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## **Rigor, Relevance and Impact**

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# Rigor, Relevance and Impact: The Tensions and Trade-Offs Between Research in the Lab and in the Wild

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**ABSTRACT**

As an interdisciplinary field, CHI embraces multiple research methods, ranging from controlled lab experiments to field studies in homes and communities. While quantitative research in the lab emphasizes the scientific rigor of hypothesis testing; qualitative research in the wild focuses on the understanding of the context of technologies in use, and each type of research has a correspondingly different kind of impact. This panel invites researchers with varied backgrounds to talk about the tensions and trade-offs between research in the lab and in the wild, with respect to scientific rigor, real-world relevance and impact. The goal is to enhance mutual understanding among researchers with diverse goals, values and practices within the CHI community.

**KEYWORDS**

Research paradigm; research in the lab; research in the wild; research methods; trade-off; impact.

**INTRODUCTION**

HCI is distinguished from pure natural sciences and the design disciplines through its study of artifacts to understand and verify design decisions and processes [11]. HCI is thus fundamentally interdisciplinary, with diverse values and points of view. The most prominent paradigm divide is probably between research in the lab, which typically employs quantitative methods to test hypotheses, and research in the wild, which uses qualitative methods to discover insights with respect to real-world contexts. According to Runkel and McGrath [13], research methods have trade-offs: lab experiments are conducted in contrived settings, with obtrusive operations design to maximize precision, whereas field studies are conducted in natural settings, with unobtrusive operations designed to maximize context.

Classic lab-based HCI research originates from experimental psychology and seeks to determine cause-and-effect relationships: Hypotheses are operationalized by isolating relevant factors and asking participants to perform specified tasks under controlled conditions, with pre-defined measures. The scientific rigor of such experiments is based on internal validity i.e. supporting specific claims about cause and effect; and external validity i.e. generalizability of the results beyond the experiment [15]. While the value of evaluation is widely accepted in HCI, some researchers have raised concerns regarding these classic methods. Nielsen [12] criticizes quantitative user research being overly focused on statistical analyses that can lead to misleading or overly narrow results. He emphasizes the value of insights found in qualitative studies and argues in favor of conducting numerous small usability tests with small numbers of participants. Greenberg and Buxton [7] argue that usability evaluation does not always lead to a scientific outcome despite of the use of scientific methods. They criticize CHI for overly stressing scientific contributions and believe this can harm design and engineering innovations.

Carroll and Rosson [4] describe HCI as an "action science" that seeks to produce actionable and effective knowledge rather than merely accurate descriptions, analyses, or theories.

Various middle-ground approaches have sought to fill the gap between research in the lab and in the wild, there have been efforts on developing middle-ground approaches. Creswell and Garrett [5] summarize the development of mixed methods research as a "movement" that integrates quantitative and qualitative approaches in various ways in order to achieve a more complete and scientific understanding of the studied phenomenon. Mackay and Fayard [11] present a framework for triangulation across methods from different disciplines and argue for its benefits for HCI as an interdisciplinary field. Blandford [3] introduces semi-structured qualitative studies, which use methods that typically involve interviews and observations with some explicit structure, allowing the researchers to perform systematic and iterative coding of verbal data. A recent emerging epistemology - Research through Design [6], is differentiated from research in the lab and in the field. This form of research focuses on the creation and testing of new artifacts as a method for learning about human experience, including their needs, desires, emotions and aspirations, rather than focusing on the artifacts themselves. Living Laboratories, originated from social science, have been proposed as research infrastructures that allow for the study of physical and social computing in authentic yet (semi) controlled settings. Living labs provide real living spaces that allow for design interventions, equipped with a rich network of sensors (e.g. [1, 8, 9]), and therefore, and commonly capitalize on both quantitative and qualitative methods [2, 16].

In addition to the methodological debate between the two research paradigms that is centered around scientific rigor and relevance in context, another key issue is impact, which is increasingly valued in HCI communities and by external funding bodies. Schneiderman [14] considers earlier research in the lab as micro-HCI, and encourages the progression towards macro-HCI to address social and societal concerns through design of technologies. This calls for new design processes and an evaluation matrix, where qualitative methods are considered to be more appropriate. Recent research in community engagement projects employ ethnographic and participatory design methods for building and deploying technologies within communities [10]. Many aim for a larger societal impact by exploring ways of sustaining engagement of community members and stakeholders. We believe each type of research offers different forms of impact. A controlled experiment can generate fundamental knowledge that can be applied to a variety of situations, e.g., a cursor pointing experiment may produce a large-scale impact. On the other hand, the tested tasks or scenarios may be very abstract or overly focused due to the need for control, with a corresponding reduction in impact due to low relevance. Conversely, a participatory design approach has a higher chance of having a specific impact because it involves users and stakeholders more directly around practical tasks and problems. However, such impact is more likely to be very context-specific.

The diverse practices and divided opinions in the HCI community lead to struggles of practitioners when conducting and publishing their research. On the one hand, a well controlled experiment with simplified tasks may be criticized for being too artificial or too narrow. On the other hand, qualitative research may be attacked for the lack of repeated measures and questions of generalization to other contexts. The tensions between researchers who favor different methodological paradigms arise, especially in the peer-review process. Furthermore, different research methods are coupled with different types of activities and involve different challenges. We argue that HCI researchers should acknowledge biases and try to better understand both sides.

This panel aims to launch a discussion about the tensions and trade-offs between these divided research paradigms in terms of scientific rigor, real-world relevance and impact, as well as implications for the practice of HCI research. How should we choose between the trade-offs of quantitative and qualitative research? How should research projects that employ mixed methods be combined to gain more insights? What are the implications of choosing different research methods in terms of the conducted activities and required skills, as well as research and professional outcomes?

#### **PANEL FORMAT**

The panel will begin with the moderator introducing the panelists and the topic of discussion. The moderator will kick off the discussion with brief examples of quantitative research in the lab, e.g., a cursor pointing experiment or a VR/AR technique, and qualitative research in the wild, e.g., a field study of tablet use in a hospital and a community engagement project for deploying sensor technology.

Each panelist will be asked to tell a 3-minutes story about their own good and bad experiences with research in the lab and/or in the wild, drawn from their writing, reading, peer-review, or teaching experiences. Based on these stories, panelists will offer their personal opinions and reflections on both types of research. They will be encouraged to ask questions of each other and the audience will also be encouraged to participate in the discussion.

Throughout the panel session, the moderator will ensure that all panelists are given equal time and opportunities to speak. The following key questions will be addressed in the discussion.

- How to find an optimal trade-off between scientific rigor and real-world relevance for a research project?
- How to avoid unfair reviews caused by this paradigm divide?
- What different skill sets do each type of research require? How do we advise students for learning and practicing them?
- How does each type of research produce an impact? What is impact and how can it be measured?
- Can we have rigor, relevance and impact all in one project? How to mix different methods?
- What are the most promising new middle-ground methods being developed?

## PANELISTS

The panel will be facilitated by **Can Liu**, an assistant professor at the School of Creative Media in the City University of Hong Kong. Her research has covered designing and studying future interfaces and employed methods both in the lab and in the wild. She has been publishing at CHI for 7 years, received Best Paper award and served as a Program Committee member.

**Hamed Alavi** is a Lecturer in the University of Fribourg, Switzerland. His research is focused on the future of humans' interactive experiences with built environments as they increasingly incorporate artificial intelligence and new forms of interactivity. Hamed has 4 years of experience conducting living lab research in University of Fribourg and University College London. Also, many of his research projects reached the market and created higher impact outside of academia.

**Enrico Costanza** is Associate Professor at the UCL Interaction Centre. His research lies at the intersection of design and technology and it is influenced by behavioural and social sciences. His current focus is on designing systems that can help people make sense of data (e.g. from the IoT) and on interaction with AI and autonomous systems in everyday situations.

**Shumin Zhai** is a Principal Scientist at Google where he leads and directs research, design, and development of human-device input methods and haptics systems. His research career has contributed to both foundational models and understandings of human-computer interaction and practical user interface designs, inventions, and flagship products. He led the ACM TOCHI journal as its Editor-in-Chief from 2009 to 2015. He is a member of the CHI academy and Fellow of the ACM.

**Wendy E. Mackay** is a Research Director at Inria and tenured faculty at the University Paris-Saclay in France, where she leads the ex)itu research group in Human-Computer Interaction. She has managed multiple product development and research groups in industry before returning to academia. Her research employs both quantitative and qualitative methods and covers a wide range of topics including interaction paradigms, research methods, mediated communication and engineering of interactive systems. She is a member of the CHI Academy and has served as Chair of ACM/SIGCHI.

**Wendy Moncur** is a professor at the University of Dundee, where she holds a joint appointment across DJCAD and the School of Nursing and Health Services. She leads the interdisciplinary Living Digital group, which is grounded in Human-Computer Interaction. The group researches the design of digital technologies to support people through ordinary experiences across the lifespan. She has served on technical program committees including CHI, CSCW and DIS. Before moving into academia, Wendy worked widely in the IT industry, across financial services, utilities and manufacturing sectors.

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