

Human-Computer Interaction

Methods

Introduction to HCI Methods

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What is HCI research?

What is considered HCI research?

- » HCI research is primarily *empirical* or *design-based* research (or both), but there are other, relatively less common types of contributions
 - » **Empirical:** Understanding phenomena from direct and indirect observation or experience
 - » **Design-based:** (or **artifact/system**) Understanding a design space by exploring it and designing (and often also developing and evaluating) solutions
 - » **Other:** New methods, new theory, datasets, survey, opinions

Types of HCI Contributions¹

- | | |
|---------------------------------|--------------------------|
| 1. Empirical contributions | 1. Dataset contributions |
| 2. Artifact contributions | 2. Survey contributions |
| 3. Methodological contributions | 3. Opinion contributions |
| 4. Theoretical contributions | |

¹Wobbrock & Kientz (2016)

Types of HCI Contributions: Empirical

- » Interview study
- » Diary study
- » Quantitative lab experiment
- » Crowdsourced study
- » Qualitative field study

Types of HCI Contributions: Artifact

- » Input device
- » System
- » Hardware toolkit
- » Input technique
- » Envisionment

Types of HCI Contributions: Methodological

- » Method application
- » Method innovation
- » Method adaptation
- » New measures
- » New instrument

Types of HCI Contributions: Theoretical

- » Thought framework
- » Design space
- » Conceptual model
- » Design criteria
- » Quantitative model

Types of HCI Contributions: Dataset

- » Test corpus
- » Benchmark tasks
- » Corpus creation
- » Repository
- » Global dataset

Types of HCI Contributions: Survey

- » Techniques
- » Emerging topic
- » Tools
- » Domain
- » Technology

Types of HCI Contributions: Opinion

- » Evaluation
- » Prioritization
- » Application
- » Vision
- » Definition

CHI 2016 (“Contribution types”)
Empirical study that tells us about how people use a system
Empirical study that tells us about people
Artifact or system
Method
Theory
Dataset
Meta-analysis / Literature survey
Essay / argument

→ Table 3. Contribution types for CHI 2016.

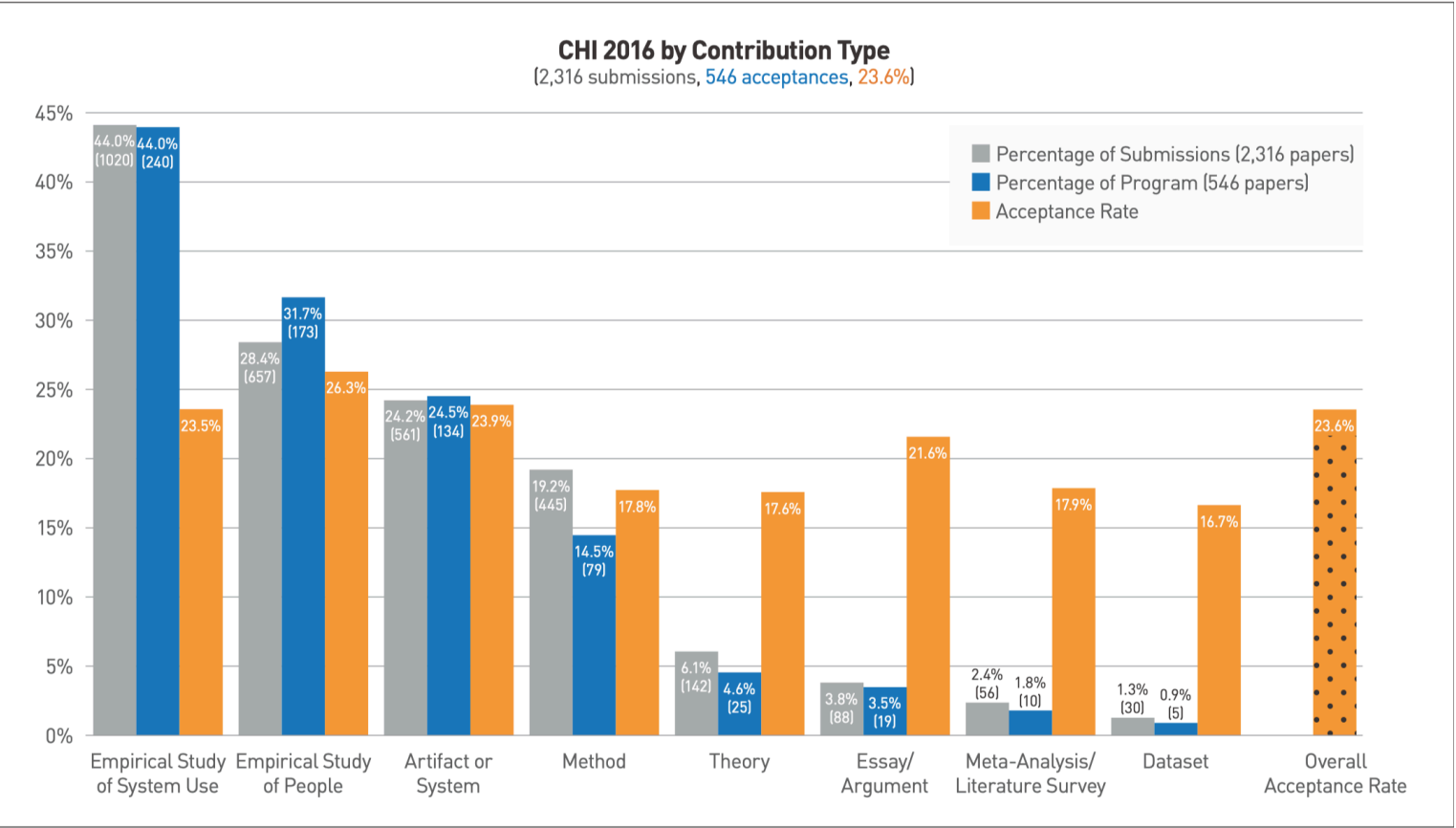


Figure 2. CHI 2016 submissions and acceptances by contribution type, sorted by descending number of submissions.

¹Wobbrock & Kientz (2016)

Key Concepts in Empirical Research

Who will we study?

» **Sample:** Which *individuals, groups, and interactions* to focus on?

How will we study them?

» **Goals:** Representation or generalization?

» **Context:** Where do we study phenomena?

» **Data:** What type of data should we collect?

Sample

Definition: A smaller, manageable version of a larger group that represents the characteristics of a larger population.

Why do we bother with a sample? Because it is impossible to study everyone!

Types: *random, purposive, snowball, convenience*

Bias: *Sampling bias due to self selection, experimenter bias*

Issues: *Research ethics, sensitive populations*

Goals

What can I do with sampled data?

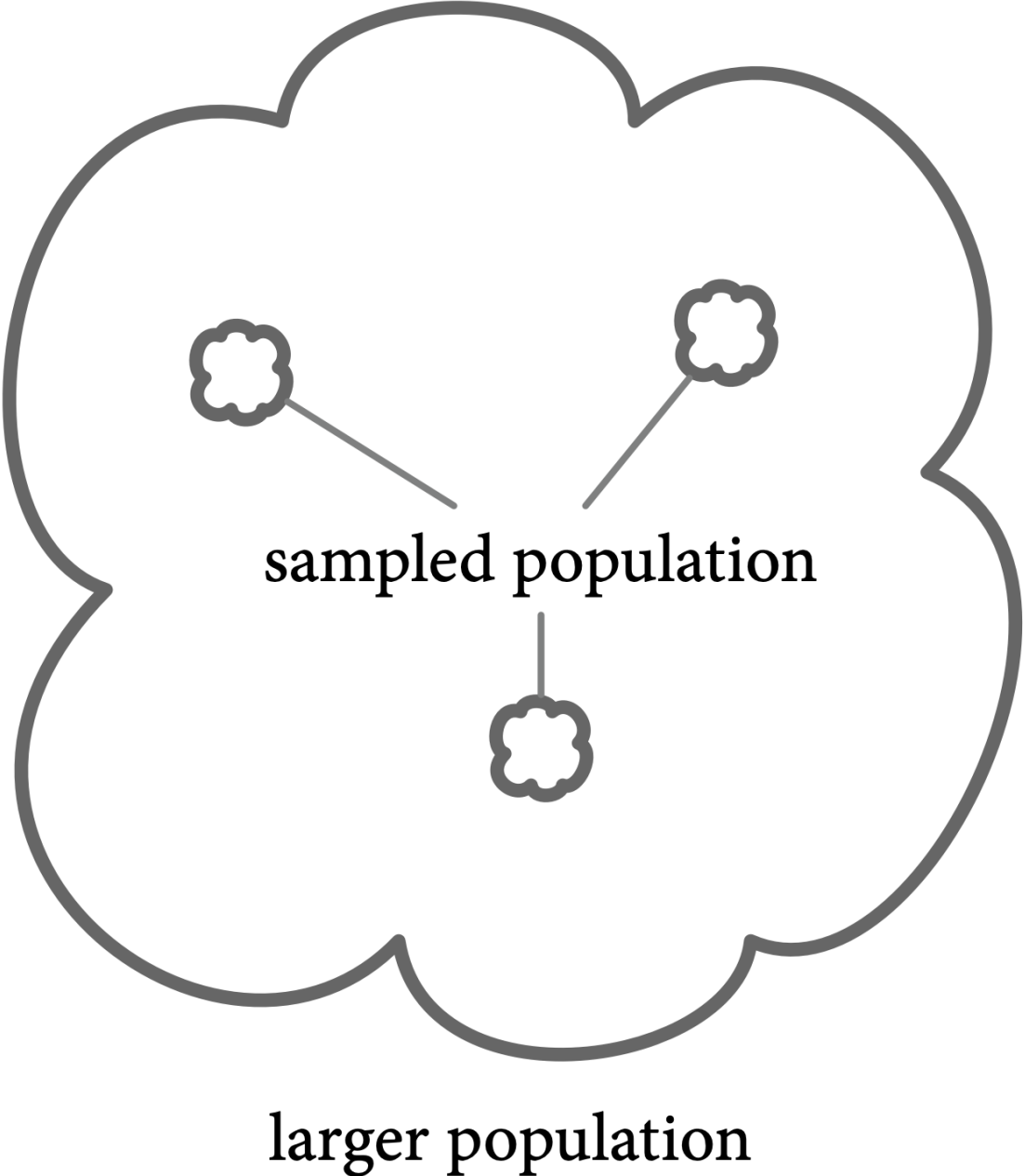
Representation: How does particular actors affect particular situations under particular circumstances?

» In-depth understanding of phenomena from *small samples* but *detailed analyses* toward *theory generation*

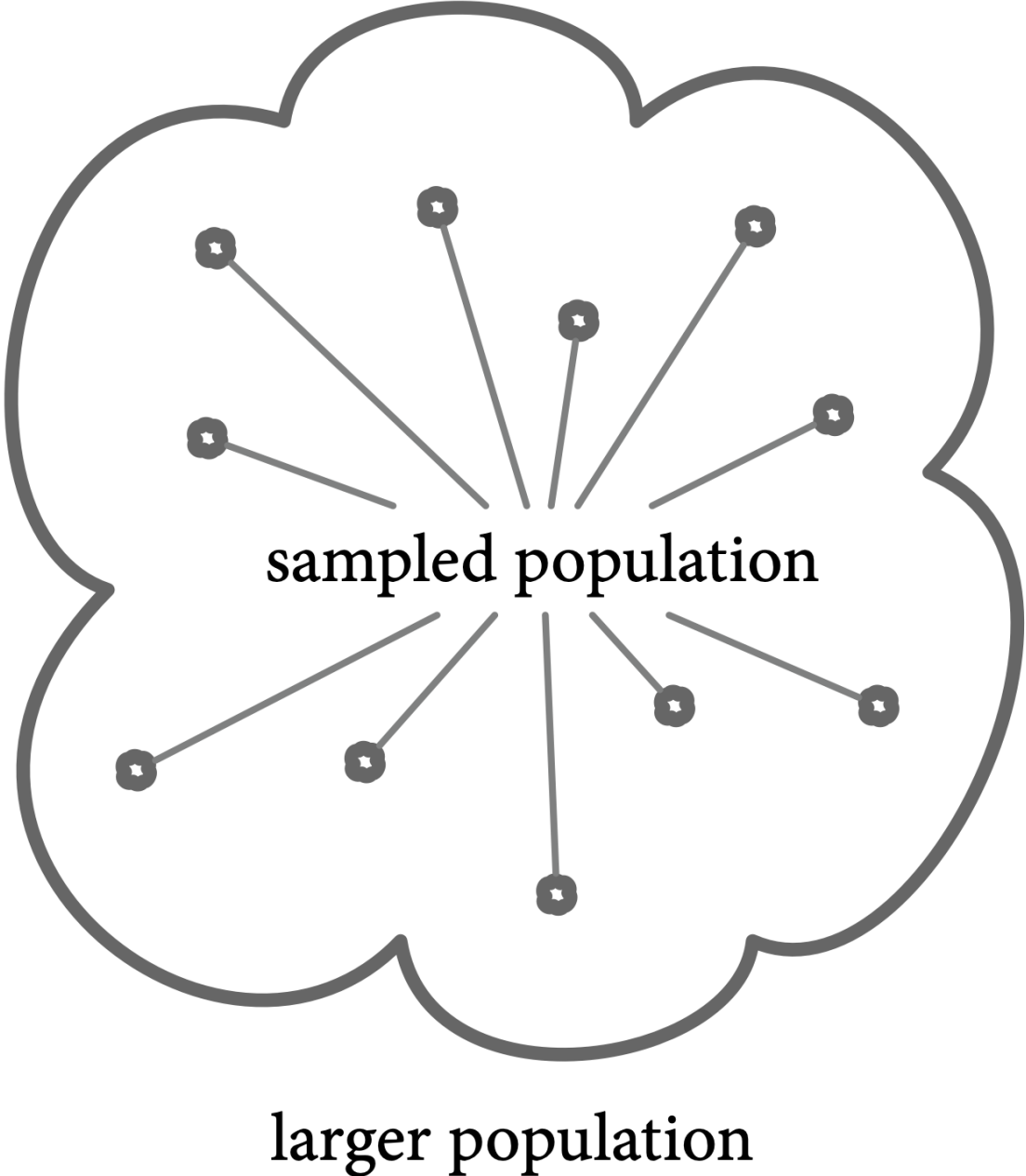
Generalization: Are the findings from the sample applicable to the larger population?

» Hypothesis testing using *larger samples* toward *theory refinement*

Representation



Generalization



Context

Where do we study phenomena?

Natural settings: In the natural environment where phenomena occurs

» *Observational studies involve no control*

» *Field experiments involve limited control*

Simulated settings: In laboratory settings by simulating the circumstances that elicit phenomena

» *Controlled experiments involve high level of control*

Data

What data should we collect?

Qualitative: Rich, textual/multimedia data from observations, interviews

» *Data:* Fly-on-the-wall/participant observations, interviews

» *Analysis:* Qualitative coding, modeling, comparative analysis

Quantitative: Numerical data from surveys, task measurements, biometrics

» *Data:* Objective, subjective, behavioral measurements

» *Analysis:* Statistical methods

Key Concepts in Design-Based Research

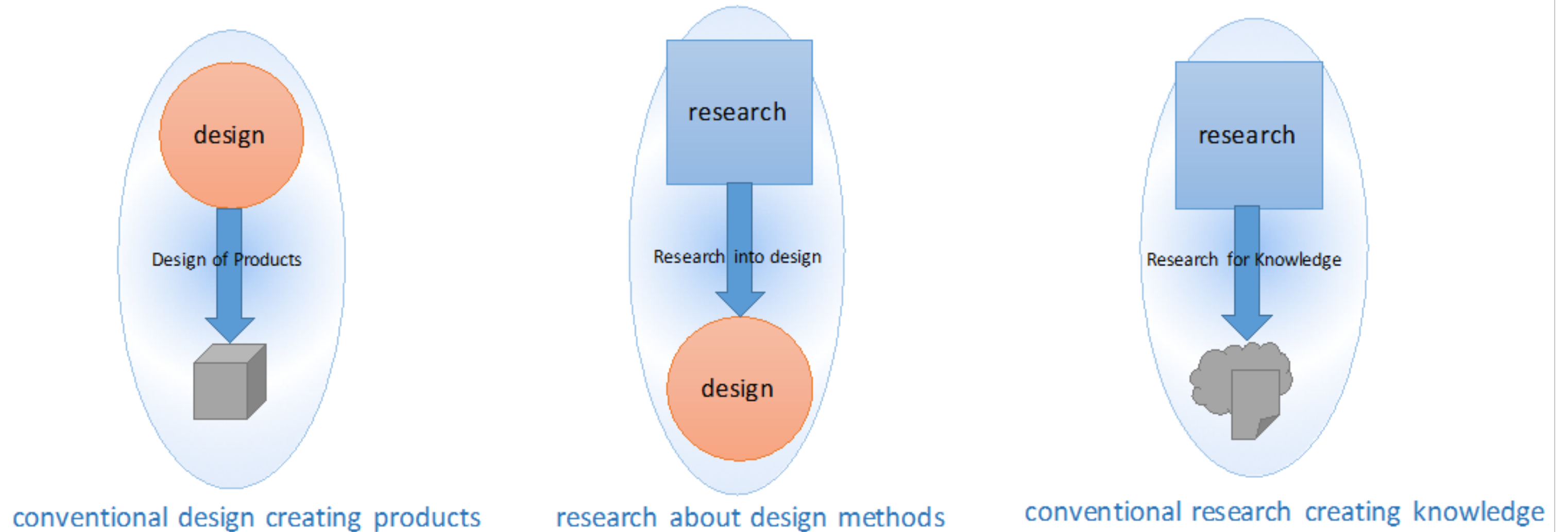
Research *for* design: Carrying out research to inform the design of a product or service.

research → design

Research *through* design: Carrying out design to create knowledge about phenomena.

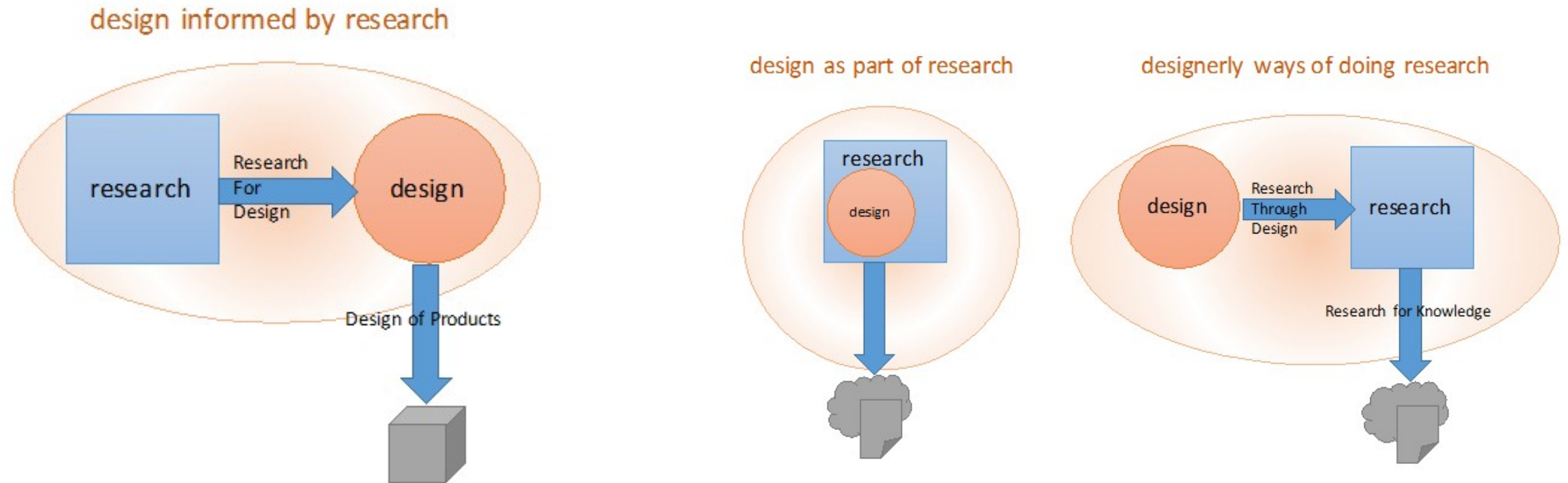
design ≈ research

How should we think about design and research?²

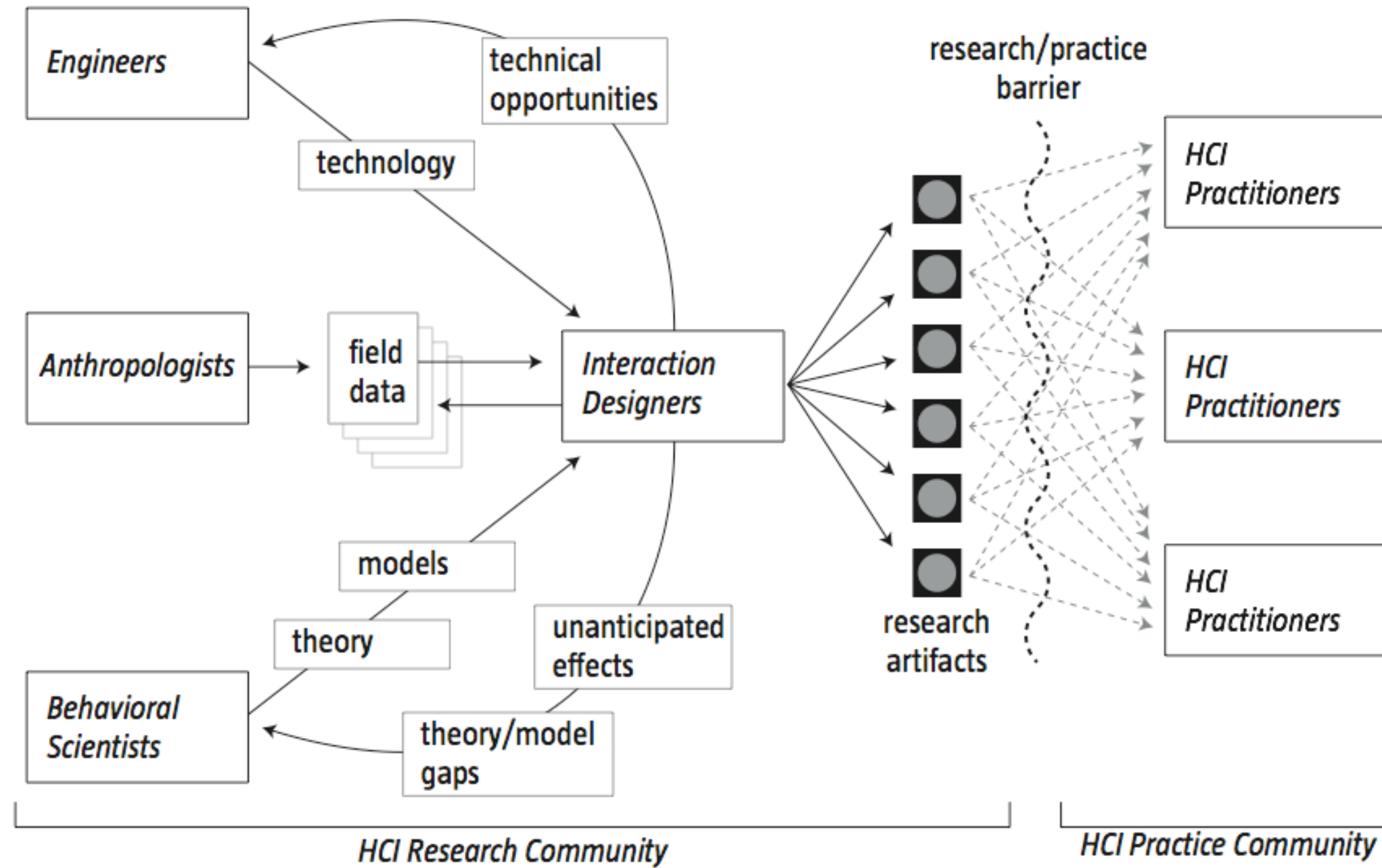


²Stappers & Giaccardi, 2014

What is the relationship between design and research?²



²Stappers & Giaccardi, 2014



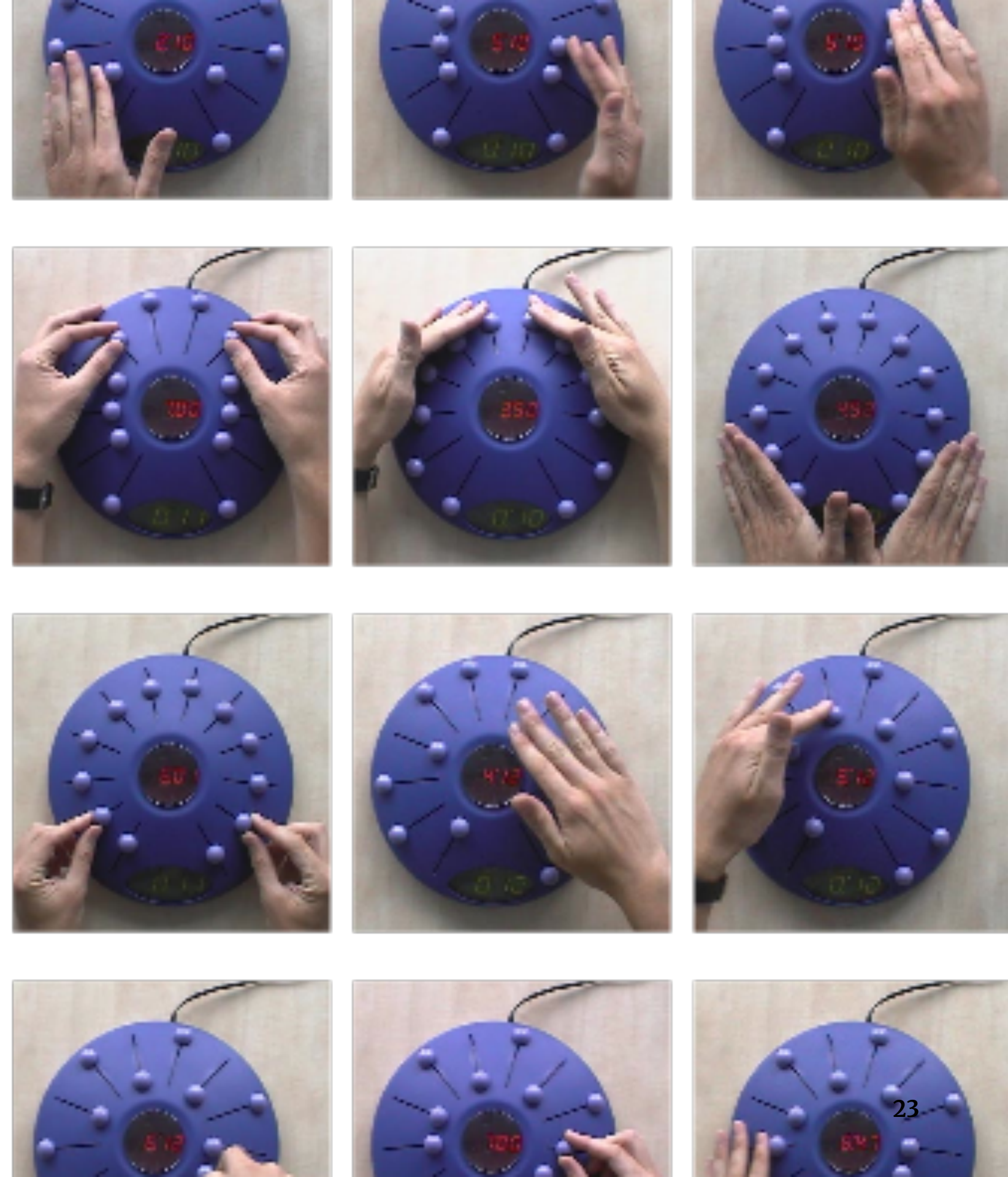
³ Zimmerman et al., 2007

An Example⁴

How can products get information about how we feel from the way we interact with them?

Wensveen (2005) designed/prototyped an alarm clock with sliders that a user could move with two hands to set a *mood* for the alarm.

Generated knowledge about how emotion can be expressed through tangible interaction.



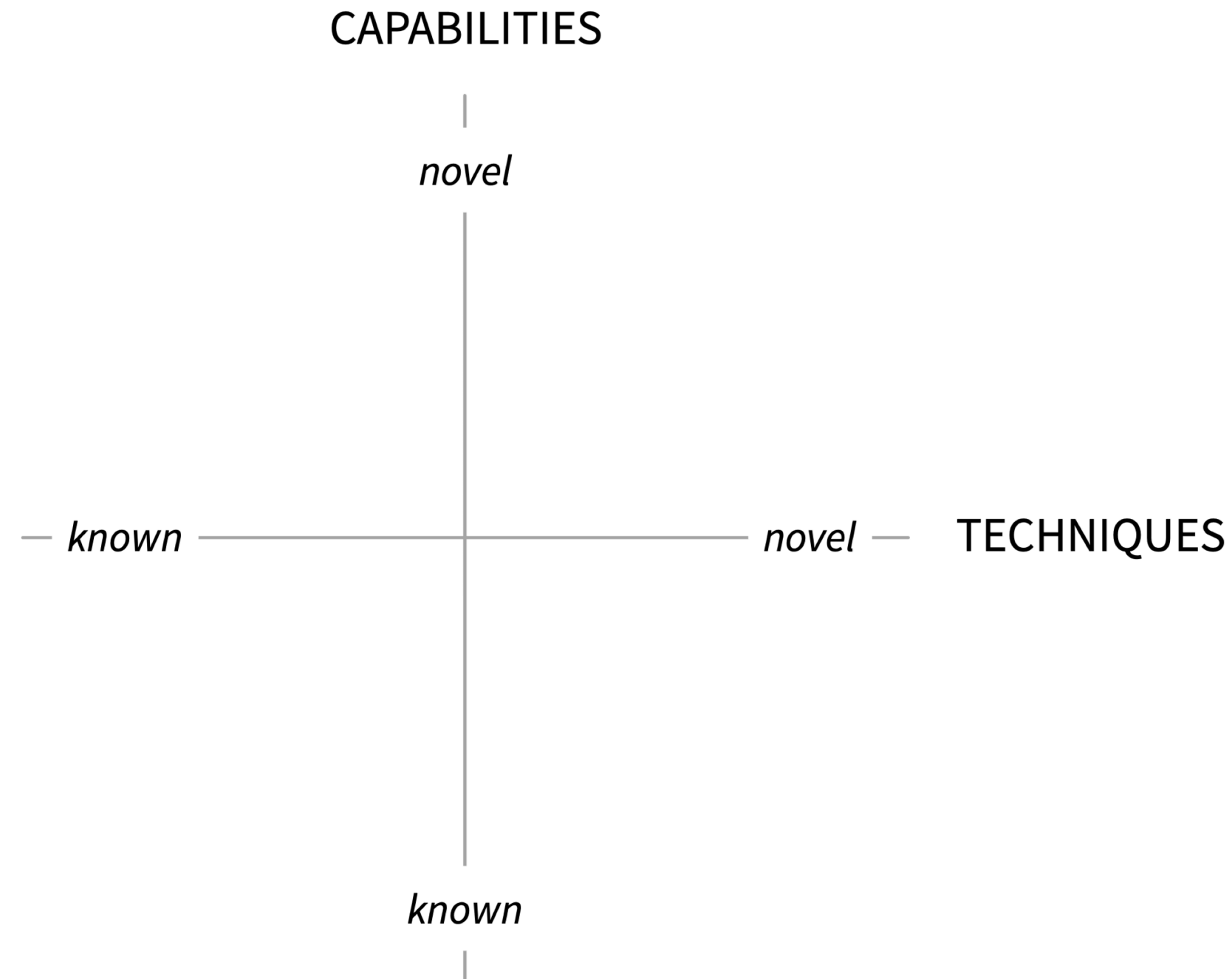
⁴Image source

HCI Systems Research

HCI systems research seeks to discover **new techniques** for building systems or **new capabilities** for systems that open up opportunities for new interaction.

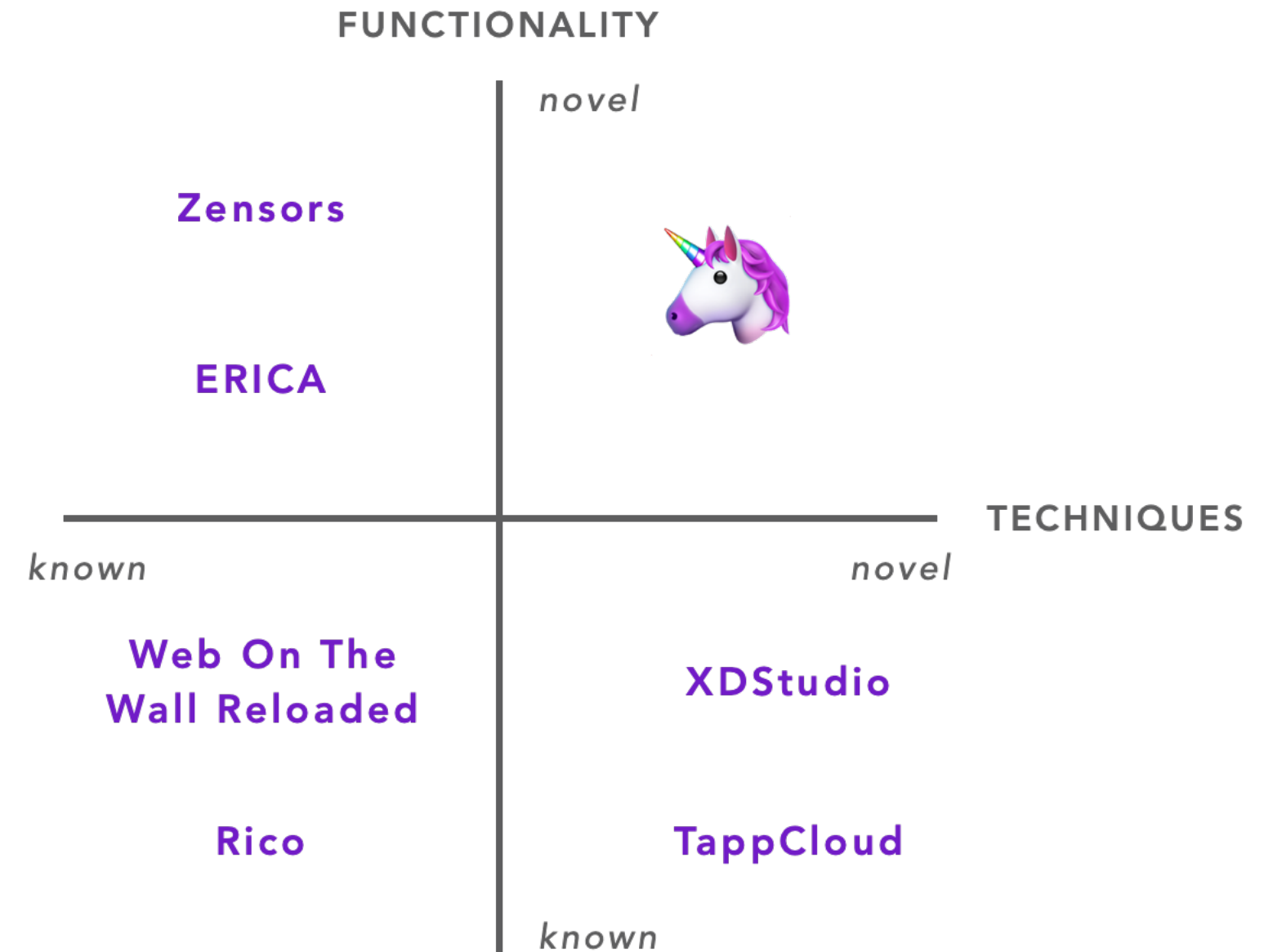
Contribution can be in techniques, which enable new systems, and capabilities, which enable new interactions.

HCI systems research is a type of design-based contribution, using primarily *prototyping* techniques instead of primarily *design* techniques.



Examples⁵

- » Novel capabilities using known techniques
- » Known capabilities using known techniques
- » Known capabilities using novel techniques
- » Novel capabilities using novel techniques 🦄



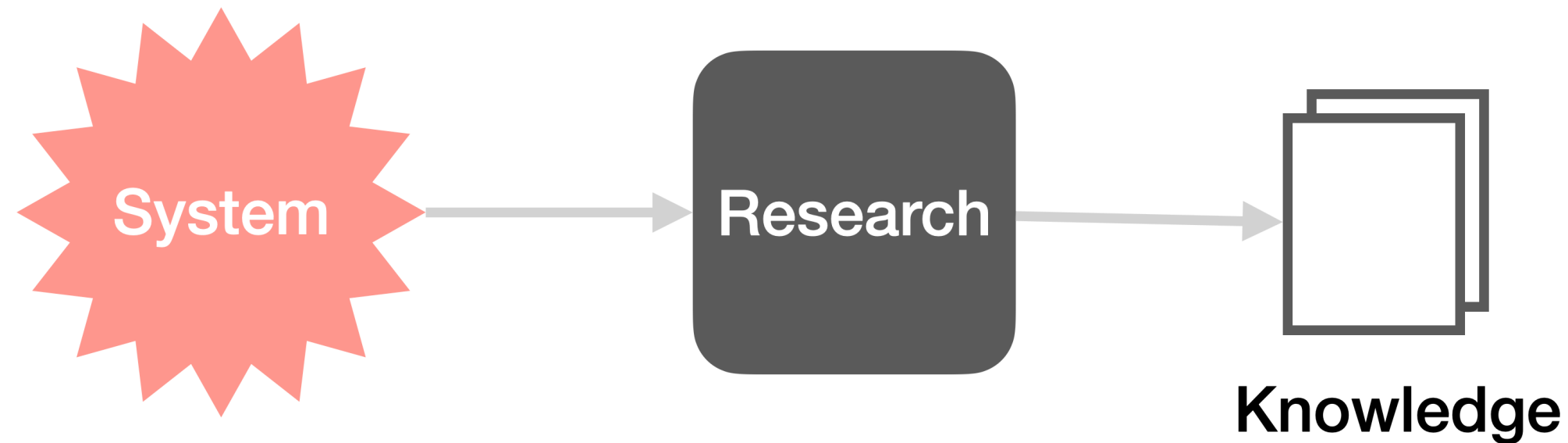
⁵ A Note from the UIST 2021 PC Chairs

Systems Research vs. Engineering

Is systems research merely engineering?

No, it is not merely engineering, but engineering is needed.

Similar to design-based research.



Assignment

- » Understanding HCI Contribution Types & Research Methods
 - » Handout on Canvas
 - » Complete individually
 - » Due next Wednesday