

# 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 Contributions<sup>1</sup>

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

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<sup>1</sup>Wobbrock & 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

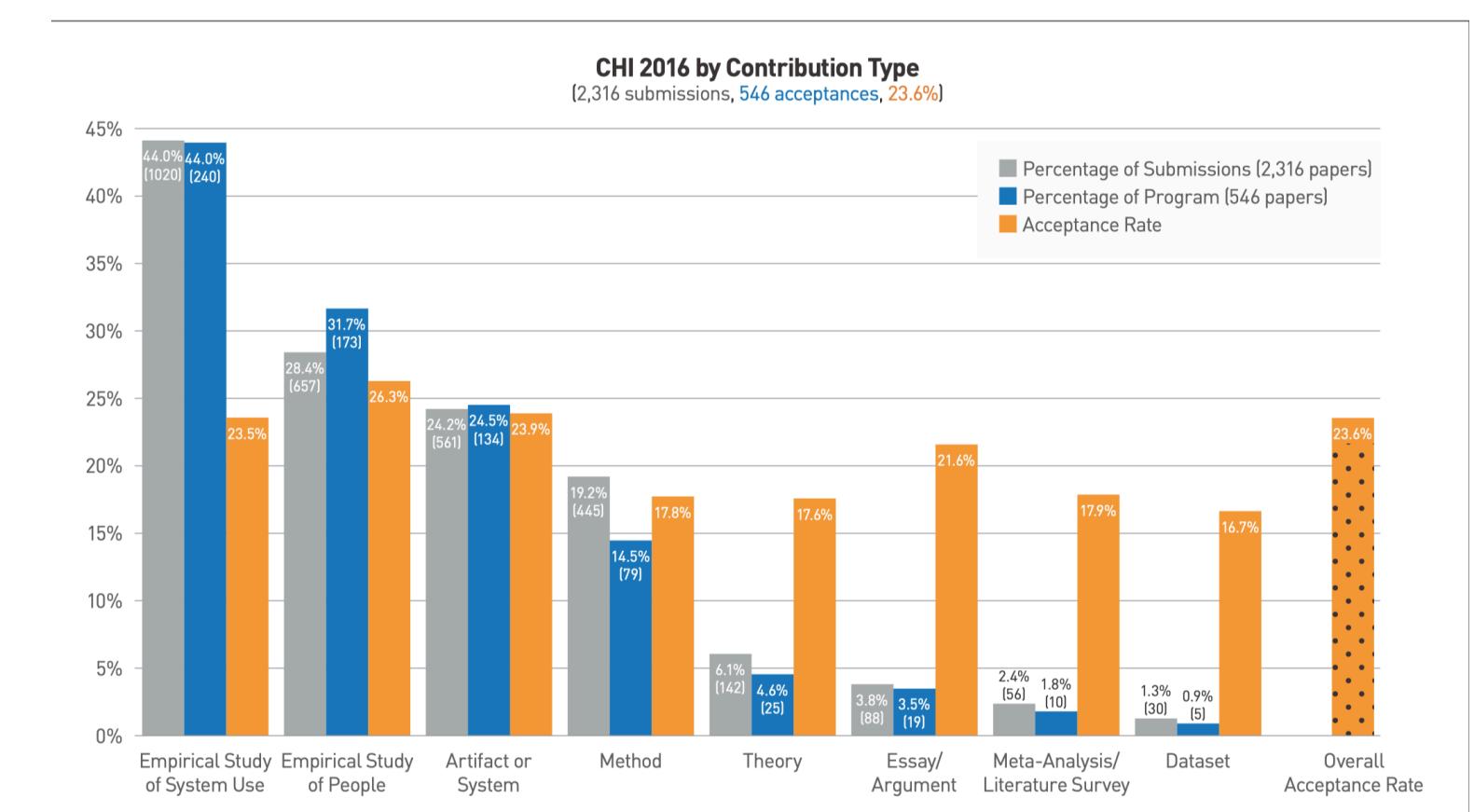
- » Techniques
- » Emerging topic
- » Tools
- » Domain
- » Technology

# 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.**

<sup>1</sup>Wobbrock & 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?*

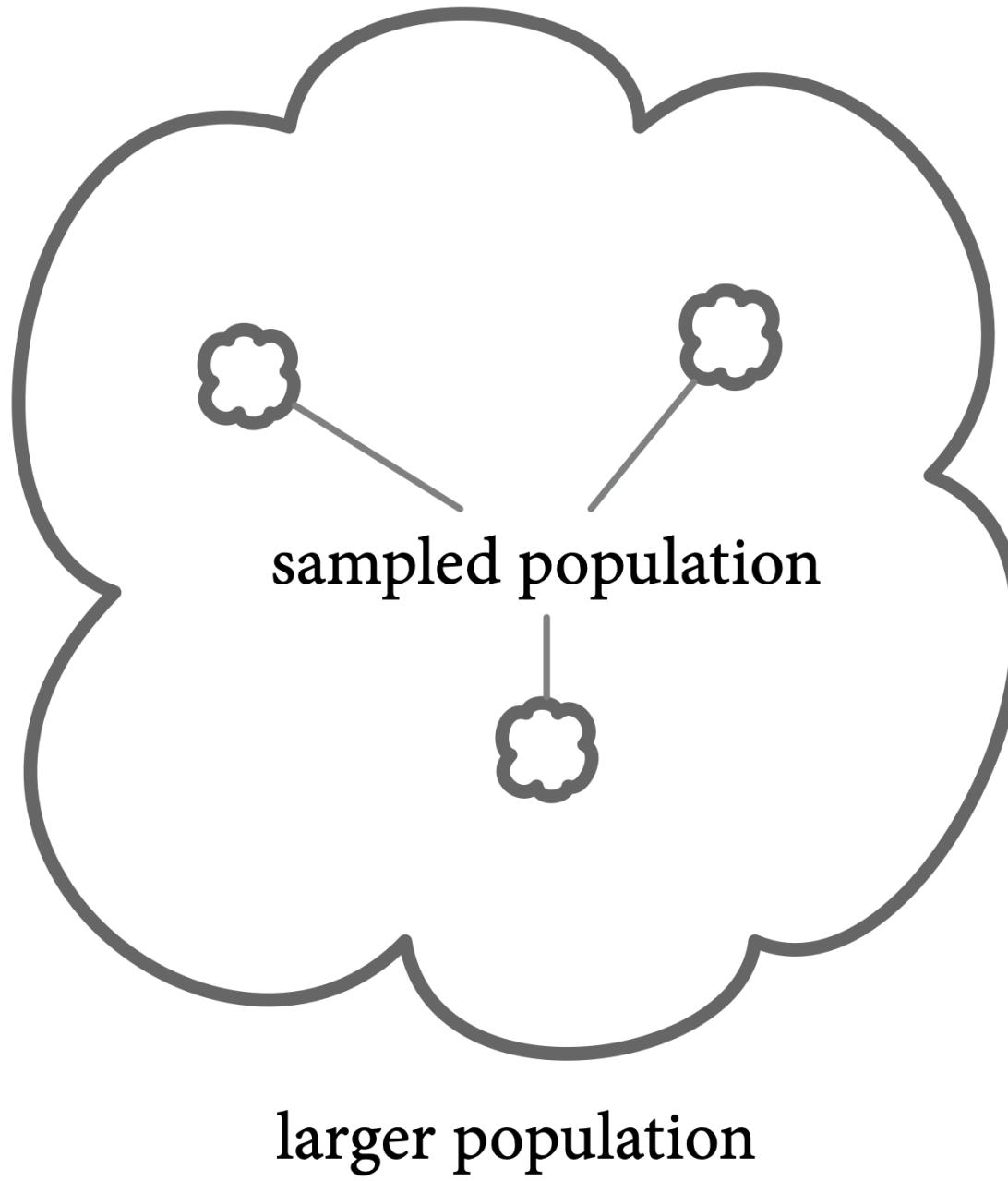
**Representation:** How does particular actors affect particular situations under particular circumstances?

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

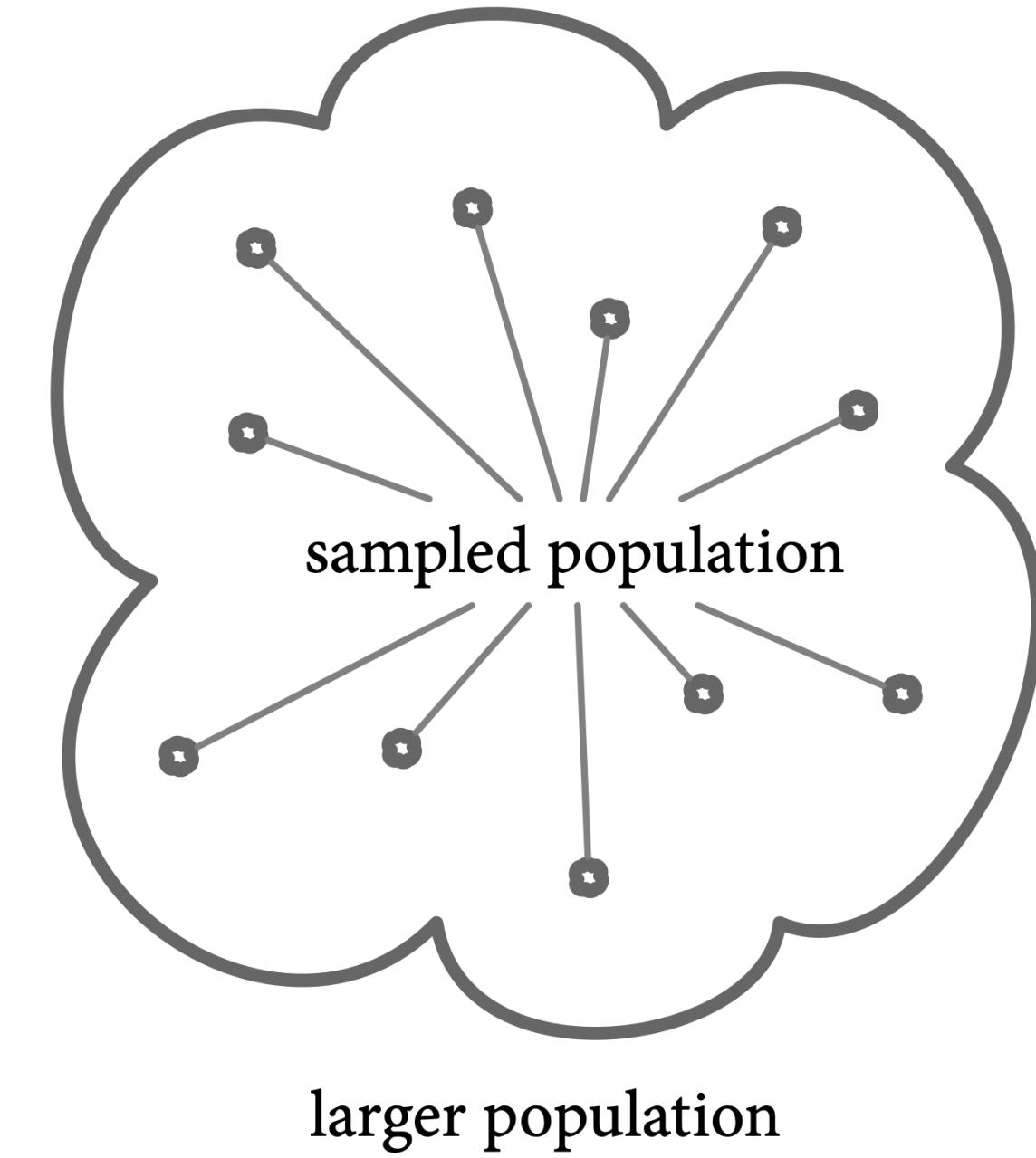
**Generalization:** Are the findings from the sample applicable to the larger population?

» 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

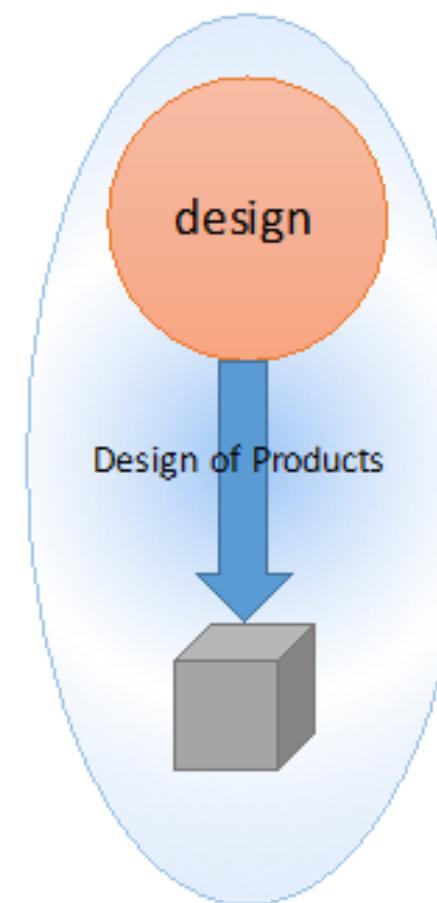
**Research for design:** Carrying out research to inform the design of a product or service.

*research → design*

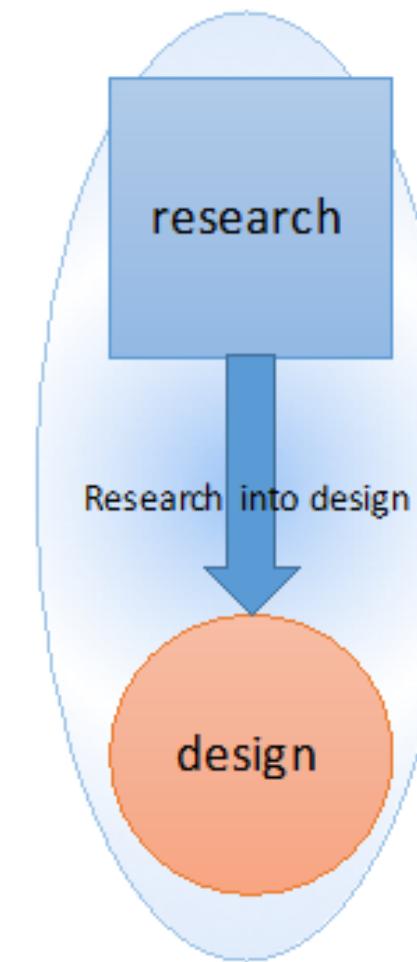
**Research through design:** Carrying out design to create knowledge about phenomena.

*design ≈ research*

# How should we think about design and research?<sup>2</sup>



conventional design creating products



research about design methods

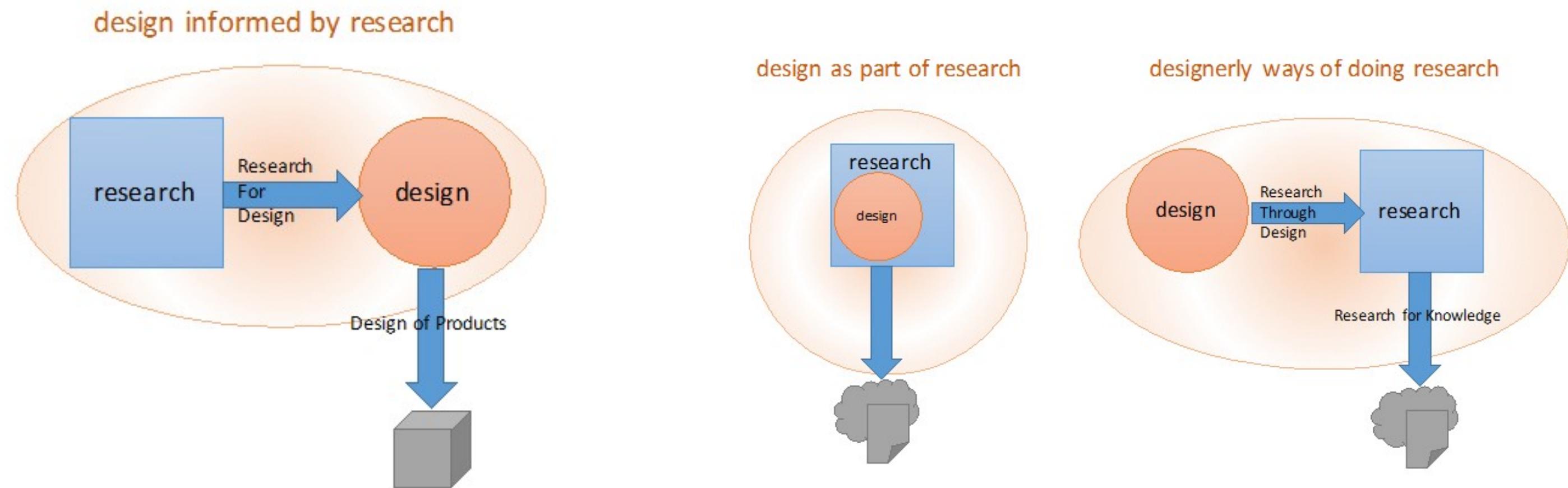


conventional research creating knowledge

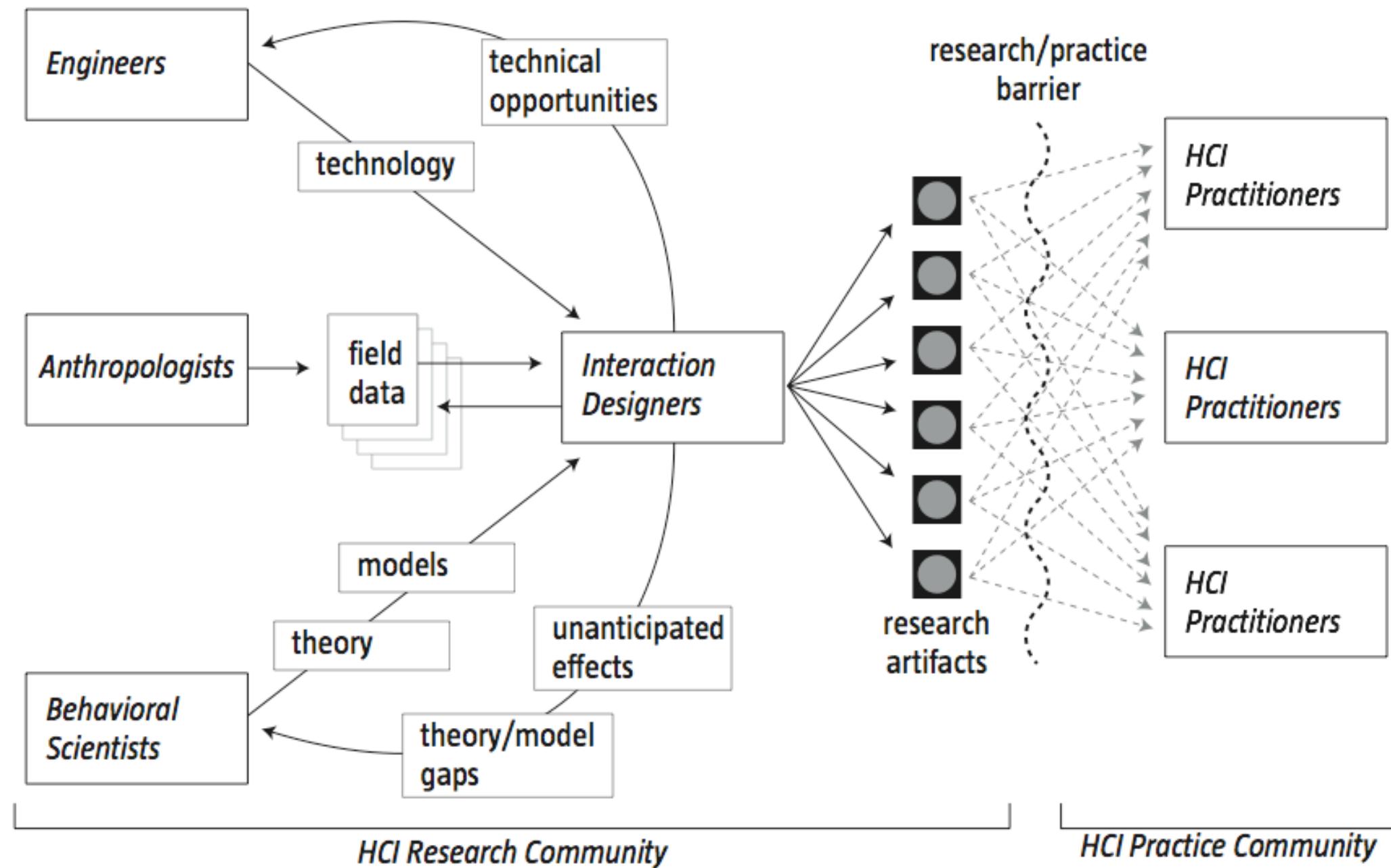
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<sup>2</sup> Stappers & Giaccardi, 2014

# What is the relationship between design and research?<sup>2</sup>



<sup>2</sup> Stappers & Giaccardi, 2014



<sup>3</sup> Zimmerman et al., 2007

# An Example<sup>4</sup>

*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.



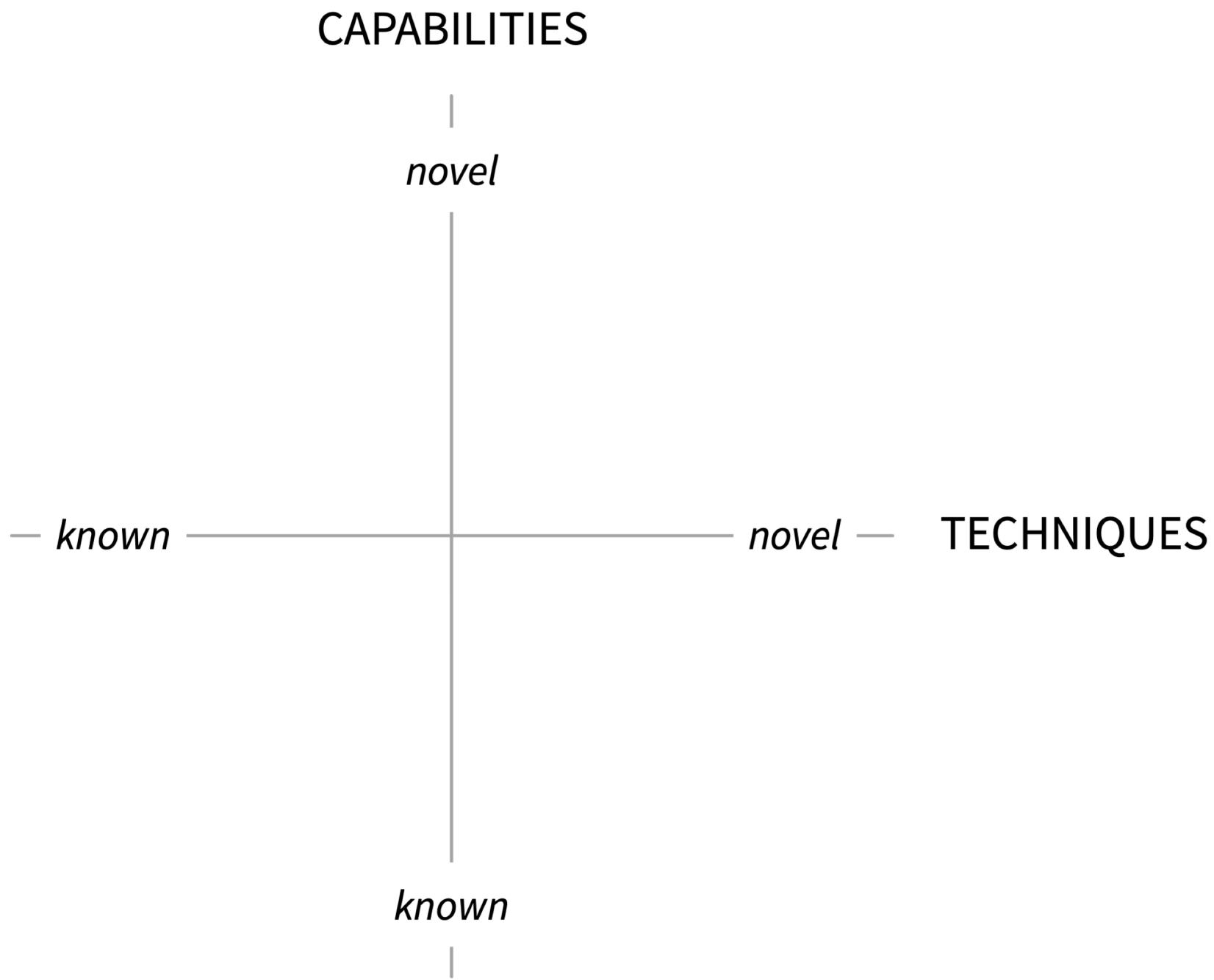
<sup>4</sup> Image source

# 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.

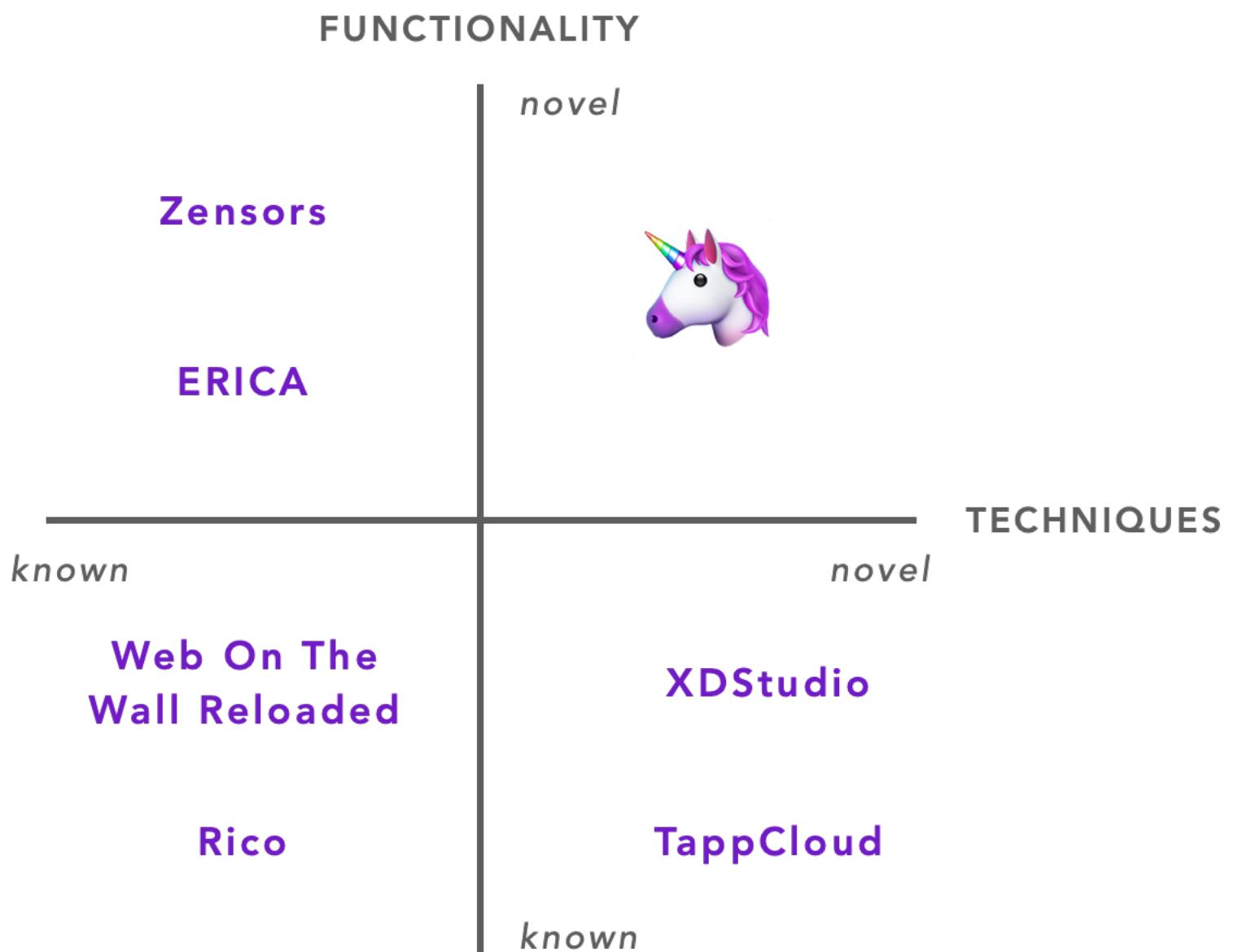
Contribution can be in techniques, which enable new systems, and capabilities, which enable new interactions.

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



# Examples<sup>5</sup>

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



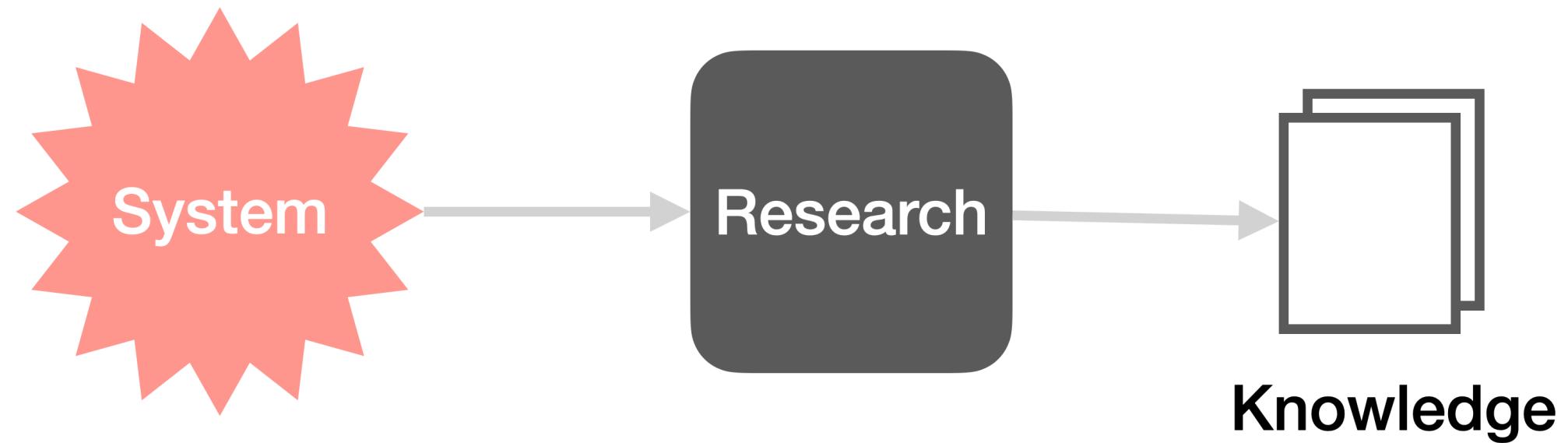
<sup>5</sup> A Note from the UIST 2021 PC Chairs

# 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