HabiTech: Inhabiting Buildings, Data & Technology.

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As larger parts of our lives are determined in the digital realm, it is critical to reflect on how democratic values can be preserved and cultivated by technology. At the city-scale, this is studied in the field of 'digital civics'; however, there seems to be no corresponding focus at the level of buildings/building inhabitants. The majority of our lives are spent indoors and therefore the impact that 'indoor digital civics' may have, might exceed that of city-scale, digital civics. The digitization of building design and building management creates an opportunity to better identify, protect, and cultivate civic values that, until now, were centralized in the hands of building designers and building owners. By bringing together leading architecture/HCI academics and commercial stakeholders, this workshop builds on previous workshops at CHI. The workshop will provide a forum where a new agenda for research in 'HabiTech[1]' can be defined and new research collaborations formed.

CCS CONCEPTS •Human-centered computing ~ Interaction design ~ Interaction design process and methods ~ Participatory design • Human-centered computing ~ Human computer interaction (HCI) ~ HCI design and evaluation methods ~ User studies • Social and professional topics ~ Computing / technology policy ~ Surveillance ~ Corporate surveillance • Computer systems organization ~ Embedded and cyber-physical systems ~ Sensor networks

[1] The word *HabiTech* is both nod to the widely used term 'PropTech', or the use of IT to research, market and manage real estate, whilst also being a play on the word 'habitat'.

Additional Keywords and Phrases: Digital technologies and inhabitant-driven design; user voice; user data; building users; building activism, technology enabled inhabitation; privacy.

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1 BACKGROUND

As larger parts of our lives are determined in the digital realm, it is critical to reflect on how democratic values can be preserved and cultivated by technology. On the city scale, this is studied in the field of 'digital civics'; However, there seems to be no corresponding comparison on the level of buildings and building occupancy. The majority of our lives are spent indoors and therefore the impact 'indoor digital civics' may have on our ethics and democratic engagement may well exceed the corresponding impact of city-scale digital civics. Furthermore, we suggest that there is a gap in the built environment/HCI literature which fails to address this mid-scale issue (see Figure 1). The digitization of building design and building management also creates an opportunity to better identify, protect, and cultivate civic values that, until now, were centralized in the hands of building designers and building owners.

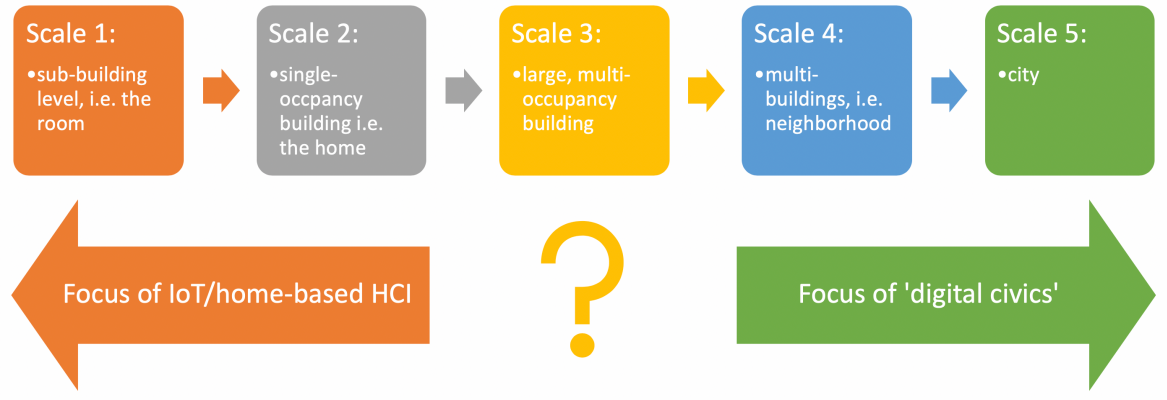

Figure 1. Showing the gap in knowledge in HCI research.

Human-Computer Interaction plays a critical role in this change, because it facilitates the exchange of information (data) between the building systems, building users, and facility managers. As more data on building use is logged, and more experiences inside buildings are determined by automated processes based on this data, it is critical to communicate to building users:

1. What data is being collected about them (what do building-owners/stakeholders now know that was previously unknown/unknowable?).
2. How their ongoing building use is being determined by automated processes based on data.
3. What possibilities exist for users to be aware of, or even control, these processes.

Furthermore, technology can serve to enhance and cultivate:

1. User-driven building design (typically known as participatory design, but this tends to occur – if at all – prior to a building being designed. Could technology facilitate user-driven design/redesign/adaptation once a building is already in use? [5]);
2. User-driven input/change in facilities management (Fig. 2);
3. The creation of communities of building users (Fig. 3), with the potential to address a number of issues ranging from loneliness to the rights to live in a safe environment.

Figure 2. A building user speaks? (Interactive public work of art and video sculpture in Chicago's Millennium Park) Image CC BY-NC-ND 2.0 by Shutter Fotos via Flickr.

At the same time, interactions with buildings cannot interfere with the spontaneous and everyday life of their inhabitants (e.g., [1]). Classical non-digital, or non-technologically enabled, building systems are typically controlled by actions as simple as pressing a light switch, pulling a handle to open a window, or rearranging chairs to change the room's purpose. Interfaces serving the 'digital civics' equivalent of the realm of indoor buildings cannot be any less inclusive or less intuitive.

This workshop is aiming to build a new CHI community of members currently working around a number of building-level related projects (e.g., workplaces of the future, sensor-enabled buildings, digital community making, user data privacy etc.). It aims to promote a discussion among the workshop participants about their past, present and future research and, most importantly, to identify areas of overlap and potential integration between participants' different academic backgrounds and the different research foci.

Specifically, the workshop will seek to answer the following questions – is there a building level equivalency to 'digital civics'? It is there enough of a difference to warrant it having a separate and distinct identity rather than it merely being a sub-part of digital civics (we, the organizers, obviously think so) and can we come up with a better name for this new area than HabiTech? Through this workshop, we hope to stimulate a lively discussion about all things *HabiTech-ish* and to produce a roadmap for how it can best be integrated into existing human-environment interaction research and to encourage members of the CHI community to engage robustly in this topic.

Figure 3. Building users engaged in community action. Image CC BY-NC-ND 2.0 by 'Daniel2005' via Flickr.

2 ORGANIZERS

The co-organizers are all researchers on the overlap between HCI and Architecture. Three of the workshop's organizers, Dalton, Hölscher and Dalton (see below), have organized two past CHI Workshops, in 2012 [3] and 2014 [4], on this area of overlap between architecture and interaction design, the 2014 workshop resulting in the book of the same title, 'Architecture and Interaction' [2] that emerged from these two workshops. We are an experienced team with international reputations in the field of architecture, interaction design and HCI:

Professor Ruth Conroy Dalton

Ruth is Lancaster University's Inaugural Professor of Architecture. Her research interests are centred on the relationship between the spatial layout of buildings and environments and their effect on how people understand and interact in those spaces. She is an expert in space syntax analysis and using virtual environments as a method for researching human factors in the built environment.

Professor Christoph Hölscher

Christoph has been Professor of Cognitive Science at ETH Zurich since 2013. Currently a member of the Singapore-ETH Future Cities Laboratory, he is also the programme director of the Future Resilient Systems programme - the second programme at the centre. His areas of research include wayfinding, spatial cognition & usability research for architectural design, HCI, user modelling & personalisation, information retrieval & web search behaviour.

Junior Professor Jakub Krukar

Jakub is a Junior Professor in spatial cognition - a branch of cognitive science studying how people think about, think in, and think with space and head of Spatial and Architectural Cognition Lab (SPARC). He is a

psychologist by training, and he applies psychological methods in the fields of geoinformatics, architecture, and human-computer interaction.

Assoc. Professor Nick Dalton

Nick's research exists in the crossover between architecture and human computer interaction. This includes areas such as space syntax in theoretical architecture. His current research area is that of very large-scale user interfaces: any user interface which is larger than a person. For example, this includes public displays, a digital wine shop, information sculptures, table-sized multitouch group interactions etc. He is a founding member of NORSC (Northumbria's social computing research group).

Christian Veddeler

Christian Veddeler is an architect and a partner at 3XN Architects and leading 3XN's emerging business in Amsterdam with a focus on design, innovation, sustainability, and entrepreneurship. Christian's portfolio encompasses over 60 projects across Europe, the United States, and Asia.

Professor Mikael Wiberg

Mikael is a Professor of Informatics at Umeå university, Sweden. He is editor for the Architecture & Interaction forum for ACM Interactions, and his research interests includes a focus on interaction design at the scale of architecture, an interest in the materiality of interaction, and an interest in concept-driven design methods. He is the author of a recent book, "The Materiality of Interaction - Notes on the Materials of Interaction Design" (MIT Press, Jan 2018).

3 WEBSITE

Information about this workshop is available at: sparc.uni-muenster.de/HabiTech.

4 PRE-WORKSHOP PLANS

The workshop will be promoted through both HCI and architectural email lists, extended interdisciplinary networks as well as social media. All of this activity will be coordinated through a dedicated workshop website. In addition, on the website there will be a forum for exchanging and posting comments/initial ideas around the theme of 'HabiTech' and participants will also be invited to help start to compile a shared resource space.

Participants will be welcomed from a range of disciplines including architecture, environmental psychology, computing, HCI, interaction and experience design, service design, digital arts and media, and cognitive science.

Following a call for papers, participants will submit a 2- 4-page position paper, related to the workshop issues, themes and goals. These position papers will be peer reviewed by an interdisciplinary review committee with workshop attendance being dependant on acceptance. To facilitate engaged discussion, it is anticipated that a maximum of 20 participants will be selected.

5 WORKSHOP STRUCTURE

This will be a one-day workshop attended by approximately 20 participants. The first activity will be run as a mini-conference with fast-paced presentations, in which each participant is asked to present three slides (see

Figure 4): the first slide introduces the participant and indicates how their past experience and expertise is relevant to ‘HabiTech’; the second slide proposes a definition or statement of what the participant thinks ‘HabiTech’ is about; the third and final slide describes what the participant hopes to get out of being part of the HabiTech CHI 2023 Workshop. Each participant has 5 minutes to present these three slides.

Figure 4. Three participant slides for rapid fire session.

This activity will be followed by a coffee break, during which participants will be encouraged to engage in a ‘domain-dotting’ exercise. On a number of provided tablets we will display a pre-prepared graphic outlining the Key concepts/terms in ‘digital civics’ mapped onto suggested, corresponding equivalents for HabiTech (see Table 1), participants will be asked to mark these with two colors of ‘dots’, one color indicating areas of expertise/research in which the participant is already engaged and the second color dot indicating future areas around ‘HabiTech’ they are hoping to explore. Online participants will access the same graphic from their own computer (MiroBoard).

Following the coffee break, architect Christian Veddeler will deliver the keynote talk titled "Motion still Matters." In this presentation, Veddeler seeks to exemplify his dedication to systemic thinking in architecture and design strategies that extend beyond a fixation on specific formal expressions. His primary focus is on researching and emphasizing the various relational conditions that influence decision-making in design. Veddeler explores the technological redefinition of design conditions and the negotiation of diverse stakeholder interests, opening up possibilities for large-scale differentiation and the introduction of conditions like association, relativity, and complexity. Utilizing rule-based approaches, he demonstrates how intricate systems can be generated with precise control and attention to relative parameters. Formal structures and programs are then intricately resolved within relational contexts and feedback loops, challenging the limitations of linear thinking and an inclination towards instant solutions. Christian's endeavors revolve around researching the relational conditions of crucial layers and influences on architecture, including space, structure, function, material, and their impact on user experience. The lecture aims to anticipate the evolving role of architects, discussing innovative design strategies that reflect the increasingly complex nature of architectural projects. This keynote serves as an industry provocation, intended to inspire and excite participants about the transformative possibilities within the field.

After lunch, at a nearby restaurant, we will immediately launch into a 90-minute session based on ‘constructive controversy' [6,7]. This is an established method permitting the pros and cons of an issue to be presented from diverse points of views, allowing to potentially arrive at a consensus solution. In constructive controversies the search for ‘certainty’ becomes a cooperative effort, seeking to accommodate the perspectives and reasoning of others. It yields creative solutions and positive feelings among the parties. Two groups will be formed, each given an opposing position, the first being that ‘HabiTech’ is a genuinely new and under-researched topic; the opposing position being that it is simply a sub-area of ‘Digital Civics’ and does not need

a separate research focus. Once each team has worked out its position, they present it. After this, the teams exchange positions, each presenting the other's viewpoint. This exercise will culminate in a group discussion and an attempt to find common ground followed by a reflection on the overall process.

After a second coffee break, the last workshop activity will build upon the results of the constructive controversy activity by engaging in a final mind-mapping exercise: in order to both map out the domain and establish the boundaries of the field. This domain-mapping will be conducted in small groups of four to five people; a spokesperson representing the group will then report on the outcomes of this session in the final wrapping up session. Finally, we will conclude with a discussion of future plans. W*orkshop Schedule:*

- Welcome: 09:05 to 09:10
- 20 x rapid fire presentations: 09:10 to 11:00
- Coffee break ('domain-dotting' activity over coffee): 11:00 to 11:30
- Christian Veddeler Keynote, Q&A: 11:30 to 12:30
- Lunch: 12:30 to 13:30
- Constructive controversy exercise: 13:30 to 14:30
- Afternoon coffee break: 14:30 to 15:00
- Mind-mapping/mapping the domain: 15:00 to 16:00
- Reporting back and discussion about future plans: 16:00 to 17:00 (and close)

6 DISTANCE ENGAGEMENT

All items of the programme will be conducted online and offline in an integrated manner. Rapid fire presentations and the keynote talk will be transmitted (Zoom) so that all participants are involved on an equal basis and remote participants can deliver presentations / ask questions. Domain dotting will be performed on an online collaborative board (Trello/EasyRetro/MiroBoard), which makes it possible to integrate responses of remote participants with those of the Hawaii-based audience (who will perform the exercise on a provided tablet or personal smartphones). For the 'constructive controversy' and mind-mapping activities, we will divide the participants into Hawaii-based teams and virtual (remote) teams in Zoom break-out rooms. The reporting sessions will be transmitted similarly to the rapid fire presentations. We will have an online moderator constantly present on the online video link, responsible for the smooth integration of the online and offline audience.

7 POST-WORKSHOP PLANS

This workshop is fairly speculative, and therefore we do not wish to be too prescriptive as to the outcomes. However, if it seems as though there is sufficient material arising from the workshop we would like to produce either a special issue of a journal, ideally within the architectural research area, such as the Architectural Science Review (ISSN 00038628) and/or to produce an summary article for Interactions/IX journal.

8 250 WORD CALL FOR PARTICIPATION

We invite submissions for a one-day workshop to help define a new research area – the building-level counterpoint to digital civics - how do new technologies enable and empower the inhabitants of a multi-occupancy buildings? This workshop will gather interdisciplinary experts in HCI, design, architecture, data ethics, and cognitive science to reflect on the role of HCI in cultivating digital civics inside buildings.

Papers should be 2-4 pages long in the CHI Extended Abstract format and may address any subjects related to the topic including but not limited to:

- Making the ongoing logging of user-behavior transparent, opt-in, and voluntary.
- Data interfaces embedded in architectural space.
- Encouraging the emergence of communities among building users.
- User-driven building design, building management, and facility maintenance.
- Ethics of building-based personal data.
- Maintaining data privacy inside buildings, including privacy-by-design.

Please see the table for a preliminary mapping of relevant concepts against those already established in digital civics. Submissions should refer to one or more of these concepts. The due date for submissions is February 22nd, 2024. Participants notified: February 29th, 2024. The submission site can be found at sparc.uni-muenster.de/HabiTech. At least one author of each accepted position paper must attend the workshop, and all participants must register for both the workshop and at least one day of the conference. Participants will be selected based on their prior experience, expressed interest in the workshop and the quality of their submissions. We will focus on recruiting from a diverse group of participants.

Table 1. Key concepts/terms in 'digital civics' mapped onto suggested, corresponding equivalents for HabiTech.

Digital Civics	**HabiTech**
The city	The building
Citizen	Building user
Citizenship	Building occupancy, residency, 'usership'
Community	Do 'building communities' exist or is it always about individual users? Who would constitute a 'building community'? People who routinely share space/tasks?
Democratic engagement	Democratic engagement
Digital technologies	Digital technologies
Citizen-driven city design	User-driven building design
Ethics	Ethics
Citizen rights	Building user rights
Privacy in public space (e.g., right not to be tracked)	Privacy in buildings (e.g., right not to have one's access logs recorded?)
Equal rights to access and use public parts of the city	Equal rights to access and use public parts of the building?
Rights to healthy environments	Rights to (mentally?) healthy buildings
(Citizen) voice	(User or inhabitant's) voice
Community-driven digital technologies	(Building) user-driven digital technologies
Community-driven digital services	(Building) user-driven digital services
Action	Building user action
City activism (offline: guerrilla gardening / digital: citizen-built public transit apps)	Building activism (offline: flexibly self-rearranging space and furniture / digital: community building)
Civic potentials of digital life	Building user potentials of digital tools
Volunteered geo-information	Volunteered building-level info (sensors?), reporting of faults/building repairs
City data from sensors (not always volunteered)	Building data from sensors (not always volunteered)

References

[1] Till Ballendat, Nicolai Marquardt, and Saul Greenberg. 2010. Proxemic Interaction: Designing for a Proximity and Orientation-aware Environment. *ACM International Conference on Interactive Tabletops and Surfaces*, ACM, 121–130.

[2] Nicholas S. Dalton, Holger Schnädelbach, Mikael Wiberg, and Tasos Varoudis. 2016. *Architecture and Interaction*. Springer International Publishing, Cham.

[3] Nicholas Dalton, Keith Green, Paul Marshall, et al. 2012. Ar-CHI-Tecture: Architecture and Interaction. *CHI '12 Extended Abstracts on Human Factors in Computing Systems*, ACM, 2743–2746.

[4] Nick Dalton, Keith Evan Green, Ruth Dalton, et al. 2014. Interaction and Architectural Space. *CHI '14 Extended Abstracts on Human Factors in Computing Systems*, ACM, 29–32.

[5] Ruth Conroy Dalton and Saskia Kuliga. 2016. Using social media to gather users' feedback of the Seattle Central Library. In *Take One Building: Interdisciplinary Research Perspectives of the Seattle Central Library*. Routledge, London, 167– 187.

[6] David W Johnson, Roger T Johnson, and Dean Tjosvold. 2000. Constructive controversy: The value of intellectual opposition. In *The handbook of conflict resolution: Theory and practice.* Jossey- Bass, San Francisco, CA, US, 65–85.

[7] Karl Smith, David W Johnson, and Roger T Johnson. 1981. Can conflict be constructive? Controversy versus concurrence seeking in learning groups. *Journal of Educational Psychology* 73, 5: 651–663.