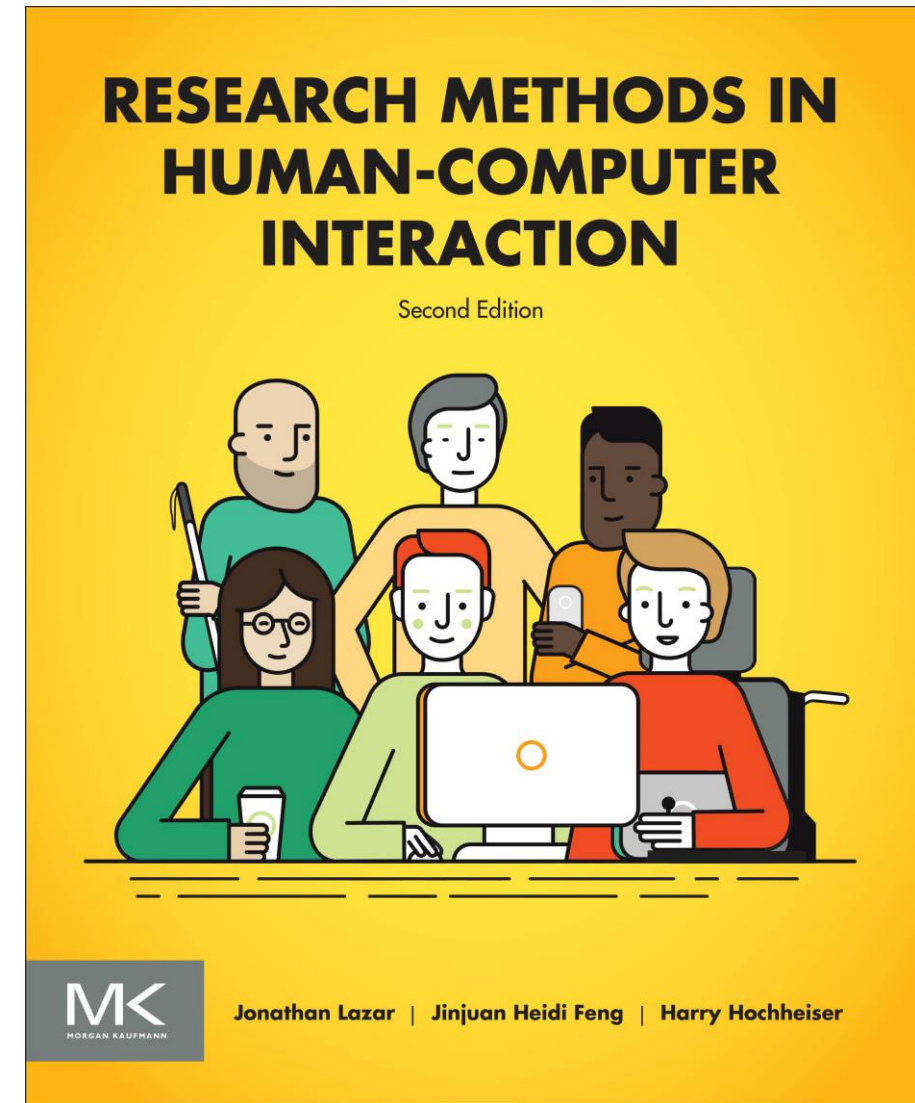


Research Methods in Human-Computer Interaction

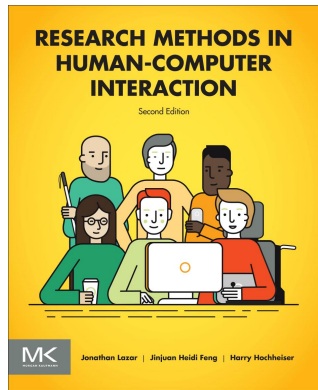
Second Edition

Chapter 1: Introduction to HCI research

Lazar, Feng, and Hochheiser



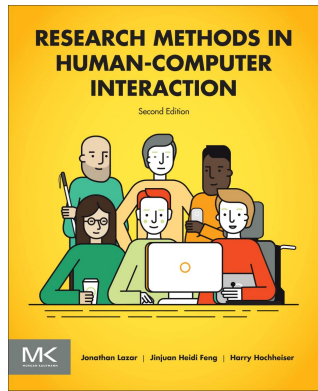
A Brief History of HCI



- 1980-The first book on HCI (Software Psychology)
- 1982-The first conference on HCI (which later became the CHI conference)
- Other similar work was going on in the late 1970s, often under “office automation” or “human factors”
- The first computer mouse was publicly demoed in 1968
- Computers were becoming smaller and being used in homes, schools, workplaces, and by non-technical people

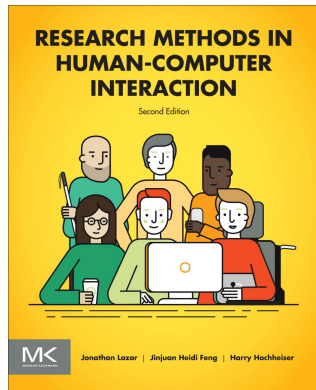
Types of HCI Research Contributions

- Empirical contributions
- Artifact contributions
- Methodological contributions
- Theoretical contributions
- Dataset contributions
- Survey contributions
- Opinion contributions
- Most published research is empirical and/or artifact (Wobbrock and Kientz, 2016)



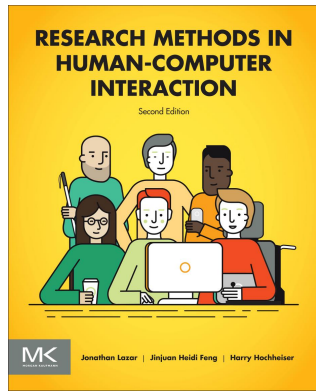
Changes in topics of HCI research over time

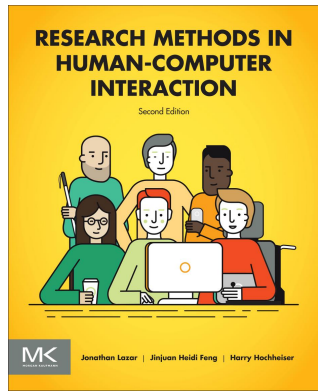
- 1980s-office automation software, basic interaction research, basic GUIs
- 1990s-advanced GUIs, UCD methods, Internet/Web, computer-mediated communication
- 2000s- user-generated content, user diversity, mobile computing, multimedia
- 2010s-collaboration, mobile/embedded computing, crowdsourcing, emotional and persuasive computing, natural user interfaces, sustainability, big data, accessibility



Changes in HCI research methods over time

- New tools or tools where the costs have dropped dramatically
 - Eye-tracking, sensors, drones, facial EMG, EEG, Mechanical Turk
- New approaches
 - Social networking, big data, crowdsourcing, personal health tracking, citation analysis, text parsing



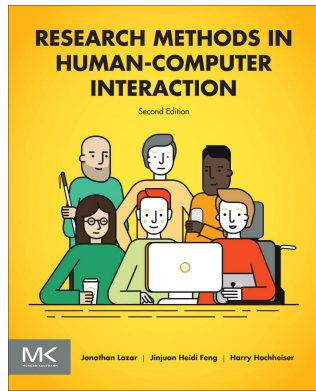


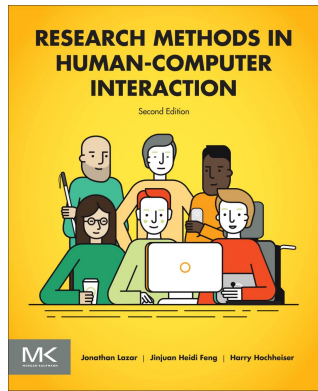
How HCI research differs from other fields

- Many disciplines collect national data sets using established methodological controls
 - National data on income, employment, family
 - Statistics Canada, U.S. Census Bureau, EuroStat
 - Large sets are publicly available which researchers can analyze
- Typically, HCI researchers must collect their own data
 - Leads to smaller size data sets
 - Or a combination of automated data collection (e.g. big data and/or text parsing) and smaller, more in-depth studies

How HCI research differs from other fields

- Other disciplines such as sociology and medicine often track longitudinal data, over decades
- HCI researchers rarely collect longitudinal data
 - Technological change may make it hard to compare devices over time
 - But other data points, such as time usage, communication patterns, or psychological well-being, are appropriate for longitudinal study
- The lack of longitudinal data limits the impact of HCI research on other fields and populations



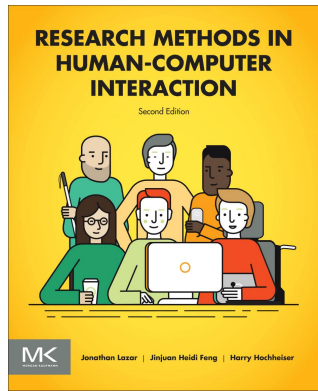


How HCI research differs from other fields

- For a majority of HCI research, you must have representative participants, not college students. 😊
- Representative in terms of:
 - Age
 - Educational experience
 - Technical experience
 - Domain knowledge/job experience
- If you are evaluating something simple like motor performance, not usage patterns, then college students may be appropriate

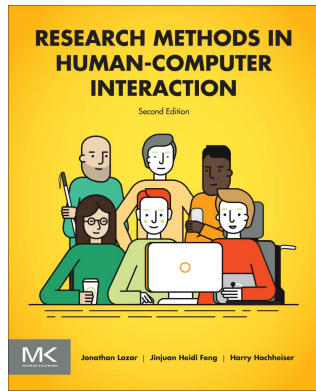
Understanding differences in HCI methods and measurement

- HCI research requires both rigorous methods and relevance
- There has been a historic focus on improving the quality of life
- Depending on the disciplinary roots of your collaborators, they may have different expectations for which methods and metrics are most appropriate
- The earliest metrics were based on human factors and psychology research (e.g. task and time performance)



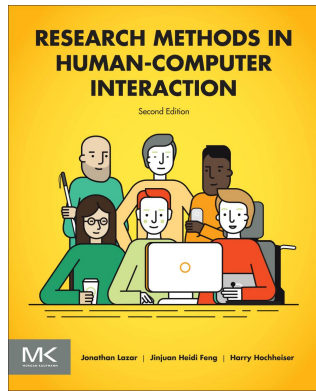
Understanding differences in HCI methods and measurement

- Difference between micro-HCI and macro-HCI research (Shneiderman, 2011)
- Micro-HCI research
 - Task performance, time performance, error rate, time to learn, retention over time, user satisfaction
 - Frequently can be studied in a lab setting
- Macro-HCI research
 - Motivation, collaboration, social participation, trust, empathy, and other societal-level impacts
 - Often cannot be studied in a lab setting



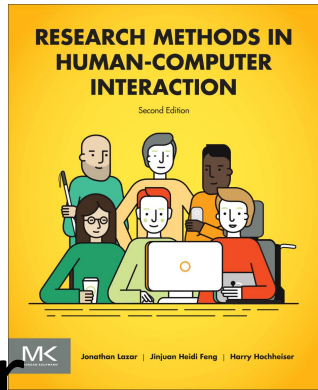
The nature of interdisciplinary research in HCI

- Is HCI interdisciplinary? Multidisciplinary? It's own discipline?
- There are often challenges when HCI research gets evaluated through a single-discipline lens
 - Journals vs. conference proceedings
 - Single-author publications vs. multi-author publications
 - Openness and transparency of research vs. secrecy
 - Does reflective research about a field count as research?
 - Is grant money considered good or bad?
 - Which stage of the research process must be perfect?



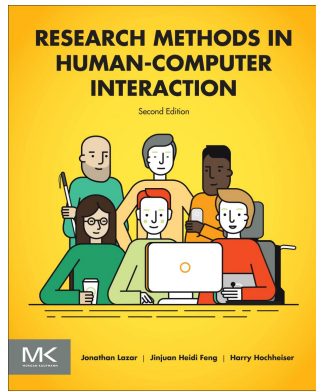
Who is the audience for your research?

- Most HCI researchers, without realizing it, target their research to other researchers
 - Publish their research in outlets primarily read by other researchers, not practitioners
 - Do not take steps to inform other target audiences, or other disciplines, about their research
 - Citation analysis, and metrics such as h-index, measure the impact on other researchers



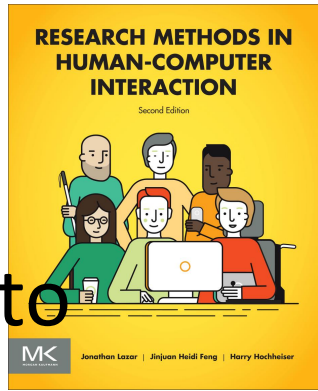
Targeting your research to developers

- The goal is to influence actual system and interface design
 - Working in corporate/industrial research labs
 - Or a university partnering with a company and working on tech transfer
 - There may be issues about secrecy, disclosure, and intellectual property ownership
 - Types of controls may differ, so that research is focused on the specific configurations that a company is interested in
 - Must publish/present in practitioner-friendly venues



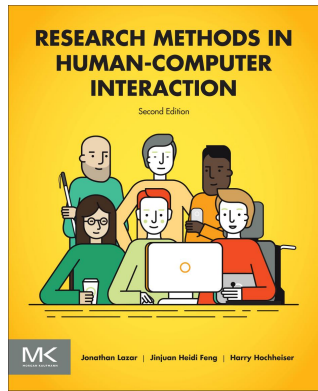
Targeting your research to policymakers

- Policymakers need to have data from the HCI community to inform their decisions related to laws, regulations, legal cases, and treaties
- The HCI community does not yet have an established outreach to public policy communities
- Individual HCI researchers are encouraged to establish long-term relationships with policymakers
 - Meet with policymakers face-to-face
 - Be specific about relevant laws and number of people impacted
 - Understand the relevant policy timelines and deadlines
 - Provide appropriate summaries of research, don't just send an academic paper



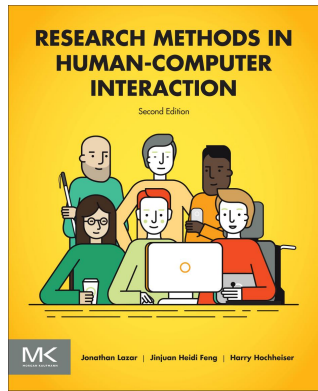
Understanding one research project in the context of related research

- There is no perfect data collection method or effort, all have flaws
- One data collection effort does not lead to a definitive answer
- Multiple teams should examine the same research questions over time, using different methods
- Replication is an important part of validating research, although it is rare in HCI



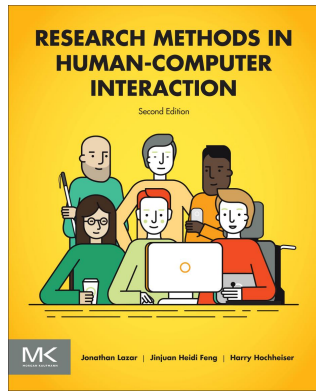
The “research lifecycle” for one project

- 1. Designing research
- 2. Running data collection
- 3. Reporting research (Hornbaek, 2011)
- This approach focuses on one specific research project, with the assumption that there is a base of existing research literature on the topic, with an understanding of challenges and biases present



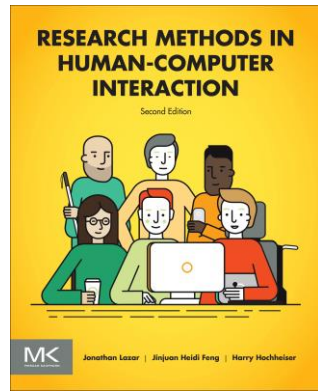
The “research lifecycle” for a new area of research

- If no previous research exists on a topic area, you should start with an exploratory research approach
- Surveys, interviews, focus groups, and ethnography are appropriate for exploratory research
- It’s hard to start structured research in a new research area, because:
 - You often don’t know what data needs to be collected
 - You don’t know what structure to put in place, what controls you need
 - You often don’t know what biases might be present
- Start with observation, before doing intervention or experimentation (Shneiderman, 2016)



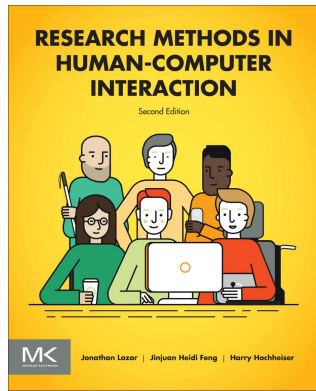
Controlled laboratory studies vs. “in the wild” field studies

- Either type of research can come first, but both types of research should be done if possible
- Findings may differ inside the lab and outside
- Field studies may be better for mobile device research
- Field studies help understand the context of users and their environments, e.g. outside noise and distractions, as well as network latencies
- Field studies may allow for more diverse users to participate
- Informed consent may also be harder in field settings



Is there a clear consensus over time?

- Over a 35-year period of research, there is a consensus that broad, shallow tree structures in menu design are superior to narrow, deep structures
- Many other questions are still hotly debated, e.g., what is the optimal number of participants required for usability testing?
- Note that user habits and preferences are fluid and change over time, and technological change (and change in technology infrastructure) may also have an impact



Inherent Trade-Offs in HCI

- HCI is not about optimization
- Socio-technical systems rarely can be reduced to two or three measurements
- Great HCI research helps us better understand all of the factors present in socio-technical systems
- We seek “better” solutions rather than “optimal” ones
- There are usually multiple stakeholders with different goals
- Example: the trade-off between greatly improved interfaces and consistent interfaces (e.g. why we still use QWERTY keyboard layouts)
- Example: the environmental impacts of continuous upgrades in hardware

