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[1]

1. Empirical contributions

2. Artifact contributions

3. Methodological contributions

4. Theoretical contributions

1. Dataset contributions

2. Survey contributions

3. Opinion contributions

[1] Wobbrock & Kientz (2016)

Types of HCI Contributions: Empirical

» Interview study

» Diary study

» Quantiative 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

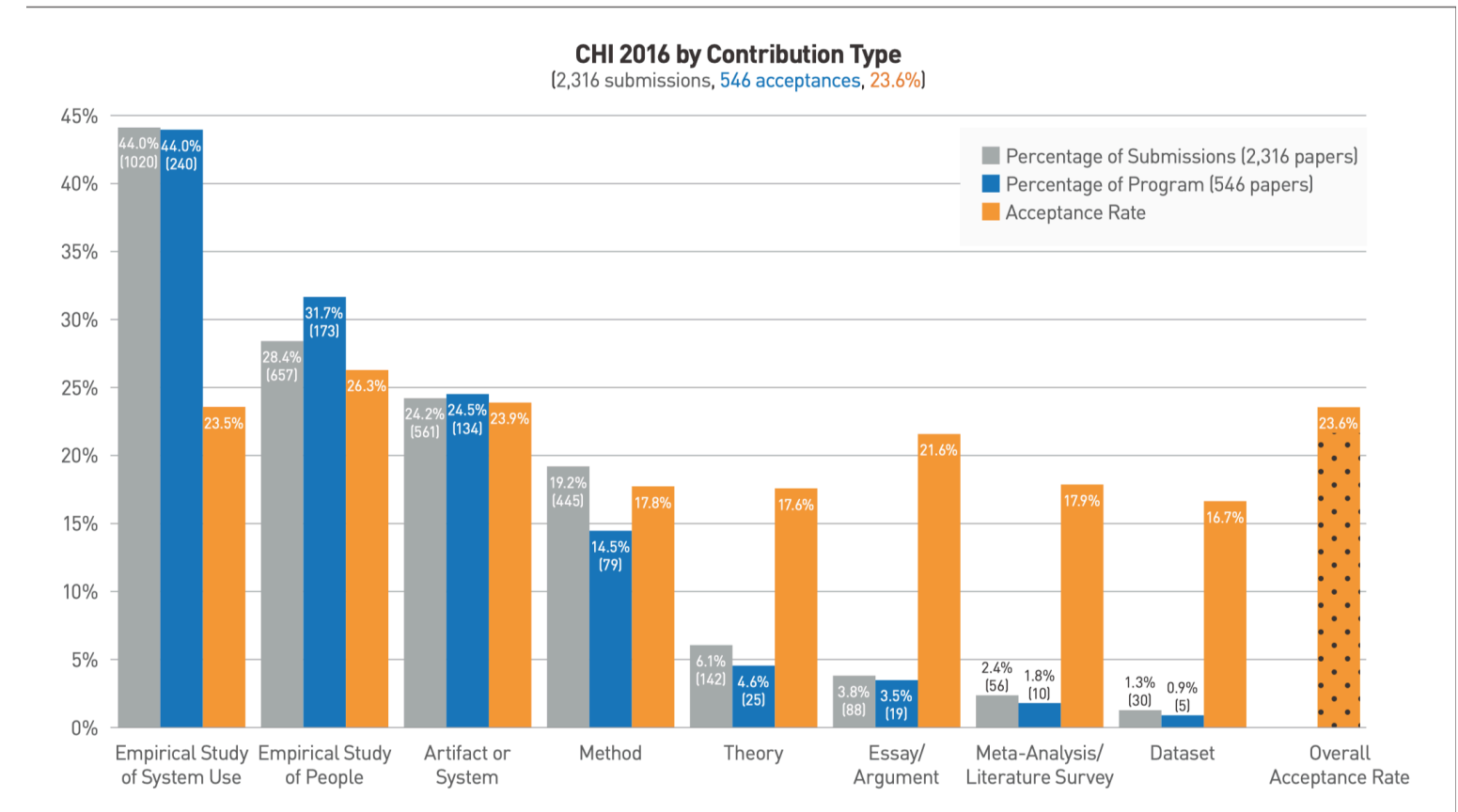Essay / argument

→ Table 3. Contribution types for CHI 2016.

CHI 2016 by Contribution Type
(2,316 submissions, 546 acceptances, 23.6%)

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

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*

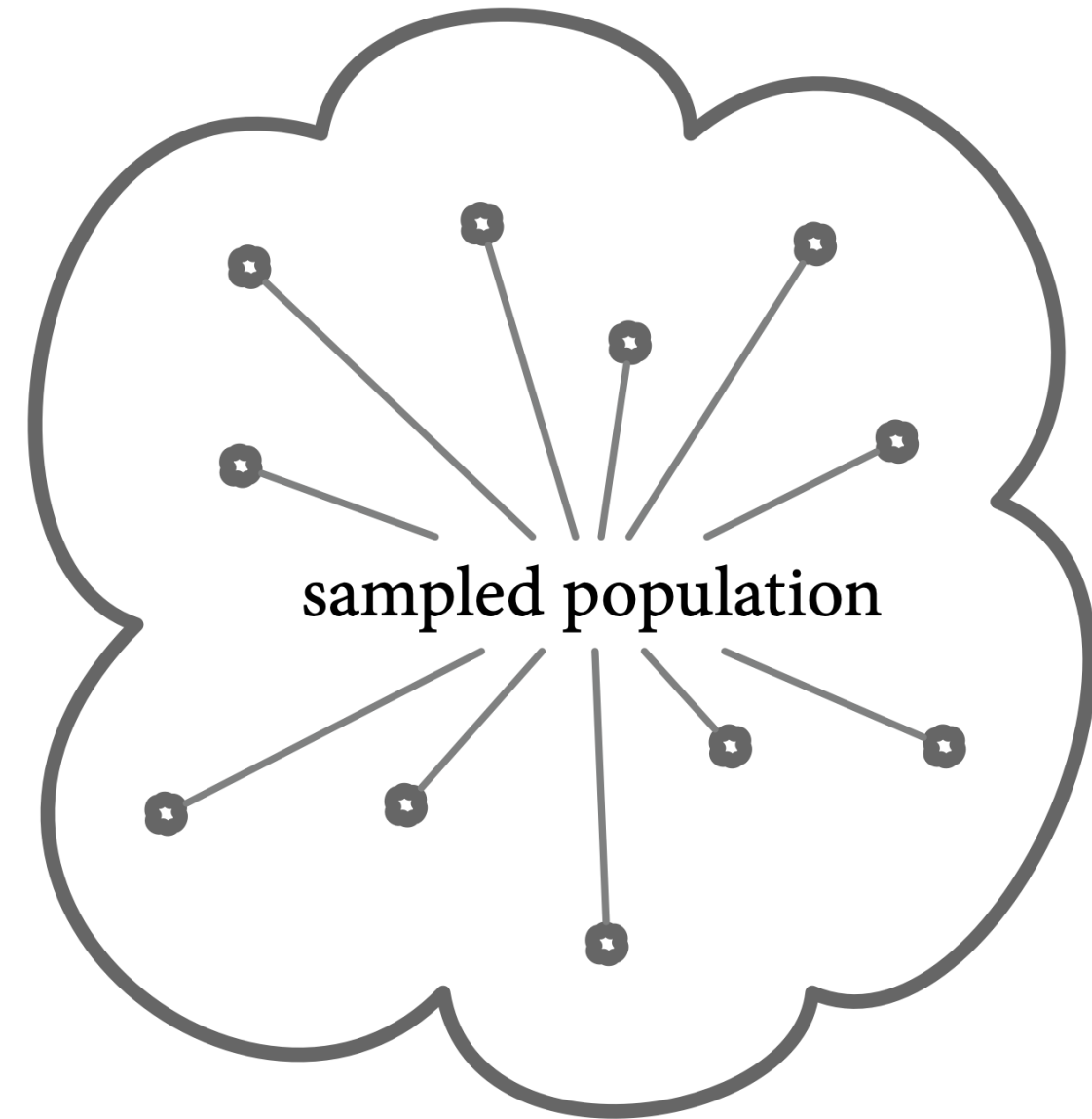**Generalization**: Are the findings from the sample applicable to the larger population?

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

Representation

Generalization

sampled population

larger population

sampled population
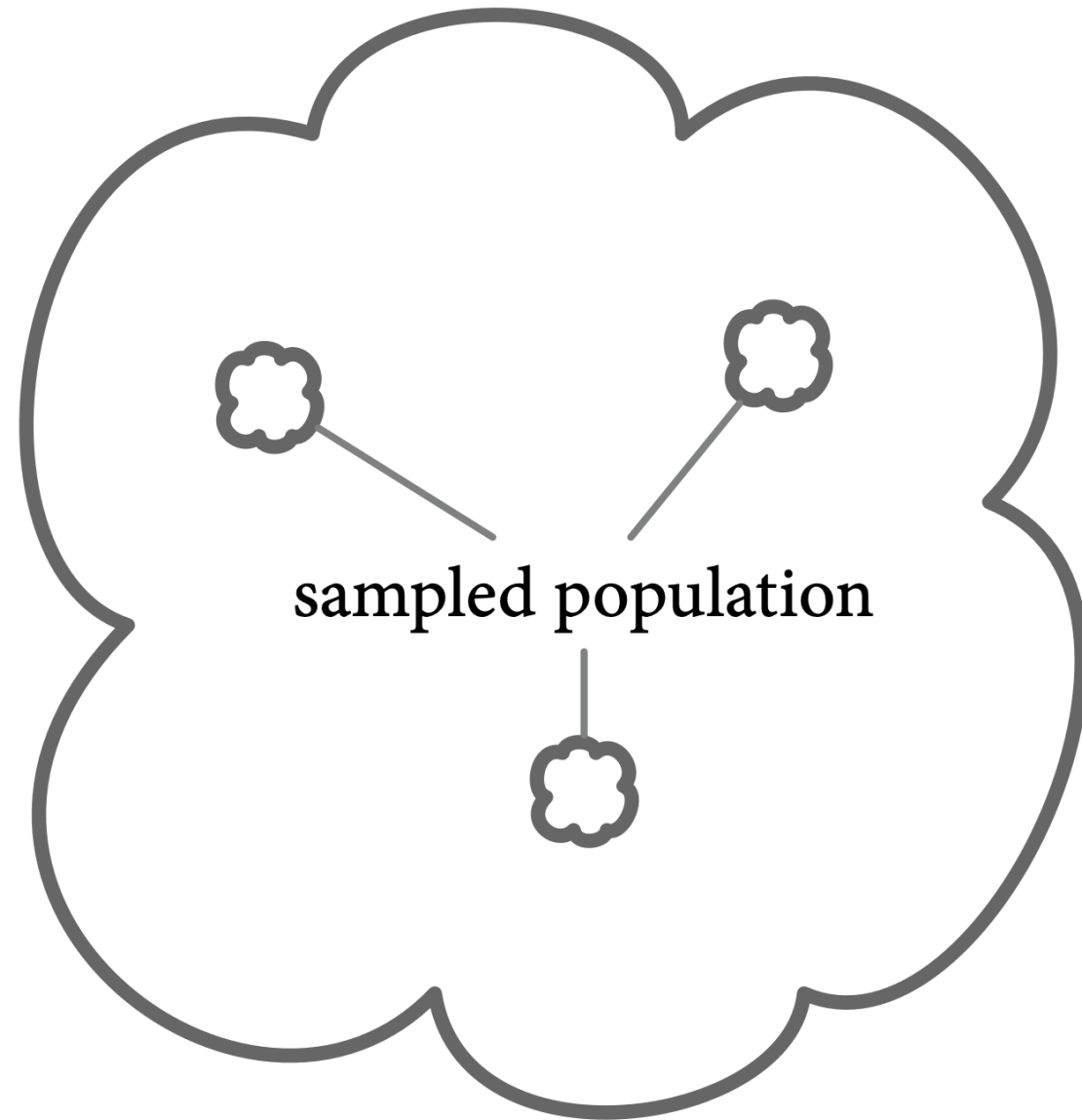
larger population

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
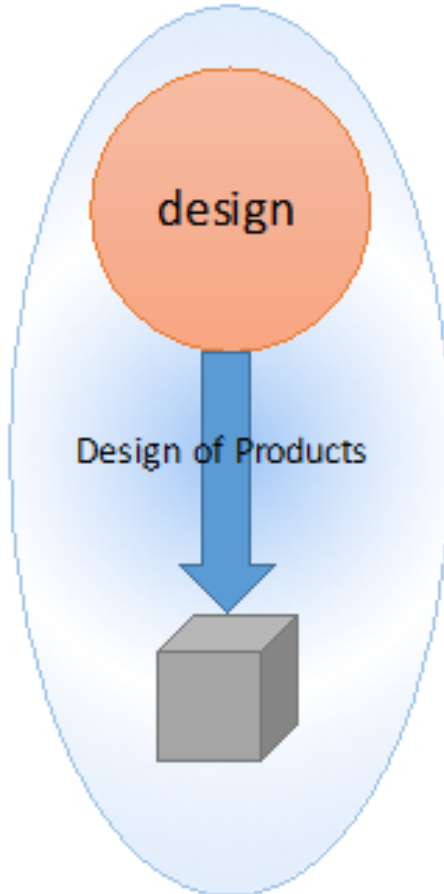
Key Concepts in Design-Based Research

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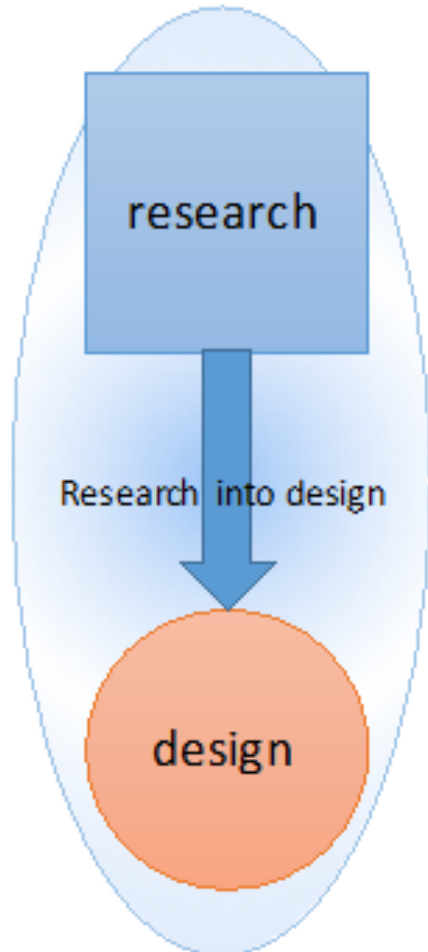
research → design

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

design ≈ research

How should we think about design and research?[2]
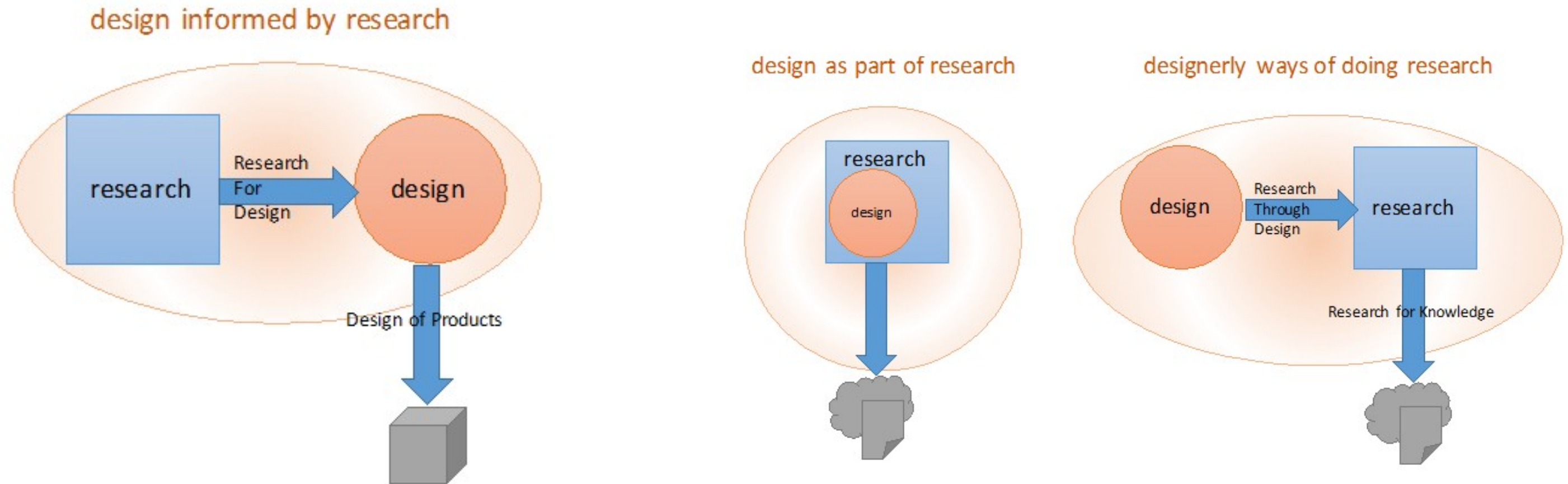

conventional design creating products

research about design methods

conventional research creating knowledge

[2] Stappers & Giaccardi, 2014

What is the relationship between design and research?[2]

design informed by research

research — Research For Design → design

Design of Products

design as part of research

research / design

designerly ways of doing research

design — Research Through Design → research
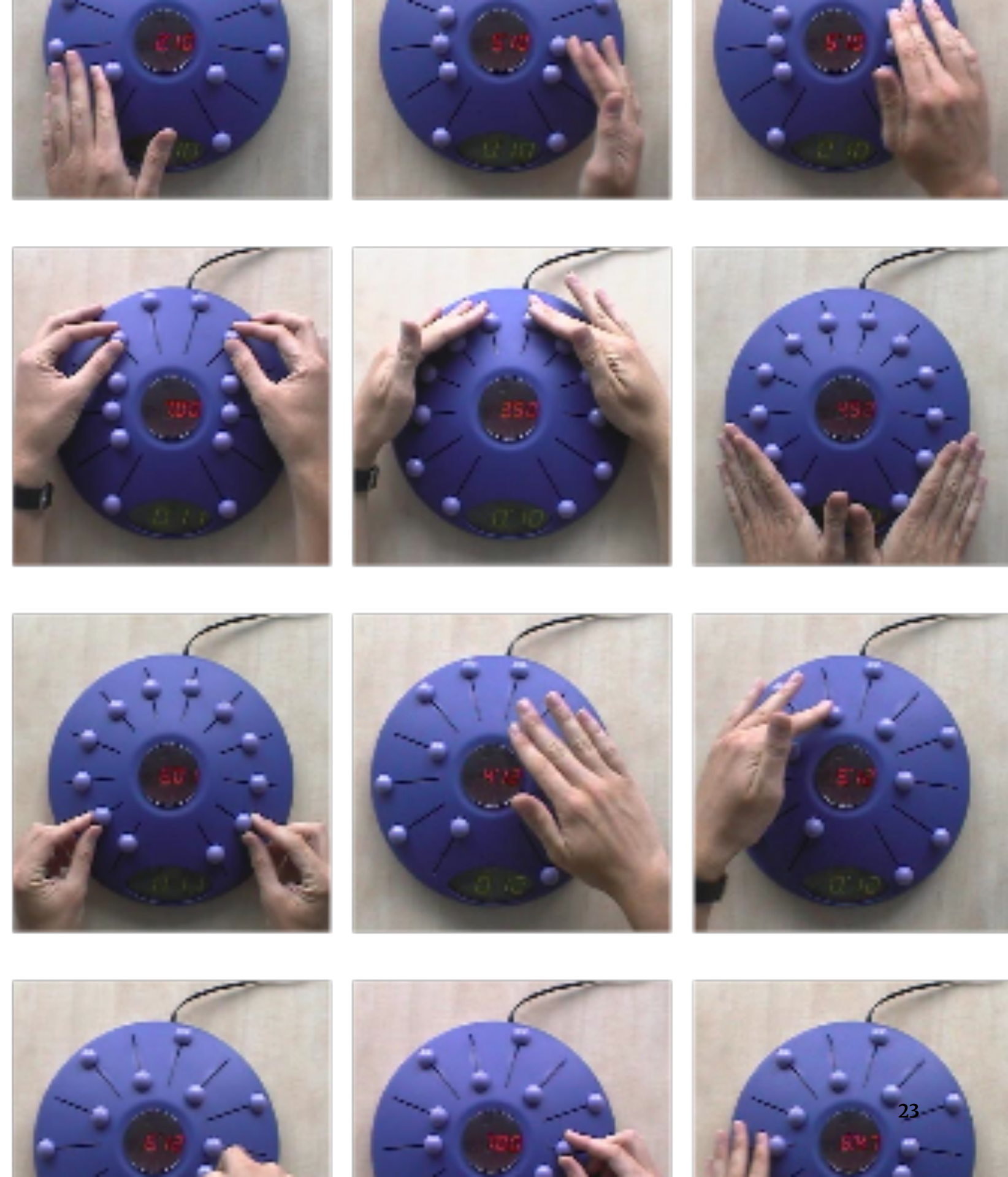
Research for Knowledge
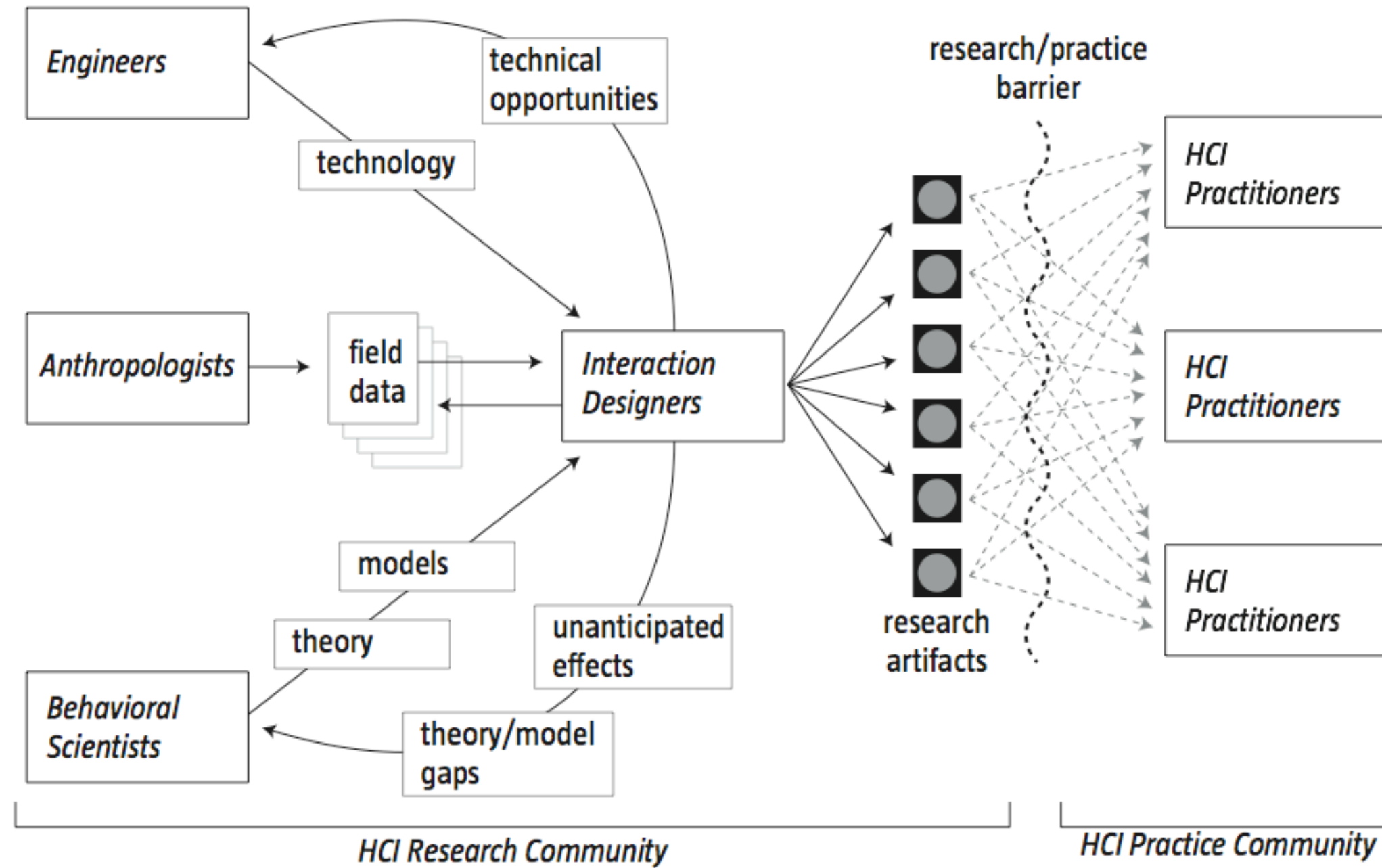
[3] Zimmerman et al., 2007

An Example[4]

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.

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[4] 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.
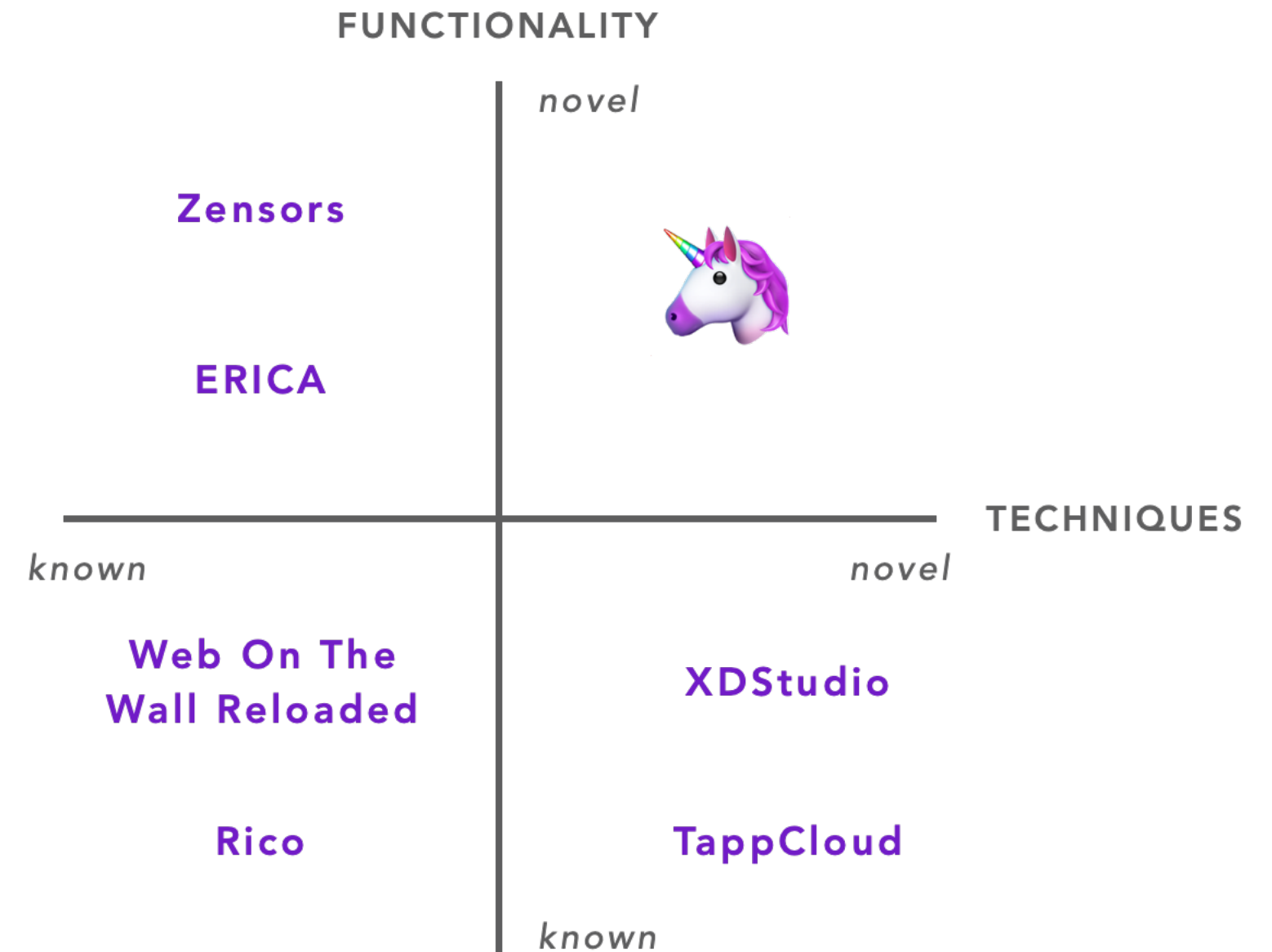
Contribution can be in techniques, which enable new systems, and capabilities, which enable new interactions.

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

CAPABILITIES

novel

— *known* ———————————— *novel* — TECHNIQUES
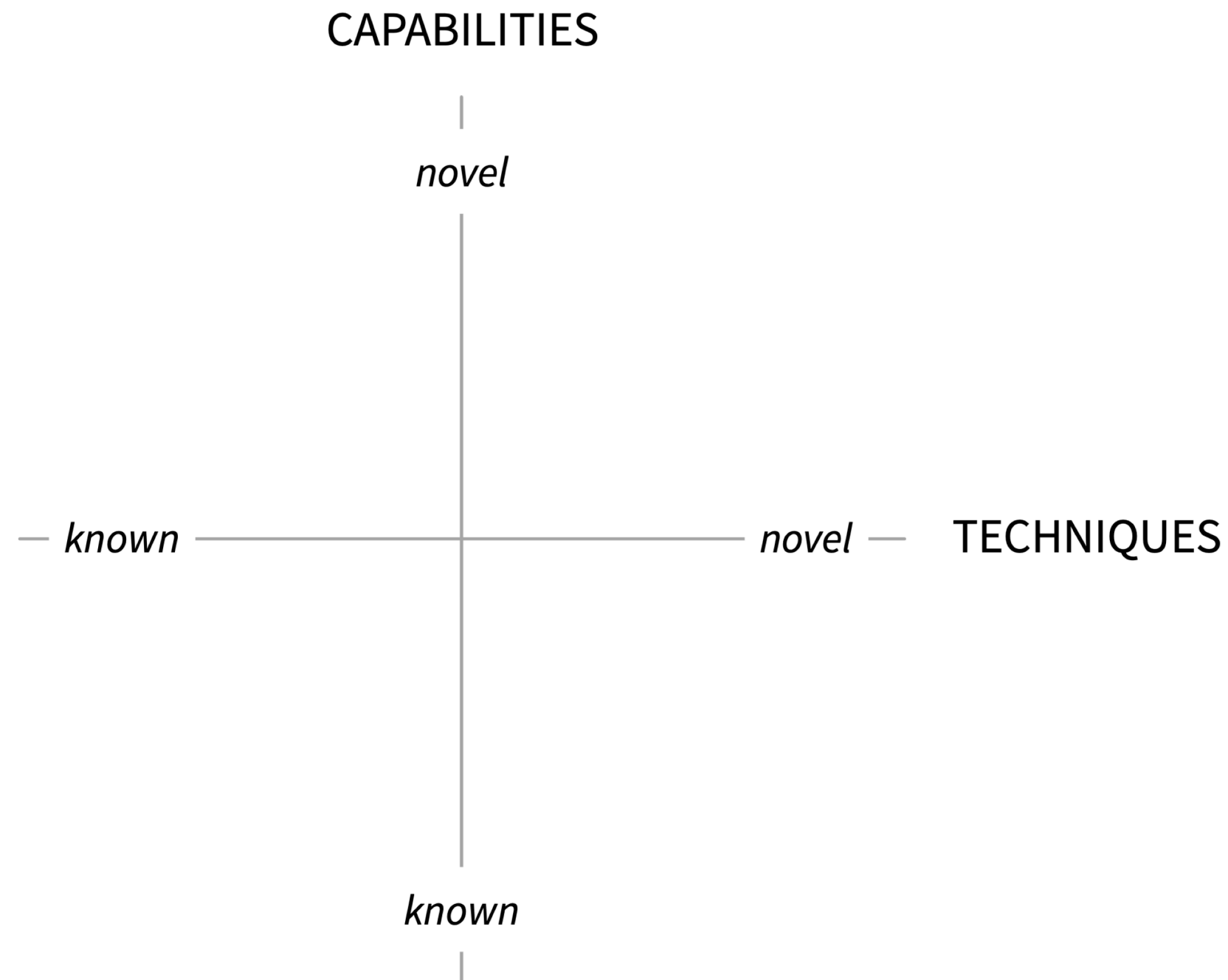
known

Examples[5]

» Novel capabilities using known techniques

» Known capabilities using known techniques

» Known capabilities using novel techniques

» Novel capabilities using novel techniques 🦄

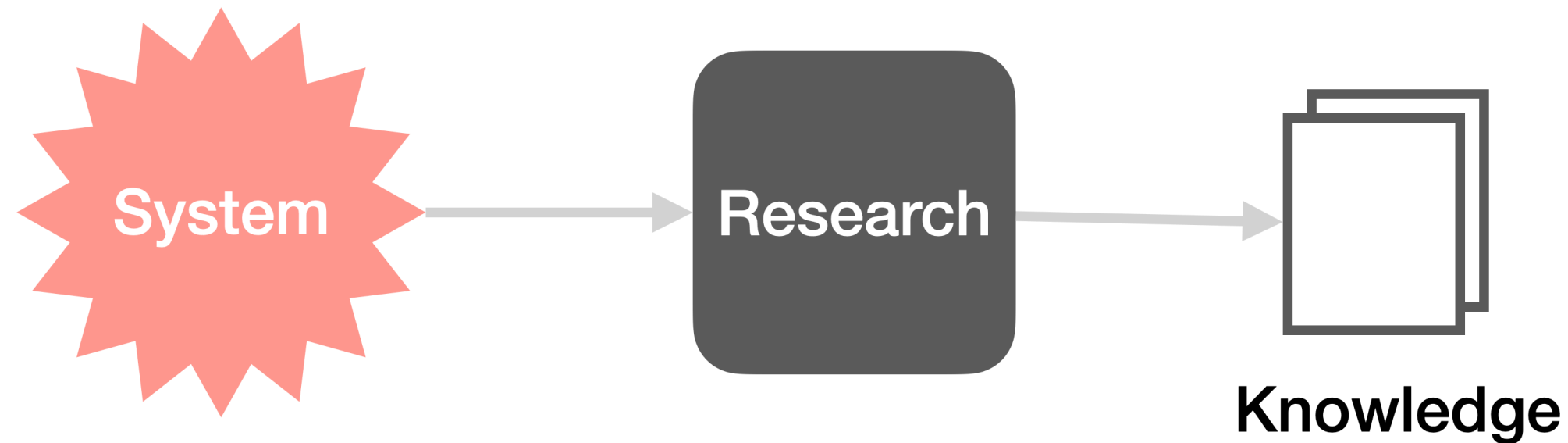**FUNCTIONALITY**

novel

Zensors

🦄

ERICA

known · *novel* **TECHNIQUES**

Web On The Wall Reloaded

XDStudio

Rico

TappCloud

known

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[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.

System → Research → Knowledge

Hands-on Activity[6]

Understanding HCI Contribution Types & Research Methods