and rejected papers) suggests that reviewing was acceptable, but that more work needs to

be done in nurturing the reviewer community. Following peer review, 81 papers were accepted, 236 were provisionally accepted pending revision, and 271 papers were rejected. At the conclusion of the review process, we accepted 317 papers for presentation and publication in the DRS Digital Library. This represents an acceptance rate of 54%. We think this strikes a good balance between publishing high-quality research and allowing a broad variety of contemporary issues and concerns in design research to be made available.

Design researchers must continue to strive to produce high-quality research: research that is carefully argued and evidence-based. While some conferences approach design research in more of a 'show and tell' manner, with DRS conferences we aim for research that is contextualised and argued in a way which will have a greater long-term impact. Many of the papers in this conference demonstrate these qualities. We should continue to bear in mind the distinction between design research and design itself. Design research is different from design, though it clearly depends on design and design activities for its meaning. Good design research asks well considered questions and answers them in interesting, innovative, and rigorous ways. Good design research leaves a legacy for others to build on.

One community of design researchers deserves a special mention in this respect, and that is the community of PhD researchers who now make up a substantial part of the DRS membership and design research more generally. This is a community that has grown considerably over past years, forming the next generation of design researchers. For many PhD researchers, who have become used to online conferences through the pandemic, DRS2022 is the first opportunity to participate in a conference in person and experience the benefits that can result—new ideas, new colleagues, new opportunities—that online conferences have sometimes struggled to recreate. Many older academics can trace important developments in their career to conferences. The progress of the design research PhD has been significant in recent years and is on show at DRS2022. PhD researchers are tackling contemporary subjects in new and exciting ways, in many cases surpassing previous generations with their insight.

We should also note how the DRS itself has developed in the past two years, since governance changes have allowed a more international and inclusive organization to take shape. This is also reflected in the geographical make-up in the production of the conference, with authors and reviewers participating from 64 countries; the majority are from Europe and the USA, with the top five countries being the UK (19%), the USA (12%), The Netherlands (10%), Denmark (6%) and Italy (6%). Notable countries for increased contributions are China (4%) and India (2%).

The biennial conference remains the major event for the DRS as an organisation, but we now have a healthy ecosystem of Special Interest Groups, Networks, and communities all offering events and initiatives of their own. We have a more active membership and opportunities for regular communications between members.

Supporting recent developments in the DRS has been our open access Digital Library: in place since 2020, the Library is now a central hub for disseminating design research. The Library is also a place where we can connect with and promote other design research communities. For example, the recent partnership with Nordes (Nordic Design Research), for example, has made more widely available a high-quality catalogue of design research.

We hope that DRS2022 will be a celebration of new ideas, of new connections, of increasing diversity, and of ways of doing things together that many have missed intensely. We also welcome opportunities for new, hybrid approaches to gathering. We should certainly look back and celebrate what we have achieved as a discipline but above all we should look forward to the potential that design research has in helping us to see older disciplines from new perspectives, to translate concepts and methods between fields, and to enable technologies to bring people together through new communicative formats. We hope that the ideas shared and the relationships created at DRS2022—whether in person, online, or a combination of both—will be powerful catalysts for design research's positive contributions to the future.

Acknowledgements

We have many people to thank in making DRS2022 happen. Above all, we have to thank everyone at Bilbao Ekintza, and especially Carolina Gutiérrez Gabriel, for her commitment, energy, trust, and professionalism. We have had many meetings, and grown into a highly effective team. It has been a joy to work together and with the amazing City of Bilbao. We would also like to thank the University of the Basque Country and other local universities who provided resources and allowed their staff to contribute to DRS2022.

We owe a special debt of gratitude to all the Theme Track Chairs who have put so much time and effort into producing their themes, as well as to the Reviewers who provided constructive criticism to help develop individual paper. And then, of course, we thank all the authors themselves who submitted their work for review. Some have been accepted and some rejected but we hope all have grown from the experience and will participate in future DRS conferences.

Finally, we should also thank two TU Delft Master's students: Caroline Häger wrote her thesis on the design of academic conferences in the future, which provided valuable inspiration for us as we planned DRS2022 as a hybrid event; and, Lenny Martinez Dominguez worked countless hours—right up to the last moment—to format papers for the conference proceedings.

DRS2022 Proceedings Editors:

Dan Lockton, Sara Lenzi, Paul Hekkert, Arlene Oak, Juan Sádaba, Peter Lloyd

1 Designing with bodily materials

Session chairs

Laura Devendorf, Marie Louise Juul Søndergaard, and Madeline Balaam

Editorial

Marie Louise Juul Søndergaard and Madeline Balaam

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More-than-human fluid speculations

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This paper shares speculative questions and ideas that emerged from considerations about bodily fluids and other related fluids as materials used for drawing and as materials related to the subject of a drawing. Partly informed by post-humanist perspectives that view human agency as entangled with other non-human material agencies, this paper presents short experiments in drawing that have prompted reflections about the ways in which knowledge is partial, situated and influenced by other forms of knowledge.

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Designing hair

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Hair forms an evolving boundary between the inside and the outside of the body, it is both separate from us and a part of us. At the same time it is strongly directed by culture and norms. With this project, we disturb and shift these norms by describing a set of speculative design explorations on hair. We describe these explorations and outline the practices and techniques that are emerging. As such this paper constitutes a report of a set of explorations and points towards the possibility of hair as an arena for designerly work.

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Designing with chemical haptics

Jasmine Lu
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Designers have developed a vast array of rich interactions to stimulate the mind and body. While much of the focus has been on creating visual systems (such as in VR), there is increasing interest in developing ways to reproduce touch sensations. This turn suggests a desire to create interactive experiences that involve our whole bodies and not solely our visual senses. However, a major part of the human sensorium has been neglected: our chemosensory systems, the sensory pathways that respond to chemical stimuli. Chemical receptors exist all throughout our body and are embedded throughout our skin. In this paper, I discuss my recent explorations in chemosensory interfaces for the skin and what possibilities it enables for the interaction design community. I outline my process of designing with these sensations, discuss how the chemical haptics approach induces uniquely complex sensations, and speculate on chemosensory design futures.

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Objects of care

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This paper describes a workshop activity intended to cultivate attention to bod-ies and care. Constructed as a card-deck, the “Objects of Care” activity prompts its players to look more closely at the objects in their lives, notice signs of care in those objects and re-think their relationships with said objects. We believe the card deck, based on the interactions we’ve had with it thus far, offers a few insights for prompting attention to bodily interactions by focusing on the way they manifest in textiles. This tended to have the effect of prompting people to take time with the old and “gross” and see them as rich historical artifacts, a kind of archaeology of the body constructed through the marks and smells it left on textiles.

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2 Ethics as creativity in design

Session chairs and Editorial

Wouter Eggink and Steven Dorrestijn

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Biodesign for a culture of life: Of microbes, ethics, and design

Rachel Armstrong
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Scientific advances at the turn of the new millennium brought radical new insights into just how microbial our world is and the extent to which microbes influence our lives: from notions of the body (human microbiome); to their distribution in our living spaces (microbiome of the built environment); playing an integral role in ecosystems services in our cities (urban microbiome) and are fundamental to biogeochemical cycles—our world is irreducibly microbial. This paper asks what it means to dwell and design in such times and proposes an ethics for biodesign: which employs the insights and tools of the biotechnological age to generate new, ecologically beneficial forms of design, where microbes are the new "workhorses."

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Ethics, design, and creativity: A fruitful combination

Wouter Eggink; Steven Dorrestijn; Karin van der Heijden; Ilse Ouwens
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In the context of the designers responsibility for the impact of technology, ethical considerations are important. However, these considerations are often seen as limiting innovation and the freedom of the designer. Is it possible, on the contrary, that ethics can also foster creativity in design? The research project Tech-Wise is about a practice oriented approach in ethics; developing tools to engage people with ethical deliberation on the impact of technology. One result of the project is a workshop format for stimulating ethical deliberation that can be tailored to particular technologies and design disciplines.

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Plagiarism or reference? Exploring the detection criteria and solutions of visual design plagiarism

Shenglan Cui; Fang Liu; Yinman Guo; Wei Wang
Hunan University, China

Visual plagiarism occurs frequently and is often controversial. This paper conducts an exploratory study to discuss detection criteria and solutions for visual plagiarism. Since visual design involves many fields, considering the ubiquity and diversity of posters, we explore plagiarism based on poster design. We summarize the eight main elements which compose a poster artwork and discuss eight factors that influence plagiarism evaluation from two aspects of “Evaluation Standard” and “Evaluation Method.” We discussed possible solutions based on technology and tools to detect visual plagiarism better and track artwork, supporting a good online design sharing environment.

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Ethics through Design

Maria Alejandra Luján Escalante, Luke Moffat, Monika Büscher
University of the Arts London, United Kingdom; Lancaster University, United Kingdom

Ethics through Design (EtD) uses co-design methods to create, facilitate and nurture anticipatory capabilities for research and innovation, responsive to both society and environment. In practice, EtD problematizes both Ethics and Design. This paper draws upon ethics of technology, specifically the work of Gilbert Simondon, to formulate principles of co-design facilitation. EtD understands ethics, beyond regulation and administrative ticking-box exercises, as contextual, creative and participatory ongoing processes. EtD has been developed within Disaster and Risk Management (DRM) and Emergency Response domains, over 7 years of working in partnership with emergency response practitioners, policymakers, academics across disciplines, standardization organizations and key IT developer companies.

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3 Wellbeing, happiness, and health (SIGWELL)

Session chairs

Leandro Tonetto, Rebecca Cain, and Ann Petermans

Editorial

Ann Petermans, Tiiu Poldma, Rebecca Cain, Deger Ozkaramanli-Leerkes, Leandro Tonetto, Anna Pohlmeyer, Marc Hassenzahl, Matthias Laschke, and Pieter Desmet
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"What makes you feel relaxed in nature?": Exploring nature-based stimuli as inspiration for designing relaxing experiences

Chan Mi Kim, Thomas J. L. Van Rompay, Geke D. S. Ludden
University of Twente, The Netherlands

Nature experiences promote relaxation and wellbeing. To bring these benefits to people with limited access to nature, digital technologies can be used to provide nature experiences. However, we do not yet completely understand which exact qualities of nature and what mechanisms are involved in eliciting relaxation. To close this gap, we conducted a diary exercise (n=25) to explore interactions and qualities that stimulate relaxation in nature. Results revealed a typology comprising three pathways to promote relaxation through nature experiences: relaxation by sensing, thinking, and doing. In addition, 8 sensorial and 6 contextual qualities were identified, and a visual summary was made that can support designers in applying nature-based stimuli to the design of digital nature with relaxing effects.

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Embodiments of compassion in caring and non-caring products: Exploring design for values with a multisensory approach

Benedetta Lusi, Geke Dina Simone Ludden, Randy Klaassen, Charlotte Marie van Lotringen, Matthijs Noordzij
University of Twente, The Netherlands

This paper explores how to design for the value of compassion by means of multi-sensory design. It reports on a study with 77 university students, carried out in the context of a design master course. The study, divided in two phases, focuses on: 1)

identifying sensory qualities as requirements to design for the value of compassion; 2) embedding these requirements in caring and non-caring products. To describe the design process, we present a student-led case study. Subsequently, we analyse the results of the study and critically reflect on the different expressions of compassion and competing values. This paper provides methodological exploration into designing for values, and practical experimentation on embedding compassion in design. Finally, it contributes to research on designing compassionate technology for wellbeing and healthcare.

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Healthricious: Improving an existing mobile app for healthy eating to support groups at risk of COVID-19

Sander Hermsen
OnePlanet Research Center, The Netherlands

Urgent health issues, such as the COVID-19 pandemic, require rapid responses based on scientific evidence. Improving existing solutions is often faster, more effective and cheaper than developing new ones. This paper describes a case study consisting of a design cycle aimed at improving an existing design, a mobile app, to better support at-risk groups with healthy nutrition, to reduce risk of debilitating consequences of COVID-19. The design process consisted of five phases: user research (lived experience), expert consultations (learned experience), behavioural analysis of the original design, development of a new iteration, and delivery & evaluation. The case study showed that the design process indeed made an evidence-driven rapid iteration possible, and may serve as building blocks for developing a method for improving existing designs. Difficulties also arose, especially in the trade-off between rigour and completeness on the one hand, and budget and time constraints on the other.

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With or without emoji? The effect of emoji on risk perception and preventive behaviors in health information

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For nearly a decade, emoji have been widely used as a substitute for nonverbal clues in computer mediated communication, especially in social media. Although the use of emoji in health communication via social media is becoming pervasive, the influences of using emoji in health information on information receivers' perceptions and behavior has not been fully studied. In order to discover these influences, this study collected 210 Taiwanese self-statement questionnaires for analysis during the COVID-19 period in Taiwan in 2021. It adopted a 2x2 between-subject design to examine and respond to the research questions. The results verified the enhancement effect of the use of emoji in health information and the moderation effect of the information source. In the emoji condition, health information leads to a higher level of risk perception at

receivers' personal and societal levels. It also enhances the receivers' preventive behavior intention. This experiment revealed an interaction effect between emoji and information source on preventive behavioral intention, namely that emoji work better on health information issued by unofficial organizations. The results provide indications and suggestions for how and when to use emoji effectively to design and deliver health information.

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Design for patient empowerment: Guidelines to design for supporting the self-management of people living with chronic conditions

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Management of a chronic condition can be challenging, yet expectations from patients towards self-management have been increasing. Patient empowerment in chronic condition care has been gaining attention as a way of increasing the quality of life of patients and sustaining the limited resources of healthcare services. Design has the potential to facilitate empowerment through the designed products and services, yet how this can be achieved has not been fully explored. In this paper, we investigate empowerment from the patient's perspective and present design guidelines to facilitate empowerment. A design research approach was followed utilising design probes. Research methods include observation, interview, cultural probe and co-making workshop. The study was conducted with people living with a chronic condition called lymphoedema and their healthcare providers. This study presents that, patient empowerment is beyond increased power in decision-making, and is associated with everyday life with its competing priorities and un-prescribed adaptations to self-management. We propose that an individual's readiness for empowerment should be considered to provide the right support at the right time for the patient. In this study, the rich everyday chronic condition experiences are transferred into design guidelines to contribute to the development of future self-management support.

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A case study of medicalized wellness clinic design process and result in the context of an emerging wellness service market

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This study presents a comprehensive design process of a medicalized wellness service clinic design project aligned with the emerging wellness service market. The project

designer, who has a background in design research, design management, and interior design, utilized an evidence-based design framework to integrate the intangible wellness service provision sequence into the tangible design language. In addition, the project client, who is familiar with the evidence-based medicine framework, participated in the programming and schematic design phases of the evidence-based design framework. As a result, the project designer and client implemented a medicalized wellness service space that integrates concepts of Hospitality, Hospital, and Wellness. Consequently, this study discusses a case of demonstrating the value of design through the integration of results from multi-disciplinary communication and decision-making processes in the emerging market for wellness services.

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Potential benefits of designing Immersive technologies to reduce anxiety in the perioperative patient journey

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This research investigates if virtual and augmented reality (VR/AR) technologies can be used to help people cope with the anxiety associated with a surgical procedure in the patient health care journey. Perioperative anxiety is a natural response to surgery stress which may happen at any point before or after a surgical procedure. Research has shown that high level of perioperative anxiety are a potential health and recovery threat for a patient due to the effects on psychologic and physiologic responses. The concept of Digital Health is increasingly playing a more substantial role in health care provision and there is a body of research showing that technology-based therapeutic tools can play an effective, acceptable, and cost- effective role in many aspects of health care delivery. Through a series of multistakeholder engagement activities, this research aims to devising a set of guiding principles and practices for the design and application of AR/VR interventions in the clinical setting. This paper presents the findings from a Policy Delphi study, conducted with healthcare professionals working in perioperative environments.

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Investigating the design opportunities for mood self-tracking and regulating

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Many studies have demonstrated the positive impact of self-tracking technology on people's health and wellbeing. Research on the effects of the tools for tracking moods to create awareness of people's affective health is also gaining attention. In addition, studies show that people are open to using tools that contribute to sharing their

moods and reflecting on them. In this paper, we aim to contribute to this emerging field. We carried out a three-phase study (i.e., exploratory survey, co-creation, and testing) with a total of 46 participants to explore preferred ways of mood tracking and the ways design can support these ways. By presenting the results of each phase, we show how design studies can contribute to mood tracking and sharing studies.

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Fragments of frictions: A route to spatial manoeuvres for uplifting wellbeing in school environments

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In the context of design for human flourishing (DfHF), this paper reports on a two-week research-by-design-and-built project by master students in (interior) architecture. A cocktail of qualitative research experiments was executed to function as a seismograph that registered fragments of frictions in the wellbeing of K-8 pupils. This particular study firstly explains how the research cocktail was designed, based on the ethnographic, participatory and immersive methods infused by the theoretical guidelines of DfHF theory, and secondly seeks to reveal how an analysis of the well-being related results from the experiment cocktail can lead to a novel type of design problem statement and thus design brief, defined by a richer understanding of the link between human flourishing and the spatial surroundings of school children. Next, the paper illustrates its merit by reporting on the design realization following the re-search. The paper concludes by stating the values for wellbeing theory, architectural practice and school designs.

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Secret dance and bring light: Enhancing user autonomy with directional ambiguity in positive emotion regulation interventions

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This case study summarizes the development of a self-administered behavioral intervention for positive emotion regulation (PER) that gives users the freedom to choose their own positive behaviors. In contrast to the predominant practice of prescribing pos-itive behaviors (e.g., “keep a gratitude journal”), we explore whether — and how — open-ended instructions could permit users to self-select such behaviors themselves. Employing a research-through-design approach over 4 iterations, our interventions utilize ambiguous prompts (e.g., ‘secret dance’ and ‘bring light’) intended to inspire users to first envision and then perform self-selected positive behaviors during their day-to-day lives. The authors engage in self-reflective exercises and/or collect user feedback with each iteration to inform purposeful design choices intended to enhance user autonomy, interest, and subjective well-being. The case study concludes with a

discussion of process-focused lessons for designers along with future research directions for enhancing user autonomy in behavioral interventions for PER.

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Tinder and heartbeats: Wellbeing in the use of dating applications

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Currently, there are more than 1500 dating applications, allowing people to connect with a single swipe. However, there is a rising concern about the behaviour encouraged by these digital forms of interactions in relation to negative effects on user wellbeing. Using an evocative autoethnographic approach combined with literature review, this study aimed to explore potential connections between the interaction design, user interactions, and user experiences within dating applications by following weekly experiences over four dating applications. The experiences were recorded with a journal, then explored using emotion capture cards, and visualised in emotionally mapped timelines. It was found that even within the first forty-five minutes of using the dating applications, significant negative emotions were experienced by the researcher. This study calls for more efforts and research from the design perspective to create interactions that are mindful and that nourish the wellbeing of users and support healthy and steady relationship developments.

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4 Biodesign

Session chair and co-chair

Anna Vallgårda and Sofie Boons

Method of mapping interdisciplinary research and practice at the intersection of biology and design

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Ubiquitous, multi-meaning terms used to describe new ideas, finding etc, presents a significant barrier for cross-disciplinary discourse especially between the arts and sciences. The research presented in this paper tackles the problem of terminological disharmony specifically within the process of contextualising creative design practice informed by biological science and/or its applications. The study is implemented in three stages; lexical semantic theories and methods are applied to corpus-based investigations to assess the scope of biologically informed disciplines (BID) terminology; results are analysed using statistical and qualitative methods and mapped against known academic domains; the resulting map is evaluated via the analysis and consequent positioning of practice-based biologically informed textile research. The findings suggest that the experimental framework enables the presentation of work within an established network of theories and concepts with transparent disciplinary connections. As such, presents an new method of mapping design practice within the BID landscape that mitigates terminological disharmony.

View Paper: https://doi.org/10.21606/drs.2022.150

Sustainable approaches to textile design: lessons from biology

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Models such as the circular economy, offer guidance to actors from the fashion and textile industry on how to navigate the negative environmental, ethical, and social impacts of the sector's current and historic practices. The principles underpinning these models originate from the intersection of biology and general systems theory and have provided us with valuable alternative paradigms via a top-down lens. This paper seeks to explore the potential for additional insight into sustainable textile

design practice from biology by reviewing sustainable design principles emerging from top-down (ecology + systems view) within the context of a bottom-up (biology + engineering) approach. The results suggest a novel practice-based conceptual framework that could enable textile designers to better understand and mitigate the impacts of resource efficiency, longevity and recovery of their design decisions.

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Bio-based plastics in durable applications: the future of sustainable product design? A design review

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This design review evaluates the use of bio-based plastics in durable consumer products. The main question is: how does the use of bio-based plastics influence the product's design, functionality, marketing & communication, and sustainability? Although higher material prices would lead one to expect that higher value applications would be targeted, research shows bio-based plastics are mainly used in short-lived applications like packaging. This study investigates their use in durable consumer products through a design review. The results indicate that bio-based plastic usage is still in its early days in durable products. Bio-based plastics appear to be utilized as straightforward replacement of fossil-based plastic. Designers are not yet using the unique properties of bio-based plastics in the design of their products. Companies mainly exploit the green image of bio-based plastics in their marketing & communication. Their focus is on the renewable feedstock and not on sourcing, or on recovery at end-of-life.

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Living with living artefacts: Six concepts for designing user acceptance of living artefacts

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Bio-designers are exploring how living organisms can become vital aspects of the design and use of an artefact. These new living artefacts have qualities, needs, design opportunities and relationships with the user that differ from nonliving artefacts. To design for user acceptance of living artefacts into daily life, designers must develop an understanding for why a user wishes to live with living artefacts. This starts with an understanding of why humans have been living with other living beings throughout history. These reasons have been examined through a semi-systematic review of literature across diverse research fields.

Qualitative thematic analysis suggests that the benefits of Biophilia, Care and Meaning and those of Performing tasks, Source of material and Knowledge & skill, are essential to why humans live with other living beings. Based on these six concepts,

eight design guidelines are proposed for designing user acceptance of living artefacts into daily life.

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New perspectives in fashion sustainability through the use of bacterial cellulose

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Fashion constitutes a sector with a high environmental impact, particularly because of shorter product life cycles and an exponential increase in the speed of production and in the number of goods created, sold, or unconsumed and thrashed. This paper aims to explore new perspectives of design and production processes toward environmental, social, and cultural sustainability through bio-fabrication. After an analysis of the context of reference and a review of existing literature, the research focuses on experimentation with bacterial cellulose (BC) to investigate the limits and potentials of controlled growth, waste processing and integration, accessories creation and recyclability, and the assembly/disassembly of clothing and/or accessories at the end of life.

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Is This Alive? - Towards a Vocabulary for Understanding and Communicating Living Material Experiences

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Living materials are a nascent material class where living organisms are embedded and kept alive in the design outcome to achieve novel functionalities, expressions, and interactions. Experiential characterisation studies with potential end-users will provide insights for developing these novel materials for meaningful material applications. Nevertheless, the current literature lacks a vocabulary to communicate and discuss living materials in user studies. To bridge this gap, our paper presents the development of a “Living Materials Vocabulary” consisting of 45 descriptive items. Through a term frequency analysis of relevant literature and in-depth interviews with eight biodesigners, we identified a set of descriptions which we clustered under five themes: origin, making, agency and autonomy, temporality, and impact of living materials. We selected representative items from these themes to compile our final vocabulary. We discuss how our vocabulary can be operationalised in living material characterisation studies and further inspire future biodesign practice.

https://doi.org/10.21606/drs.2022.796

5 Graphics and spirituality

Session chair and co-chair

Estelle Berger and Tim Cowlishaw

Design as posture: Developing enlightened subjectivity with the philosophy of Yoga

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This research aims at supporting designers in developing a both embodied and reflective posture in practice – referred to as “enlightened subjectivity”. A dialogue is set up between the Samkhya, an early Buddhist philosophy at the basis of Yoga, and the design discipline. Grounded in practical experience, this inspirational framework allows approaching the sense-making process occurring in practice, through perception, understanding, action, and relation. This is sustained by professional posture, the specific way in which one invests their activity, giving it substance, meaning and justification. Implications for design education relate to increasing awareness among designers on their own posture, and learning to adjust it in different situations to achieve union – the meaning of “yoga”. Reflection is prompted on the use of tools and methods, on the meaning of action in design, and on the development of professional identity.

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Visual communication design as a form of mindfulness-based intervention

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The paper explores the effects of mindfulness-based design interventions to help children better self-regulate their emotions. It attempts to ascertain if the use of prototype designs could further enhance the children’s awareness or mindfulness, and emotional wellbeing. Children’s emotional and behavioural problems have become a growing concern. These problems are related to the difficulties children face in controlling their emotions, which may lead to psychological problems in adulthood. This indicates the need to help children understand feelings and how to self-regulate

emotions. A pilot design project was conducted to explore the connection between mindfulness-based practice and emotion regulation in children to develop usable mindfulness-based prototype designs. Preliminary findings indicate storytelling to be a mindfulness-based prototype design that can benefit children in terms of emotional regulation. To fully realize the potential of mindfulness-based design interventions may require the development of more robust and rigorous activities and thorough analysis.

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Graphic design and artificial intelligence: Interdisciplinary challenges for designers in the search for research collaboration

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The introduction of electronic publishing, multimedia, the web and social media have influenced and presented challenges for graphic design. Now the implementation of artificial intelligence (AI) features within graphic design software enables practitioners to automate many design processes. However, this threatens to deskill the profession and create a second tier of 'non-professional' designers, particularly within less creative work that emphasises fast turnover and functional artefact production. Research at the intersection of AI and graphic design has been led by computer scientists. This paper argues, from a designer's perspective, that a paucity of scholarly engagement by graphic designers with their own practice and of AI research has resulted in computer scientists defaulting to functional approaches to design. Acknowledging that discursive and methodological differences between computer science and graphic design renders interdisciplinary collaboration problematic, this paper places the onus on design practitioners and researchers to engage with research into AI-supported graphic design.

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6 Tangible and embedded objects and practices (TENT SIG & OPEN SIG)

Session chair and co-chair

Miriam Sturdee and Carmem Saito

Editorial

Tom Fisher and Sarah Kettley

https://doi.org/10.21606/drs.2022.1074

A More-than-Human Right-to-Repair

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Whilst the recent introduction of the Right-to-Repair to European citizens is undoubtedly a step forward in tackling planned obsolescence, and the resultant deluge of electronic product waste — the efficacy of this new legislation is reliant on consumers availing themselves of this right. Given that repairing and maintaining devices will often require specialist knowledge and skills, it is difficult to assess how effective this right may prove to be in practice. To address this concern, we draw from the expanding infusion of datafication and Artificial Intelligence into everyday products and services via the Internet of Things to consider alternative futures whereby the Right-to-Repair is granted to the device itself. Building upon More-than-Human-Centred Design approaches, we explore the potential embodiment for such a perspective and present two Speculative Designs that concretise this consideration: the Toaster for Life and The Three Rights of AI Things.

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Experiencing interactive ecologies

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IoT devices can be characterised by complex intertwined interactions between devices, users, and the environment. As these devices become more dynamic and widely connected, designing for such complex ecologies requires a holistic approach

with a consideration of diverse perspectives on the interactions between all actants connected to and through these devices. To support designers in this challenge, we propose a design approach that can help them explore the nature of the interactions and connections within this complex interactive ecology. The design approach borrows its underlying design considerations from somaesthetics and post-anthropocentric design to support experiential design exploration. The implemented design approach resulted in a collaborative choreography of interactions among users and devices. The result suggests that the current design approach provided designers with an opportunity to explore, experience, and understand a broader range of perspectives that are essential for designing complex interactive ecologies.

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Experiencing mundane AI Futures

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Whilst popular visions of Artificial Intelligence (AI) are often presented through the lens of sentient machines, our lived experience of AI is more mundane and exemplified by so-called 'smart' products and services. Whilst this mundane reality is often presented using design approaches that make their operation appear simple and innocuous, these smart systems, and the data they use and collect, can challenge and even disrupt ordinary expectations. Our ability to manage smart technologies effectively is key to the field of Human Data Interaction (HDI), which seeks to shape systems design and empower users by implementing core principles of legibility, agency and negotiability. However, how these principles manifest in practice is yet to be fully understood. We seek to understand key challenges confronting HDI by situating smart products and services in everyday life and creating a mundane experiential future that houses AI in a caravan for evaluation with the general public.

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How smart clothing can mediate the space between users and their environment, a case study using face masks

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Augmenting clothes with sensors and actuators and turning them into smart clothes, offers new possibilities to mediate the space between users and their environment. The current COVID pandemic provides an ideal research opportunity, given that it challenges conventional norms of personal distance. We developed hairs with LEDs showing six types of dynamic behaviour as a research vehicle and mounted them onto face masks, commonly used during the pandemic. A qualitative phenomenological study was conducted with six subjects. The interview data from their experiences was analysed using the 'framework of context' from environmental psychology. We uncover three modes by which smart clothes can influence the user-environment

context: to increase the perception of the body; to alter the perception of space; or as a medium to communicate with our environment. The findings are interpreted to discuss new opportunities for the design of smart clothing that play an active role in mediating the user-environment context.

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Designing experiences for IoT Products: A case study testing existing UX frameworks

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IoT products are believed to be a new type of things that combine both material and immaterial resources. Their unique attributes can result in user experiences strongly differing from traditional products, imposing new design challenges. This study aims to 1) test whether existing UX frameworks are applicable to IoT products in design practices, 2) identify essential elements in experience design for IoT products, and 3) explore new associated experience design opportunities. We conducted a workshop including 25 design-engineering students testing two UX frameworks. The participants designed new experiences for a representative IoT product (i.e., smartwatch) in the workshop and presented the experience scenarios by role-playing, revealing existing frameworks' insufficiencies and highlighting how interactions in an IoT network influenced experiences. The study critically discusses whether pleasurable elements should be prioritised in IoT products' experience design and how the agency of IoT products can be a tool for designers to shape experiences.

https://doi.org/10.21606/drs.2022.593

7 Schön's design inquiry: Pragmatist epistemology of practice

Session chairs and Editorial

Frithjof Wegener and Brian Dixon

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Remaking the social: Dialogical, creative, and cooperative capacities of thought at Hull House

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While social research is often positioned as a way to reflect social realities or develop theories for specialized fields through analyzing empirical evidence, based on data that is extracted from communities, Jane Addams points to a different mode of inquiry. This chapter introduces the theories and practices of the Hull House as an iterative and experimental process of inquiry— creating new knowledge in and through action, in a process of facing down pressing social challenges. In particular it uses examples from the Hull House— which involved the design of the working people's social science club, exhibitions on the industrial condition, and spaces for solidarity across class lines—to demonstrate the dialogical, creative, and cooperative potentials of social thought in the practice of Jane Addams and Hull House. Implications are explored in regards to what the model of Addams and Hull House can contribute to modes of social thought and design inquiry today.

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Touch ground: Introducing design inquiry in higher education

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In higher education, design thinking is often taught as a process. Yet design cognition resides in action and design practices. Dewey's pragmatism offers a solid epistemology for design thinking. This paper describes a design research whereby Dewey's inquiry served as the foundation for educating students. Three extensive

educational case studies are presented whereby a design inquiry was introduced and became part of the curricula. It was found that students and coaches struggled with doubts experienced as a result of the co-evolution of problem and solution, means and ends. Four coping mechanisms were observed: (1) focus on problems, risking analysis paralysis; (2) focus on creative problem-solving, risking unsubstantiated design; (3) focus on means, risking fixation; and (4) focus on future ends, risking hanging on to a dream. By establishing a joint practice and a community of learners through show-and-share sessions, the students establish solid ground.

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It's complicated: Dewey, Schön and reflection-in-action

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While Schön's work is prominent in design literature, some of its concepts stay unclear. In this paper we examine the distinctions Schön made in 1992 between "reflection-in-action" and "reflection on reflection-in-action" (or "conversation with the situation" and "reflective conversation with the situation"). To clarify the meaning of these two terms, we will refer to pragmatist philosophy, using Dewey's work on inquiry and epistemology. Our results show that there is indeed a difference between the two expressions. Moreover, revisiting Dewey's and Schön's work allows for a new visual representation of the reflection-in-action process, which can then be used as a tool to enhance the designers' reflection on reflection-in-action.

https://doi.org/10.21606/drs.2022.349

Re-framing design and designers: studying design processes through a Pragmatist lens

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Becoming a competent professional entails both developing scholarly knowledge, learning the craft, and developing the social skills demanded in the profession. In this paper I provide insight into how studying professionals at work can be understood as a continuous social inquiry where both researcher and the professionals reflect on reflection-in-action. Embedded in a performative process approach based on the temporal and transactional understandings of John Dewey and George Herbert Mead, and Donald Schön's understanding of the reflective practitioner, research on product design processes are discussed and explored as a mutual process of becoming. This paper proposes that studying professional work is a collaboration between professionals and the researcher where both work- and research activities are made possible by the temporal re-framings of social identities and of situations.

https://doi.org/10.21606/drs.2022.567

Pragmatism, design and public sector innovation: Reflections on action

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This reflective paper explores the intersection of Pragmatism, Design Research and Public Sector Innovation through the lens of a body of work undertaken at a public sector innovation, design research center between 2010-2018. This center drew explicitly on the work of Donald Schön and Charles Sanders Peirce in the development of its research methodology and practice. The paper includes an illustrative case study that demonstrates the application of Peirce's model of Innovative Abduction, draws on recent interview data that demonstrates engagement with Deweyan Analysis of Reflective Thinking and reflects on the possibilities that may come from further engagement with the Pragmatist movement.

https://doi.org/10.21606/drs.2022.778

A theoretical model for studying design inquiry in a real-world context

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Schön's contribution is significant in defining and understanding design inquiry, though he wrote little about its socio-cultural aspects, as Dewey initially intended. While ethnographic research has provided insight into the socio-cultural aspects of designers' inquiry, it poses several methodological challenges for observing designers in action in real-world contexts. In reference to pragmatist theories of design and professional action, this article proposes a theoretical model for qualitatively observing and analyzing designers' inquiry in real- world contexts. The model aims to capture design inquiry in a richer and more holistic way, by including its socio-cultural aspects. The model serves as a collection and analysis tool compatible with the shadowing investigative approach. It emerges from a previous study of video game artists. The discussion addresses the contributions and limitations of the model and points out the value for the enrichment of Schön's thinking, and for the research and teaching of design practice.

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8 Design methods for sensing and experience

Session chair and co-chair

Paul Hekkert and Teksin Kopanoglu

Towards a Standard: Designing an Open Source Clay Measuring Tool

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This paper describes early stage research into the development of a common standard for measuring clay hardnesses in craft and design practice. The research has emerged in the context of the development of 3D printing with ceramic paste. The paper initially provides the wider context and motivation for research followed by a review of the development of this new area of practice – an area of innovation that has largely been driven by individual design practitioners through an open source approach. The paper also outlines existing approaches for measuring the plasticity and hardness of clay. The paper presents key re-search objectives in the aim of establishing low-cost methods that can be used for measuring ceramic paste consistencies for 3D printing, as well as other ceramic production methods. In response to this research challenge a 3D printed design for a simple measuring devise based on the 'fall cone' principle is presented.

https://doi.org/10.21606/drs.2022.671

Exploring the effect of visual and auditory information in haptic experience

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Haptic experience always has a close relationship with visual and auditory modalities, but little research uses both visual and auditory modalities to map haptic perception in tangible interaction. It is essential to understand how to make haptic information harmonious with visual and auditory modalities, and how users describe haptic feedback in physical interface design. In this paper, participants are divided into three groups: auditory-haptic (AH), visual-haptic (VH), and haptic (H) groups to test a sensory integrated prototype in order to explore the effect of visual and auditory

information on haptic experience and users' description patterns. We find that users' haptic descriptions range from abstract to concrete and are affected by modalities. Moreover, there is a massive difference in the function of visual and auditory influencing the sense of touch. The findings are beneficial to haptic experience design.

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Toward a Method of Psychological Ownership Mapping

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The mental state in which an individual claims an object as theirs is called psychological ownership. Psychological ownership is associated with motives, routes, affordances, and outcomes directly linked to attachment. This research introduces a qualitative method for psychological ownership mapping. Ownership mapping seeks to explain the changes in a user's psychological ownership of a target over time. Previous studies suggested conceptual pathways of ownership. This method extends current research on ownership as it offers a viable application. The method has been tested with over 100 students and is an easy, flexible, and adaptable to many different contexts. We believe that ownership mapping method coupled with the theory of psychological ownership will be an essential tool for designers, organizations, and etc. to better inform design decisions

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Biosensor Measures of Human Emotion

Brodie Kershaw, Stuart Favilla, David Sly
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There is clear potential for consumer-grade wearable biosensors in future emotional state research because they are cheap, portable, and accessible. In this study, biosensor measures of valence and arousal, calculated from Electroencephalography and Apple Watch were correlated with self-reported valence and arousal measured by the EmojiGrid. We establish requirements for the use of biosensors, specifically the Muse 2 and Apple Watch in future emotion research applications and passive real-time analysis of participant emotional states. When compared to the IAPS & OxVoc, mean dataset valence and arousal values for visual and auditory stimuli, the EmojiGrid recorded significant correlations for valence but not for arousal. Spectral alpha power and the asymmetry index had strong correlations with participant valence for some participants, but weak for others. There was no correlation between heart rate change and self-reported arousal recorded from the Apple Watch and EmojiGrid respectively.

https://doi.org/10.21606/drs.2022.401

9 Sound and design

Session chairs and Editorial

Stefano Delle Monache, Nicolas Misdariis, Elif Özcan

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Sounds that satisfy: Describing the relationship between sound and need fulfilment

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Psychological needs of users as a basis for design are at the core of design practice, yet the importance of fundamental human needs when designing soundscapes has not been studied specifically. This paper investigates the relationship between nine fundamental human needs and the affective qualities and categories of soundscapes. In a free-labeling survey study, we collected descriptions of imagined sound environments for the fulfilment of the needs, as well as ratings of the perceived affective quality of these environments. We found that needs were associated with pleasant soundscapes, while their eventfulness varied. 'Human' sounds were a common category for each of the nine needs considered in this study, but systematic variations of the categories were found dependent on the need. Results suggest that designing categorically different soundscapes dependent on the users' needs will have beneficial effects.

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Towards a quieter Neonatal Intensive Care Unit: Current approaches and design opportunities

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Recent studies show that the well-being of patients and the performance of healthcare professionals in modern neonatal intensive care units (NICUs) are severely affected by the amount of auditory alarms and sound nuisance. This paper presents a

semi-systematic review on the topic of environmental sound in the NICU, where current themes, insights, and limitations are highlighted. Furthermore, it outlines the results of an observation of the NICU environment and an interview with nurses at Erasmus Medical Center, in order to understand the users, their context, and the technology that can enable design interventions. The insights gathered from the literature and the users, together with a technology search, lead to potential design opportunities to be developed further. Based on these, we propose a technological solution towards a healthy sound environment in the NICU.

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Listening tests for sound design: Faster optimization through lower-dimensional parameter spaces

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Listening tests are often an essential part of sound design but can be resource intensive to carry out. Where there are many degrees of freedom in the sound design parameters, the 'curse of dimensionality', means that the number of trials required to reliably understand the impact of a particular design variable increases exponentially with increasing number of parameters. When there is a particular design goal in mind (e.g. maximum audibility, pleasantness, etc.) this can be somewhat mitigated by using efficient optimisation techniques with online sound generation during listening tests -- whereby a black box optimiser iteratively moves the parameters towards those which produce the desired percept. We show in a pilot study that this approach can be improved yet further by first using dimensionality reduction for the synthesis parameters prior to performing the listening test. This allows sound designers to use fewer testing resources when optimising for a particular percept.

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A designerly approach to the sonification of Electric Vehicles

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In recent years, efforts to frame sound-related areas of research such as sonification, sonic interaction design and product sound design in terms of design methodologies became more common. Sound designers seem to be willing to structure a field traditionally characterised by tacit knowledge in terms of explicit design processes, tools and methods, to increase the reach and impact of the field. In this paper, we describe the first two stages of a commercial sonification project for the design of sounds for Electric Vehicles. The project was developed applying a design

methodology that integrates a specific tool (the sonification canvas), which we describe in detail. We approach the creation of sounds for Electric Vehicles as a designerly endeavour with the goal of contributing to the transition of sound design from a heterogenous, practice-based field to a structured discipline that can enrich the creation of fulfilling experiences.

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Soundscape gardens: An evaluation on use of the Northern Ireland Hospice's sound garden installation

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The purpose of this paper is to share the results of an evaluation of the Northern Ireland (NI) Hospice's Sound Garden installation placed at the Somerton Road site in Belfast. The sound gardens are an immersive installation split into three separate garden spaces, each using a combination of outdoor loudspeakers. The Sound Garden is designed to project a growing collection of soundscapes composed by both students, doctoral candidates, and staff from the Sonic Arts Research Centre (SARC) at Queen's University Belfast. This evaluation, which took place in late 2019 as part of a Master of Research, uses both pseudonymised questionnaires and on-site observations to determine not only use of the facility, but also the impact that its presence in the hospice can have on patients, relatives, staff, and users of the facility.

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Audiovisual sonifications. A design map for multisensory integration in data representation

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In the field of data sonification, the construction of meaning is hampered by the lack of shared perceptual codes derived from common modes of perception, as it happens for the visual register. In this paper, we re-organize knowledge from previous experimental projects to build the foundations of future work in data representation. This experimental investigation aims to identify patterns in the translation process from different sensory modalities. To this end, 80 audiovisual sonifications have been collected and analyzed through phenomenological analysis with the goal of recording sensory correspondences. The resulting cross-sensory design map is a visual synthesis of the analysis, and it has a dual function. In the research domain, it proposes testable hypotheses for a systematic approach to data sonification. In the practice, it offers a space that is based on shared conventions that aim to standardize the actions and the choices of both sonification experts and communication designers.

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Functional and Sensible: Patient Monitoring Alarm Tones Designed with Those Who Hear Them

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This is a case study in participatory design of alarm tones for the Philips IntelliVue patient monitoring system. Through interviews and workshops, we asked clinicians and other stakeholders what mattered to them as we designed new tones. We distilled responses into criteria with which to evaluate new tone options that we created by adjusting the tones' pitch, timbre, and other parameters. In surveys, participants compared these options using the criteria distilled from interviews. The results were: 1) new tones that stakeholders judged to be improvements over the originals, and 2) criteria for evaluating future tones, based on "functionality" (i.e., their ability to be heard, understood, and prompt response) as well as "sensibility" (i.e., avoidance of unintended consequences: annoyance, fatigue, patient distress). We found that we could engage stakeholders meaningfully in the definition and design of "better" tones. We also found it possible to make tones that are both functional and more sensible.

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Soundscapes for storytelling and meaningful activity in dementia care

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Researchers are investigating how soundscapes can reduce agitation and contribute to the well-being of people with dementia. We advance this research by exploring further how to incorporate the personal background and preferences of individuals with dementia in soundscapes to evoke storytelling and meaningful activity in their everyday surroundings. In this study, we assembled personal soundscapes that were evaluated in individual participatory workshops with six care home residents with dementia. The workshops provided insights into the experiences of people in the mid to advanced stages of dementia listening to personal sounds. The results demonstrate how these soundscapes evoked: interaction with surroundings; open-ended storytelling; activation through pleasurable experiences; and rest and comfort. We propose implications for design to adopt personal soundscapes in care to support engaging and meaningful one-on-one activities in the care home.

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Soundscape design for historical buildings as a sonic place-making process

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Through the design of soundscape installations for three historical museum buildings, we explore how sonic placemaking may be used to reveal intangible cultural heritage. We build on Harrison and Dourish's distinction between space and place, and Jordan Lacey's definition of sonic placemaking to understand sound-scape design as a process of creating places that support sensory connection be-tween the museum guest and museum space, hereby enabling new experiences. We apply design space thinking as the approach to systematize and explore how distinct design choices affect the intended sonic placemaking. Through an inter-disciplinary approach that spans interaction design and sound studies, we investigate how the design space is explored through a series of design activities addressing sonic placemaking. Hereby, we identify three design aspects unique to sonic placemaking: Types of Sound, Listening Attention and Spatiality of Listening.

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Investigating the sound design process: two case studies from radio and film production

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This paper presents two case studies in which the sound design processes of two professional sound designers, from radio and film, are examined. Through a study procedure that uses techniques such as interviews, observations and a novel set of design briefs, the sound designers' unique approaches and primary concerns are revealed. Results from these studies aim to inform and consolidate the link between professional sound designers´ practices in media production and the field of sonic interaction design.

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10 Design methods and transdisciplinary practices

Session chairs

Deger Ozkaramanli and Cristina Zaga

Editorial

Deger Ozkaramanli, Cristina Zaga, Nazli Cila, Klaasjan Visscher, and Mascha van der Voort

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Design, one piece of the puzzle: A conceptual and practical perspective on transdisciplinary design

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Transdisciplinary research is claimed to be essential in tackling today's complex societal challenges. Transdisciplinarity includes collaboration and integration across academic disciplines, non-academic ways of knowing, and the 'real world' of citizens, professionals and other stakeholders. Design can contribute to transdisciplinarity by framing complex challenges, integrating knowledge towards synthesizing solutions, and providing participatory practices to engage with the real world. However, for design to be successful in transdisciplinary research contexts, a better understanding of transdisciplinarity and design is required. In this paper I present a conceptual and practical perspective on transdisciplinary de-sign. I show how design relates to three different conceptions of transdisciplinarity: a multi-level disciplinary practice, a participatory practice, and a practice focused on complexity and social learning. Furthermore, I propose a set of trans-disciplinary competences that enhance designers' ability to contribute to tack-ling complex societal challenges, including epistemic intelligence, worldview awareness, power literacy and reflexive and dialogic skills.

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Learning from creative biology: promoting transdisciplinarity through vocabularies of practice

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Transdisciplinary ways of collaborating are considered essential to support new approaches to tackling societal and environmental “wicked” problems. But how can collaborations take place in ways that reach this envisioned state? In this work, we look for cues of transdisciplinarity in the experience of those with a successful track record of working across disciplines. We interviewed 38 practitioners and researchers working in “creative biology”, an umbrella term that we use to address work that incorporates biology-related methods and research outside purely scientific realms. The interviews provide insights into how language can be used to support strategic shifts of positionality and nudge others to step out of their disciplinary realms, which contributes practical advice for those who are looking to collaborate with other disciplines. They further provide examples that can help expand the discussion of transdisciplinarity in design practice and education.

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Positioning design in transdisciplinary collaborations: Experiences from a smart city consortium project

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This paper explores the positioning of design in transdisciplinary collaborations. Design is increasingly positioned as a promising way of working in complex, multi-stakeholder collaborations. In this paper, we want to deepen and challenge this positioning in order to better clarify the contribution of design. Building on literature and experiences from an ongoing consortium-type research project in the context of smart cities, we conceptualize five preliminary roles that design adopts in collaborative settings: (1) generator; (2) communicator; (3) facilitator; (4) mediator and (5) provocateur. We argue that the latter two roles, namely the mediator and provocateur, are the most recent and the most suiting roles in transdisciplinary settings. To fully encompass these new roles, however, design must keep evolving itself and ground its practices with more sensitivity to the ethics and politics of technology. Deeping and expanding these roles will eventually strengthen the position of design when addressing socio-technical challenges.

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Towards a lifecycle of design methods

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As the design discipline is expanding and increasingly contributing to solving complex, socio-technical challenges in society, its role evolves alongside this expanding scope. A significant contribution of the design discipline is its methodologies and the expertise to facilitate transdisciplinary work in these complex innovation arenas. This emphasizes the importance of design methods and, at the same time, puts higher demands on their efficacy, robustness, and usability. However, there is a lack of understanding of the method development process, the standards and norms constituting high-quality design methods, as well as the transfer and use of these methods and how they impact practice. More specifically, there is a need to understand the entire lifecycle of methods — across the research and practice communities. The literature is fragmented, and some aspect is only addressed in isolation. In this paper, we bring together existing research and propose an initial model of the lifecycle of methods in design. We discuss implications and recommendations for future research.

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Service journeys as boundary objects in participatory processes for multi-stakeholder engagement: The case of the easyRights journeys

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Design disciplines are increasingly using journeys as a tool that addresses multiple purposes. Also known as Journey Maps, User Journey, Customer Journey, Experience Journey, or Service Journey, they represent the interaction of a person with a product or service step-by-step. This compilation of data reveals valuable insights for companies, organizations, decision-makers, managers, and service-owners to empathize with their users, triangulate their pain points and identify opportunities for improvement and innovation. Consequently, it is easy to understand the popularity of this method. This paper describes the case of the use of journeys in the easyRights project and presents their value as boundary objects; as a common artifact that facilitated the interaction of members of various groups of stakeholders, affording collaborative knowledge collection, generation, and distribution — traditionally attributed to boundary objects — but also complementary strategies — like the identification of knowledge opportunities, the management of knowledge generation and the concurrence around such knowledge.

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Coming to terms with design wickedness: Reflections from a Forum Theatre on design thinking

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Contemporary design thinking is often described as a designerly approach to dealing with wicked problems — problems that are too complex and deemed impossible to fix, but that can be tamed and solved with proper design methods. Wickedness is a fundamental justification for designing things as a leap of faith or even as a kind of magic. This practice-based design research questions this justification while also opening up new understandings of wickedness. By creating a Forum Theatre session with characters inspired by the musical Wicked as allegories for different design agents/subjects in an online event, the authors engaged design spectators in critical thinking of their own roles and practices from a broader social and political perspective. We conclude that wickedness is not necessarily a nasty quality of design problems and solutions but a relational quality that can be explored by anti-oppressive approaches to design thinking and design doing.

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Material metaphors: An approach to collaborative knowledge production in transdisciplinary sustainability research

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The integration of different forms of knowing and bodies of knowledge, as well as collaborative forms of knowledge production, seems particularly significant for the core of scientific work and in inter- and transdisciplinary processes in sustainability research. Nevertheless, collaborative knowledge production in heterogeneous teams brings up specific challenges. This is where existing methods for group negotiation processes, strongly based on language and text, reach their limits. To fill this gap, design-based methods can be used. They expand the mode of language and text to include the visual-haptic dimension, which allows access to other levels of thinking as it appeals to many senses. Therefore, this paper shows the application of design prototyping, as one specific design method, for collaborative knowledge production and integration in inter- and transdisciplinary research processes. The findings cover three different approaches to collaborative knowledge production and shed light on the role of material metaphors as translators of different cognitive modes and bridge to the knowledge of others.

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Crafting in the backstage: Materiality and the changing work of designers

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Drawing on Goffman's metaphor of frontstage and backstage, this article analyses the role of materiality in day-to-day work practices of craftspersons. The study is based on an ethnographic study of 17 months at a design firm which was amid a shift from product to service design. This means that instead of tangible products, the designers at the firm created intangible services. This shift in work practices reduced crafting to making visualizations for reports and presentations. As a response, the designers sought ways to spend more time on manually crafting in their work. In the backstage, when among trusted peers and not facing clients and other audiences, the designers spent a lot of time on making new design tools and practicing new techniques even though this did not directly contribute to the success of the design project for their client. It allowed them to practice and develop their craft skills, make sense of requirements of their renewed work context, and replenish emotional energy. The main contribution of this paper is through adding empirical evidence emphasizing the embodied perspective to crafting. Because of the entangled relationship between craftspersons and materiality, crafting practices are enacted as a matter of habit.

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How might we evaluate co-design? A literature review on existing practices

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Background: In recent years, co-design has seen exponential adoption in response to complex socio-technical transitions. However, the appraisal around co-design still lacks development, making its quality, effect, and value ambiguous. Aim: This study aims to encourage more research and practice in co-design evaluation by summarizing existing attempts. Method: We first conducted an integrative literature review in Scopus by analyzing and comparing existing methods used for assessing co-design. Then we iteratively coded the reviewed articles in ATLAS.ti following grounded theory. Through critical reflection and synthesis of the codes, we formed higher-level themes describing different aspects of co-design assessment. Based on these, we proposed an evaluation framework with five steps guiding the practice. Result: An overview of the methods, values, challenges, and suggestions for co-design assessment has been presented, and an assessment framework is proposed to support applications in this area.

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A co-design method for museums to engage migrant communities with cultural heritage

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This chapter presents an experimental method designed to engage migrant participants with local cultural heritage. The initiative was part of an exploratory field study conducted in the context of the European-funded project MEMEX, a research effort promoting the social wellbeing of communities at risk of exclusion through the narration and collection of memories and stories related to cultural heritage. To engage members of such communities with the topic of cultural heritage, we deployed a two-stage intervention: a five-day photo-challenge, where participants were asked to photograph sites that they felt connected to, and a four-hour co-design workshop in which they explored the photos they had captured and co-created stories around specific sites, linking them to their memories. This chapter reflects how this process can benefit designers, individuals, and organizations in the cultural sector in capturing and reflecting on cultural heritage, engaging communities at risk of exclusion while supporting scientific and societal impact.

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Supporting research on gender and design amongst STEAM researchers in the souths: A case study of subsumption in design methods

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This paper tells the story of a research program that subsumed the approaches of design, arts and social sciences to enhance gender aware and inclusive research amongst twenty academic teams of Science, Technology, Engineering, Arts and Mathematics located in the Souths. These are the findings of our empirical exploration to support the emergence of a transdisciplinary area of research and practice which we defined as Gendered Design. The key factors that proved crucial to overcome disciplinary boundaries and catalyse processes of empowerment are: theoretical and methodological openness, design-driven strategy and experimentation, as well as a holistic and affective approach to collaborations and relationships.

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S+S, Spatial design + service design: Framing a transdisciplinary perspective

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Design-driven praxis aimed at the transformation of spaces in relation to social and relational practices confront design researchers with the need to develop transdisciplinary approaches. If, on one side, it is impossible to envision a space without its subject matter — encounters, relations, and interactions between human and non-human entities –, on the other any type of service designed to be part of that place relies on a spatial dimension and its material reality is inevitably influences. This assumption raises questions for the design discipline: what happens when the design of spaces and services is intertwined? How can we design the service interaction through the spatial definition? Albeit apparently simple, the relationship between Spatial Design and Service Design still hasn't been fully explored, and this paper aims to contribute filling this gap through a preliminary framework as means to explore a possible scenario of Spatial Design + Service Design (S+S). The paper presents S+S as a potential approach to designing spaces and delivering services as a single entity. In this scenario, the separation of disciplinary design areas ceases, and a design approach emerges, where places and social practices are fully interconnected.

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11 Healthcare experience

Session chair and co-chair

Tek-Jin Nam and Anya Petyaeva

Designing menstruation - An examination into the influence of experiences on the use of menstrual products

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This study examines the experiences of eight menstruators and the impact these experiences have had on their attitudes towards menstruation and menstrual products. Participants engaged in a virtual workshop and discussed their personal experiences, both positive and negative, their opinions on various menstrual products, and the impact their experiences had on their attitudes towards menstruation and menstrual products. The findings from this study were thematically coded, and the influence of experiences on product choices was subsequently discussed. The varying needs of participants were also highlighted and discussed. Additionally, this study has identified that existing menstrual products do not meet all the needs of menstruators. Whilst the findings from this design-based research study bring forward new insights, it also sheds light on the gaps in knowledge and understanding of menstrual experiences.

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Towards a toolkit to empower young autistic adults: Using grounded theory to analyze ten design case studies

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Assistive technologies (ATs) are increasingly proposed to support young autistic individuals (YAAs) in daily life. Yet, the uptake of these technologies remains limited. Most ATs are designed for and by non-autistic people, which makes them less usable for YAAs. Moreover, ATs specifically designed for YAAs are often part of formal

therapy or training and typically aim to mitigate and rectify 'problematic' autistic behavior. In the research project Design Your Life, we are working with YAAs to develop a co-design toolkit that will help them create a personalized environment to support their independence. By now, we have completed ten design case studies, each deploying a different version of the toolkit. In this paper, we report on the insights that we gained from these case studies, for which we used a grounded theory approach. In total, we identified ten categories of knowledge that will inform the development of a single, final toolkit.

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The State of Inclusive and Human-Centred Design in Oral Healthcare

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There is an increasing body of work that explores the potential of inclusive and human-centred design to address challenges to our societies' healthcare. However, there is limited evidence of the utilisation and understanding of these approaches specifically in oral healthcare. This paper reviews the state of inclusive and human-centred design in oral healthcare. A systematic mapping study is used to identify 50 projects relevant to inclusive and human-centred design in oral healthcare. The data extracted from each project helps to examine the nature of inclusive and human-centred design in oral healthcare, reflect on who is being designed for and with, and assess the balance of outcomes and contributions being produced. The review reveals limited recognition and awareness of the two fields, particularly inclusive design, highlighting issues of design communication and application, and uncovering key gaps and missed opportunities that might inform future design activity in this area.

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Filling in the Gaps: Navigating the Human Experience of COVID

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Our international study team of health design professionals applied human-centered design methods to compare the COVID recovery experiences of 28 hospitalized and 30 community-managed patients in five hospital-affiliated sites across Canada and the United States. This study identified three drivers of the COVID patient recovery experience — gaps in care; uncertainty (largely driven by unclear or missing information); and isolation and loneliness. An examination of patient responses to these drivers identified six types of supports needed to facilitate healing and recovery: interpersonal, spiritual, information and communication; technology and access, direct

healthcare, and basic needs supports. We link the absence, presence, or separation from these supports during recovery to degrees of isolation and loneliness experienced by participants. We conclude with three principles that health system and public health leaders may apply to meet the needs of future people experiencing a public health emergency.

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12 Embodying experiential knowledge (Experiential SIG)

Session chairs

Spyros Bofylatos and Camilla Groth

Editorial

Nithikul Nimkulrat and Camilla Groth

https://doi.org/10.21606/drs.2022.1073

From wine tasting to materials sensorial perception: A framework for materials experience

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This paper puts forward a novel approach to study material experience leaning on the wine tasting protocols. The framework proposed in this paper aims to help new (biofabricated and non-biofabricated) ”growing” and ”living” materials make a good name out of themselves by deploying all their unique sensorial qualities in a more poetic manner. We believe that adopting wine tasting philosophy and techniques in the field of (aesthetic) materials experience and the synthesis of a materials experience lexicon will enable the commercialization process of new materials. We identify three layers of the material experience and point to how adapting the wine tasting protocol and dialogue formats can inform the grammar, syntax and narrative of a material experience.

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The unfolding of textileness in Animated Textiles: An exploration of woven textile-forms

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Designers of textile-based interactive systems tend to treat woven fabrics as static materials and lack deeper understandings of how the textile can be designed for

responsive behaviours in artefacts. As a result, in most studies across design and HCI, textiles are employed as substrates for computational, biological, or smart materials. This narrow view limits the potential of textiles that can be programmed to express responsive behaviour through their inherent material qualities. Our paper aims at bridging this gap in the design of animated textile artefacts. We present woven textile-forms where textile structures are programmed to tune the behaviour of low-melt polyester yarn that shrinks when heat is applied, resulting in complex topological and textural woven forms that can change over time. Foregrounding woven-forms as a medium for animated textiles, our work calls for design and HCI researchers to pay attention to textileness for prolonged relationships between users and animated textile artefacts while eliminating waste from production and end of life.

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Intertwining material science and textile thinking: Aspects of contrast and collaboration

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The current research of eTextiles tends to focus on integrating new functionalities into textile structures in a technology-driven manner. Meanwhile, we approach the development of eTextiles through utilizing interdisciplinary practice-based materials research for creating new types of textile-integrated actuators. Our study aims to shed light on how interdisciplinarity and especially the interphase between scientific thinking and practice-based research can create added value both through contrasts and mutual alignments. Based on interviews of researchers working in that intersection, we have identified some key factors concerning specifically the eTextile environment: differences in ways of thinking, intertwining concepts, common practices, and the need for a certain degree of individual autonomy. Overall, we advance the understanding of the inner workings of interdisciplinary projects and how to better facilitate them, as well as provide some concrete ideas of how this type of research should be supported.

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Design placebos for the impossibility of empathy in videotelephony

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This year, humans were locked in their homes with a rising need for digital communication such as videotelephony. Although videotelephony helps to reduce the physical gap, it leaves little room for the transmission of body language that is usually associated with empathy. This research is inspired by the cognitive model of empathy which can be explained as our desire to understand others' emotions and interact with them accordingly. By creating a reflective experience of imagining through the body in

movement, the research looks into what interaction design's role be in working with empathy and asks: In which ways design placebos as body triggers could extend digital natives' sense of empathy during videotelephony? This paper describes this ongoing investigation from the perspective of how experiential knowledge of tangibles can be used to embody feeling and thinking in action and support the creation of the design placebos through an experiment of cultural probing.

https://doi.org/10.21606/drs.2022.598

13 Design for behaviour change: Taking the long view fast (Behaviour SIG)

Session chairs

Kristina Niedderer and Shital Desai

Editorial

Kristina Niedderer, Geke D.S. Ludden, Shital Desai, Sander Hermsen

https://doi.org/10.21606/drs.2022.1075

Reflection during goal setting: An analysis of popular personal informatics apps

Tina Ekhtiar, Rúben Gouveia, Armağan Karahanoğlu, Geke Ludden
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Setting achievable, realistic goals aligned to people's current abilities and needs is an important part of behavior change. Reflection is a critical part of this process, as it helps people identify and elicit appropriate goals. Commercial applications that support behavior change often use goal setting; however, we know very little about if these implementations are based on theory and how they support reflection. In this paper, we analyze how popular health tracking apps support reflection during goal setting. We found that a majority supported limited or no reflection during the elicitation of goals. We discuss our findings and suggest design considerations for improving how these tools can help people in reflecting and eliciting goals.

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Manta and Cactaceae: Rehabilitative smartphone accessories for people with chronic mild stroke impairments

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Stroke causes damage to the brain, often resulting in weakness or paralysis on one side of the body. Everyday objects such as smartphones can play an important role after a stroke facilitating participation in daily activities. However, commercial

smartphones can be challenging to use, and people with stroke of-ten adjust their behavior to minimize the affected arm and hand use. This study explores how an object attached to a smartphone could evoke behavior change and contribute to the initiation of use of the affected arm. As part of a design workshop, different ideas were envisioned to promote the use initiation of the affected side of the body. Two high-fidelity smartphone accessories were developed and tested with four people with chronic, mild stroke impairments based on the results. The initiation of use observed during the formative usability test seems to be evoked by the learned behavior patterns rather than the design prototypes.

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Designing appropriate things: An experiential perspective on the effectiveness of artefacts in contributing to behaviour change

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Behavioural design is an emergent discipline that aims to harness design's influence on behaviour in an intentional way. However, there is limited knowledge on how to translate knowledge on behaviour and its determinants to specific design properties in ways that can maintain such change. We adopt a user experiential view to discuss the role that artefacts and their materiality play in effectively changing behaviour by introducing the notion of appropriateness, a quality of user-artefact interaction that describes the fitness of an artefact to the user and context that may play a moderating role in effectiveness of a design intervention in contributing to behaviour change. Based on an in-situ exploratory study with two conceptual artefacts we show that this appropriateness could help to investigate the long-term effectiveness of artefacts.

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Are stereotypes, such as the 'headclutcher', in stock images for mental illness stigmatizing?

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Public perception and attitudes of mental illness are heavily influenced by mass media, so it is important the visual communication delivered into society is responsible and not unintentionally damaging. Stereotypes are used frequently in visual communication for speed of understanding. However, stereotypes are often based on unfounded assumptions, and these assumptions can cause stigma towards the stereotyped group. This study questions what stereotypes, if any, are present in stock images of mental illness and discusses what effect they may have on stigma. There have been previous calls for images such as the 'headclutcher' to not be used to represent mental illness as many believe them to be an inaccurate depiction. The results of this study provides recommendations for media outlets, and encourages

other researchers and organisations to pay consideration to the imagery they use for communication about mental illness, to ensure no unintentional stigma is caused.

https://doi.org/10.21606/drs.2022.354

14 Linking human and planetary health (Global Health SIG)

Session chairs

Emmanuel Tsekleves and Cláudia de Souza Libânio

Editorial

Emmanuel Tsekleves, Cláudia de Souza Libânio, Blaise Nguendo Yongsi, Leigh-Anne Hepburn, Spyros Bofylatos, Juan Giusepe Montalván Lume, Xanat Vargas Meza, and Perline Hwee Ling Siek

https://doi.org/10.21606/drs.2022.1084

'Making the dust fly': (A case study of) design research promoting health and sustainability in addressing household infections

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Global health crisis, such as antimicrobial resistance, threaten planetary health, as they have a direct impact on the environment, as well as to humans and animals. Personal and environmental hygiene form the best and most natural ways of reducing home infections and hence the need to take antibiotics. Despite this our understanding of cleaning in the home and interventions on home cleaning are limited. In this paper we present a project, which combined design research with environmental microbiology, to address this issue and to co-design sustainable cleaning interventions for human and planetary health. We focus on the design of a co-design workshop which led to the development of cleaning interventions tested for a month by several households. We share the challenges faced and the lessons learnt, which we envisage will help guide design researchers moving into this exciting research field of planetary and human health.

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Design contributions in generating innovative solutions for human and planetary health

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The study aims to identify the design contributions in generating innovative solutions for human and planetary health published in peer-reviewed journals in the past five years and relate them to the Sustainable Development Goals (SDGs). A systematic literature review was performed by mapping the current research on design and human and planetary health. The analysis allowed us to identify that the solutions generated consider SDG 3 in all studies. Other SDGs were also identified, aimed at the planet's sustainability, but in a more incipient way. The role of design has been identified as crucial to meeting global demands, but design still needs to focus more on other SDGs and the environment.

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Service design for experience in forest therapy: A case study in Xitou nature education area

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Forest therapy is a way of connecting with nature to promote physical and mental health. With 60% of its land covered in forest, Taiwan is an ideal prospect for such a program. However, most forest therapy services are ill-developed and unsustainable in Taiwan. To address this issue, we first conducted semi-structured interviews of administrators and customers in Xitou Nature Education Area, a forest area with great potential for forest therapy in Taiwan, to explore the context and existing problems. Second, we applied service design to produce a revamped forest therapy program that involved the integration of co-creation workshop and service bricolage. Finally, based on user experience in desirability and feasibility of our concepts, we design new service strategies for forest therapy in Xitou. In academics, the results explore the benefits of using service design in forest therapy. In practice, the results will raise health awareness for forest therapy in Taiwan.

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Tree Box: Designing embedded and embodied interaction for contemplative experiences in nature-rich environments

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We present Tree Box, an interactive artefact designed to connect users to nature-rich environments through contemplation. The object draws on recent debates that juxtapose the benefits of meditation and mindfulness practices with exposure to nature-rich environments. Combining both with embedded and embodied interaction, we hope to add to the growing importance of designing for human well-being and planetary health. Technically, Tree Box uses Bluetooth wireless technology to locate spots for contemplation in natural surroundings. The prototype also uses a vibrating motor and an accelerometer sensor to invite users to stop in each location. By drawing on the literature that informed our prototype, we consider how design research and practice might help promote mental health alongside preserving green spaces and biodiversity hotspots. Theoretically, Tree Box draws on key literature covering "digital mindfulness", environmental sustainability, and the relationship between nature, culture, and the mind from the standpoint of critical theory.

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Designing digital health for hip osteoarthritis self-care in Brazil: a study on patients' socioeconomic profile and media preferences

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Digital health has a great potential to promote predictive, personalised, preventive, and participatory care while also reducing in-person visits to medical services. Osteoarthritis (OA) is a prevalent joint disorder and a leading cause of disabilities worldwide. Health literacy is crucial to cope with pain and mobility limitations. However, in the Brazilian context, trusty information about OA is scarce, inadequate, or non-existent in the Brazilian Unified National Health System (SUS). Knowing the audience is decisive in designing digital health solutions. This study aimed to collect data on SUS patients' socioeconomic status and media preferences. The results of 52 participants show the preponderance of C and D classes with basic educational levels, for whom video format and WhatsApp messaging application may be favourable to disseminate health information. This study is part of a multidisciplinary research project that employs a human-centred design approach to create products and services for hip OA SUS patients.

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15 Rethinking design for a complex world

Session chairs and Editorial

Cecilia Landa-Avila, Sofia Bosch Gomez, Sine Celik, Ben Sweeting, Josina Vink

https://doi.org/10.21606/drs.2022.1056

Co-designing the future in complex systems

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The face-to-face co-design workshop has been the default mode for designers to collaborate with stakeholder groups to solve complex challenges. However, the disruption associated with COVID-19 led to practitioners exploring alternative modes of collaboration that opened an array of new possibilities. The aim of this paper is to present the case study of Reboot STEMM, a distributed co-design process that combined live and asynchronous modes of contribution, and explored how digital technologies could be used to scale-up co-design processes, while also prioritising accessibility, and promoting empowerment. The case demonstrates the success of using an augmented version of the Multi-Level Perspective as a facilitation tool for co-designing complex systems, and of using a digital platform as an ongoing and interactive record of project data alongside traditional reporting practices.

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Design disciplines in the age of climate change: Systemic views on current and potential roles

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After working several years with industrial design as a tool for the kind of radical systemic change, climate change arguably requires; it now seems timely to discuss the systemic obstacles that make such a shift so hard to implement. Much at odds with current discourse, the article defends current design disciplinary skills by focusing on the tension between what designers tend to do for sustaining the present system vs. what designers could do to support transition to a radically different system and why the latter is so hard to achieve but still so urgently required. With the overarching question — ”what can design(ers) do?” — the article establish design disciplines as a

distinct entity apart from design. Subsequently it gives an overview of how different disciplines have emerged as 'answers' to how societies, have developed and finally suggest a model for how to address climate change through disciplinary cooperation.

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Improvisational design dialogue: Exploring relational design encounters as means to dismantle oppression in design

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To explore dismantling oppressive power relations in design, we bring to fore design encounters through the lens of relationality and improvisational competence. This paper is based on the premise that, if we are to move toward decolonizing design, design(ers) needs to re-think the organization of the design encounter and how we as designers practice participation in such encounters. We emphasize the improvisational nature of turn-taking in dialogue amidst asymmetric and dynamic power relations, with design's commitment to generating resources for future practices, and decolonization's commitment to re-configure power structures.

After problematizing the design encounter from a power relation perspective, we explore practice models for developing improvisational competence. We do this by looking at the two improvisational dialogic practices of Capoeira and Improv Theater. We focus on what it can mean to develop skills in "improvisational competence" of relationality in design. We first touch on our previous Participatory Design work in the language learning "in the wild" agenda and then draw on each of our personal improvisational practices: Capoeira martial art, and improvisational theater. We then outline possibilities for relational improvisational design dialogue and conclude by outlining how it can be practiced in Design education and practice.

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How actor-network mapping informs the early stages of system innovation: A case study

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This paper discusses how the participatory mapping of an actor-network map can inform the early stages of system innovation as described in the approach adopted by the Rockwool Foundation. It argues that mapping actors with an external expert at the beginning of a design process allows to explore not only the macro, meso and micro levels of a given complex system, but also the different key components of it, such as relations, resources, power and purpose.

The Mental Health Initiative carried out at the Rockwool Foundation, will be used as a case study to present and analyse the actor-network mapping process of the Danish

School System in relation to youngsters' wellbeing, derive the main system insights and discuss limitations and opportunities towards its innovation.

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Articulating Theories of Change Towards More Just and Transformative Design Practices

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In any collaborative change-making process, team members hold individual, and often differing, ideas about how change happens. These ideas may address whether to work top-down or bottom-up, what leverage points are to be targeted, or who should be involved in the work, in what capacity, and when. If these differences in perspectives are not examined and discussed, they can lead to conflicting actions, lessen positive impact, and may even do harm. Mapping "Theories of Change" is an approach that has been used to clarify strategies for initiating change across many sectors. Yet, when it comes to complex design engagements, we propose that a different approach is needed. Rather than utilizing a formal modeling process, we believe that teams can find alignment and build more productive working relationships through conversations that engage and clarify beliefs about transformation. In this paper, we propose that designers should acknowledge, reflect, and discuss change theories within collaborative teams. We offer a framework to support dialogue about change that reflects three common phases of designing: Situate & Relate, Understand & Reframe, Intervene & Observe.

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Engaging with competing demands in systems through design: Fostering a paradox lens

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This paper aims to foster a paradox lens on competing demands to ensure their productive engagement in design. Competing demands are inevitable and ubiquitous features of today's systems. Thus, being subject to competing demands is a pervasive and inherent feature of designerly work. Drawing from organizational studies, we first outline four main streams of competing demands underlying today's systems; related to time, cognition, social interactions, and focus. We demonstrate the importance of a purposeful conceptualization of competing demands by exemplifying how different conceptualizations can lead to different responses. We suggest employing a paradox lens on competing demands, which stresses that seemingly contradictory or even mutually exclusive factors can and should coexist and therefore should be leveraged simultaneously. Through a series of research-through-design experiments, we explore how framing competing demands according to paradoxes impacts the way they are

approached in design practice, and how paradoxes can be engaged with through design.

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Social commoning as a way to transition towards alternative systems by design

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Increased interest in systemic design approaches and their impact on climate and societal crises make revisiting the theories of the commons and their applicability to system transitions a timely endeavour. By examining a case study of a marine protected area in the South African ocean, the paper explores how a commoning practice could be applied more intentionally in system design to increase cooperation amongst system actors and apply a multispecies - as opposed to human-centred - perspective to the management of natural, social, and immaterial resources. By tracing the historical understandings of the commons, the study explores how Ostrom's design principles could be applied as a set of heuristics to help system actors thrive in improved cohabitation. Thus, the paper draws on a working hypothesis of how economic and complexity theory could be integrated with systems thinking to create the conditions for increased stakeholder cooperation and alternative systems by design.

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Teixint Superilles: a grassroots project of participatory design for inclusive public spaces

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This paper presents the Teixint Superilles project which developed participatory design activities to create more inclusive public space. Our hypothesis was that when citizens have the opportunity to participate in placemaking activities, they gain not only greater awareness of their environment, but also a sense of agency over their city.

Through a series of workshops, we have been experimenting with diverse methodologies for civic participation while confronting a wide range of participants with topics of gender, functional diversity, cross-generational inclusivity, and sustainability. We facilitated workshops in three different environments, thus reaching a wide range of participants: a public park, a festival and a secondary school.

This paper is aimed at urban planners and designers seeking to create more liveable, sustainable and inclusive public space together with citizens. Beyond our local impact

in the neighborhood, we seek to contribute to a global cultural shift towards increasingly meaningful community engagement.

https://doi.org/10.21606/drs.2022.661

Design experiments for a development organisation in the Brazilian Amazon rainforest

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In the midst of climate change, and the need to seek more sustainable ways of living, design is increasingly tackling problems at a societal level. This paper reflects on a strategic design project at a Brazilian foundation focused on sustainable development in the Amazon rainforest region. In this study, we asked what contributions design can bring to organisations involved in addressing development issues. The paper describes several experiments and strategies to make it tangible to non-designers how a design-led process unfolds and how design can support the organisation's efforts in delivering value to the communities they serve. The case study offers an example on how design practices combined with systemic approaches can spark increasing levels of collaboration across siloed departments.

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Systemic assessment as a tool for the design process

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This paper introduces the idea of a systemic issue of misrepresentation of certain factors in the design process that could lead to ignoring the complexity and possible impact of some design actions and artefacts in the system. By analyzing different cases from literature, professional practice, and design research, a frame-work of initial analysis of the different factors that can assess some of the complexity of a project is presented, and a reflection is made regarding their significance and the elements they could evaluate from different cases.

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Backcasting as a design device to support grassroots system change: insights from a case study on future energy pathways in rural Kenya

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The interlinked global crises of poverty, inequality and climate change call for transformative solutions. Transformative change requires local agency and long-term

planning, but this is not easily accommodated in development programmes, which often rely on short-term thinking and top-down technological solutions. Design methods have proved useful for facilitating co-development of technological solutions with marginalised communities. This case study explores whether—and, if so, how—participatory design can support grassroots transformational change by facilitating community engagement around the challenge of energy access. We used backcasting to facilitate the co-design of a 10-year transition roadmap to electric cooking with 30 members of a rural community in Kenya. The roadmap articulates a local vision of a long-term development process, including the community's role in that process. Through follow-up interviews we found that workshop participation was linked to subsequent grassroots community actions. The findings are discussed in relation to the literature on transformation design.

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The power in maps: Reviewing a 'youth violence' systems map as discursive intervention

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This paper offers a reflection on a systems mapping experiment undertaken as part of the Redesign Youth Futures project, which aimed to visualise the complex system producing youth violence in London. The paper brings together key ideas in the practice of systems thinking and mapping, with contributions from the literature on design and power, to theorise the map as an intervention in a discourse — in this case, the popular and policy discourse around youth violence. In doing so, it offers an account of how power is operant in and through such an artefact: in the embodiment of (and resistance to) ideologies or discursive themes, in the naturalization and normalization of certain 'truths' and the silencing of others, in rendering a system amenable to management, and through the selection of which perspectives and interests to represent.

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Beyond progress: Exploring alternative trajectories for design museums

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How can design museums be disentangled from systems like patriarchy, so that they become able to support change towards more justice? To explore this question, we use our standpoint as design researchers in combination with a feminist perspective. Historically, most design museums supported a path of progress which supposedly leads straight from the past into the future. Even though today attempts to change

design museums can be observed, criteria for good design and methods for collecting and exhibiting mainly stay unchanged. However, when questioning them, it becomes clear that they were shaped by a white, male, imperialist perspective. Through shifting focus and leaving the well-trodden path, we identify three possible paths toward envisioning what we call alternative design museums that might contribute to the bigger struggle for changing the design discipline, and shaping a more just world.

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Cognitive challenges in complex system design

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Design intentions guide design efforts but complex systems can lead to designers' intentions being eclipsed. Artificial Intelligence systems are examples of complex sociotechnical systems that exercise self-learning, innovation and creativity that can exceed their designers' imaginations. This paper's proposition is that sociotechnical systems design offers scope for improved reliability and is built on three features of current design practice. First, design teams seek cooperative cognition to work together but joint understanding can be impoverished by inadequately understood outcome scenarios. Second, design team collaboration is bounded by innate psychological biases which can influence design decisions. Third, some views of risk in design thinking suffer from a limited conception of uncertainty and its influence. These constraints in design practice are examined, considering the reach of Artificial Intelligence as an example design domain, and how such constraints may be addressed in design practice.

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Design thinking community health & well-being: Creating with and for community capacities

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This paper shares initial findings from an ongoing study assessing the value and limitations of a two-year community-engaged design thinking initiative intended to foster more inclusive and holistic public health community-based innovations with underserved communities across one county in the southeast U.S. The initiative hopes to institutionalize and socialize community-based design within a public health framework and build organizational and individual capacities. Initial findings indicate that participants find value in design thinking tools and processes, and that such processes have transformed mental models, fostered relationships, and built skills for participants' professional, civic, and personal lives. Findings also surfaced challenges related to power inequities, a lack of alignment between grant initiative requirements and participant needs, as well as rapidly evolving guidelines and divergent capacities. Recommendations for researchers and practitioners are noted, including pursuing a

relationship-rich design practice, investing time and energy in framing issues of power and positionality, ensuring long-term and flexible access to resources, and creating consistent visual validation across the initiative.

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Decolonizing cultural safety education in the healthcare system through cultural immersion in Indigenous knowledge sharing & material practice

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This project explores Indigenous-led arts and material practice workshops as a form of cultural safety education by fostering dialogue between non-Indigenous healthcare students and Indigenous students in the Lheidli T'enneh Territory (Prince George, Canada). Uniquely, this project is led by an art and design university, and combines Indigenous and designerly ways of knowing to consider an approach to cultural safety education that is not solely focused on the healthcare student or practitioner as the learner, but includes the community as key contributors to the learning experience. Core to the workshop model is the combination of sharing Indigenous histories and the current state of systemic racism, with the making of drums, rattles and other Indigenous material practice. The paper will provide an in-depth overview of the four key components of the workshop model — convening, sharing, making, and resting — and discusses the role of designers in supporting this cultural safety education initiative.

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16 What Legal Design could be: Towards an expanded practice of inquiry, critique, and action

Session chairs and Editorial

NuLawLab (Dan Jackson, Miso Kim, Jules Rochielle Sievert, Sankalp Bhatnagar)

https://doi.org/10.21606/drs.2022.1083

Disciplinarity and the modes of Legal Design

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This paper examines the emerging field of Legal Design through a critical reflection on the literature on academic disciplines and disciplinarity and argues that Legal Design does meet the criteria for recognition as an emerging academic sub-discipline. Its central contention is that Legal Design academics (together with their collaborative partners) have a timely opportunity to intentionally design the modalities of their nascent discipline. Academic disciplines can be understood in various ways. Whether this is, for example, from a sociological or an anthropological perspective, Legal Design has the chance to examine the human experience of disciplinarity and to consciously build an academic discipline that works for its users, be they academic practitioners, students or wider professional communities.

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Legal design could and should be more sociolegal

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Legal design could and should be more sociolegal. Sociolegal research can offer conceptual frameworks, empirical methods and data, and normative direction to legal design. At the same time, designerly methods can enhance the abilities of sociolegal researchers to make and communicate sense of things to, with and for themselves, academics in other disciplines, and the wider world. So, if legal designers were to engage more deeply and systematically with sociolegal research and researchers, benefits could flow to legal design, to cross-disciplinary research and to the wider world.

https://doi.org/10.21606/drs.2022.281

Liberatory legal design and radical imagination

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This paper briefly summarizes the concept of radical imagination, urges legal designers, advocates, and organizers to engage in radical imagination whenever confronting problems of subordination, and suggests a practical, playful method for doing so.

https://doi.org/10.21606/drs.2022.689

Beyond design thinking and into speculative futures in legal design

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The Legal Design movement has succeeded in proposing change to communities through collaboration between the legal and design professions. As a result, new kinds of empathetic solutions have been introduced where the citizen experience is prioritized over commercial goals. Still missing from Legal Design, however, is a stronger understanding of current theoretical literature in design that is questioning the ontology of the discipline and formulating new scenarios of transition toward the future. This paper encourages an embrace of these methodologies and cautions against their use without a solid understanding of the present and a real understanding of their potential effects. The methods of “futuring” used by designers can help the legal profession imagine better futures with a view toward implementation. These futures keep the moral compass straight for leaders whose exercise of power leads to injustice and how people can have access to justice, governance, and accountability within difficult situations.

https://doi.org/10.21606/drs.2022.307

James v Birnmann: The potential of critical design for examining legal issues

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The current approach of legal design is solution-driven, with design considered a series of methodological steps used to improve existing legal systems. Such an approach fails to address systemic problems within these systems, and can instead exacerbate such issues. So far, there has been insufficient examination into the kinds of design used in conjunction with legal problems. This paper considers the potential of critical design to challenge more fundamental issues than those currently addressed with legal design. Through the project ‘James v Birnmann’, the paper illustrates how critical design can widen the discussion around legal issues, challenging the public’s perception of existing systems, which can assist in legal reform. The paper concludes that whilst it is important that critical design projects take place within the

culture of critical design studios, they can also work alongside, inform and challenge more traditional legal design practices.

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What if data protection embraced foresight and speculative design?

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Due to rapid technological advancements and the growing "datafication" of our societies, individuals' privacy constitutes an increasingly explored speculative space for regulators, researchers, practitioners, designers and artists. This article reports two experiences at a national and an international data protection authority (i.e., the Commission Nationale de l'Informatique et des Libertés - CNIL - and the European Data Protection Supervisor - EDPS - respectively), where foresight methods and speculative design are employed in policy-making with the goal of anticipating technological trends, their implications for society and their impact on regulations, as well as the effects of existing and upcoming laws on emerging technologies. Such initiatives can enhance strategic proactive abilities, raise public awareness of privacy issues and engender a participatory approach to the design of policies. They can also inspire the research, education and practice of legal design.

https://doi.org/10.21606/drs.2022.681

Locked down with abusers: Designing for the dignity and autonomy of domestic violence survivors during the COVID-19 pandemic

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The COVID-19 pandemic and national quarantine requirements exacerbated domestic violence, as survivors had to stay at home with their abusers with limited access to communication channels or resources for help. In this project, a team of lawyers, designers, and technologists collaborated to assist a domestic violence clinic at a law school to design services to help student attorneys and advocates to better connect with domestic violence survivors who sought legal help during the pandemic. The aim of this service was to support the domestic violence survivors with remote assistance, such as remote intake, a safe means of collecting information, and access to court forms to file abuse-prevention orders. This COVID-19 rapid response case study contributes to the emerging field of legal design by showcasing how the interdisciplinary collaboration of law, design, and technology can help enhance stakeholders' dignity and autonomy in the design of services.

https://doi.org/10.21606/drs.2022.298

Designing inside and alongside the system: working with residents of Ferguson, Missouri on police reform

Alix Gerber
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After uprisings exposed the racial bias of policing in Ferguson, Missouri in 2014, the U.S. Department of Justice committed the city to a process of court-ordered reform. This paper outlines a creative exploration of two design approaches to impacting policymaking and legal reform in this context: a Participant Designer approach that sought to include more people's lived experience and perspectives in policymaking, and a Speculative approach that worked to reframe the discussion from a problem about policing to an opportunity to imagine new forms of public safety. These approaches explored ways of working inside and alongside the legal system, on one hand synthesizing resident perspectives, on the other allowing them to diverge and conflict. They showed ways of both following and leading participatory processes as a designer.

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Designing with theories: producing Legal Design diffractively in courts of justice

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This paper proposes Designing with Theories as an invitation to approach Legal Design practices and studies differently. We take advantage of a rich and diverse theoretical tradition that allows us to expand the applications and impact of Legal Design. Building on diffraction as a methodology, we articulate this invitation by suggesting seven theories and approaches to designing for justice differently. In a generative and provocative style, we ask seven times the question "what if we design for justice from X theory?". For each theory, we provide the main assumptions, followed by sense-making with examples from a case study on Chilean courts of justice. Each section is divided by a visual intermezzo as a space for reflection. Our contribution is twofold. First, we propose a new approach to Legal Design. Second, we provide fellow researchers and practitioners with new possibilities — and how to create them- to imagine alternative futures for justice.

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What Legal Design Is as opposed to Could/Should be

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How come legal designers keep relying on design things that make change appear possible when we know that legal things are more reliable at making change actually

possible? We argue for an understanding of what legal design is as opposed to could / should be in terms of actual change (sensed as changes of a world) and the appearance of change (sensed as changed in the world). We describe what things and background practices are and do, what design things and legal things are and do, and what designers and lawyers or judges are and tend to do. We conclude with a discussion of what legal designers could/should be doing and what will stand in their way.

https://doi.org/10.21606/drs.2022.669

17 Healthcare systems

Session chair and co-chair

Stella Boess and Haiou Zhu

Design research at the border of art, technology, and healthcare: Interdisciplinary challenges of games for health research

Aslihan Tece Bayrak
Media Design School, New Zealand

Healthcare research is increasingly becoming more multidisciplinary with the involvement of various disciplines outside the medical sciences including but not limited to engineering, computer science, human computer interaction, and games. Since game development is interdisciplinary, games for health (G4H) encloses transitions between technology, humanities, social sciences, and health & rehabilitation. At an overlapping discourse of multi-disciplinarity, inter-disciplinarity, and trans-disciplinarity, this paper presents design research as a core research methodology for G4H research via reflecting on a G4H project. The aims of the paper are (1) motivating the use of design research for G4H, (2) reflecting on the challenges of interdisciplinary research, and (3) initiating a discourse for a more informed research practice and a well-directed research future in the areas of G4H.

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Health Information Design Model (HIDeM): a replicable model of the design process for data-intensive applications in health informatics

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Genetic and healthcare data have experienced an explosion in the last decade and with it, a deluge of new and cutting-edge research as well as digital tools and software. However, visualizing and working with such large amounts of information also poses organizational challenges in transdisciplinary collaboration between scientific domain experts and design professionals. We propose Health Information Design Model (HIDeM), a collaborative process model with a novel series of principles and activities that tackle the specific nature of digital, data-intensive products for scientific research while considering different organizational contexts. The model was developed in

collaboration with several domain experts in the life sciences and has been tested in diverse scenarios. We also present a use case that demonstrates this model's potential and outcomes.

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Systematic Review of Community-Led Initiatives Fighting the Opioid Crisis and Opportunities for Design

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The opioid epidemic has been declared a health emergency in the US. This crisis has been addressed from multiple perspectives and by different stakeholders, like communities that have participated in self-organizing and mobilizing to fight back the crisis from a bottom-up approach. Community-led initiatives have been fundamental in tackling the opioid epidemic with education, service linkage, and distributing Naloxone, an overdose-reversing medicine. They are also the perfect space for social innovation because they can strengthen social relationships, however, little has been written about the role of Design in these organizations. The purpose of this paper is to conduct a systematic review of community-led initiatives tackling the opioid crisis, an assessment of their strategies of action, and the presence of Design. Finally, we discuss 3 of the gaps in the practice where design can generate impact and offer means of innovation.

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18 Doing and undoing post-anthropocentric design

Session chairs and Editorial

Li Jönsson, Martín Tironi, Pablo Hermansen and Alex Wilkie

https://doi.org/10.21606/drs.2022.1068

Designing & worlding: Prototyping equivocal encounters

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Pontificia Universidad Católica de Chile, Chile

To sustainably coexist with other ontologies, human beings must overcome the perception of being the center of the world. This article describes how a video log refuted the initial — anthropocentric — hypothesis explaining the breakdown of an experiment with Judy and Gombe, chimpanzees that inhabit the National Zoo of Chile. This shows that it is wrong to ascribe human affects and reactions to other ontologies, and also that there is a long way to go to apprehend, comprehend, and sustainable coexist with other ontologies in more-than-human ecosystems.

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Design beyond the human world of management and organizations: Towards a cosmology for the Anthropocene

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In this paper, we intend to make explicit the shared ontological foundation of design and management and question them in light of the advent of the Anthropocene. To do so, we first draw these disciplines closer before qualifying their common ground as an underlying “cosmology they share”. This cosmology is characterized by the centrality of the notion of organization. We argue that design as well as design knowledge must be assessed with regards to this peculiar cosmology. We call for the need to go beyond what we call the “monism of organizations” or the “organized world”. We propose a new direction for design oriented equally a) toward the organized world, setting the task of suitably deconstructing it or properly shutting it down, and b) towards the Earth itself, in search of a new, more adequate cosmology and more

sustain-able forms of life rather than trying to hubristically improve the habitability of the world.

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Narrating ecological grief and hope through reproduction and translations

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The Swedish government has decided that Sweden will become carbon neutral by 2045. What are the implications for us as citizens in such a transition? What formats allow us to favour careful transformation over progress through radical innovation? In this paper, we attempt to understand grief and hope in the context of this transition. We describe a designerly format of re-production and translation aimed at collectively working through potential future changes, uncertainties and loss. Influenced by plaster moulding techniques used at a closed-down pottery, we invite participants to reproduce and translate original animal and plant motifs into present circumstances. These practical hands-on engagements allow us to notice and articulate change in relation to the past and orient ourselves towards uncertain futures. Hope can be found in the ruins of industries, in locally produced alternative energies and in small-scale attempts to undo biodiversity loss.

https://doi.org/10.21606/drs.2022.333

Making-with the environment through more-than-human design

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Current climate and ecological crises require questioning currently dominant understandings and relations to nonhumans. While design is a human-centered field and practice, many intruders or competing theories challenge human-centered approaches and propose ways to include nonhumans in design. This article explores different perspectives for post-anthropocentric design approaches and focuses on how design can approach the notion more-than-human as an intruder to human-centered design. Proposing practice-based studies of making-with the environment as an alternative to human-centered design, it explores how to design beyond ideas of “human progress”. Firstly, more-than-human and related concepts are introduced. Secondly, how human-centered design can be challenged is explained through the concept of core theories and intruders, relating it with “more-than-human” and posthuman theories. Afterwards, traditional knowledge is introduced as a concept to explore more-than-human approaches, and a case study is introduced as a post-anthropocentric making activity. The case study demonstrates that designers should acknowledge and listen to traditional and indigenous knowledges, while shifting to a more-than-human design approach.

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Shitty stories: Experimenting with probiotic participation through design

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The Shit! project brings focus to the human-gut microbiome, to consider how we might move towards more harmonious coexistence with the uncountable microscopic entities that inhabit our gut. The work recognizes humans as multi-species assemblages, and the Western scientific models that form how we conceptualize, measure and engage with ourselves as embodied species, insufficient to account for the multiplicity of relational scales at play. We present a workshop undertaken with the Danish Colitis and Crohn's Patient Association that converges food, fæces and performativity. We position this work as an exploration of what we provisionally term probiotic participation through design. Framed as a collective inquiry, the workshop examines the potential of multispecies narratives among people suffering from chronic gastrointestinal disorders. We argue that one avenue towards better human-gut microbiome co-existence could be threaded through participatory, material and embodied design engagements—with fæces—caught up in and entangled with participants' other concerns.

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Why would I ever fry and eat my SCOBY? It would be like murder! : Attuning to nonhumans through kombucha fermentation practices

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Kombucha fermentation is a multispecies activity guided by human-microbe interactions. This study investigates kombucha fermentation practices as a platform to recognize relationality with nonhuman microbes. For this, relational theories enable reframing human-microbe relations by focusing on reciprocity and interconnectedness within multispecies relations. The empirical research consists of interviews, a design probing task, and a collective reflection workshop with kombucha brewers. The empirical research delivers insights into the agency of microbes, sensory experiences, and embodied knowledge in kombucha fermentation practices. Findings investigate how humans attune to the needs of microbes, and the role of embeddedness in ethical doings. In this way, the study explores alternative ways of relating to nonhumans beyond prevalent human exceptionalist mindsets in design and sustainability. By interpreting the research findings, the research proposes methodological and theoretical implications for designers to enable recognition of relationality with nonhumans.

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19 Design innovation and strategy

Session chair and co-chair

Milene Gonçalves and Sander Välk

Design Innovation Strategy for an IoT Startup in Xiaomi Business Ecosystem — A Case Study of Yeelight Technology

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Through case study and in-depth interviews, this research investigated the development process of an IoT startup company—Yeelight Technologies—to gain insights about resources sharing and co-creation between an IoT smart hardware startup and the Xiaomi business ecosystem. The research findings show that during the life cycle of a start-up venture, certain cooperative strategies were employed to create partnerships to lower risks, to provide expertise transfer in a complementary fash-ion, and to create value while mitigating competition in the vulnerable start-up phase. The initial support in design expertise from Xiaomi played a vital and indispensable role for Yeelight in strengthen its design expertise, enabling the latter transition phase where Yeelight developed its own design strategy to compete with globally well-known lighting brands. The case study provides a reference about how an IoT smart hardware startup cooperates with a major company with a strong business ecosystem.

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An Analysis of Design Maturity Models used in Design Organizations

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Maturity models are structures that help assess key performance metrics and provide guidelines for assessment and growth in various areas of an organization. In this paper we review some of the significant design maturity frameworks that are used by practitioners in design organizations. The field of design is ramifying with emerging

forms of design practice and requires a need to study maturity models from the perspective of practitioners in design organizations. The pandemic has disrupted normal organizational operations forcing practitioners to discuss the need for maturity models in workplaces that follow the new normal. This necessitates a review of significant maturity models recommended by practitioners as effective models for design practices during the pandemic era for organizational operations. We catalogue the study insights into three categories of maturity models which are (1) design-oriented industry models (2) organizational design models and (3) user experience models.

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Infrastructuring the foundations for a Service-Dominant Orientation

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Design has been identified as a transformational approach to help organisations build capabilities to become customer-centred and adopt a Service-Dominant Orientation. However, there's a need to study how to develop the enabling structures that support and sustain these capabilities in time and at scale. This study explores how transformational work developed at a large international retailer helped develop the enabling structures that support these organisational level capabilities. The concept "infrastructuring" is proposed as a valid construct to analyse the ongoing strategic design work done to support the adoption of new practices and tools that will shape a new organisational logic and set the conditions for the introduction of service design. This work suggests designers should refocus their attention beyond methods and tools, acknowledging the hidden infrastructures inhibiting transformation within organisations.

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Two Approaches to Foresight-Driven Design

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As a response to rapid and uncertain environmental change, foresight has emerged as an approach offering a future-oriented framing to design practice. Using theory on foresight, design, and change management, this paper reports a case study on how companies engage with foresight combined with design at a strategic level to become more future-oriented in their process and better prepared for taking long term action in the present. Through observations and interviews, the study follows companies participating in the development program Future Now facilitated by the Danish Design Center. We identify two distinct company approaches to foresight-driven design, involving distinct types of reasoning about the future, and leading to different types of strategic directionality. Further, we explore strategic timing and resources as possible

moderators for which of the two approaches companies adopt. Our findings illuminate the different ways foresight can be used in combination with design at a strategic level.

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20 Curation, museums, and exhibition design

Session chair and co-chairs

Mikel Azcona, Carla Molins-Pitarch, Mimi Nguyen

Storing cultural archives in synthetic DNA: An integrated prospective design investigation

Emily Groves, Romain Talou, Andrea Schneider, Nicolas Henchoz
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As cultural institutions digitize their archives, they become more accessible and versatile. However, there are significant economic and environmental costs to maintaining large databases over time. Synthetic DNA is an emerging technology that can store data at high density, with almost no energy, for thousands of years. Yet, as technical advances bring DNA storage closer to everyday use, little has been done to understand how we will interact with the technology and accept it into society. We developed an integrated prospective design approach to investigate these challenges. This included participative workshops, narrative building and the design of three tangible DNA storage objects. User evaluations showed how summarized information within the object strengthens understanding and appreciation of the technology. We also gathered insights around material and societal perception. This work opens perspectives for the adoption of long-term sustainable preservation for cultural archives, and pushes prospective design methodologies into far-future contexts.

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Museum and exhibit design: how forms and places of knowledge exchange influence community participation and empowerment

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Museums have been criticized for sharing a singular narrative that does not reflect the diverse beliefs and values of their communities. Participatory design has been recognized as an approach capable of processes that allow communities to contribute to designing museums and exhibits. However, as the participatory design processes change according to the specific situation, they can lead to a wide range of outcomes, and degrees of community participation. This paper explores how a specific element of the participatory design approach, knowledge exchange, influences the degree of

community participation. Three examples of participatory design processes in museum and exhibit design are analyzed and compared to understand how the degree of participation varies through Arnstein's Ladder of Citizen Participation. Results reveal that processes that are community-driven and embrace frequent knowledge exchange between designers and community members achieve higher levels of community participation.

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How to design tangible learning experiences – A literature review about science exhibit design

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Designing science exhibits that promote visitor engagement and learning remains a challenge. While theoretical models about visitor learning has been thoroughly addressed in the academic literature, there is little empirical knowledge about actual exhibit design. This takes place in a landscape of rapidly developing interaction technologies, while the demand for inclusion and equity measures increases. This literature review aims at bridging knowledge from across various disciplines to offer a recent and comprehensible overview, providing a new status quo for further research and practice in exhibit design. Beginning with a definition and introduction of central terms and theoretical constructs around informal learning and visitor experience, the paper continues with a chronological overview of exhibit design research. Finally, a comprehensive female-promoting science exhibit design framework is presented, and major research gaps are identified.

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Who's place is it? Enacted territories in the museum

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There is a growing trend to embrace the idea of public participation in the work of museums, from exhibition design to collections. To further develop participatory cultures in museums, these negotiations and emerging practices should be examined more closely.

This paper explores a museum's whole-hearted attempt to engage with the societal issue of climate change and work with a high degree of participation from civic society when staging a temporary exhibition. We investigate experiences in the process of building, measuring, separating and transgressing during the collaboration.

Based on these explorations the paper presents three emerging and interconnected territories in the staging of participatory temporary exhibitions, the territory of aesthetics, the territory of action (autonomy), and the territory of unpredictability. The result contributes to research on public participatory practices mainly in museum context.

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21 Design process / design theory

Session chair and co-chair

Colin Gray and Cathryn Anneka Hall

Creation and characterization of design spaces

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Designers advance in the design processes by creating and expanding the design space where the solution they develop unfolds. This process requires the co-evolution of the problem and the solution space through design state changes. In this paper, we provide a methodology to capture how designers create, structure and expand their design space across time. Design verbalizations from a team of three professional engineers are coded into design elements from the Function Behavior Structure ontology to identify the characteristics of design state changes. Three types of changes can occur: a change within the problem space, a change within the solution space or a change between the problem and the solution space or inversely. The paper explores how to represent such changes by generating a network of design concepts. By tracking the evolution of the design space over time, we represent how the design space expands as the design activity progresses.

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Ontogenesis as a Model for Design Processes

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The technical rationality (TR) and reflective practice (RP) paradigms have heavily influenced thinking about design and design cognition in the 20th century. This paper concisely highlights some of the features and limitations of these paradigms. In particular, it develops the suggestion that we require a new “root metaphor” or leading set of concepts to develop our thinking about designing beyond the work of Donald Schön. Building on this assumption, this paper examines some useful aspects of selected concepts developed by Gilbert Simondon, in particular the notion of ontogenesis. Furthermore, it is argued that Simondon’s thought helps us to connect epistemology to the fluidity of lived experience. The suggestion is made that a so-called ontogenetic approach is better suited to deal with the inevitable fluidity and

developmental character of experience itself, and that this could be new approach for thinking about design processes.

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Connecting Creative Product Design Processes to Creative Product Design Outcomes: A Scoping Review

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Generating repeatable guidelines for designing creative products has long been an aim of the design research community. Even so, a widely trusted or agreed-upon process has not yet emerged. As a first step toward this goal, it is important to take stock of the reported connections between creative design processes and creative design outcomes. Thus, we conducted a scoping review focusing on creative prod-uct design. Our search identified 130 papers published from 1969 to 2021. The most frequent study type was a proposal paper (n = 53). Twenty-seven of the included papers used experimental methods. When connecting the creative design process to the outcome, 72 papers theorized about how the targeted design process could influence design outcome creativity; 58 papers used empirical methods to assess outcome creativity. These findings suggest that more empirical studies are needed to examine the process-to-outcome association in creative product design.

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Reframing advanced manufacturing ontologies through an exploration of ductus

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Ontologies of manufacturing and making have received closer attention in recent years thanks to a renewed interest in materiality and questions of form-emergence and form perception. This work argues that the hylomorphic ontologies dominant within advanced manufacturing can be challenged through the introduction of a “ductus” concept, which relates to the traces left by unique material interactions and energy transferences as artefacts are fabricated. Drawing on multiple strands of scholarship, this paper develops a new ontological model integrating material-process relationships and end user experiences with the ductus of the making process at its core. This model is illustrated and elucidated, and the implications for design and manufacturing researchers and practitioners are discussed.

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22 Design strategies for resilient organisations

Session chair

Sylvia Liu

Editorial

Ida Telalbasic, Sotiris T. Lalaounis, Sylvia Liu

https://doi.org/10.21606/drs.2022.1077

Fostering resilience: The potential of design to support strategic agility

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'Strategic agility'– i.e., how organizations can strategically plan and cope with uncertainty through a continuous tuning, monitoring, and re-balancing of their operations — has been characterized as a critical component to foster organizational resilience. This paper aims at investigating whether and how design can support organizations to acquire greater strategic agility. Our analysis is grounded in a case of a globally operating software company that has recently established a design team and introduced design methods in its development processes. The paper shows how design favoured processes that are generally linked to strategic agility (distancing, anticipating, reframing, experimenting, decoupling, and dialoguing). Taken together, these processes were key in building the strategic agility needed in transitioning from a product- centric orientation towards a user- and service-centred approach.

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Restrategizing for the post-pandemic era: Service design for digital transformation in the art and cultural sector

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This paper explores the challenges of entrepreneurs and organisations within the art and cultural fields in meeting the challenges of digital transformation. Drawing on a

multidisciplinary conceptual framework, and a qualitative empirical investigation comprising four case studies, which illuminate how cultural field organisations and entrepreneurs have adapted to the market disruption caused by the Covid19-pandemic through digital service innovation means, we propose a model for a four stage service design programme, which links design methods as concrete development tools for assisting companies develop innovative digital services and restrategise in post-pandemic markets.

https://doi.org/10.21606/drs.2022.687

Service design in organisational change

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This paper reports an empirical study analysing 80 projects delivered by two leading service design agencies to understand the relevance and breadth of service design to organisational change. The analysis revealed two clearly divided camps of service design practice, playing different roles in organisational change and representing two distinct definitions of service design. Some projects evidenced that service design had the potential to move into the realm of transdisciplinary innovation and facilitate collaboration across boundaries and to engage various stakeholders in searching for solutions to complex problems. This makes service design practice of this kind acutely relevant in addressing the challenges facing our society from the COVID-19 pandemic. This paper approaches the topic from two specific angles; one is taking a systemic approach and the other is focusing on service design practice and the sector. It provided much needed empirical evidence to understand how service design practice is used in and contributes to organisational change. Further, it contributes to the current discussion about the definition, boundary and context of service design practice.

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Systemic design's guidelines to implement organizational change

Caterina Rosini, Silvia Barbero
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In the future, organisations must face sudden changes and increase competitiveness. Firms need to have resources and competencies to set a strategic advantage in the business context to survive. This paper describes two management models used to define strategy and implement benefits for the firm and compares them with a systemic framework and the Systemic Design Approach. The comparison highlights the necessity to analyse organisations considering their complexity in terms of resources and interactions between spheres and roles. This evidence led us to sustain that Systemic Design can provide a better approach to organisational complexity and could be able to manage the multiple interactions that an organisational implementation requires. The result is defining Systemic Design guidelines to

implement the Systemic framework better and developing a toolkit to support firms in their organisational processes.

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Designing for dynamic stability in an uncertain world: A media content study of the aviation industry

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The Covid-19 pandemic has caused radical restructuring of many industries including the aviation industry. Seeking a deeper understanding of how organizations are responding to this disruption, we use media content analysis of 331 news articles to extract approaches used in the aviation industry in response to Covid-19 and clustered them in six categories: research, reframe, repurpose, reimagine, redesign and resile (be resilient). We suggest that, taken collectively, these six approaches may provide a framework that companies might leverage to achieve dynamic stability — the ability of a system to return to steady state after a significant disturbance — as the ecosystems in which they operate continue to change and evolve. The framework provides guidance for developing resilience in the face of both short- and long-term change.

https://doi.org/10.21606/drs.2022.376

23 Culture-sensitive design

Session chair and co-chair

Juan Giusepe Montalván Lume and Isaac Ortega Alvarado

Documenting new design ontologies

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Ontological design — characterized by the understanding that what we design designs us — has been invoked as a necessary framing in redirecting the design discipline toward more pluralistic and sustainable ends. In this paper, I situate ongoing conversations about process documentation within emergent conversations surrounding ontological design, considering ways in which innovative documentation practices may support new ontological agendas. By considering process documentation as a hermeneutical, knowledge-making practice, I speculate ways that new, experimental modes of process documentation may afford designers — and design itself — new vantage points from which to (re)interpret design practice and the discipline writ large. To this end, I sketch out some preliminary ideas of what ontological documentation may look like. In particular, I explore how deliberately open-ended (or even speculative) approaches to design documentation could invite critical reflection and collaborative meaning-making — inviting more voices to shape the narratives and ontologies of design.

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Towards an Object-Oriented Design Ontology

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Object-oriented ontology, speculative realism, new materialism, and similar contemporary philosophies, proposing alternative theories to understand the world and relations within, became more prevalent and effective in the last two decades. However, expect several solitary examples; these do not seem to be having a transformative effect on design disciplines, theory, and practices. This paper initially introduces primary theorisations of object-oriented thinking and how these theories would inform design thinking, education, theory and practice. The author argues that this is not, by no means, an option or alternative, but is a necessity, an urging

fundamental transformation waiting to happen, considering the current environmental, social and cultural concerns of our age.

https://doi.org/10.21606/drs.2022.728

Resistance, Social Reproduction and emerging commitments for collaborative design from the margins

Nathaly Pinto, Brenda Vertiz, Andrea Botero
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The paper introduces two design research cases tracing how the concepts and experiences of resistance and social reproduction can help design research become a more assertive part of the coding that interprets, exposes and disputes social reality, particularly in Latin America. Through reflections on (1) a design intervention contributing to an Indigenous popular education initiative in the Ecuadorian Amazon and (2) a series of ongoing public space design interventions taking place in colonias populares of Mexico City, we propose four interrelated commitments (visibility, sustainment, tensions and collectivity) to orient ourselves in understanding what it actually takes to build knowledge and create resources together.

https://doi.org/10.21606/drs.2022.648

Transilience: Assemblage and relationality in a complex urban setting

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Social change is experienced profoundly by adult youth in India, especially in cities like Delhi with large rural migrant populations. This youth is a generation in transition, with aspirations and experiences that are different from their communities of origin. However, their perceptions of their world have rarely been documented qualitatively, in their own voice.

My doctoral research, titled Transilience, which means ‘to leap across’, is a practice-based reflection on my work as a social designer within this milieu, and specifically focuses on how adult youth perceive themselves and their context, to explore ways to reframe the way social design practitioners mediate participatory engagements with youth.

This paper represents an integral part of the research; conversations with adult youth in the urban slums of Delhi, conducted across two continents in the disruption of the pandemic, causing methodological shifts that enhanced and revealed the research in surprising ways.

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Towards a framework for designing technology with Country: A perspective from Australia

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Lifestyles, principles and methods adopted by First Nations peoples have attracted increased interest from non-Indigenous researchers and professionals. Following greater awareness about the destructive effects of colonization on sustainable pre-colonial ways of living that thrived for millennia, a growing movement towards understanding of Indigenous ways of relating to Country has led to questions about culturally and environmentally appropriate approaches to design digital systems, technologies, services, and products. In this paper, we investigate recently emerging frameworks for design with Country identified from the literature, compiling a list of 40 precepts and 15 principles to inform our interaction design process. Furthermore, we propose a process timeline, mapping to it the identified principles and a set of methods.

https://doi.org/10.21606/drs.2022.270

24 Heritage and memorialisation

Session chair and co-chairs

Robert Harland, Angelina Pan, Nikou Javadi, and Peiying Jian

Editorial

Robert Harland, Alison Barnes, Rob Tovey, and Jie Xu

https://doi.org/10.21606/drs.2022.1072

Food's urban graphic heritage in Walthamstow

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Food's material and symbolic values are central to cultural heritage. Urban foodscapes are dense in graphic communication, with memories and meanings that connect us with place often triggered by food's 'graphic heritage', for example, through fascia signs, packaging, branding, patterns, and lettering. This paper's focus is on everyday grass roots manifestations of food's graphic heritage within urban settings. It introduces and argues that food's urban graphic heritage 'speaks' differently to diverse individuals and communities, inviting different interpretations that play a part in the development of place attachment and social interaction. The paper also proposes methods for the recording and analysis of these relatively understudied urban features. Questions about what 'design literacy' might mean in a multicultural context are discussed as well as notions of power and politics inherent within design choices made in urban environments.

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Designing a tangible augmented reality experience for cultural heritage research

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The Tangible Augmented Reality Archives (TARA) is an augmented reality system developed to assist cultural heritage researchers in remotely collecting and assessing information on rare artifacts. Building on prior research, we designed TARA to address challenges faced by cultural heritage researchers, including limited access to collections, as well as the time and budget constraints associated with archival visits. In this paper, we examine the use of augmented reality to advance cultural heritage research, and describe a series of design explorations that explore tangible interactions with remote cultural heritage artifacts. These include a three-dimensional cube design, a two-dimensional prop design and an object-based design. We conclude with a discussion of lessons learned from our design process and how this will impact future designs.

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Arabic type in urban environments: A graphic heritage

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Graphic design as a cultural object can contribute to the design of heritage in various ways. This study investigates the meaning of heritage and graphic design in relation to culture and communication. It discusses cultural heritage in Arab states with reference to Arabic type and introduces Naskh-style typefaces in wayfinding systems and signage as a graphic urban heritage. This is done using a framework for analyzing urban graphic heritage alongside empirical field study from the United Arab Emirates and the Hashemite Kingdom of Jordan. The study reveals that graphic design provides a unique framework toward understanding the role of typographic heritage in creating human experiences with the urban environment.

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25 Meta-design in the complexity of global challenges

Session chairs

Paolo Ciuccarelli and Silvia Barbero

Editorial

Paolo Ciuccarelli, Nathan Felde, Paul Pangaro, Silvia Barbero

https://doi.org/10.21606/drs.2022.1076

The politics of metadesign

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This is a conceptual paper that explores the notion of metadesign which is premised on redesigning design itself. It interrogates the claim that metadesign is 'open', 'fluid' and 'democratising' by analysing its literature and practices. The paper makes two arguments. First, that metadesign is a theoretical power grab that prioritises language at the expense of material design which separates it from other design approaches. Second, that metadesign currently does not offer conceptual tools for observing and analysing the politics of real-world metadesign. If metadesign wants to be a democratising force, then it needs to question its legacy of transcendent language and engage with metadesign in practice and the politics it enacts in the world. Metadesign must shift towards 'practice-based metadesign' and work with concepts from Science and Technology Studies such as 'infrastructural inversion' to observe the politics of infrastructure and destabilise assumptions about discourse as immaterial and structures as material.

https://doi.org/10.21606/drs.2022.260

Anatomy of a “technology”: Proposing a meta-design framework for sustainability literacy that addresses the issue of efficacy in modern socio-technical cultures

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In the era of the Anthropocene, where the climate crisis forces humankind to rethink its values and systems of production, sustainability literacy becomes crucial for any design practitioner. This paper aims to contribute to the extensive literature that regards meta-design as a reflexive practice for the study of design purposes, processes, methods, and outputs by outlining a meta-design framework to tackle the modern artificial environments in which humankind has become naturalized. Specifically, by inscribing modern “technologies” within Simondon’s concept of “technical object”, it delineates the preliminary guidelines of a research approach for design education that, drawing from Lemonnier’s chaîne opératoire and Leroi-Gourhan’s degrés du fait, applies locally situated ethnographic explorations with system analysis to the study of modern artifacts to stimulate self-reflexivity on “efficacy” biases in design thinking.

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Designing for what? Approaching necessary production and consumption for a circular economy

Isaac Arturo Ortega Alvarado, Ida Nilstad Pettersen
Norwegian University of Science and Technology, Norway

Circular economy (CE) is currently a ’hot topic’ in design discourse. The focus of these discourses has centered on product design, which is a core aspect of material circularity. However, CE is more than products. This assumption is the base for a research question: what should be the intention in designing for a CE? The recognition of CE as a systemic transition opens up opportunities for other forms of design. These forms should contribute to societal goals concerning why and what is produced –more than the profit-making. We contend that a CE should not be approached from the perspective of the usual actors, reduced to business/industry and waste management. We propose instead to take discussions about the governance of production and consumption as the starting point. Finally, we demonstrate the opportunity to open the futuring of CE through participatory and discursive methods based on cycles of speculation and visioning.

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Regeneration in action: Toward a new path for sustainable research projects

Caroline Nowacki, Marguerite Foissac
frogLab

As COP26 just ended with moderate commitments from governments to keep global warming under 1.5°C, how can designers contribute to fight climate change? Systemic design has proposed to change design perspective from the user to the system in which the user and the designer operate to envision better our social and environmental impact. Regenerative design adds that we should aim for positive instead of net-zero impact and change our mindset and practices to create the conditions for all forms of life to thrive. If regenerative guidelines exist in urban design, it is unclear how UX-UI designers should change their practices and profession for regeneration. Based a participative research approach in a web design project, the authors created a regenerative design compass to guide UX-UI practitioners to make their projects regenerative. We also present the concrete actions we took to make our website regenerative.

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Design for wellbeing during COVID-19: A cybernetic perspective on data feedback loops in complex sociotechnical systems

Willem van der Maden, James Derek Lomas, Paul Hekkert
Delft University of Technology, The Netherlands

The COVID-19 pandemic has put wellbeing on the global agenda like never before. Many businesses, organizations, and even governments have recognized wellbeing as a formal policy goal. This paper addresses the question of how to design complex systems to improve the wellbeing of their stakeholders. We present a case of helping a university adopt a systematic approach to wellbeing assessment and improvement during the COVID-19 crisis. To support the improvement of student and staff wellbeing, we adopted a cybernetic perspective. Practically, this involved focusing on the design of a feedback loop that used wellbeing assessments to inform organizational actions. We argue that “off-the-shelf” assessments of wellbeing are often insufficient for supporting a systemic response to data because they lack context-sensitivity and actionability. While a “cybernetic perspective” may evoke a sense of the inhuman or mechanical in the optimization of wellbeing, our case study suggests otherwise. At least from our perspective, a society that aims to improve wellbeing may look more like a deliberative or dialogical democracy than an automated AI system.

https://doi.org/10.21606/drs.2022.771

A Meta-design research project to enhance the User Experience of university's digital services ecosystem

Federica Colombo, Alice Paracolli, Venanzio Arquilla
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Digitalisation is essential in contemporary institutions. Politecnico di Milano started to re-think its digital services to design an application that could help students manage every aspect of their daily university life, starting from their own goals and unmet needs, while considering the complexity of the university system. The Meta-design approach was adopted to redefine a public university's digital services, assuring the users' centrality in the research and design process. Meta-design is a circular and reflective method that enables the designer to continuously provide innovative solutions, updating the product to the ever-changing user needs. This methodology is the basis of User Experience practice. This paper demonstrates how Meta-design and its pillars - 'user research', 'market analysis', and finally 'technology investigation'- led to the ideation of an innovative and proactive concept for a mobile app where students are the protagonists.

https://doi.org/10.21606/drs.2022.580

26 Sustainable design

Session chair and co-chair

Arlene Oak and Dan Lockton

Upcycling discarded HDPE plastic bags for creative exploration in product design

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Upcycling enables new product production out of discarded materials. This paper presents a new structured process to support designers to use discarded HDPE plastic bags as useful and meaningful materials for creative exploration. The proposed process involves a four-step fabrication workflow using tools and machines widely available in design studios: (1) preparing a stack of plastic sheets, (2) fusing the stack of materials to create a new plastic sheet with intended thickness, (3) cutting and scoring the fused sheet to create parts, and (4) assembling the parts to build 3D artifacts. To assist the fabrication, we also present a custom design software as an add-on to an existing CAD environment and describe how we developed the fabrication-aware design features through a workshop with seven students. We demonstrate the feasibility and creative potential of the design and fabrication process by four application examples and expert reviews with three product designers.

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Enhancing consumers' willingness to repair electronic products: How design can nudge sustainable behaviour

Renske van den Berge, Lise Magnier, Ruth Mugge
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Product repair can decrease the ecological burden of consumer electronics by lengthening their lifetimes, but it is still too rarely practised by consumers. Design for behaviour change can motivate consumers to undertake repair activities. An increased level of repair self-efficacy can nudge consumers towards repair. In two experiments, we tested the effects of a fault indication on consumers' willingness to repair washing machines, vacuum cleaners and stick vacuum cleaners. A fault indication is a signal appearing on a product providing information about the occurring failure. For products

that are relatively less likely to be repaired by a repair professional, the willingness to repair increased significantly when a fault indication was present. The perceived level of self-efficacy mediated these results. These results remained consistent among different types of product failures. Finally, we provide implications for designers and future opportunities on how to further stimulate consumers' willingness to repair electronic products.

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OptiWash: A Constructive Inquiry on Maintenance of Washing Machines as an Everyday Practice

Kamila Kunrath, Anna Sophia Sørensen, Petra Kerepecká, Kartikeya Satish Acharya
Aarhus University, Denmark

Electrical and electronic equipment is the fastest growing waste stream globally, and large appliances such as washing machines significantly contribute to this environmental problem. Therefore, we look into maintenance as a practice to improve the lifecycle and circularity of washing machines. To inquire into maintenance practices, we undertook the development of a series of prototypes with a constructive design research approach. The design of the prototypes incorporated nudge and persuasive technologies as part of the inquiry. We present this inquiry for understanding the gap between an everyday engagement with the washing machine and the necessary maintenance practices for prolonging the use and durability of these appliances. The final prototype, OptiWash, is presented not only as an object that characterizes this gap but also as a device for facilitating the everyday maintenance of washing machines and thus, prolonging the equipment lifespan and minimizing waste of electrical and electronic equipment.

https://doi.org/10.21606/drs.2022.559

Long-lasting smart products: Overview of longevity concepts in sustainable ICT and Design for Sustainability

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Designing longer lasting smart products need a longevity understanding that is informed by both Sustainable ICT and design for sustainability. By conducting a literature review in both areas, we are able to identify longevity related concepts. We briefly outline these ideas in the two fields before discussing their relationships to reveal how they can contribute to one another. By nourishing the viewpoint from both sides, we broaden our understanding of longevity. We conclude our research by highlighting the gaps that (1) there is a need for applicable coping strategies for smart products, (2) a fair division of responsibilities between the multiple actors, and (3) the need for more interdisciplinary research to clarify longevity considerations.

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Setting the stage: the value of contextual social research when designing with local sustainability initiatives

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This paper presents an exploration of the (pre)conditions in which local energy transition initiatives operate in the city of Groningen, the Netherlands, and to what extent these conditions influence the co-design process. The findings show that participation in such schemes is not necessarily a given, as local initiatives and (design) practitioners can encounter several interrelated issues, which must be taken into account before even considering a co-design approach to the energy transition. Informed by insights from the social research studies conducted, the initial design-centred approach was altered to incorporate (co)design in a more flexible and iterative manner, inspiring new ways to collaborate.

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27 Retail and brand design: Service futures, innovation, and intelligence (DRSF SIG)

Session chairs

Katelijn Quartier, Catarina Lelis and Federico Vaz

Editorial

Katelijn Quartier

https://doi.org/10.21606/drs.2022.1057

Fuzzy logic evaluation of customer loyalty in local, community, and international cafes in Hong Kong

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It is a company's paramount goal to achieve customer loyalty and expand its business. The effectiveness of these business strategies is relative to customer loyalty which is often pursued through a binary approach. This paper primarily focuses on a non-binary approach using Mamdani Fuzzy logic to measure customer loyalty and compares the outcomes with a binary approach. Also, the customer loyalty factors, including repeat patronage and relative attitude, are explored. Further, a comparison of loyalty towards various cafe categories in Hong Kong is presented. Customer Loyalty Matrix has been used to classify the above cafes based on the loyalty factors. A sociological study has been conducted where responses recorded from an online questionnaire are used to measure the above loyalty factors. With the help of the questionnaire and parameter touchpoints, the authors hope that companies will employ the dynamic loyalty factors in practice to improve value creation and differentiation strategies.

https://doi.org/10.21606/drs.2022.745

Service design tool: How to use the ERRC decision model for service designer to prioritize touchpoints

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This research aims to remedy lack of design principle at touchpoints of customer journey. ERRC decision model was developed to support designer in strategic evaluating and taking design action in response to customer feedback at different touchpoints. The model was constructed using customer feedback on experience and four actions framework of Blue Ocean Theory. Designer can use customer experience data to evaluate touchpoints along customer journey and, based on model's distribution result, link service delivery level to competitor and redesign to eliminate, reduce, raise or create individual touchpoint.

https://doi.org/10.21606/drs.2022.204

Can ritual experience be the jam to stick consumers and service provider? The case study of ritual experience in Disney experience as service design application

Derrick Yang, Tseng-Ping Chiu, Min-Yuan Ma
National Cheng Kung University, Taiwan

Service design has dominated the marketing strategies in recent years. This study proposes a conventional ritual sandwich model that explores the ritual patterns hidden in service and the intermediate interaction between consumer and industry, enhancing user engagement and long-term recurring consumption. The study took Disneyland as an example and extracted the interaction model between consumers and industry, further interviewed for preliminary verification, found out that the core value of ritual experience is generating unique meaning to consumers through experience the script provided by the service provider, further transform to the internal trigger and participatory motivation into the next cycle. It is hoped that the result of this study can provide a new perspective on service design methods, provide a sustainable or long-term service experience to service designers, e-commerce, or related industry as a reference in the future.

https://doi.org/10.21606/drs.2022.425

A service design perspective on examining the business process of customized services

Yu-Hui Lu, Hsien-Hui Tang
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In the post-pandemic era, consumer behavior patterns have changed, and digital transformation has become a hot topic. With high-touch service features, the Taiwanese custom furniture industry has been depending on manual operations, and the inconsistent internal business processes have resulted in the slow progress of digital transformation plans. Therefore, the study aims to propose a more practical planning model using service design thinking on business process perspectives. By establishing explicit guidelines on back-of-stage interactions, the study intends to standardize the sequence of the operations and reduce the improvements gap among stakeholders. Meanwhile, through studying the service network of the case, we can help businesses discover the critical elements for internal process optimization and reaching consensus among stakeholders so as to serve as references for facilitating service design and improving digital transformation effectiveness.

https://doi.org/10.21606/drs.2022.621

How consumers interpret visually similar packaging

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This study explored how leader brands might use design to better manage the challenge of copycat packaging. Online semi-structured interviews incorporating photo-elicitation were conducted with 37 interviewees to understand how consumers perceive and differentiate between visually similar packaging from fast-moving consumer goods (FMCG) categories. Our findings show that participants find similarity in colour scheme and similarity in product name more likely to lead to mistaken purchases of copycat brands. These findings suggest that leader brands could minimise the impact of copycat brands by using their packaging designs to emphasise the protectable characteristics of their brands. This research contributes to the discussion on copycat phenomena by highlighting how design can play a central role in mitigating copycat packaging, and should be considered alongside more traditional reactive mitigation tools.

https://doi.org/10.21606/drs.2022.554

28 Futures of design education (Pluriversal Design SIG and Education SIG)

Session chairs and Editorial

Derek Jones, Lesley-Ann Noel, Renata Marques Leitao, Nicole Lotz, Liv Merete Nielsen, Ingvild Digranes, Naz A.G.Z. Börekçi, James Corazzo

https://doi.org/10.21606/drs.2022.1064

Australian architectural education in the pluriverse

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Among the design disciplines, architectural education in Australia has a unique constraint: accreditation. On the one hand, competency requirements by accrediting bodies potentially limit an educator's autonomy and curriculum development. On the other, competencies define and regulate a profession by ensuring standard knowledge and skills. In this paper, we analyse the pedagogical and professional impacts of the 2021 "National Standard of Competencies" for Australian architects, particularly the inclusion of Indigenous Knowledge for the first time. Together with the recent Indigenous Design Charter — Communication Design, these competencies signal a shift in Australian architectural and design education that suggests a vision closer to Escobar's "design for the pluriverse". Embedding Indigenous Knowledge and world-views through mandatory requirements is a first step in changing not only pedagogy but also the design professions.

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Towards responsible interaction design education

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This paper addresses the need and opportunities to align courses in interaction design with ideas behind responsible research, design, and innovation by focusing on values, responsibility, and longer-term and more sustainable perspectives. Rather than discussing the design of new courses leveraging a specific perspective, e.g., sustainable interaction design, we suggest ongoing iterative transformations of an existing course aiming to include multiple relevant perspectives toward responsible

education in interaction design. The course re-design utilizes research through design approach exploring how to position responsibility, values, and ontological perspectives when teaching interaction design, using educational components that we identified as a design material. The paper contributes by 1) leveraging the importance of responsible education and 2) a method to 'steer' interaction design courses toward more responsible education in interaction and related design fields concerned with digital artefacts and interactions with technology.

https://doi.org/10.21606/drs.2022.465

Workgroup curriculum: Design students & teachers co-designing new ways of learning

Michael Hohl, Brigitte Hartwig, Uwe Gellert, Klaus Pollmeier, Vanessa Enigk, Tom Gernegross, Lena Kozig
Anhalt University of Applied Sciences, Germany

In this paper we present our 'workgroup curriculum', in which a group of dedicated teachers and students work together to devise better ways of learning and teaching to design. Formed in 2018 at Anhalt University of Applied Sciences, we work, in voluntary weekly meetings, on developing a more learner centered curriculum and overall learning experience. Our weekly workshops follow a structured approach, crucial however, is that all members encounter one another on an eye level. Roles, such as facilitating, writing minutes, timekeeping, off-topic, are rotated fairly among all participants. Since then the workgroup has resolved small curricular dilemmas while also devising larger curricular experiments. In this paper we will provide an insight into our working methods and also briefly present and discuss some of our curricular explorations. In this context we also discuss the limitations of 'learning outcomes' and the importance of learning soft skills/social skills.

https://doi.org/10.21606/drs.2022.217

By invitation only: a multidisciplinary framework for an industry-led design approach.

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Considering the issues faced by education during the pandemic, the need for design programmes to synchronise with the industry is rather essential. The disconnect between design students' studio practice during the pandemic has aggravated the situation further, considering that the most appointed defect of design programmes is their low involvement with the industry in multidisciplinary projects. What benefits for design students and Higher Education Institutions (HEIs) to participate in industry-led projects? How can those be implemented, considering the recovery state in which many design programmes currently are? Through a survey with students who participated in this brief (N=32), and interviews conducted with the alumni who mentored them during the project (N=8), this mix-methods approach will refine the

framework used in this project, involving industry partners and design programmes, providing insight on how students can benefit from such projects, creating another approach to connect them with the industry, other than a traditional internship.

https://doi.org/10.21606/drs.2022.192

Research on the Doctoral Consortium Structure of Design

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The consortium can be regarded as one of the most essential approaches in the process of academic communication, of which the forms have conferences, meetings, colloquium, etc. Among them, the doctoral consortium has generally been seen as an indispensable part of doctoral training, because it will not only provide communication platforms to stakeholders, but facilitate the transferability between knowledge and skills. Based on the conditions mentioned above, this study conducts a comparative study on 17 worldwide doctoral consortia in design from three perspectives: staff composition, support system, and interactive mode, by which the researcher aims to investigate the situation of doctoral communication and inform the emerging doctoral pedagogies, to benefit the design education field with first-hand empirical materials for mainland China and the world. Finally, three aspects of findings have been proposed after a systematic investigation, which is related to inclusiveness, openness, and timeliness of doctoral communication and education.

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Exploring bio-based materials in an interdisciplinary learning environment: Outlining the design inquiry cycle

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This article focuses on a higher education learning environment that combines expertise in design and chemical engineering in the field of bio-based materials and in a framework of inquiry-based learning (IBL). During two summer schools, students framed their own small material projects in which they practised constraining the design task from a new perspective, with pedagogical support. In this study, we qualitatively analysed design students' inquiry processes from their project reports. Based on this, we outlined a general five-phase inquiry process that followed three aims of the pedagogical framework. In the results section, we explain the process phases, using illustrative examples from the student' reports and concretely highlighting the nature of learning. We conclude that our illustration of the general phases of inquiry provides an analytical tool for conceptualising the learning process and further developing and studying this context.

https://doi.org/10.21606/drs.2022.546

An analysis of master's in industrial design theses at U.S. land-grant universities: A systematic literature review.

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This study systematically reviewed recent (2016-2021) Industrial Design (ID) master theses and final projects at U.S. land grant universities to understand the trend of ID graduate program outcomes from the selected universities. The process consisted of 1) framing questions for a review, 2) identifying relevant works, 3) assessing the quality of studies, 4) summarizing the evidence, and 5) interpreting the findings. This paper presents the findings of the study, including thesis/final project research types, the diversity of committees, fields of design influences that the thesis/final project contribute to, types of outcomes, and the utilized research methodologies. Furthermore, the author discusses how to improve the guidance for ID graduate students for their master's thesis course at a practical level by comparing the results of the study with existing literature. This paper will help inform future practices of masters of ID thesis courses and graduate education.

https://doi.org/10.21606/drs.2022.627

North-South design education: Integrating Māori knowledge in design using the blend approach

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We investigated how to align design education that integrates mātauranga Māori (Māori knowledge) with the knowledge development aim of modern university education. Our main idea was to use culture-based knowledge as a source of creativity rather than socialization. We share insights from two critical cases where we tested whether the blend approach is a useful design method for integrating Māori knowledge in design education. The insights show that conceptual blending is an effective method for students to understand culture-based knowledge through creative design activity.

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Making posters to understand statistics: Towards a didactical approach in communication design

Michele Mauri, Simone Vantini, Beatrice Gobbo, Tommaso Elli, Elena Aversa, Andrea Benedetti, María de los Ángeles Briones Rojas, Gabriele Colombo
Politecnico di Milano, Italy

The paper describes a didactical approach to introducing statistics to communication design students at the master level. The approach helps them develop a critical attitude toward data manipulation and information visualization, acknowledging a lack of education in such areas despite their growing relevance in the communication

design field. In previous experiences, we observed how theoretical lessons in statistics were inefficient because they were perceived as distant from the communication design practice. We, therefore, adopted a “thinking-through-doing” approach: instead of asking students to study statistical methods, we asked them to design a poster explaining them. In the paper, we present the didactical experience discussing the outcomes. The approach brought students to understand better statistical methods and the implications of the decision taken in setting the analysis. In conclusion, we argue that it succeeds in making students more aware of the intersections between design and statistics.

https://doi.org/10.21606/drs.2022.597

Explore industrial design pedagogy under the pandemic in the U.S.

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Due to Covid -19 pandemic, industrial design educators were forced out of their comfort zone and instructed students in an online environment with limited preparation and experience. Therefore, research in online design education has become a booming topic. Design educators are required to rethink and re-evaluate the post-pandemic model of industrial design education. To better understand industrial design educators’ online teaching experiences, expectations, challenges, and issues during the pandemic, this exploratory study interviewed eight industrial design faculties who had taught design studios during their past careers and the pandemic period. Interview data were analyzed using five signature design pedagogy as a lens: the studio, project, materiality, dialogue, and crit. This study also compared the efficiency and effectiveness of teaching methods used in different environments. Furthermore, this study explores the possibility of applying new online technology tools into industrial design education and how it would affect design education in the future.

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Spatialized video communication platforms: Applications in design education and conferencing

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During the pandemic, the impact of video communication platforms drastically increased. But in front of a screen, flexible and serendipitous interactions known from real-life settings were reduced to a minimum. Zoom fatigue occurred very quickly and early on developments were started to provide more flexible alternatives to video-focused platforms. Spatialized Video Communication Platforms (SVCP) reintroduce

more flexibility, serendipity and improved dynamic group forming by providing game-like environments. After a brief review on SVCPs, we are focusing here on the highly-customizable Gather.town platform. We developed an Open-Source pipeline to create 3D-based environments that meet the demand for visual requirements from design-engineering students as well as visualization professionals. Based on three surveys, we evaluated the potential of SVCPs in the context of virtualizing learning, teaching, exhibiting as well as conferencing. Along the way we tested several new features designed for increased user engagement and creating a sense of ownership.

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Examining performance of VR sketch modeling tool in personal sketches.

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This study examined the performance of the virtual reality (VR) sketch modeling tool Gravity Sketch in the early stage of design and explored its advantages and disadvantages. In the experiment, nine graduate students in the field of design with several months of experience with Gravity Sketch sketched ideas in VR and on paper. Qualitative analysis was performed using retrospective methods and grounded theory. The results revealed that fewer sketches were produced and less time was spent on design thinking in VR than on paper because (1) sketches created using the VR tool are three-dimensional models and (2) the high degree of simulation results in low-ambiguity visual information. The VR users subconsciously strove for accuracy when creating sketches. This suggests that the three-dimensional adjustability of VR sketching makes it suitable for the later stages of personal sketching.

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(Anti)Dialogical Reflection Cards: politicizing design education through Paulo Freire's critical pedagogy

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UTFPR, Design & Oppression Network, Brazil; ESDI/UERJ, Design & Oppression Network, Brazil

Paulo Freire's critical pedagogy can contribute to politicize design reflection and practice, promoting a praxis aimed at unveiling systems of oppression and producing transformative interventions. Freire helps us reflect on why and for whom we design and provokes us to question design processes as anti-dialogic, reinforcing oppressions; or dialogic, promoting alliances with the oppressed in the struggle to overcome oppressive situations.

To help designers critically debate and appropriate these practices and concepts, we propose an educational material composed of 16 reflective cards based on Freire's critical pedagogy. Throughout this paper, we present the theoretical-practical basis

that brings Freire and Design together, the content of the cards, suggestions for use and reflect on a real case of its use.

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A place we call home: Curriculum for land-based education

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This paper describes initial research into the creation of curriculum that combines visual communication design with local Indigenous knowledge in the Tłı̨chǫ Dene region of subarctic Canada. This curriculum is intended for regional youth, and to be accredited by the Faculty of Extension at the University of Alberta. Situated outside dominant models of design education, the following sections illustrate the significant role that embodied knowledge and relationality can play in land-based pedagogy. As part of this discussion, the field of design is situated as an intermediary between an Indigenous community and a Western academic institution. Through a reflexive, narrative form of writing, the following sections provide an account of consultations between the principal investigator and Tłı̨chǫ community members during the early stages of research in 2019. Consultation during this time led to the creation of two curriculum drafts that are presented in the following pages.

https://doi.org/10.21606/drs.2022.161

29 Inclusive design practice and healthy ageing (Inclusive SIG)

Session chairs and Editorial

Farnaz Nickpour, Hua Dong, and Chris McGinley

https://doi.org/10.21606/drs.2022.1061

Design as a practice of care: Feminist perspectives on preventing harm and promoting healing through design

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Design as a discipline has traditionally positioned itself as an enterprise in service to capitalism, perpetuating the domination of wealth and the exploitation of labor and resources, but recent discourse in the field has increasingly raised questions around design's social and environmental impact. These discourses typically address themes of inclusion, sustainability and ethics, but some have gone further to explore the potential for care to play a role in the design process. More than ever, an interrogation of the connection between design and care is need-ed, as issues such as climate change, social inequality, global pandemics and aging populations require designers to negotiate relational values in order to ad-dress systemic problems. This paper aims to explore and elucidate design as a practice of care through a critical, intersectional feminist lens by interrogating existing design practices and norms, and reimagining the role that care could play in inclusive design. An analysis of case studies is presented to document a plurality of ways in which concepts of care are shaping present modes of design, and to propose methodologies and pedagogies that are necessary to make care an integral part of design.

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Design as an agent of narratives: A conceptual framework and a first exploration in the context of inclusive paediatric mobility design

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Although much of human experience is qualitative, front-end design documentation typically defaults to quantification which can abstract, dilute or lose meaning and

reasoning with regards to lived experiences. Narratives are a well-established channel for gathering rich qualitative insights around individual and collective experiences, perceptions and values. However, the potential to advance the role of design beyond simply an embodiment agent for dominant narratives - to an agent for uncovering, interrogating, speculating, and scaling a diversity of narrative 'classes' and 'statuses' - is yet to be fully explored. This paper proposes a conceptual framework positioning design as an agent of narratives through three strategic narrative roles: (1) acknowledgement and capture, (2) negotiation and speculation, and (3) embedding and scaling. A first exploration in the context of inclusive paediatric mobility design is used to explore initial insights, implications and limitations of incorporating narratives, as well as their potential to amplify marginalised voices, inform and steer design practice, and bring about transformative impact.

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Exploring the roles of inclusive design in fulfilling corporate social responsibility: a multi-case study of three large-size health corporations

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Large-size corporations play important roles in addressing social problems such as health disparity. The concept of corporate social responsibility (CSR) demonstrates the roles of corporations in society and argues for sustainable business development. Inclusive Design as a responsible design approach could contribute to developing inclusive products and services and creating sustainable value for businesses. This paper explores the opportunities to integrate Inclusive Design into business, with a focus on fulling corporate social responsibility. The literature review on CSR and Inclusive Design identifies the common objective of creating sustainable value and generating social value simultaneously. Subsequently, a multi-case study of three mHealth service providers in China was conducted by using publicly available information to gain an understanding of the antecedents, actions, and outcomes of CSR practices. The case analysis finds a lack of awareness of delivering inclusive mHealth services and a divergent use of market-based approaches and philanthropic-based approaches. The discussion presents different levels of integrating Inclusive Design into business and proposes future research opportunities.

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Notions of designing inclusively from practitioner perspectives

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Even though inclusion is a well-researched subject in design, the numerous ways to describe and understand it are unsettled. The theoretical landscape often leads into paradoxes about how to best practice inclusion in design development processes.

Instead, this study probes present-day understandings of designing inclusively from the perspective of practitioners who adopt an inclusive approach in their practice. A review of existing literature helped formulate preliminary notions that guide discussions with practitioners recruited across different domains. Iterative analysis of the data from these interviews reveals some differences between the original theoretical constructs and how they are perceived and used in practice. This paper outlines the notions reformed through practitioners' lived experiences: They are Proof of Logic, Governing Ways of Thinking, User Accessibility, Project Constraints, User Involvement, Design Stages, and Outcomes and Impact. The research can help untangle the issues that matter to practitioners which can ultimately help inform future practice.

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The evolution of inclusive design: A first timeline review of narratives and milestones of design for disability

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This paper sets out to critically review the history of Inclusive Design on two distinct levels, i.e. the narratives that shape it and the historical milestones which contribute to its evolution. Through an illustrative review of literature and object ethnography, two sets of timelines are outlined. First, a milestone timeline helps establish the chronological evolution of Inclusive Design based on historical milestones and sociocultural perspectives. Second, a narrative timeline helps uncover the underlying narratives around matters of disability, design and inclusivity, and how they evolved. Though identifying historical and emerging shifts in mentality, the timeline review of narratives and milestones offer granular as well as holistic views on Inclusive Design as a field in need of more critically reflective approaches - conceptually and in practice.

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Values arising from participatory inclusive design in a complex process

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This paper addresses inclusive design in a situation of complexity and how to improve it. The focus is on the inclusive design of a complex process and its tools, which is increasingly an issue in systemic design challenges. The current situation of climate change means we need to work on sustainability and inclusion at the same time. The paper presents a case study of an energetic renovation process and the stakeholders' activities and views in it. In a research-through-design process, the paper traces the possibilities to intervene in the process with communication tools to increase inclusivity of both process and outcomes. Values emerging from the interventions revolve around insight, openness, and responsiveness in answering needs and

resolving mismatches. The paper concludes that the communication tools developed help to generate these values and manage complexity. The tools give residents a voice in goal alignment towards inclusivity.

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Improving our understanding of user trial samples using survey data

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User trials provide valuable information on how users respond to interfaces in practice. However, it can be hard to ensure a representative sample. We propose a methodology to improve the understanding of the sample's skew and to identify the characteristics of those who are missing. This can improve the interpretation of results and inform further recruitment to improve the sample. The methodology involves comparing samples with survey data from the UK population on technology experience, competence and attitudes. We provide a case study of this methodology in practice. 30 participants were recruited using quota sampling with significant effort to obtain people with low technology experience. Nevertheless, comparison with the survey data identified four key groups of people not included in the sample, covering 29% of the population. We discuss how these missing people would likely respond on the tasks, based on the characteristics of similar people in the survey.

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Designing for dementia: An analysis of design principles

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Designing for people with dementia requires a tailored approach that addresses the specific complexities related to dementia. Design principles can provide guidance for designing in this complex context. Work in this field discusses recommendations, guidelines, or principles to design for dementia. However, this information is scattered and a clear overview of design principles, that designers can apply, is missing. In this paper we propose a set of design principles that is grounded in existing literature on designing for people with dementia. We first explore and analyse design recommendations that are described in related work. Next, we merge them into 10 design principles. Finally, we discuss the different roles of these principles, and how they are interconnected. This results in a tool for researchers and designers to use in designing for people with dementia: the Wheel of Design Principles.

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How to apply service design thinking on designing accessibility apps: A case study of public transportation for the visually impaired

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Accessibility App programming consists of multiple technical utilizations and ease-of-use specifications. Many challenges were encountered when landing in complex contexts, making it difficult for traditional App designers to overcome. As a result, the success rate of the service and satisfaction stays stagnant after the App launches. This research takes the service design case “improving the public transportation for the visually impaired”, which received critical acclaims from service participants as the research subject. We explored service design as problem-solving-oriented innovative thinking and how it assists and improves the design process for App designers, thereby increasing the success rate of the overall service. This research presents the design process of service design integrated into accessibility Apps, the process and result of responding to related challenges. Subsequently, setting them as guidelines for App designers to follow while pointing out the integration of service design thinking can increase the integrity of accessibility apps.

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Identifying inclusive design goals for the blind and visually impaired in Venice

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The aim of this paper is to understand how the use of inclusive design methodologies can contribute to the creation of projects for mobility and access to cultural information. Specifically, the research focuses on visual disabilities in a unique context such as the city of Venice. Starting from ethnographic research and a comparison of different case studies, the purpose of this paper is to identify some Design Goals useful to visually impaired users in the Venetian context. The Design Goals definition allowed us to investigate how the use of inclusive design methodologies for visually impaired users can contribute to the creation of products and services for a larger audience in the Venetian context, according to the Design for All methodology.

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Significance of age-friendly co-design from a multi-stakeholder collaboration in Greenland

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The world’s population is ageing, and there is increased attention on developing well-functioning age-friendly cities and communities. This requires addressing topics with

complex socio-spatial dimensions and involving multiple stakeholders in the process. This also means including older people as active partners in the design process to create environments that reflect their needs and aspirations. In this paper, we present a study, where multiple stakeholders from a Greenlandic city worked together to co-design new neighbourhood spaces in a senior housing area. Approximately 50 older people were involved in the co-design process, and follow-up interviews were conducted with municipal stakeholders two months later. By focusing on the different stakeholder perspectives, we extracted insights into the significance of age-friendly co-design in such processes. Our findings suggest that age-friendly co-design contributed to crossing boundaries through the establishment of a shared language, and to revising perceptions of older people's capabilities. These findings can benefit local communities, but also the greater ageing society when developing future age-friendly cities and communities.

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30 Understanding play: Designing for emergence

Session chairs and Editorial

Karen Feder and Sune Gudiksen

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Introducing the play activity wheel: Designing social, physical and playful learning activities from digital game universes

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This article introduces and describes the play activity wheel, developed by the authors. It was created through looking back at 19 years of personal experiences of transforming television shows, board games and digital games into pedagogical activities, and has a focus on social, physical and playful learning. The idea of developing computer games, television series and board games into physical activities arose from observing children's interests in transforming these universes into games and activities. The play activity wheel was developed in various settings with different participants, such as children aged 1–15, students in higher education, educators, researchers and other stakeholders. For the purpose of this study, the play activity wheel was tested as a tool for preservice teachers. A researcher/educator collaborated on designing a process to achieve common learning goals in a playful learning space. In this study, we present the theoretical background for the play activity wheel and demonstrate how it can be used to design playful learning.

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Play probe: An approach that reveals emergent identity building in youth

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This paper explores the gradual use and development of play probes as an approach to gain insights about young people and identity development. Recent studies, which are part of a larger research project, have suggested that play probes can be useful for professionals attempting to gain insights about young people. The approach can also provide participants with an enjoyable experience. The aim of this study was to identify the most important principles to consider when designing a play probe and

which types of play triggers are most effective at producing insights about young people. An analysis of play probes revealed that tasks involving play triggers from construction play and fantasy play worked well in the probes. However, flexibility in terms of materials was important for enabling young people to express themselves. Finally, supplementing probes with written tasks generated deeper insights.

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Co-creating playful learning designs for interprofessional higher education: Dialogic perspectives on design-based research

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This paper examines the co-creation of playful learning designs across educational and professional boundaries in teacher education and social education through dialogic theories. It focuses on the understandings and voices of playful learning and how dialogic co-creation is influenced by the presence of multiple voices and perspectives. The study is guided by Design-Based Research in developing, testing, evaluating, and iterating a playful learning design in higher education. The results expand on playful learning across boundaries as a polyphonic and heterogeneous phenomenon with diverse and dynamic voices interplaying with each other. It is conceptualised as both experimental, affective, and relational learning processes, and is generally framed as anti-structural and thus in constant tension with inherent structures of education. The paper finally discusses the co-creation of playful learning as dialogic and tensional with constant paradoxical longings for conceptual diversity and mutuality, for both polyphony and common language.

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Gamified user interface design for dysphagia rehabilitation based on common mental models

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Dysphagia is a term for swallowing difficulties. It is usually caused by another health condition, such as stroke, or dementia. Exercise-based training with biofeedback is commonly practiced in dysphagia therapy. Existing gamified solutions for bio-feedback devices provide scenarios that conflict with natural mapping of the swallowing activity. In this study, we have identified and addressed these conflicts based on mismatches with common mental representations to create a more well-matched training experience.

Our study showcases an example of designing a gamified user interface for dysphagia rehabilitation, while also defining important UI principles for gamified training. It also serves as valuable and emerging research that puts emphasis on the importance of designing for dysphagia rehabilitation. We expect that our re- search will inspire other

designers to incorporate gamification elements into their de- signs in a rational and well-designed way.

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Internship as a child: What designers can learn through play with children

Karen Feder
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When designing for children's play, designers need to understand the people and the context for which they are designing. This paper studies what designers can learn through play when completing an internship as a child, meaning spending time with children in their everyday lives without a predefined agenda. The data material involves reflective letters written by former design students who participated in an internship four years ago, as part of a Master's course in child-centred design for play. The analysis of the letters shows how designers learn about play, children, designers, the method, and reflection when doing an internship as a child. The paper concludes that an internship as a child includes all the characteristics of learning through play, and appears as a quick and simple, yet insightful, method of understanding how to design for children and their play experiences.

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Developing Play Tarot Cards to Support Playful Learning in Teacher Education

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Via two design-based research experiments, this paper explores how we can design a tool to support designing for playful learning in teacher education. Several recent review studies show that integrating play qualities into a learning context is not always easy. We design a set of tarot cards with the aim of exploring actions in learning situations and play qualities for those specific actions. Our experiments show that using the tarot cards as a way for students and teachers to reflect and come up with further playful learning designs brings in a broader diversity of play qualities, especially qualities that are not commonly seen as productive in an educational context.

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Emotional textures: Exploring children's emotional and haptic play

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The paper details the process of Design Based Research (DBR) conducted in a Danish Early Childhood Education (ECE) setting. It explores how relating haptics in tandem with play can provide an angle and a space for addressing and sharing emotional experiences. The research is centered around two iterations of the DBR model and the two subsequent interventions, and finds that using generative toolkit workshop formats as DBR interventions generate rich amounts of data that can be sensitive to interpretation by the researcher. It finds trends within applying meaning to textures and materials, and preferences of material selection. The paper discusses the merits of applied DBR methods and playful learning within the ECE curriculum.

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The junk playground as agora: Designing spaces to re-invigorate democratic participation

Mathias Poulsen
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In this paper, I suggest that there is an urgent need to design new spaces and possibilities for democratic participation. With inspiration from the tradition of "adventure playgrounds", I argue that play design can contribute to expanding the participatory repertoire within deliberative democracy. Two design experiments are presented and discussed through the prism of self-determination theory and the findings point to a new understanding of democratic participation and the intrinsic, civic motivation that drives it. By shifting focus from the classical deliberative ideals of rational discourse towards sensorial, open-ended exploration and creation, new democratic possibilities emerge. It is argued that such opportunities can foster a sense of collective joy, which is seen as vital to healthy democratic societies.

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Dramatic reflection: Enhancing play qualities in a design experiment for inclusive play practices in school

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Starting from a codesign project on inclusive, pedagogical play practices in schools, this paper presents a phenomenological design experiment called Dramatic Reflection. The Dramatic Reflection experiment was created in collaboration with pedagogical teams in two Danish schools for the purpose of exploring pedagogical actions regarding different children's ability to participate in play. Inclusive pedagogical actions

are understood in a holistic and child-centered manner, and children's play participation is understood as an essential part of their ability to experience relational interdependence within the context of a school. This paper shows how a design experiment for play reflections, Dramatic Reflection, might, due to play qualities such as lightness, travesty, and empathy, nourish the emergence of genuine and meaningful changes within the pedagogical profession. In conclusion, we discuss the relationship between understanding pedagogical professionalism in schools through play design and the development of play qualities in a concrete design as Dramatic Reflection

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Exploring the complexity and agency of play through co-design and experiential design with and for adults.

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This paper investigates the notion of designing opportunities for adult play in public space. The project responds to a changing landscape of play, within a context of worsening national mental health and a need for building resilience in our current climate. Following a methodology that includes co-design, social innovation and craft, the design intervention is a curated play walk in a local urban environment, inviting participation, exploration and creative expression. Through a qualitative evaluation of the intervention's impact, there is an emergence of insights related to designing for play in public space, leading to the elaboration of a set of design for play principles.

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31 Valuing the qualitative in design and data

Session chairs

Carine Lallemand, Marion Lean, and Dan Lockton

Editorial

Dan Lockton, Carine Lallemand, Daphne Menheere, Chang Hee Lee, Marion Lean, Dietmar Offenhuber, Holly Robbins, Elisa Giaccardi, and Samuel Huron

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Data-painting: Expressive free-form visualisation

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Data visualization can be powerful in enabling us to make sense of complex data. Expressive data representation — where individuals have control over the nature of the output — is hard to incorporate into existing frameworks and techniques for visualization. The power of informal, rough, expressive sketches in working out ideas is well documented. This points to an opportunity to better understand how expressivity can exist in data visualization creation. We explore the expressive potential of Data Painting through a study aimed at improving our understanding of what people need and make use of in creating novel examples of data expression. Participants use exact measures of paint for data-mapping and then explore the expressive possibilities of free-form data representation. Our intentions are to improve our understanding of expressivity in data visualization; to raise questions as to the creation and use of non-traditional data visualizations; and to suggest directions for expressivity in visualization.

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Visualizing stories of sexual harassment in the academy: community empowerment through qualitative data

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This paper presents the design report of an experimental data visualization art-work that deals with sexual harassment in academic environments. The visualization employs a qualitative dataset of stories of abuse and aims at nurturing emotional involvement by creating connections with the people behind the data. In the paper, we outline our theoretical background, considering previous research on anthropomorphic and artistic visualizations. Successively, we disclose our de-sign approach and discuss the visualizations' capability to nurture reflection, stimulate conversations, and empower the community of people fighting against sexual harassment in academia and beyond.

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Designing data interaction in exhibitions contexts

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Nowadays, the primary purpose of information representation is to support users in understanding complex phenomena. Avoiding the 'black hole between data and knowledge" means research tools and methods that help people experience and benefit from this data. Through the analysis of case studies, the contribution aims to provide an overview of existing data visualization and physicalization techniques that enable participatory processes with users. This contribution focuses on interactive data visualizations, particularly on installations in museums, exhibitions or events that involve the user in an active and participatory way. These types of activities offer a simple but effective way to make complex data understandable. It will explore processes of collaborative creation of input from visitors, processes of direct interaction of the public with data that are not easily accessible by traditional methods, and finally, some visualizations that, through this powerful representational medium, promote renewed needs for engagement.

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Design elements in data physicalization: A systematic literature review

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Data physicalization is a growing research field that focuses on data representation and communication through the geometry or materials of physical objects. As part of

this paper, we aim to contribute to the design-centric physicalization research by presenting a systematic literature review on the topic. We have identified and included 163 published and peer-reviewed conference papers and journal articles with primary data on physicalization artifacts. We have analyzed the sources from the point of view of conceptual and practical design elements. The results provide an insight into the state-of-the art research on design elements in data physicalization. This review is especially relevant for design and art researchers interested in the field of physicalizations.

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Exploring contexts for data materialisation in post-pandemic research activities with rural communities

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Insights into the ideas and experiences of people and communities affected by policy implementation enable policymakers to design systems and interventions. This is particularly pertinent in areas such as rural connectivity, where policy is often implemented by civil servants living in urban areas with limited experiences or understanding of the unique challenges presented by the rural terrain to digital infrastructure.

Drawing on proposals for the value of design in policy settings by Whicher (2020) this paper illustrates practical examples of the use of design in particular in the areas of “changing the nature of evidence” and “more meaningful public consultation” and was conducted as part of a wider government response to the unique challenges presented by rural communities. The researchers used methods based in design research; textile thinking, games design; and ethnographic approaches.

Design research approaches were used to learn from rural communities resulting in insights, observations, anecdotes and ideas that were embedded into artefacts and used to generate discussion about strategy to support the rollout of broadband in remote areas. The researchers uncovered new ways to present the nuanced details of the findings that are generated by the use of these methods, enabling policymakers access to rural lived experiences.

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Textile thinking in practice: Creative textile design methods as research in a circular economy

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This paper presents a new analysis of practice research work exploring Textile Design for Disassembly as a design for recyclability strategy. It suggests a response to challenges relating to blends in the context of a circular textile economy. This paper

highlights the potential for qualitative and creative textile design methods to produce research insights. Three textile design methods: the mood board, textile sampling, and garment prototyping, are reviewed in terms of their contribution to research. The methods are used to frame the problem space, develop a range of solutions, and test these in concepts that can materialise future fashion systems. The textile design methods are combined with information visualisation to produce insights. The approach thus makes visible some inherently tacit knowledge embedded in the textile design process. This supports a better understanding of the mechanisms for change towards sustainability at the core of design practices.

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Investigating materiality for a renewed focus on data design practice

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This paper attempts to question reductionist processes of data science that help sustain digital economies and proposes a new perspective for a data design practice. It follows recent discussions about the materiality of data in design and proposes a new notion of data materiality that unfolds its ethical and ecological aspects from a philosophical point of view. This is presented as an opportunity to envision how data can be enacted as data practice within a system. We provide an example that illustrates different kinds of data and data practices, and how ethical and ecological challenges can emerge in a system. We show how systemic challenges can be alleviated within this new notion of data, demonstrating why recovering data materiality is crucial for an ecological future. We finally argue that designers play a significant role in this context, producing practical examples that extend theoretical discussions on data materiality.

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Designing Qualitative Interfaces: Experiences from studio education

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Interaction designers tend to use quantification as a default to present information and a way to enable interactions with technologies. There is a notion that quantification is valued to be the most actionable and legitimate form of presentation, while our actual experiences of the world are largely qualitative. But can we design ‘qualitative interfaces’? What would they be like? In this paper, we explore insights and experiences from four years of applying the notion of qualitative interfaces in interaction design student projects in two countries. We introduce, review, and compare projects across different application areas ranging from running training schemes to electricity use, and discuss questions around the relationships between

the underlying phenomena and links to the ways in which they are displayed or represented, around the variety of ways in which students arrived at their designs, and suggest considerations for others interested in this kind of approach.

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Hyaku: A qualitative negotiation-through-interaction interface to support runners in achieving balanced training sessions

Juan Restrepo, Steven Vos, Evert Verhagen, Carine Lallemand
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Wearable systems and apps for recreational running provide awareness of one's performance and activity and aim for increased engagement. Yet, these systems focus on sensor-generated data and do little to integrate subjective and contextual factors as meaningful insights. Their interaction and feedback mechanisms mostly rely on numbers and do not always match users' real-life needs. To address these gaps, we explore human-computer negotiation as an interactive mechanism to enable recreational runners to adjust the recommendations delivered by a system. We do so by designing tangible qualitative interfaces la-belled "Tradeables" (whose label is inspired by the idea of "trading" with a system). By reaching a trade-off between objective sensor evaluation and subjective feelings, we gather insights into the design of negotiation interfaces for sport and well-being. We present Hyaku, a research artifact providing insights on the design considerations, challenges, and opportunities of tangible and qualitative interfaces for negotiation.

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Beyond the body: Moving past the metricised bodily goal in self-tracking

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Currently self-tracking systems, that sense and infer data about an individual or 'the self', focus on gathering quantitative data about the body. The social features present in these systems measure data about the body against other bodies or 'the other'. However, focus on these metrics is causing harm. In this paper we discuss relations between the self and the other and more-than-human perspectives to pose questions for moving beyond the body and acknowledging potential harm in self-tracking systems. Throughout we draw on work from across Design Research, Human-Computer Interaction (HCI), Philosophy and Sociology, to high-light challenges and opportunities for Designers in the self-tracking space and discuss how the future of these systems needs to change.

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Multitudes: Widening the research agenda for personal informatics design

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The personal informatics field claims many potential benefits for users, from self-reflection to self-improvement. However, despite this focus on the self, the personal informatics literature has given little attention to how the self is conceptualised in tool design. From a starting point that all notions of the self are socially constructed, we draw on critiques of the PI literature to track three key conceptualisations of the self that are prevalent in the personal informatics literature — the unitary self, the lacking self, and the knowable self. For each of these, we suggest a possible design space opened by embracing an alternative conception of the self: design for fluidity and fragmentation; design for "human-ness"; and dialogical design. These design spaces offer some future directions for personal informatics that take seriously recent critiques of the field and, in centering how the self is conceptualised, provide alternative research approaches for personal informatics.

https://doi.org/10.21606/drs.2022.415

32 Exploring online collaboration

Session co-chair

Thijs Waardenburg

Lockdown Collaboration: Partnering to Solve the Wicked Problems of COVID-19 Through Interprofessional Collaboration

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The University of Cincinnati's Design + Nursing Collaborative (D+NC) responds to the unlikely but natural similarities between Design and Nursing. The "Touch and Go" method promotes iterative interprofessional collaboration as a core competency. It fulfills the academic requirements of two major programs positioning students to use discipline-specific knowledge while learning new skills and then leveraging their new knowledge to address community health challenges as a unified team. The COVID pandemic has exposed the holes within society from resource availability and supply to access to health care. Though these have been longstanding issues, the pandemic forced the public to recognize them and begin addressing them. This project allowed the Design + Nursing Collaborative students to select an identified problem, follow the process, and build a solution in collaboration with NIOSH.

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Three degrees of influence in virtual workshops: towards an understanding of co-creative facilitation practice in technologically mediated settings

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Virtual workshops look here to stay, however much of the recent discourse focuses on methods, tools, techniques and routines in abstraction from practice and practitioner. Collaborations in virtual space are necessarily changed and shaped by their technologically mediated nature. Therefore, it is imperative to enter into reflective dialogue to effectively develop future participatory and co-creative design practice in virtual settings. Several significant phenomena, occurring within virtual workshops, have been identified through focused co-reflection by expert facilitators. Duality is

used as a rhetorical device to explore these phenomena as complex elements that are expressions of dynamic and intertwined influences within the virtual setting. Where these elements are simultaneously experienced as both enablers and barriers in virtual workshops, and are negotiated through practice. This paper positions these elements as objects for critical reflection within a conceptual model of three expanding degrees of influence; stage, setting, and environment.

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Play at Work: Virtual Conferencing in Game Space

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The Covid-19 pandemic accelerated the adoption of video conferencing, making it a prominent space that our work and social lives are lived within. For many this transition to virtual co-presence has been joyless, highlighting the shortcomings of mainstream video conferencing. In contrast the video gaming community had already pleasurably adopted and occupied online shared spaces for decades prior to the pandemic. In this paper we discuss the designed affordances of the video conferencing platform Gather Town, which adapts some of the conventions of video games and implements them to better support video conferencing. In this research we consider whether gaming conventions—including interactive spatial design, use of avatars, and a retro art style—may enable us to inject more joy into remote working. By critically considering Gather Town's affordances through our own experimental spaces within it, we seek to encourage the design of more diverse and engaging digital spaces.

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How has Covid-19 pandemic unearthed hidden social affordances on Tinder: A virtual ethnography on dating in Turkey

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In this study, we explore changing social relations and dynamics during pandemic, particularly in online dating via one of the most popular dating apps, Tinder. Conducting a virtual ethnography on Tinder over a 2 month period, we determine four main changes in the context of online dating: changes in the community, changes in the conversations, changes in the context of video call, and changes in the perception of online dating. Embracing the notion of social affordances, we further discuss how these changes have initiated new forms of social interaction in the Tinder community, making members realise the hidden social affordances of the app. Considering these shifts in the context of online dating, we discuss how any narrow definition of dating, and more broadly socialising online, may adversely impact users' online social experiences. Hence, we offer design implications that provide allowing variety in online (dating) communities, and merging offline and online.

https://doi.org/10.21606/drs.2022.459

Redefining the Structure: A Design for Remote Studio Learning

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Paula Antonelli stated that it was up to designers to teach the world how to use them well. Taking a change-led, research-led perspective on design learning, could encourage future designers “to exercise the acute critical sense that comes from their analytical training in order to help other citizens slow down, stop, reassess, and continue or change course.” (Antonelli, 2019). The sector, and discipline, has a propensity toward disaggregation, to operate as silos that are defined by their distinction.

This paper sets out and discusses a Design Case, a Restorative Learning Thing, as an model for how remote design studio learning might redefine not only the structures for growing and shaping knowledge, but address inherited notions of disciplinary boundaries within Creative Higher Education. This research points toward a new way of building and delivering undisciplined design learning, an approach that incubates communities of interest instead of distinct, disciplinary practices.

https://doi.org/10.21606/drs.2022.672

33 Ageing

Session chair and co-chair

Peter Lloyd and Willem van der Maden

Co-design as healing: A multi-level analysis based on two projects within the mental health community

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The present paper explores the notion of co-design as healing by focusing on two co-design projects conducted with participants facing mental health problems, who met once a week, guided by open design processes. Reflecting on data (interviews) across projects, as well as relevant literature from different disciplines, the paper offers a conceptual framing of how co-design can be considered as a healing practice, at a systems, social and individual level. At a systems level, co-design allows working with complexity, and approaching mental health problems holistically. At a social level, co-design empowers collectives to negotiate what realities to change and how. At an individual level, co-design affects people's wellbeing, by enhancing their sense of agency and connection, stimulating thinking and essentially providing a grounding embodied experience. The paper offers a lens through which to reflect and expand on what we do as designers. .

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An overview of current practices and approaches to co-designing services with and for people with dementia towards developing a framework for best practice

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The aim of this paper is to provide an overview of current practices and approaches to co-designing services with and for people living with early to mid-stage dementia to derive a set of principles and practices for application in the IDoService project. It explores the understanding of service design and of co-design for the purposes of this paper, and then uses a meta-review of co-design of services for people with dementia, underpinned by a selection of case studies from the literature to extract and collate a set of key principles of best practice. We then consider the application of these

principles and practices for the development of the IDoService to discuss implications and benefits of this approach for designing services.

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Constant Problem and Solution Space Investigation Method in a User Study Phase: Focusing on Early Elderly's Needs and Design Solutions Identification

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The design thinking process also known as the problem-solving process has a unique cognitive process compared with other areas, such as natural science. During the design process, the problem and solution areas are created in the designer's mind and evolve simultaneously until the process is completed. This co-evolution also occurs at the stage of a user study that is considered the stage of discovering the problem in the typical design process, such as the Double Diamond Model. However, the solution de-rived in discovering the problem stage is ignored or does not develop enough. This re-search suggests the method that can capture and develop the solution generated in a user study. Furthermore, through the case study, this research shows how it can be ap-plied in an actual user study and how the co-evolution of the problem and solution area occurs in the user study.

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Empathy in the design of assistive devices for older adults: An exploratory study with Portuguese women

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Assistive Devices (AD) aim to enhance the autonomy of their users, among whom are older adults. However, older adults often have negative feelings towards these products, such as the fear of dependence, which in turn influence their acceptance and use. These feelings can result from the use of design approaches that focus merely on users' physical abilities. This article argues for the importance of rethinking approaches to the design of AD by focusing on a holistic and empathic view of older people. It also seeks to contribute to a richer understanding of what independence and dependence means to older people. This article describes an exploratory study with eleven older women, living in two distinct contexts in the north of Portugal – rural and urban. The qualitative data that emerged from this research were used to develop five empirical personas, to provide a readily usable and useful tool for design.

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Design meets death; a first systematic mapping review of design contributions to end of life field

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This paper, for the first time, maps and interrogates the contributions towards the emerging field of design and death, through a systematic mapping review. Key databases and grey literature publications are searched and 183 design contributions are analysed, categorising results according to death spectrum; type of contribution; interventional complexity; design approach; and stakeholder involvement. Findings show an increasing trend of design contributions towards death between 2000-2021. The field is being progressed by a triad of Healthcare, Computer Science and Design disciplines, often siloed in their efforts. Design approaches and methods including Human Centred Design and Co-design are popular, particularly within Healthcare. Majority of design interventions are object-based and focused towards final disposition, with a lack of 3rd and 4th order designs i.e. service, interaction and systems. Strategic implications include transitioning through transdisciplinarity; interconnectivity across the death spectrum; expansion of design theories in the field; and interventions beyond the object.

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34 Design dematerialisation: Opportunities through reduction

Session chairs

Ashley Hall, Delfina Fantini van Ditmar, and Rob Phillips

Editorial

Ashley Hall, Rob Phillips, Delfina Fantini van Ditmar, Jonathan Chapman, James Tooze

https://doi.org/10.21606/drs.2022.1081

Alternative hedonisms and earth practices: Design and degrowth in the Capitalocene

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This design anthropology piece contributes to thinking on how to decouple design practices from neoliberal globalised capitalism, economic growth and consumerism. Drawing on the Marxist philosopher Kate Soper's theorising around patterns of work and consumption in affluent countries (such as the UK) and her post-growth theory of the alternative hedonisms or pleasures of a less harried and acquisitive living, the paper argues that one way to achieve this decoupling could be to consider how more pleasure and greater well-being could be one of the 'opportunities through reduction', if you will. Illustration is provided by ethnography with natural builders working with earth as their main material. The paper proposes that earth-builders' alternatively hedonistic practices and ecological experiences might give design, more widely, ideas for how to truly acknowledge our practice's problematic and continued hitching to the extractive and exploitative systems of capitalism and, ultimately, for how to degrow.

https://doi.org/10.21606/drs.2022.590

Why consumers have contamination concerns in refurbished personal care products and how to reduce them via design

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Refurbishment is a strategy to extend products' lifetimes. However, refurbished products that are used intimately, such as personal care products, feel uncomfortable to use for consumers because they are perceived to be contaminated. In fifteen in-depth interviews, we explored why consumers have contamination concerns regarding a refurbished Intense-Pulsed-Light device and how to decrease them. Participants expected refurbished personal care products with wear-and-tear to malfunction, to have a shorter product lifetime and to be contaminated. Participants' inferences differed depending on the location and amount of wear-and-tear. To keep refurbished personal care products at their highest value, we suggest five design strategies to minimize contamination concerns by designing a product that smells and looks hygienic after multiple lifecycles: 1. Using color to evoking associations with hygiene, 2. making wear-and-tear less visible, 3. using smooth materials, 4. minimizing the number of split lines, and 5. a clean product smell.

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Are short product lifetimes ineluctable? An exploration of consumers' perceptions of lifetime extension strategies

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There is consensus that product lifetimes are generally decreasing. To create a sustainable society, the circular economy promotes slowing down the use of resources by lengthening product lifetimes. This is especially important for electronic products that are energy-intensive in their production phase and create vast amounts of waste after use. While design strategies have been proposed to lengthen product lifetimes, it is unclear whether consumers deem them effective. This paper proposes an overview of lifetime extension strategies for electronic products and reports the results of a quantitative study with 617 participants who were asked to evaluate the extent to which these strategies could have extended the lifetime of a recently replaced product. Results indicate that the durability / reliability strategy is most effective. However, consumers are not yet convinced of the effectiveness of most strategies.

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Deep products via undisciplined stewardship; Towards an environmentally-led design pedagogy for the 21st century

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Designers are envisioning new typologies of products aiming for instance to ex-tract CO2 from the environment or creating products from landfill waste, in this context a fundamental question arises; what could be a philosophical framework for a subtractive practise in design? In this paper the notion of Deep Products is introduced by building from notions of Deep ecology, Deep Design, and steward-ship. This theoretical proposition addresses the design of products from a life-cycle perspective through contemporary notions of subtraction-by-design. The model presented transitions design to a model demanding extended projects considering every aspect of the life-cycle of products, from inception to deployment, while addressing issues of impact and reuse with the characteristic of sub-traction-by-design. In this context, undisciplined stewardship is introduced as an ethical responsibility principle to enable the creation of such products by building from notions of personal responsibility, alterplinarity, and stewardship.

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Integrating ecodesign in food packaging solutions for EPR compliance in Chile: Knowledge transfer from theory to practice

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An extended producer responsibility legislation will operate in Chile, to help solve the problem of product post-consumer waste. Packaging is subject to the law, and waste management systems are being created to deal with post-consumer packaging waste. To enable products' packaging for successful waste management in such systems, great changes will need to be made in new packaging solutions as opposed to existing ones. To help in this task, the course Packaging Ecodesign for EPR Compliance was created, for an audience of professionals in packaging companies. This article reports the design, implementation, and results of this course, focusing on final project results, for an audience of designers and non-designers involved in design processes. The course students succeeded in incorporating its core contents in applied systemic packaging design solutions for real products, which can comply with the extended producer responsibility through the upcoming waste management systems.

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35 Designing neighbourhoods: From the domestic to the community

Session chairs and Editorial

Fernando Bajo and Ezequiel Collantes

https://doi.org/10.21606/drs.2022.1071

Strategies and Tactics of Participatory Architecture.

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This paper explores participatory architecture through counterbalancing a historical review with an analysis of four emergent projects. This paper aims to contribute to understanding emergent participatory architecture practices and extract best practice and insights around these forms of designing with people. We analyse four emergent participatory projects developed in Spain, France, Norway and England, using a narrative inquiry-based method to examine interviews, observations, and literature. We then discuss the lessons learnt and argue for contemporary participatory architecture as a strong alternative to overcome the issues associated with conventional approaches to architecture that exclude people from the design process; and to address the most pressing challenges in our society and cities with local communities.

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A participatory approach in urban development: Co-designing resilient coastal neighbourhoods

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Urban development projects are complex processes that involve numerous stakeholders. Lately, urban design has gained a human-centred dynamic to be able to correspond to the needs and aspirations of the stakeholders that form the community. This paper proposes a participatory approach to bring the community to the centre of the design process. Through a case study conducted in the coastal areas of the Philippines, we take a closer look at how co-design can help tackle fragile living situations that emerge from challenging environmental and social conditions. First,

future scenarios are co-created with residents in the form of visual summaries, boards and relationship maps. Secondly, these insights are translated into a design framework, where stakeholders can discuss and further iterate on the proposed solutions. This bottom-up approach that directly uses participants' input in identifying the essential elements of the new settlements enabled the generation of implementable design scenarios on neighbourhood scale.

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Playful co-creation in urban space: Igniting activation, closeness, and collective intervention of residents in neighbourhoods

Nicole Arthur, Liridona Sopjani
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How public space is designed, who it is designed by, and the events embedded within it can have a huge impact on the lived experiences in a city. Traditional ways of developing urban space have been generating an increasing distance between citizens, the spaces they inhabit, and the processes for creating these spaces. This can be seen in the reduced interactions between people in public space, the little use of public space and the disengagement of citizens from existing development processes. In view of this a playful co-creation approach of temporary urban spaces is explored within a community in Sweden as a new way of developing urban space, using playfulness to enable active and extended involvement of residents. Both playfulness and co-creation present multiple benefits when it comes to bringing people together and facilitating creativity, and this process combines these terms and applies them in the context of developing urban space. A resulting low-budget, playful process ignited activation, fostered closeness, and brought change led by residents to the neighbourhood.

https://doi.org/10.21606/drs.2022.805

Framing resilience in public transportation systems, inspired by biomimicry

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Resilience is a concept that describes the capability to be restored after unprecedented events, originally emerged from biology and human sciences. This paper aims to explore what a resilient public transportation system is and how nature's wisdom can be used as an inspiration for the creation of resilience in the area of mobility, by linking public transportation systems, biomimicry and resilience together. To this end, qualitative co-creative workshops were conducted with eleven domain experts from public transportation, biomimicry, and biology. The experts addressed several factors contributing to resilience in public transport that could be categorized into four aggregated dimensions: resilience through system organization, resilience through information management, resilience through operating performance, and

resilience through subsystem integration. Finally, a conceptual wheel framework on factors of resilient public transportation systems is proposed, aiming to shed light on future public transport developments, where a systemic perspective is to be adopted.

https://doi.org/10.21606/drs.2022.323

Birds, bees and bats: Exploring possibilities for cohabitation in the more-than-human city

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Urbanization pressures are creating conditions for greater urban density. However, cities are home for both humans and a diversity of nonhuman natures, where heightened proximity between species can cause friction and conflict. This paper explores possibilities for convivial multispecies cohabitation in more-than-human cities. It grounds more-than-human theory through the application of three case studies — birds, bees and bats — based in the city of Trondheim, Norway. Drawing on three related studies, these creatures help illuminate what kind of spaces, needs and considerations are required beyond a human-centric focus in the urban environment. Issues to consider include disease, insecure land access and unpredictable and complex feedback loops, while benefits from nonhuman natures include sources of wellbeing, food and wonder. Relevant concepts include agency, assemblage, and urban acupuncture. The paper also develops the concept of 'multispecies mutualisms' and offers a suite of suggestions for design interventions.

https://doi.org/10.21606/drs.2022.770

36 Studio matters in design education (Education SIG)

Session chairs and Editorial

Derek Jones, Colin M. Gray, Lorraine Marshalsey, Elizabeth Boling, Nicole Lotz, James Corazzo, James Benedict Brown

https://doi.org/10.21606/drs.2022.1063

Critical pedagogy and the pluriversal design studio

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Studio learning is central to the teaching of design. However, the disruption of the COVID-19 pandemic, alongside emerging and historic critiques of studio pedagogy, creates a space for critical engagement with the present and potential futures of design education in studio. In this paper, I outline historic critiques of studio pedagogy, drawing primarily from critical pedagogy literature to frame is-sues relating to disempowerment, student agency, and monolithic representations of the student role and student development. I build upon this critical foundation to reimagine studio practices as pluriversal, recognizing the challenges and opportunities of bridging epistemological differences and facilitating the potential for pluralism in design curricula, our student experiences, and the future of design professions.

https://doi.org/10.21606/drs.2022.238

Illuminating themes and narratives in studio through expert elicitation and collaborative autoethnography

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The studio remains central to design education as a shared place, practice and even concept. And yet studio persists as an ill-defined entity: a complex puzzle composed of thousands of diverse jigsaw parts constructed by teachers and students, with no definitive list of parts. Given this background, it was opportune to review the landscape of studio, both in terms of research and practice. In 2020, this study brought together an invited collective of design educators from the USA, Australia, United Kingdom, Sweden, Spain, Iran, and Germany, experienced in the research and

operation of design studios in education to explore these issues. Expert elicitation, conducted over several months illuminated the critical values, questions, and themes of studio to foreground and inform future re-search studies in this field. The authors approached this study via thematic analysis and collaborative autoethnography. Later, they determined their own subjective narratives as they reflected on the themes relevant to their individual studio research interests. These narratives briefly examined studio through the lens of sensory affect and the inclusiveness of the design studio. The emergent themes from this study have implications for both studio research and practice: identifying a plurality of the boundaries of studio today.

https://doi.org/10.21606/drs.2022.273

Camera-on/camera-off: Visibility in the design studio

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What constitutes, defines or bounds the 'studio' in architecture education when it is wholly online? The design studio contributes to a very particular spatial con-struct in proximal teaching, one that has been challenged during the pandemic as educators have adopted distance and online learning and teaching. This paper presents a brief history of the design studio in architectural education and speculates about three dimensions of visibility therein. It contextualises the design studio against the broader higher education experiences of teaching online during the Covid-19 pandemic, in particular so-called 'Zoom anxiety' and 'Zoom fatigue' experienced by teachers and students. The paper explores how the visibility of teacher and student in the studio conspire in the reproduction of inequity and precarity in higher education, while also raising questions about students' agency in disabling their cameras in online teaching.

https://doi.org/10.21606/drs.2022.343

Where do we go from here? Rethinking the design studio after the COVID-19 pandemic

Saskia van Kampen, Anne Galperin, Karin Jager, Lesley-Ann Noel, Johnathon Strube

San Francisco State University, USA; State University of New York at New Paltz, SA; University of the Fraser Valley, USA; North Carolina State University, USA; East Tennessee State University, USA

In this paper, five design educators apply an investigative framework to discuss the who, what, when, where, why, and how of the Design Studio and the future of design education at North American universities. The educators are dispersed geographically across Canada and the United States and teach in public higher education. They have a working and reflection group that has met weekly or bi-weekly for 18 months to discuss and write about their practice as design educators. This paper is a distillation of the group's experiences, their reflections regarding the future of the design studio, and their intentions for practice moving forward.

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Studio Through Studio: a diffractive reading of the educational design studio

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This article aims to unsettle familiar notions of the educational design studio by examining how it is different from the professional studio. Both settings share similar routines, practices, and physical features; however, I argue their operations differ in critical ways. By bringing attention to these differences, I hope to open up new perspectives on how learning happens in educational studios and make a case for further material and spatial accounts of learning. I will draw on empirical accounts of professional studios from the book Studio Studies. Wilkie and Farias identify the studio as a sociologically significant yet overlooked setting for understanding how creativity happens. They implore researchers to take materials, spaces, and routines seriously to enrich our understanding of what takes place in studios. Through a close reading of Studio Studies, I identify five critical aspects of the professional studio: 1) the outside; 2) gathering; 3) material intimacy; 4) boundary-making practices and; 5) making. Taking each aspect in turn, I examine how they do or do not appear in accounts of contemporary educational studios. The intention is to provide new frames for studying the educational studio and develop enriched accounts of how learning happens in the studio.

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Exploring studio proximities: Space, time, being

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The studio remains central to design education but has been severely tested during the emergency transition in design education during the global Covid-19 pandemic. This period highlighted problems and opportunities experienced in translating studio to online and distance modes of education, many of which arose because of the dramatic shift in use of space and time. By investigating how educators conceptualised these basic terms in descriptions around learning, it is possible to make visible some of our foundational assumptions in studio education practice. These assumptions are important to take account of as educators transition to whatever new normal may emerge in the next years. A series of theoretical arguments resulting in pragmatic suggestions are presented to enable educators to reflect and develop their teaching materials independently of mode of learning and teaching.

https://doi.org/10.21606/drs.2022.344

37 Bias in design

Session chair and co-chair

Catalina Cortés and Madeline Sides

Implementation intention as a debiasing intervention for a bias blind spot among UX practitioners

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When designing digital products that millions of people use, User Experience (UX) practitioners are prone to typical cognitive biases that might threaten the quality of their work. A barrier for mitigating such biases is the bias blind spot: People are more likely to detect bias in others than in themselves. Since practitioners have no standard means to diminish the bias blind spot, this paper investigates the prospect of implementation intention, designed as a commitment to consider how one evaluates others when evaluating oneself, as a debiasing intervention. As a preliminary study, an online experiment was conducted among 123 UX practitioners to examine whether implementation intention could yield a short-term bias blind spot diminution. The results suggest that the UX practitioners perceived more cognitive bias in the 'average UX practitioner' than in themselves, and that implementation intention served to diminish this bias blind spot short-term for novices and experts alike.

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Experimenting the role of UX Design in the definition of gender-sensitive service design policies

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The environmental and social sustainability objectives indicated in the 2030 agenda require the development of services for urban contexts capable of responding to the diversified primary needs of different segments of the population. International studies on gender issues show that understanding the specific needs of women, their

behaviors and their expectations can yield indications for creating more equitable and inclusive services. The article reports the significant results obtained using UX Design techniques and tools for gender-oriented service design. This activity was carried out in collaboration between university researchers, students, and women's associations, and produced indications on the specific female points of view capable of guiding the development of better services and inspiring decision-makers and service providers. The research also demonstrates the potential of applying the UX Design approach in the investigation of the gender perspective and in dialogue with non-profit associations interested in social innovation.

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Negotiating the Page: Digital Annotation and Graphic Literature

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The past ten years have seen an increased acceptance and study of the graphic novel as a literary instrument. More and more authors and designers are using the comic book platform and its shorter, serialized structure, to tell stories about race, class, and gender. In tackling these more complex issues, creators are intentionally or unintentionally making environments where readers are engaging in methods of negotiated reading—discovering an affinity with aspects of the characters and stories, and actively creating a discourse with identity and positionality. Digital annotation and reading platforms offer a unique opportunity to teachers, designers, scholars, and readers to actively examine and enhance the ways this negotiated reading is experienced, but most privilege text-based literature over graphic literature, and few actively connect the texts to real-world, contemporary experiences or evidence. This paper describes an approach for augmenting graphic novels through visual and digital annotation.

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Design and cyberactivism on social media during Covid-19 in Brazil

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The article presented below addresses the presence of design, in its intersection with art and technology, in activist actions disseminated and organized through digital social media during the context of the COVID-19 pandemic in Brazil. To this, four contemporary works of cyberactivism and art-activism in digital social media will be presented and analyzed to obtain a more in-depth insight into how these cases show design, as well as the respective strategies of action in this period, marked by political crises, hyperconnectivity in networks, and social distancing.

https://doi.org/10.21606/drs.2022.229

38 User-centred design

Session chair and co-chair

Weston Baxter and Tina Ekhtiar

Designers in Action: Insights and design opportunities for supporting Embodied Learning in Climbing

Hakan Yılmazer, Aykut Coşkun
Koç University – Arçelik Research Center For Creative Industries

Action sports have been under research spotlight due to increase in research opportunities and popularity. Though previous work focused on performance and success metrics, research on mental and emotional aspects, which make up an important part of the learning experience of action sports is still lacking. By focusing on climbing and climbers' learning experiences, we aimed to extract user insights into learning practices of sportspeople and identify design opportunities to enhance these practices. Initially we gave climbing lectures to interaction designers, as a first-hand experience of learning processes. Then we conducted co-creation sessions with climbers and designers to identify learning needs and generate possible design proposals. Analyzing these, we identified three user insights that summarize climbers' learning needs: bodily awareness, social feedback and learning how to fall, and design opportunities for addressing these, grouped as how to design feedback for climbers and how to address mental challenges of the climbing.

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Usability Testing with Children: History of Best Practices, Comparison of Methods & Gaps in Literature

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This paper is a systematized literature review centered on the best practices of usability testing with children, when they are the target end user in product development. The paper begins with a brief history of usability testing with children during the prototyping stage of product development. Following, the methodology guiding this literature review is described. Then, guidelines for usability testing with children provided by past research are outlined in chronological order, documented to show the evolution of changes or improvements in the practices over time.

Additionally, most of the approaches to usability (as part of evaluative research) have been identified and com-pared between one another with a variety of factors. In conclusion, directions for further research are suggested based on current unanswered questions in the field of prototype usability testing with children, such as considerations for longitudinal vs. cross-sectional testing, physical vs. digital product testing, and age range of children.

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Digital toys as tangible, embodied, embedded interactions

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Our research aims to explore the potential that tangible, embedded, embodied interactions (TEIs) has in enabling children's (age 3-5 years old) active play. This paper describes our study of 66 commercially available digitally augmented toys that have the potential to get children moving, and how these digital toys may be conceptualised as TEIs. During our analysis, the type and persistence of digital feedback from the toys was an important factor in our conceptualisation of these toys as tangible and embodied. We also encounter issues when conceptualising children's toys, particularly toys for pretend play, as embedded interaction. These findings offer the opportunity to refine our definition of embeddedness to capture children's play and highlights the importance of designing toys with strong feedback for physical activity.

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A framework for designing the seamless automotive multimodal experience in future connected and autonomous vehicles

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As multimodal user interfaces (MUIs) significantly enrich user experience with connected and autonomous vehicles (CAVs), a seamless modality combination and multimodal switch is the key to enhancing human interaction's efficiency and usability across multiple interfaces in vehicles. From the theoretical review, we discuss the concept of seamlessness. Based on the consideration of driving automation upgrade and multi-tasking dynamics, we introduce two seamless dimensions of the new design space of multimodal user interfaces in both chronological and spatial orders. We propose a framework incorporating the design space and discuss the factors influencing the performance of multimodal seamlessness with the driving tasks constantly changing. Further, we present three design practices using this framework to illustrate the design methods. We also discuss the framework's potentials and limitations for designing the human-machine interaction in CAVs.

https://doi.org/10.21606/drs.2022.163

39 Designing new financial transactions: Theories, case studies, methods, practice, and futures

Session chairs and Editorial

Chris Elsden, Bettina Nissen and Inte Gloerich

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Financial wellbeing canvas: Tool for designing holistic financial services for all life stages

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The paper introduces a design tool, 'Financial Well-being Canvas' that is developed to help conceptualize, evaluate, and identify opportunities to create holistic financial well-being service offerings for various 'life stages' of users. The paper includes a survey and value mapping of existing product offerings and finance and fintech offers with a focus on interaction style, user approach, and role/character of the service. Taking these insights, the Canvas is designed with the concept of financial well-being at the forefront, specifically in understanding how banks can be present at certain life moments for users to achieve it. The Canvas touches upon three dimensions: modality, degree of service and timing (life moments). The paper exemplifies usefulness of the Canvas through two examples: as an evaluation tool of existing offerings, and as an ideation tool of new holistic services.

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Envisioning personal finance and expense tracking for a sustainable future

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Young Koreans who are financially inexperienced and unconcerned about environmental and social issues cannot achieve balanced goals—economic self-sufficiency, environmental-health sustainability and ethical consumption—for a

sustainable future. Although current personal finance apps provide daily, weekly and monthly spending trends, they do not effectively raise awareness of these goals. In response, we envisioned an alternative expense tracking app UI with two reference points against which a user can compare his/her current spending: (1) the user's peer age/household/income group spending averages and (2) expert recommendations on the appropriate savings rate, energy consumption limits and ethically manufactured products. According to a survey questionnaire that evaluated the effectiveness of the alternative UI design, participants' priorities are skewed towards individualistic goals of fulfilling their material needs. However, the alternative UI design was comprehensible and participants considered the two reference points valuable for personal finance management. These findings are discussed in relation to financial socialisation.

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Curb your enthusiasm: The dissonances of digitising personal finance

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Financial technologies are often credited with empowering the consumer-citizen. The discourse that surrounds them is overwhelmingly positive, emphasising their contribution to speed, efficiency, availability, competition, quality and affordability. These very same technologies, however, also clash against the meanings that we attach to money, and against the things we value in our interactions with it. Through a review of the design literature on moneywork, and our own research with people experiencing both mental illness and financial difficulty, we discuss a list of dissonances that result from digitising our personal finances. We hope this discussion will encourage designers to reflect and think critically about financial technologies, and to look beyond the hype currently built around them.

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CariCrop: Can a digital payment system support fairer agricultural trade?

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What difference can new technologies make for small-scale farmers facing a multitude of uncertainties that could affect not only the value of their crops but also when and whether they get paid? To understand how Distributed Ledger Technologies such as Blockchains, could be leveraged to address such uncertainties in agricultural trade, we engaged small-scale farmers in a problem delineation exercise and designed CariCrop, a payment system and currency that specifically addresses the issue of delayed payments. We investigated the potential impact of this system through immersive

drama and deliberative workshops. We found that although digital payment systems can give farmers greater autonomy in agri-cultural trade, these systems do need to be designed with careful consideration of social values and integrate local economic and legal infrastructures.

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Designing new money: Creative transactions on Twitch

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There is a wealth of contemporary scholarship pointing to ways in which money and payment media are being rapidly reconfigured through data and technology platforms, towards what Swartz terms 'New Money'. In this article, we look at these developments through the lens of design research and ask: how might we approach the design of new money? And how can design research complement and extend critical sociological work on payment technologies, monetization and new cultural economies? To respond to these questions, we analyse a series of 'creative transactions' that take place on live-streaming platform Twitch. Twitch offers a rich example of payments as they are interweaved with social media. Employing Kow et al.'s (2017) framework for 'transactional attributes' we explore how various forms of payment and exchange in Twitch have been designed and adopted to perform relational work across a 'transactional community'. Through this case study, we identify novel qualities and patterns of 'new money', and propose means and opportunities for designers to engage critically with the design of contemporary payment technologies.

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40 Designing public organisations

Session chair and co-chair

Sampsa Hyysalo and Susan Evans

Design types in diversified city administration

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Design is increasingly used to develop public services, and considerations have arisen regarding how to gain best value from it. Design ladders and design maturity models are commonly referenced also in the public sector, but we argue that their adequate use must rest on an informed view of the diversity of design activities in the public sector organizations. The world's major cities are large and highly diversified organizations. Our case study of one of them, the city of Helsinki, reveals 23 distinct types of design activities, distinct in terms of the process, outcomes, and agency that design has. These activities can be grouped into six different clusters. These lay the ground for each other and support the cultural transformation of the organization towards being a more citizen-centric organization. At the same time, they also create a design management challenge and confusion over what "design" is and what it can do.

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Incubating civic leadership in design: The role of cross-pollination spaces

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The paper explores the hypothesis that access to places that enhance capabilities for co-design work across sectors, is an important vehicle for incubating and sup-porting civic leadership. More specifically, the paper reports insights from a study which created 'cross-pollination' spaces to bring together academic and non-academic individuals from different backgrounds, disciplines, and sectors to explore the notion of incubating civic leadership and to develop pop-up interventions to test ideas for incubating civic leadership in two locations in the UK. Drawing on the reflections of participants collected through group reflection spaces and through individual interviews, the study identifies a number of common themes which help understand the value of cross-pollination spaces, but al-so the barriers and enablers of civic

design leadership. As such, the study con-tributes to both the theory and practice of co-design within and with communities across sectors.

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Organizational learning through collaborative project-based service design course: The flip side of the coin

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Collaborating with public or private sector organizations in project-based courses equips design students with key skills to future-proof their careers, but this gives only one side of the story as the key feature of these partnerships is that they are mutualistic collaborations. However, the benefits to organizations of collaborating are not fully explored. This paper presents a case study of partnerships with four different public organizations in a service design course over a five-year period. It argues that collaborating in project-based courses serves as risk-free experimentation and paves the way for organizational learning. The paper first reviews the existing research on collaboration in design education and organizational learning. Then, three types of learning that emerged from the data are analyzed. Next, the steps to successful collaboration are discussed, noting the ups and downs of managing the project partnerships. Finally, the challenges of teaching a collaborative project-based design course are discussed.

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Walking in my shoes: Creating a toolkit for co-designing a shared vision for city development

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This research explores the creation of co-design methods that build and maintain long-term relationships in council development projects and engages in innovative design outcomes for the future of the city. A series of workshops were conducted with participants, including designers and urban planners. Stage 1 investigated mechanisms of building trust and understanding roles and responsibilities to test different relationship dynamics. Stage 2 explored activities suitable for dealing with innovation, negotiation, and shared planning to test innovative design outcomes. Findings show that relationship dynamics developed better through conversational activities than pure brainstorming, and that innovative outcomes were best generated through the sharing of values and visions rather than one-sided communication. To support councils to build relationships with developers, we designed a co-design toolkit. The toolkit aims to facilitate meaningful discussions and navigate conflicts in a project, while allowing for the dynamicity of long-term relationships for collaborative city planning.

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Participatory design towards digital democracy

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The potential contributions of participatory design towards current problems of digital democracy platforms are investigated in this research. Literature review, thematic analysis, and inter-rater reliability test were used to determine the major issues in digital democracy platforms and what approaches and tools from participatory design study and practice can be used to address them, considering that democratic dynamics face similar difficulties in both participatory design, and digital democracy. As a result, a participatory design guide for digital democracy is developed, which included seven proposed strategies for dealing with five common issues of public participation platforms. This work contributes to the discussion of design and democracy by expanding the application of participatory design to different areas.

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41 Design education

Session chair and co-chair

Marie Van den Bergh and Isaac Ortega Alvarado

Embedding authentic feedback literacy in design students: A new model for peer assessment

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Design-based subjects consistently perform poorly in relation to assessment and feedback in measures such as the National Student Survey (UK), which prompts educators to consider more effective ways of engaging design students in the assessment and feedback process. There is a growing field of research supporting the view that exercises can be designed to deliver authentic experiences and enhance student assessment and feedback literacy. Through a literature review of this emerging field, this study establishes a framework for designing a peer-assessment and feedback exercise aimed specifically at developing authentic feedback literacy in design students, through emulating real-world experiences of the design industry. A single explanatory case study is then used to test the effectiveness of this exercise on 30 design students. The conclusion develops an understanding of using peer-assessment and feedback to embed authentic feedback literacy, and a set of recommendations for evolving the exercise design.

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The value of being close - social and ecological sustainability in coliving for students

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Sustainability challenges demands that we live smaller and more efficient in terms of re-sources and energy, at the same time, loneliness and mental unhealth are in-creasing among young people and students. One solution to both ecological and social sustain-ability is provided by coliving, where a small group of people share a home. Living in a shared home is an opportunity for friendship and sense of community but is also associated with frictions. This paper describes an interdisciplinary and experimental research project about coliving for students and particularly focuses on

the social aspects and new practices of living together. We conclude that a small homelike environment has great potential to create the social belonging young people need as well as spreading sustainable practices, but there has to be a so-cial and practical structures there from the start in order to create a resilient and safe space for living.

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A community-based learning program to improve wellbeing and design student success

Marie Van den Bergh, Mieke van der Bijl-Brouwer, Rebecca Price
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While the Pandemic has increased awareness towards student wellbeing in higher education (HE), it also exacerbated existing challenges. Specifically, students pursuing their master graduation thesis often find themselves isolated and overwhelmed due to the individualistic nature of their project and the pressure to create a 'masterpiece'. In this paper, we provide insight into how designing for community can positively impact thesis design students' motivation, sense of community and wellbeing, which we identify as drivers of student success. We discuss and evaluate a community-based learning (CBL) program we designed and implemented to improve student success during the master thesis journey of 92 students at the Faculty of Industrial Design Engineering, TU Delft. Our findings from the program are that; (1) facilitating connections between students generates a sense of community; (2) a customizable program supports student agency which in turn drives motivation; (3) a focus on student success instead of performance improves wellbeing.

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Differential moral framing and the design imagination

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The objective of this paper is to provide a proof of concept for a pedagogical apparatus aiming to foster moral education and reflection about the inner good of their practice among apprentice-designers. We designed this tool with the aim of helping students understand how modern moral pluralism imprints professional mores, and how particular conceptions of the good life may affect the way they envision and devise how the world should be (and how they ought to design it). Our tool comes in the form of a role-playing game based on different species of worth coexisting in modern democracies, and that French sociologists Luc Boltanski and Laurent Thévenot have been depicting in their book On Justification—Economies of Worth (2006). Our proof of concept is based on two use cases related to the many studio courses that offered us settings to develop our tool.

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42 Practice research in social design as a form of inquiry

Session chairs and Editorial

Patrycja Kaszynska, Eva Knutz and Thomas Markussen

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Repair as a social design practice: Three case studies in vulnerable households in Chile

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The work presented herein addresses the socio-material implications and spontaneous design actions that emerge from the home repair practices of household objects in low-income areas. Through qualitative research and contextual inquiry from the investigation of their praxis (Cross, 2007), we reassess the principles of planned obsolescence associated with product design and throw-away culture. Within the framework of matters of care of non-human devices that are part of a social assembly, a theoretical discussion develops around certain actions; in particular, repairing everyday household objects, as design solutions. The exploratory methodology of this project is based on literature review and on-site case studies in Villa El Refugio in the commune of Puente Alto, an area in Santiago, Chile where basic actions such as waste collection are scarce. Through observing and analyzing the repair of essential objects for everyday use, we recognize creative actions that activate the relationship between humans and non-humans when altering the social life of objects to extend their use.

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Talking about food: Reflecting on transitions of practice in people with lived experience of food poverty

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In this paper, we deploy a practice theory lens to explore how co-design activities have enabled individuals to transition to new and different advocacy, inquiry and engagement practices. The co-design project we describe sought to bring about change in a national network of organisations addressing food poverty in the UK. The

aim of the project was to collaborate with young people and adults from different communities of the North of England to co-design tools for gathering stories and enabling advocacy relating to food insecurity. We use a practice theory lens to describe the relationships between co-design activities and transitions in practices of a single participant. The findings show the value of exploring and sharing meanings, practical experimentation and facilitating transitions within participant's practice. We argue that practice theory provides an analytical framework to understand the impacts of co-design and social design by interpreting the transitioning practices in participants.

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Artifacts in the Co-production of Knowledge in Social Design

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Abstract: Social Design Research is a design and research approach that is characterised by an attempt to make a difference for marginalized, underprivileged or vulnerable groups in society through participatory processes and the use of knowledge artifacts. This article demonstrates how knowledge is generated co-productively and shows the interplay between different types of tacit or explicit forms of knowledge and models the knowledge exchange between design re-searchers, practitioners and the participating citizens.

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Performative modes of inquiry as everyday theatre

Maria Foverskov
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I aim to strengthen Social Design inquiries by introducing lenses from Performance Studies and Design Anthropology for acquiring better understandings of how social designers navigate performative processes of practice research. I draw upon experiences in co-producing performative modes of inquiries as an everyday theatre. A design research project supporting citizens, public and private partners in different ways in which communities of senior citizens could be supported in organizing and meeting up for social and outdoor exercise activities on an ad-hoc basis. I show how knowledge is bodily co-produced and performed through multiple partners co-scripting the performance of an everyday theatre, which manifests itself in a performative praxis. I offer a performative framework that enables social designers to explore different performative modes of inquiry as approaching worldmaking as rehearsing by trickstering, performing by wayfaring and re-enacting by bartering multiple worldviews of an everyday theatre. Performance Studies and Design Anthropology has the potential to support situated experiential inquiries and portray the values for partners in practice research transitioning civic and public relations in welfare societies.

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Preparing for the pluriverse: Embracing critical self-reflection in service design practice

Shivani Prakash
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This paper explores how service designers in the public sector can embrace a lens of cultural plurality in their daily design practice. When designing for public services, a gap between the cultural assumptions of the designer and diverse residents is going to emerge. If this gap is not addressed, service design risks enacting harmful oppressive structures. This study develops a process model based on a research through design approach. It describes how a generative feedback loop of critical self-reflection negotiated within design practice could support designers to begin embracing cultural plurality along with concrete examples. The process model addresses the missing how of critical reflection in service design practice and explores how design artefacts can be leveraged to start creating a designerly critical self-reflective practice.

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Social design as normative inquiry

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This paper gives a stipulative definition of social design. It argues that there is a distinctive field of design practice, and design practice research that can be labelled 'social design' but that this distinctiveness cannot be spelled out directly in terms of the relation between design and the social, which has been the dominant view up till now. Rather, social design is defined in terms of the kind of knowledge production that it is — as a form of situational normative inquiry. This means that it is conducted empirically by responding to problems identified in specific situations and according to the ends-in-view that can be collectively warranted, and thus responding to the norms of justification and standards of criticism of those affected. This stipulative definition not only has the advantage of delineating and orienting the fields of practices of social design, it also opens some interesting considerations with respect to knowledge claims made by social design research.

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Evaluating Social Innovations (SI), how Creative Evaluation (CE) can help articulate their values and impacts.

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Locally, nationally and internationally, Social Innovations (SI) are increasingly seen as a way to address the complex problems posed by society. Emphasised by both funding bodies and in UK legislation and initiatives such as Public Services (Social Value) Act

2012 and Social Impact Bonds, there is a greater urgency in evidencing the value generated by SIs. However, the process of measuring and evidencing social value is still underdeveloped. This necessitates developing evaluation approaches that are adaptive, responsive to context, and able to demonstrate value beyond financial return. This paper presents an overview of the current evaluation methods employed to capture the social value generated by SI's and examines the problems with these methods. Furthermore, it reviews Creative Evaluation (CE), a constellation of evaluation approaches, which has recently garnered renewed attention in evaluation research, and presents it as a promising avenue that could help mitigate the current issues faced when evaluating SI's.

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43 Designing dialogue: Human-AI collaboration in design processes

Session chairs

Senthil Chandrasegaran and Euiyoung Kim

Editorial

Peter Lloyd, Senthil Chandrasegaran, Euiyoung Kim, Jonathan Cagan, Maria Yang, and Kosa Goucher-Lambert

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Pushing divergence and promoting convergence in a speculative design process: Considerations on the role of AI as a co-creation partner

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Within design research, several studies have looked at Artificial Intelligence as a tool to help ideation processes. However, the potential of using Artificial Intelligence to support a specific characteristic of the design process, namely the interplay between divergent and convergent thinking, remains underexplored. Aiming to address this gap, this paper examines how 136 students interacted with Artificial Intelligence on the occasion of two courses run by the authors in a prominent European design school.

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Exploring diversity perceptions in a community through a Q&A chatbot

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While diversity has become a debated issue in design, very little research exists on positive use-cases for diversity beyond scholarly criticism. The current work addresses this gap through the case of a diversity-aware chatbot, exploring what benefits a diversity-aware chatbot could bring to people and how do people interpret diversity when being presented with it. In this paper, we motivate a Q&A chatbot as a technology probe and deploy it in two student communities within a study. During the study, we collected contextual data on people's expectations and perceptions when presented with diversity. Our key findings show that people seek out others with shared niche interests, or their search is driven by exploration and inspiration when presented with diversity. Although interacting through a chatbot is limited, participants found the engagement novel and interesting to motivate future research.

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AI in design idea development: A workshop on creativity and human-AI collaboration

Fabio Antonio Figoli, Lucia Rampino, Francesca Mattioli
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In a fast-paced society, AI systems can prove to be reliable teammates alongside human agents during the early stages of the design process, capable of helping to manage the increasing complexity of projects. Therefore, the introduction of AI systems into the design process is analysed according to the implications on the designer's creativity and the kind of human-AI collaboration that is established, highlighting trust balance and the new role played by the designer. The main aspects covered by the study were tested in a workshop, in which continuous and discontinuous human-AI collaboration were compared. In the case of continuous collaboration, the results show that AI assumed the role of a bossy groupmate, leading to an AI-driven creative process. In the second case, AI took the role of an expert capable of generating variance outside the team, leading to a human-driven creative process.

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Ceci n'est pas une chaise: Emerging practices in designer-AI collaboration

Vera van der Burg, Almila Akdag Salah, Senthil Chandrasegaran, Peter Lloyd

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Emerging practices of using 'off the shelf' AI as a creative partner in design processes are receiving increasing attention in design research. This paper takes the well-known concept of 'framing' in design, along with the Schönian concept of 'surprise' to explore how a human-AI dialogue could work. The approach taken is practice-based, with the human designer documenting her process of inquiry and decision making. We show how artificial creativity is expressed through misfiring object detection algorithms, and further how these 'mistakes' can be perceived and interpreted by the human designer. The contribution of the research is in laying the foundations for a novel human-AI dialogic practice.

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IdeaSquares: Utilizing generative text as a source of design inspiration

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Online searching tools are used for early design ideation. However, they tend to limit designers' creativity due to direct visual feedback and lack of novelty. We pre-sent IdeaSquares, a design concept text generation tool for supporting the ideation process. We used text-generation artificial intelligence (AI) that was fine-tuned on the Red Dot design award winners' data to show newly generated design examples as search results. To understand how young designers use concept text generation tool for the design ideation, we conducted a comparative user study where participants used two versions, generative querying and conventional searching mode, of the tools during the ideation task. Our findings revealed that (1) texts are combined and reinterpreted to different meanings during the ideation and (2) ideas are developed by finding appropriate keywords that fit to a primitive idea when the generative querying mode was used. Based on the tool development and the study results, we discuss how generative text empowered by AI can be used as a source of inspiration and further support the design ideation.

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44 Perspectives on climate change

Session chair and co-chairs

Dan Lockton, Ziyu Zhou, Wasabii Ng

Deep Listening: A Framework for Collaborative Climate Adaptation

Eric Gordon, Yihyun Lim, James Paradis, Tomas Guarna, Gabriela Degetau, Mona Vijaykumar
MIT Civic Design Initiative

This article introduces Deep Listening, a novel transdisciplinary research agenda and framework for collaborative climate adaptation. It argues for the urgency to develop a communication approach in understanding how frontline communities interact with mediating institutions. Deep Listening is presented in five components: 1) knowledge sharing (mutually agreed upon protocols for data production and use); 2) holding space (co-creating spaces where institutional actors and communities can exchange, learn from each other and discuss); 3) the production and sharing of climate imaginaries (where local or Indigenous knowledge and community values are respected); 4) sensemaking with a diversity of perspectives and scientific data; and 5) evaluation and monitoring support to assure accountability and to assess quality of information. Based on a literature review of adaptation studies, the case is made that the Deep Listening approach can enhance the sense of procedural justice and mitigate maladaptive outcomes.

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A material-centric approach in non-anthropocentric design

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With the non-anthropocentric view, the materials—the non-human actors, can be seen as active contributors to the design process itself. Materials become carriers of a wide variety of information and reshape human and non-human relations as relational agencies. Many pioneer design activities that de-center humanity rethink the relationship among different material actors to reflect on the 'Anthropocene' issues. The approaches to designing for post-Anthropocene scenarios are usually provocative in various aspects. This paper proposes a speculative, material-centric design approach to engage discussions towards post-Anthropocene scenarios by rethinking the entanglement of human and non-human actors. This approach was used to

conduct a workshop called 'Future matters'. By sharing its results, this paper aims to trigger more discussions on the enriching roles material plays in post-anthropocentric design.

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Mediating the needs of human and natural nonhuman stakeholders: Towards a design methodological framework

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More-than-human approaches to design are one of the ways in which the design community is rethinking itself in the face of sustainability challenges. These approaches most often decenter humans from being the sole focus, stakeholder, or actant in design processes. However, currently, there is a shortage of more-than-human methods and tools that would be applicable in day-to-day design practice. In this paper, we, as one of the academic partners in a transdisciplinary consortium project, report results from our preliminary work and early insights towards developing a design methodological framework that would support the mediation of human and nonhuman needs in design. We view the concept of needs as a boundary object and, through semi-structured interviews with the consortium members, explore perspectives on 'needs' within the consortium. Then, we discuss five areas of complexity that our team needs to consider and further learn about while developing the design methodological framework.

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Promoting climate awareness through the design of interactive moving posters

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Nowadays, the ubiquity of digital media has promoted the establishment of novel Graphic Design practices that seek to better catch the audience's attention. In the Poster Design scenario, we observed the appearance of moving posters, digital-based artefacts that include animated elements; nevertheless, as moving posters get increasingly common, the search for more effective communication approaches should be conducted.

This paper studies the impact of interactivity on poster design. Computational and Artificial Intelligence approaches have been employed to design a set of interactive moving posters which can adapt according to the viewer's actions and the surrounding environment. The current environmental issues of the planet Earth have been the theme explored in these experimental posters. To assess whether interactivity was favouring the posters, these were tested against printing and moving versions. The

preliminary results encouraged the adoption of interactivity to create more attractive and engaging posters.

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Framing Scenario Thinking in a Mode of Futures by Design Inquiry

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In Transdisciplinary Design inquiry, the conceptual and ideational need to be clarified when relational and qualitative methodologies are enacted. This is crucial concerning complex, emergent, and urgent matters of climate change, sustainability, and collective citizenship. Theoretically, this paper covers conceptualizing scenarios as part of future-orientated envisioning and sits between design, anticipation, and foresight studies. We then propose three scenario thinking devices based on initial literature review and conceptual positioning to engage scenario thinking. The paper proposes a reframing of scenario thinking by design research as a means to inform clearer scenario building for long term sustainable collaborative futures. Methodologically, we draw on explorative and compositional methodology to reposition scenario thinking as anticipatory scenario building. The three scenario thinking devices are work-in-progress and will be investigated in the field through a series of ongoing research activities.

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45 Design for policy and governance (PoGo SIG)

Session chairs

Scott Schmidt, Marzia Mortati, Louise Mullagh, Lucy Kimbell, Liz Richardson, and Catherine Durose

Editorial

Marzia Mortati, Scott Schmidt, and Louise Mullagh

https://doi.org/10.21606/drs.2022.1066

Design for public policy: Embracing uncertainty and hybridity in mapping future research

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Addressing contemporary public policy challenges requires new thinking and new practice. Therefore, there is a renewed sense of urgency to critically assess the potential of the emerging field of 'design for policy'. On the one hand, design approaches are seen as bringing new capacities for problem-solving to public policy development. On the other, the attendant risks posed to effective and democratic policy making are unclear, partly because of a limited evidence base. The paper synthesises recent contributions in design research, policy studies, political science and democratic theory which have examined the uses of design for public policy making. Mapping out areas of debate building on studies of design from policy studies and from within design research, we suggest promising directions for future cross-disciplinary research in a context of uncertainty.

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A study on strategic activities to foster design practices in a local government organization

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In recent years, governments have increasingly pursued innovation by embed-ding design into their organizations. One particularly common approach to embedding design in government organization is to establish public sector innovation labs. These labs are described as contributors and facilitators of innovation in policymaking processes; however, less light has been shed on the role of in-house designers (including these labs) in fostering and managing the changes made by design practices within government organizations. In the current study, design management has been used as a theoretical lens to study the strategic activities of in-house designers in a Dutch municipality to embed design within the organization. The findings show the importance of strategic activity by in-house designers to foster design practice and resulting organizational changes and the need for participation of more organizational members in this activity. We conclude with setting an agenda for more research and practices on strategic activities to foster design practices and organizational changes in government.

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Co-designing public value: Collective ownership of outcomes in the public sphere

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Design principles and practices have contributed substantially to the discipline of public management, particularly over the last decade. Service design, design for policy, and design for social innovation demonstrate the increasing degree of convergence between design and public management. This paper considers the concept of 'creating public value', at a strategic level beyond specific policies and services, from a co-design perspective. The paper explores opportunities for co-design principles and methods to contribute to the creation of public value - via policy design and enactment - through the examination of public value and co-design literature. Implications for co-designers and policymakers are considered in shaping processes of what the paper describes as collective 'co-valuing' between actors in the public sphere. The paper recognises the contribution designers can make outside the predetermined parameters of specific services and policies, and proposes a model within which this activity can take place. Further research is recommended in an empirical environment.

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“What a designer does in a municipality?” – different approaches towards design in 3 Danish municipalities

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In recent years, design in the public sector has gained popularity amongst policymakers as well as among scholars. Design is perceived as a promising way to create more successful policies and public services. Out of many different approaches, design thinking (DT) has become significantly popular, as it promises to deal with wicked problems in a new way. Despite growing popularity, however, a critical reflection on benefits and challenges, as well as about different understandings of DT practices in public sector, are still lacking. Therefore, this paper aims to investigate different ways public organisations engage and introduce DT. In this paper we present 3 different municipalities in Denmark and the way design and DT is understood and implemented in organizational work practices. Our contribution to theory is twofold. First, our research responds to the recent call of different researchers to investigate how DT is operationalised and drawn upon in practice by different organizations in the public sector. Second, our research contributes to the design field, by showing barriers of implementations, different benefits and challenges connected with design implementation in organisations with no prior experience in design.

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On the importance of an enlarged ‘design for policy’ framework within the public policy cycle

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This paper aims to reinforce the importance of looking at ‘design for policy’ in an enlarged perspective, encompassing the entirety of the public policy cycle. This is substantiated with a re-examination of ‘design for policy’ foundational literature, by highlighting a narrative which we argue to have set its expectations mostly on processes for (co-)creating new policies. In turn, the later stages of the policy cycle have not been getting sufficient attention, leading to an unbalanced ‘design for policy’ approach. We also contrast this interpretation with recent literature, further attesting to its fragmentation.

Furthermore, this is analysed considering evidence emerging within the New European Bauhaus policy, while also seeing it as an opportunity to further strengthen a ‘design for policy’ approach.

Ultimately, this fragmentation seems to lie both on the incipient nature of 'design for policy', but also on how design is understood, and is translated to the policy making process.

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Applying Design-led Approaches to Public Sector Innovation: A Case Study of New Zealand's Service Innovation Lab

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This paper adds to emerging research on the application of design-led approaches to public policy and services by public sector innovation labs. It presents key findings from the first in-depth case study on the New Zealand government Service Innovation Lab, which operated between 2017 and 2020 as part of broader public sector efforts for citizen-centric digital transformation. Based on a thematic analysis of semi-structured interviews and organizational documentation, it discusses how the challenges of applying the Lab's design-led approach in this public sector context were navigated by professionals involved with the Lab over time. The findings reveal that to navigate the public sector system barriers to innovation, conditions for innovation were created on a strategic and operational level through an authorizing environment, leadership, and innovation culture. These conditions enabled the Lab team to facilitate learning for, and delivery of, innovation with cross sector stakeholders through its approach and supporting strategies.

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Values and challenges in rapid prototyping of global health policies

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This paper identifies the value and challenges in introducing rapid prototyping of policy to design non-expert and expert groups by analysing an online workshop series that was conducted with early-career professionals, policy makers, and design researchers. The COVID-19 pandemic evidenced, even more, the need for situated policies in the area of health as global health policies were ineffective in addressing livelihood diversity, particularly of underserved communities. Therefore, the untapped potential of rapid prototyping for policy making in the area of global health is explored. We particularly analyse the creativity of the different groups who joined the workshop series and point out implications for the rapid prototype of situated global health policies in international low-resourceful settings.

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Participatory IoT Policies: A Case Study of Designing Governance at a Local Level

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As IoT devices proliferate public spaces, it is vital that adequate governance structures and policies are designed and implemented in order to enhance trust, and protect privacy and security of citizens. At a local level, smaller towns and cities that are not part of the 'smart city' movement, but instead are connected through IoT devices, also need to consider how these devices are governed. This research explores how two novel methods (design fiction and walkshops) can be combined and embedded in the design of policy for IoT governance at a local level. The contribution of the work lies in wider discussions of design methods in policy making and offers a case study of how these methods can be used at a local level.

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A case of design-enabled public policy formulation process

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Governments are increasingly applying design practices to address public challenges. While the study of these practices evidences their utility for designing public services, the specific design activities and their value for policy formulation are rather unclear. To shed light in this direction, this paper presents a case study on the collaboration of LABgobar and SENASA in reforming the Bovine Tuberculosis regulations in Argentina. By analysing the project's documentation and interviewing project members, this study illustrates design practices that complement traditional policy formulation processes. These practices include methods for problem understanding and reframing, idea generation, and collaborative policy prototyping. Interestingly, these adapt elements coming from multiple disciplines. Despite the potential value of design in policy formulation processes, real adoption remains tied to local -and often small scale- experiments. This paper adds further studies for a more robust understanding of design's contribution to addressing policy challenges.

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Design capabilities for community resilience: towards dialogic practices and policies

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This paper draws on a pilot study insight into Brazilian informal-settlement communities' problems, adaptative strategies and needs during the COVID-19 pandemic. Although communities play a noteworthy role in resilience, emergency and recovery plans often lack sufficient community engagement. This contributes to leaving particularly disadvantaged communities behind. Inequalities were further exacerbated during the pandemic, urging the deployment of plural and sustainable measures, which can promote equity in a global health crisis. Design can play a meaningful role in tackling inequalities in emergency and recovery. However, this role of design is still under-researched in resilience. We expand on related work analyses to draw on key design capabilities for the development of dialogic practices and policies aiming to contribute to designing effective participation of communities in decision-making processes. These key design capabilities support the development of dialogic design practices and policies by enhancing and supporting collaboration and communication throughout policy co-design.

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I-Lab: the co-design program for the construction of the new ERP system of the Italian State

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This document presents the contribution of the I-Lab co-design and requirements program to the implementation of the new Enterprise Resource Planning (ERP) system of Italian public accounting (InIt). Chosen by the State General Accounting Office Department (RGS) of the Ministry of Economy and Finance (MEF) to support the construction of the new ERP, I-Lab has integrated and enhanced the vast range of skills and needs of all the different Italian central administrations, placing them in a series of multidisciplinary innovation teams aimed at the discovery of the main requirements of users/stakeholders/beneficiaries in their relationship with the new ERP solution. A multi-year project with a very wide and profoundly innovative scope for all Italian public accounting.

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46 Pasts, presents, and possible futures of design literacies

Session chairs and Editorial

Úrsula Bravo, Liv Merete Nielsen, Erik Bohemia, and Naz A G Z Börekçi

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Weaving design as a practice of freedom: Critical pedagogy in an insurgent network

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Design can be both a practice of freedom or a practice of oppression, depending on who designs and whose intentions are prioritized. When this practice underestimates, excludes, disrespects, or deceives people who are part of oppressed groups, it intensifies oppression. Design as a practice of freedom takes more than a new design method. It requires the union of the oppressed. This paper describes the weaving of the Design & Oppression network, which responded to the growth of political authoritarianism and naive consciousness in design. The network's goal is to establish bonds of solidarity between all struggles against oppression that cut across design. Its critical pedagogy draws from the Latin American tradition of critical thinking in Education, Arts, and Sociology, promoting both professional training and concrete social actions.

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Involving craft know-how and traditions in design education: Cases of Switzerland, Turkey and India

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The design profession evolved during technologically transformative times of industrialization. While the requirements of mass production have been the major

paradigm shaping the nature of industrial design education in industrialised countries, developing countries also embraced it despite their late and peculiar processes of industrialisation. The idea was that the industrial sectors in these countries would also need industrial designers who are able to design products for mass production. This, in turn, caused the ignorance of crafts or at best the view to keep them as a source of product ideas that would appeal to tourists or export markets looking for “authentic” products. In this paper, we will explore the past and current ways of linking with crafts in design education in three countries with different historical backgrounds and industrialization experiences. We identify some of the notable differences and overlaps in the integration of crafts in design schools in three different countries and show reciprocal influences between crafts and design schools with a modernist tradition.

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Dynamic learning: A learner-centered paradigm in Art + Design

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There is a critical need for training students to think critically, creatively, and practically. Traditional art and design education classrooms, more focused on end products, do not foster students’ abilities for inquiry and connection making and are missing opportunities to develop the capacities of tomorrow’s change makers and problem solvers. From a systems-thinking approach, this article discusses the importance of teacher pedagogy and process skills as important underlying drivers in developing’ learning power. Fostering students’ integrated, self-directed, and dynamic learning requires a more learner-centered paradigm. It reports on a mixed model research study conducted in middle school art and design classrooms with findings indicating that more learner-centered visual art classrooms increase students’ balanced thinking and self-perceptions as learners. An emerging theory and design thinking model are presented, along with an action research project in university art education class-rooms that provides new models for “designing thinking” in art and design class-rooms.

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Democratic design literacy research

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This paper presents ideas about education and democracy embedded in studies on de-sign literacy for sustainability. The descriptions of one semi-structured group interview study and one action research study provided in three research papers are analysed in light of three different conceptions of education and democracy. The analysis outlines how the research methods used in situations in which students (1) engage in questions, introductions and tightly structured tasks developed from

research-based knowledge; (2) interact with and share their thoughts and reflections in groups; and (3) respond to open-ended questions contribute to research enabling design education for democracy, design education through democracy and democratic design education, respectively. These results are of relevance to the development of both education and educational research concerning design literacy.

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47 AI and the conditions of design: Towards a new set of design ideals

Session chairs

Elisa Giaccardi, Johan Redström, Chris Speed

Editorial

Elisa Giaccardi, Chris Speed, Johan Redström, Somaya Ben Allouch, Irina Shklovski, and Rachel Charlotte Smith

https://doi.org/10.21606/drs.2022.1078

From explanations to shared understandings of AI

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A key challenge in the design of AI systems is how to support people in understanding them. We address this challenge by positioning explanations in everyday life, within ongoing relations between people and artificial agents. By reorienting explainability through more-than-human design, we call for a new approach that considers both people and artificial agents as active participants in constructing understandings. To articulate such an approach, we first review the assumptions underpinning the premise of explaining AI. We then conceptualize a shift from explanations to shared understandings, which we characterize as situated, dynamic, and performative. We conclude by proposing two design strategies to support shared understandings, i.e. looking across AI and exposing AI failures. We argue that these strategies can help designers reveal the hidden complexity of AI (e.g., positionality and infrastructures), and thus support people in understanding agents' capabilities and limitations in the context of their own lives.

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Mutant in the mirror: queer becomings with AI

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This paper contributes to scholarly discourse on design and AI by using queerness as a theoretical grounding to explore potentialities for design to interface with and imagine artificial intelligence (AI) differently. The paper does so by reporting on an autotheoretical experiment in which I pose the questions: What if we understood AI as queer, a kind of mutant, in a state of becoming; a dynamic, relational, non-binary gender variant? How then might AI show up in and act on the world (with us humans) differently? The experiment uses a Generative Adversarial Network (GAN) to unsettle how AI is understood today, and to allow for new AI propositions to take root. The work provides a glimpse into forms of design refusal that might illuminate designers to cultural computability and self-determination when designing with AI systems.

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Towards a Living Lab for Responsible Applied AI

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AI ethics research has mainly focused on high-level principles and guidelines, and technical issues. This position paper argues that more attention should go to the practical and contextual aspects of designing AI applications and explores how living labs can contribute to the ethical design, development and deployment of AI. Literature on AI ethics is discussed, and the term 'Responsible Applied AI' (RAAI) is introduced to refer to the ethical application of AI. Five requirements for the development of RAAI in a living lab are distinguished. Subsequently, the paper brings together literature from Open Innovation and Human Computer Interaction to examine the suitability of different types of living labs for developing RAAI. It concludes that Innovation Spaces (online and physical) combined with temporary and ethically governed Instrumented Places and People could be a fruitful environment for a living lab for RAAI. Implications and challenges for further research and practice are discussed.

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The Future of Money as a Design Material

Chris Speed, Jonathan Rankin, Chris Elsden, John Vines
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For many years the primary representation of value has been money. However complex we perceive its material, social and symbolic characteristics, money is now undergoing significant change as it becomes data. This paper explores the

implications for design as a series of technological and regulatory shifts are taking place that are changing the representation of money into data. The paper anticipates that it won't be long before personal bank accounts will be better understood to be personal data stores, and monies held within them are connected to data-driven systems to 'pay' for services that we require. By charting the changes that are taking place, and introducing a series of design case studies that make tangible the design opportunities, the paper suggests an emerging design space in which designers should anticipate new forms of money as an entirely new design material.

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Metaphors for Designers working with AI

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In this paper, we explore the use of metaphors for people working with artificial intelligence, in particular those that support designers in thinking about the creation of AI systems. Metaphors both illuminate and hide, simplifying and connecting to existing knowledge, centring particular ideas, marginalising others, and shaping fields of practice. The practices of machine learning and artificial intelligence draw heavily on metaphors, whether black boxes, or the idea of learning and training, but at the edges of the field, as design engages with computational practices, it is not always apparent which terms are used metaphorically, and which associations can be safely drawn on. In this paper, we look at some of the ways metaphors are deployed around machine learning and ask about where they might lead us astray. We then develop some qualities of useful metaphors, and finally explore a small collection of helpful metaphors and practices that illuminate different aspects of machine learning in a way that can support design thinking.

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48 Framing practices in design

Session chair and co-chair

Paul Hekkert and Beatrice Gobbo

Reframing Homelessness

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The persistent negative framing surrounding homelessness in the Netherlands hinders constructive policymaking and has a damaging effect on the self-esteem of the young homeless (van Steenbergen, 2020). So far, no strategies have been developed to think beyond this persistent framing. In the design research trajectories Bouwdepot [building depot] & Beelddepot [image depot] journalism researchers, design researchers, social researchers, policymakers, and formerly homeless young adults, co-designed methods to develop new ways of representing homelessness. Utilizing Frame Innovation (Dorst, 2015), we co-designed and reimagined solutions going forward including the perspectives of policymakers, journalists, and people with lived experiences in homelessness. We have reasons to believe the Beelddepot strategies are a first step in reframing the perception of homelessness

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Reframing The Narrative of Privacy through System-Thinking Design

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We present a transdisciplinary approach to the problem of careless privacy be-haviour manifested when people publish images online. Combining the discipllines of Design and Computer Vision, we developed an interface and a narrative by modelling privacy in a socio-technical context. Building on Gordon Pask's Theory of Conversation, we designed an experiential dialogue between people and algorithms, and we used this dialogue as a platform to observe people as a system composed of the reactions to the stimuli received from profiling algorithms. Through this platform we assessed any changes in awareness and proactivity in mitigating the risk of algorithmic profiling.

Integrating design abductive thinking with privacy protection technology enabled us to reframe the analysis of human and technology relations through behavioural elements. This defined a narrative offering participants a heuristic learning experience about the importance of privacy, which was achieved by harnessing complexity as an opportunity to develop change.

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Identifying Problem Frames in Design Conversation

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Design thinking concepts such as framing, storytelling, and co-evolution, have been widely identified as part of design activity though generally have been evidenced from manual coding of design conversations and close reading of transcripts. The increase in easy-to-use computational linguistic methodologies provides an opportunity not only to validate these concepts, but compare them to other kinds of activity in large datasets. However, the process of systematically identifying such concepts in design conversation is not straightforward. In this paper we explore methods of linguistic analysis for revealing problem frames within design process transcripts. We find that frames can be identified through n-grams with high mutual information scores, used at low frequencies, along with subsequent lexical entrainment. Furthermore, we show how frames are organised in primary and secondary structures. Our results represent a step forward in computationally determining frames in datasets featuring design, or design-like activity.

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Musings on vocabulary choices when proposing design towards profound systems change

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The search for an imaginative vocabulary that encourages mind and behaviour shifts is not an easy task in processes of formulating design trajectories towards profound systems change. At the same time many design concerns are embedded in larger ecological, social, economical or political systemic crises and call for generating systems change across multiple dimensions. A prolonged terminology search when describing the theoretical and practical results of a PhD research into Pakistan's craft sector through the systems lens triggered the interest in penning this paper about the entanglements of language and expanded design horizons and methods. While it can only offer initial thoughts the topic might extend into a larger interest. So how enabling or limiting are established terminologies in fields such as development aid, grassroots empowerment, design and systems thinking? What impact does the use of a particular vocabulary have on design attitudes and practices?

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Activity theory as a framework for understanding framing complexity of design projects

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With the growing complexity of design projects, framing is expanding in scope. We question how to describe and analyse the varied elements contributing to framing and aim at better understanding the complexity of framing design projects through activity awareness. Activity theory was mobilized as a Research through Design framework in a team of students to find answers to the question. First, the team mapped and reflected upon their project's process over fifteen weeks. They then participated in the analysis of the collected data highlighting the contextual tensions of their experience. Their interpretation unveils the tensions emerging between the project's central and peripheral activity systems. They presented how the project framing is developed, which activity systems are solicited, and to what extent they are considered. Finally, a tentative approach to organising the framing phases according to central and peripheral systems is presented to produce an orderly translation of a project's complexity.

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49 Creating connections: Social research of, for, and with design

Session chairs and Editorial

Arlene Oak and Claire Nicholas

https://doi.org/10.21606/drs.2022.1052

After practice: Messy relations in the ethnographic study of design

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The Thinking While Doing (TWD) project was an ambitious "research-creation" project that involved the designing and building of several full scale, "real" structures by architecture students and professors in "design-build" education. The grant also included two ethnographers (as well as scholars from the humanities). Together the participants in TWD were engaged in intersecting and distinct modes of research, ranging from architecture practice to philosophical reflections. While there were intentions for the insights of the ethnographers to ex-tend and inform knowledge of practice, as the TWD structures were created, it became evident that undertaking ethnography coincident with designing and building was more challenging than anticipated. This paper outlines some of the experiences of ethnographers who followed the activities of designing and building. This paper delves into two interrelated difficulties of cross-disciplinary collaborative work: the logistical organization and implementation of the research project and temporal disjunctions between modes of knowledge production (e.g. design versus ethnography). By exploring TWD as a collaboration between disparate forms of research, each with its distinct rhythms, unpredictable engagements, and contexts of knowledge production, we consider some of the challenges and possibilities of connecting ethnography with the practices of architectural design.

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Augmented: Design and ethnography in/of an architecture, computer science, and textile research-creative collective

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This paper introduces a multi-disciplinary research-creation project that examines the embodied and social nature of textile design and making at different structural scales – from beaded accessories to architectural components. Bringing together anthropology, architecture, computer science, and textile craft, "Gesture and Form" seeks to develop effective and ethical pedagogies for teaching design and handcraft with new materials and technologies. Specifically, the project explores the potentialities and limitations of a head-worn augmented reality (AR) system that documents, encodes, and later guides making practices. The discussion first introduces different disciplinary frameworks for understanding and researching embodied knowledge, before sketching the multi-disciplinary research design, which loosely distinguishes "design research" (and creation) from "design anthropology." We then dwell on the multiple challenges of the endeavor, from orchestrating and defining the activities of "design" and "research," to asymmetries of technical expertise its communication, to the blurring of participant-observer positionalities.

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Studying Interaction Design Practices with Theory Instruments

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From previous research we learned that (1) interaction designers are experiencing new challenges in response to increasing digitalization, and that (2) current methods and conceptual frameworks seem insufficient for addressing these challenges. In this paper, we explore how playing with theoretical concepts in tangible ways may allow practitioners to gain new perspectives on cur-rent practices, challenges and possibilities. We introduce a set of Design Anthropological Theory Instruments to bring social theory into conversations with practitioners. Via the instruments, the researchers' data collection process and the participants' reflection processes come together in a collective sense-making experience. Our analysis of video recordings from experimental sessions in 10 companies provides insights into interaction designers' practices and inspires further inquiry into the potential of theory instruments for transforming design practice. Furthermore, we see potential for development of theory instruments to open new avenues for practicing Design Anthropology.

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Weaving with design research to study children's everyday practices in cancer care environments

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Children affected by cancer often require repeated hospitalisations. The impact of the material hospital environment on children's well-being receives growing attention across various disciplines. Yet, because of their 'double vulnerability' – being children and being ill – young people affected by cancer are less considered as direct research participants. We set out to put the experiences of these children at the centre of attention. To do justice to the complexity of their interactions with the material hospital environment, we brought together concepts and insights from childhood studies; scholarship in anthropology and philosophy; theories on materiality; and design research; and combined these with fieldwork in a children's oncology ward and day-care ward. By interweaving different lines of inquiry, we exemplify how fusing theoretical and empirical work in a transdisciplinary way allows advancing both social sciences and design research and invites to adopt a nuanced way a seeing.

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Constructing a critical anthropology of contemporary design practices

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This paper articulates a critical approach to researching design as a contemporary phenomenon that was developed through my doctoral research. The approach - critical anthropology of design - is a combination of anthropology of design, critical strategies borrowed from other fields, and a 'Foucauldian' theoretical toolkit, which together allow us to see design as a complex disciplinary apparatus. I advocate for such an approach – a switching of the disciplinary lens when studying design, and a more sceptical engagement between social disciplines and design – as essential for both robust critique and original insight. Such an approach is productive and necessary specifically where one's intent is investigating how power is operant in and through design. The argument for criticality is followed by a discussion of the practicalities both methodological and ethical of implementing such an approach.

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50 Speculative design and futuring

Session chair and co-chairs

Dan Lockton, Benedetta Lusi, Iohanna Nicenboim

Making dinner in an uncomfortable future: Comparing provocations as user insight elicitation methods

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To aid the transition to a renewable energy future, user-centred designers need to design for a future with limits perceived as uncomfortable to users. This paper explores whether methods borrowed from critical and speculative design can elicit actionable insights to aid such designers. A comparative analysis is performed of the insights gained from two studies, using a provotype and speculative enactment respectively to situate the participants in a speculative, uncomfortable, distant future. The two methods do allow elicitation of rich and deep insights surrounding values, latent needs, and tacit knowledge, but with slightly different emphasis regarding content, temporal scope, and reflective depth. However, the implementation of the methods failed to provoke the participants to question their prioritisations and views on societal development, maybe related to an inability to provoke enough.

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Value-drive design approach to envision speculative futures

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This paper presents a design approach that brings together speculative design, value-sensitive design, and emotion-based ethnographic method to identify value-experiences for the design of value-driven speculative futures.

The paper discusses the approach in five steps; 1) emotion-based design ethnography, 2) visual mapping and value-extraction, 3) secondary research of technology and socio-cultural trends and filtering of technologies based on its interpreted value-experiences, 4) design of value-driven future scenarios, 5) materializing scenarios as

discursive prototypes. We explore COVID19 pandemic as a context of research-through-design inquiry in developing this approach.

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Thinking Outside the Bag: Worker-led Speculation and the Future of Gig Economy Delivery Platforms

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Gig economy is presented as disruptive, technologically driven, and forward thinking. Design is explicit in this framing, through use of slick apps to reduce friction and simplify experience for customer and worker. However, this framing is often driven by the platforms, and does not fully recognize the actual experience of work. In this paper we report on a collaborative design process on developing concepts for the future of gig work from a worker-centric perspective. This explicitly does not involve the platforms as stakeholders and uses design fiction as a tool for workers to ex-press fears, joys, and the aspects of their work that are nuanced, reflective and surprising. We reflect on the designs created through this process, the tensions, and opportunities with working with gig working couriers, and issues around power and representation when designing with and for this community.

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Towards a Heuristic Model for Experiential AI: Analysing The Zizi Show in The New Real

Drew Hemment, Martin Zeilinger, Matjaz Vidmar, Jake Elwes, Holly Warner, David Sarmiento, Robin Hill
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Based on the rapid pace of evolving creative practice in AI arts, we identify an urgent need to develop frameworks for analysing the critical dimensions (including social/political) of this emerging field. This paper offers a comprehensive case study of The Zizi Show, by Jake Elwes, developed as part of The New Real and Experiential AI programme at the Edinburgh Futures Institute within the University of Edinburgh. Based on this case study analysis, we propose the structuring of distinct project characteristics into four categories (socio-cultural and institutional aspects; technology and media; artistic experience and affect; and audience and staging) which form the basis for a heuristic model. The statements/descriptors collected in each category serve to capture creative and design strategies that can lead design processes from cultural and technological perspectives, enable projects' cross-examination and evaluation and surface blindspots in the creative process.

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51 Designing proximities

Session chairs and Editorial

Rosie Hornbuckle and Alison Prendiville

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Designing proximity with situated stakeholders

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Neighborhoods are becoming laboratories to test new ways to design the cities to solve social, environmental and cultural issues affecting global cities. The car-centered urban planning experienced in the 20th century has fostered researchers and practitioners to explore more the theme of livability and proximity. To trigger the blossoming of these models, a participatory process involving proactive networks of situated stakeholders is needed. This paper shows how competences from the academic realm can effectively boost civic awareness on the role that situated stakeholders have in producing solutions for their own wellbeing. It highlights a process enacted by the Polimi DESIS Lab with the community of Nolo (a neighborhood in Milan, Italy) with participatory design methods and tools. The research lab led two different activities to test a 3-phases strategy to explore the context and its feature, co-design new spatial (and social) solutions, and validate the results obtained.

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Hybrid Economies in Hybrid Cities built on Manufacturing, Networks, and Design

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The concept of networks will be analyzed through a Hybrid Economy model, looking at new organizational forms and new multi-actor collaborations; Evolutionary Economic Geography defines these as interested in both social and financial returns, and it identifies institutions as particularly relevant in the success of these new enterprises. Six main factors that define the hybridity of a business and an enterprise have been identified: Offer; Goals and impacts; Founders composition; Team/Staff composition; (Relationship with) customers. To test this approach, we decided to analyze qualitative data collected during a research project which involved two sister cities: Milano and

Chicago. The paper will focus on the Milanese case study, which considered manufacturing activities, including both 4.0 manufacturing and more traditional craftmanship activities. We will define different forms of networks that can favor the hybridity of businesses and the roles that design can play. The research project was conducted before the COVID-19 pandemic spread worldwide; however, it is relevant to notice how reflections on the future of our cities were already part of policies and planning programs. The pandemic made evident the importance of local (and hyper-local) networks and also accelerated intervention processes devoted to favoring the creation of self-sustaining neighborhoods.

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Participatory tool for productive citizenship in a regional maker network

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The various types of fab-labs and makerspaces distributed in the urban context can be recognised as an organism capable of optimizing resources, producing ideas and artefacts in a participatory culture, that is also a tool for citizen engagement and self-organisation. This contribution reports on a series of surveys aimed at identifying and evaluating the network of urban manufacturers and users across the maker culture in Italy's Lazio region. These actors are inserted in a framework of public and private initiatives, and they cover a social role within the urban fabric. Based on the regional context of inquiry, the ongoing research proposes a new platform, which should become a tool for coordinating digital manufacturing resources, thus improving their potential of acting as a diffused supply chain of services and products, stimulating social innovation, shared economies, and good practices of resilience.

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Out of isolation: Designing reusable PPE gowns based on an understanding of healthcare workers' lived experiences

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The paper reports on an AHRC-funded project aimed at mitigating the personal and environmental impact of PPE isolation gowns, as worn by healthcare workers treating patients with COVID-19. The enquiry was devised in collaboration with NHS and industry partners and is informed by empirical investigations into procured gowns and the lived experiences the health professionals' wearing them. The development of an industry standard 'reusable gown system' requires negotiating various proximities: between safety and disease trans-mission; sustainability and medical waste; the needs of end users, regulation and cost; public and private stakeholders. The article contextualises the research problem and methodology, incorporating survey, co-design and material methods employed to gain a better understanding of the issues

associated with cur-rent gown design, fabrication and use. The study raises questions around how critical clothing items are produced, procured and disposed of, and the need for circular design and supply chain models.

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Technologies and collaborative services proximity in the smart cities. Distributed ledger as a push for new relationships

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The expected demographic densification presents specific critical points where opportunities for improving citizens' lives can be identified. For this reason, projects are underway to analyze and explore the dynamics of cities to adapt to new con-texts. Several European cities, including Milan, Paris, and Barcelona, are already implementing changes to encourage new types of neighborhood organizations which revolve around the concept of proximity, and primary services close to home. In this context, it seems fundamental to seek connectivity, encouraging new forms of relationships between citizens. The use of new digital tools, such as blockchain, favors new types of autonomous organizations that can manage activities on a neighborhood scale. Design should propose suitable and innovative models of ap-plication and act as a facilitator for their implementation. Through design, it is also possible to identify guidelines for the relationships in a neighborhood and to define activities and experiences with which citizens can relate.

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Project proximities: A meta review of how design addresses distance in complex collaborations

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Complex collaborations involving multiple disciplines and stakeholders are seen as necessary in the pursuit of transformative innovation. Yet these 'systemic' science & technology-led projects pose a challenge for knowledge exchange, co-creation and co-operation. Design research teams brought in, often to work on tangible outcomes, are faced with chasms between the understanding of diverse actors. From this problematization of distances in complex collaboration, a new design research practice has emerged: 'translational design practice' (Page & John 2019). This paper builds on this concept through a 'meta' level review of the design research approaches in three European publicly-funded consortium projects to address observed distances by building proximity for i) partners, ii) external stakeholders and iii) wider audiences. Translational design practice is repositioned as an expanded, transferrable practice which can address the challenges of complex collaborations and therefore support transformative innovation, and perhaps beyond a technology-first approach.

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52 Food + design: Transformations via transversal and transdisciplinary approaches

Session chairs and Editorial

Silvana Juri, Sonia Massari, Pedro Reissig

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Development of Eco-friendly Bubble Tea Take-away Cups

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The plastic straws negative impact on marine life has led to increasingly strict legislation. In-deed, plastic straws will be banned by 2030 in Taiwan, where three billion non-biodegradable plastic straws are consumed every year. We propose an innovative design for an eco-friendly take-away cup with a focus on the functionality required for bubble tea. The design process was based on scenario analysis using the black box approach and direct observation of the suppliers, retailers, and consumers of bubble tea. The proposed design comprises a removable lid and four different types of filters. Using morphological charts, we made mock-ups of the proposed design and tested them empirically and using fluid dynamics simulation. The final design performs well without a need for a straw and further solves the problem of tapioca pearls getting stuck in the bottom of the cup beneath the ice cubes, as is the case with conventional disposable cups.

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Diving in. What will it take for consumers to transition to a circular economy ready-to-cook fish product? Insights from the UK

Hayley Alter, Emmanuel Tsekleves, Serena Pollastri
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To balance production needs with the need to sustain or regenerate the health of ocean ecosystems, stakeholders in the European fish and seafood sector are calling for transition to a circular economy. New industry methods will produce fish-based foods that consumers are not accustomed to eating so we ask, what will it take for consumers to adopt these industrial circular economy foods? Taking the Seafood Age consortium product prototype as a basis, we have created a design method for would-

be consumers to reflect on their fish consumption practices and possible adoption of the fish product prototype prompted by a de-sign speculation. This paper reports on insights emerging from the research and recommendations for product adoption amongst consumers in the UK. Our findings have implications for food designers, design researchers and fish and sea-food, plus more broadly food industry stakeholders concerned with circular economy product and method adoption in industry.

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A product-service system design approach for the frame innovation of Food and Beverage on board of civil aviation aircraft

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A multidisciplinary research team from the College of Design and Innovation, Tongji University in Shanghai, in collaboration with Boeing, developed research on the future of in-flight Food & Beverage (F&B). The goal was to outline four possible scenarios, illustrating distinct product-service systems and highlighting how Boeing could help airlines create value for passengers. The research addresses three questions: How to guarantee F&B health and safety while reducing disposable packaging and food waste? How to optimize the aisle use during service without making the cabin crew's work more cumbersome? How to meet passengers' demands while staying on a budget? Dorst's (2015) frame innovation methodology guides the whole exploration. The Product-Service System Design approach ensures multidisciplinary coordination of product design, AI & algorithms, Business, Data Visualization, and Open Design. The result is a radical product-service system innovation that can inspire Boeing's management in exploring new long-term directions.

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User research to design a more-than-human food commons

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The way humans approach food systems not only affects our survival but also creates or destroys futures for humans and nonhuman species alike. Rooted in a rights-based approach, food as a commons offers an important and robust economic alternative to food as a commodity. The commons literature also struggles with anthropocentrism, however, particularly the recognized analytical frameworks used by scholars that classify nonhuman nature as inputs. How can user research tools support communities to create a more-than-human food commons that treats nonhuman nature as equal actants? This paper responds to this question by adapting two user research tools to support a community to create the building blocks of a food commons with nonhuman

nature as equal actants. These user research tools are tested in a workshop with commons scholars to assess how well they support more-than-human thinking against recognized commons analytical frameworks.

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