IN4MATX 232: Research in HCI

Class 4:
Research Methods Used in HCI

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Notes

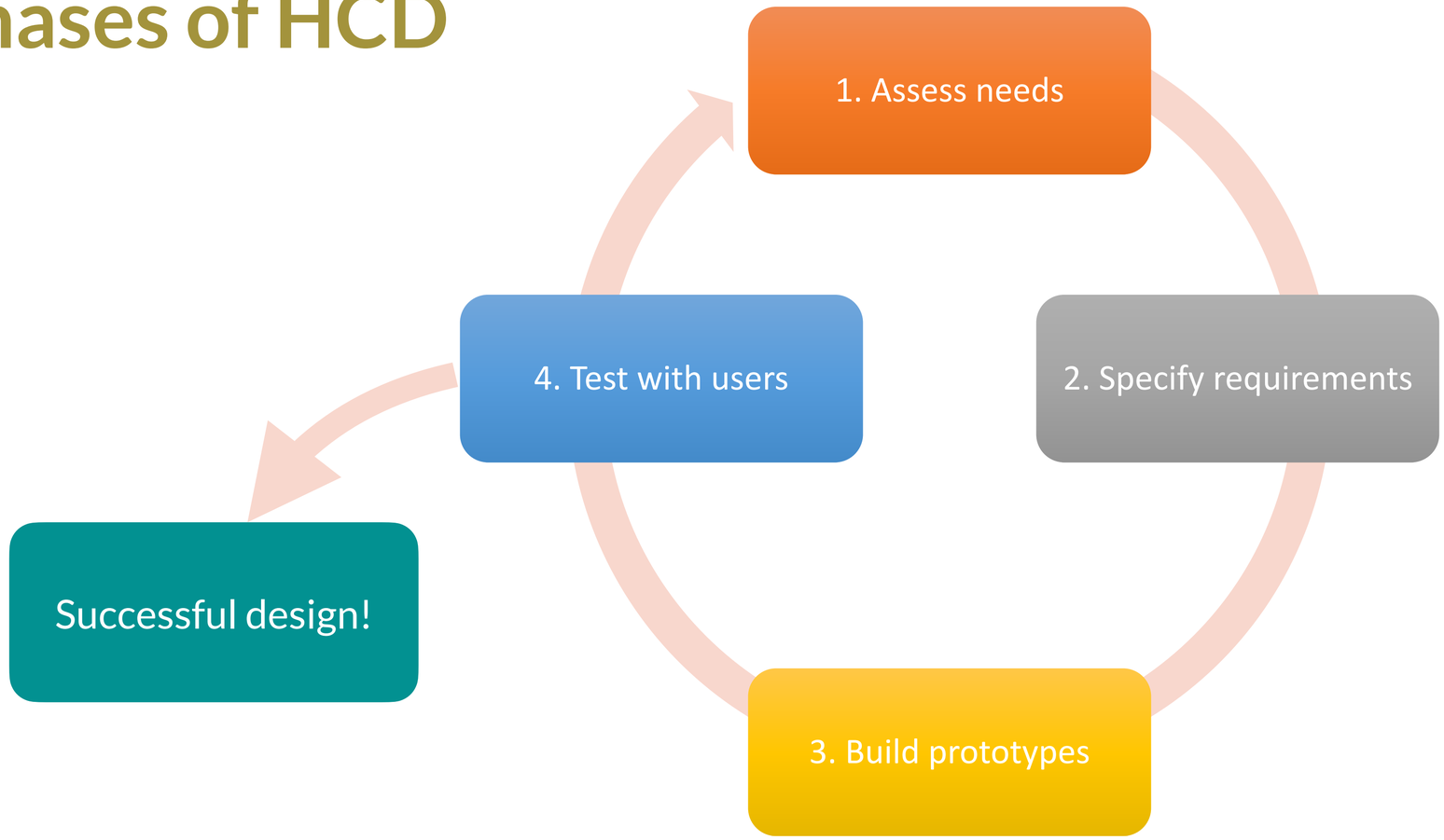
- This accidentally turned into a class on Research through Design, Log Analysis, and Technical HCI, but that wasn't really the intent
- The intent was to introduce the breadth of methods in HCI research, and have a discussion about them prior to diving into specific research topics
- So, bring up whatever questions you have about HCI methods
- (My slides aren't very important today, I'd rather have a good discussion)

Disclaimer

- I have not used many of the methods we will talk about today
- Some of the methods are at the edge of my breadth of HCI knowledge
- As always this quarter, the goal is *appreciation* of different approaches and epistemological traditions

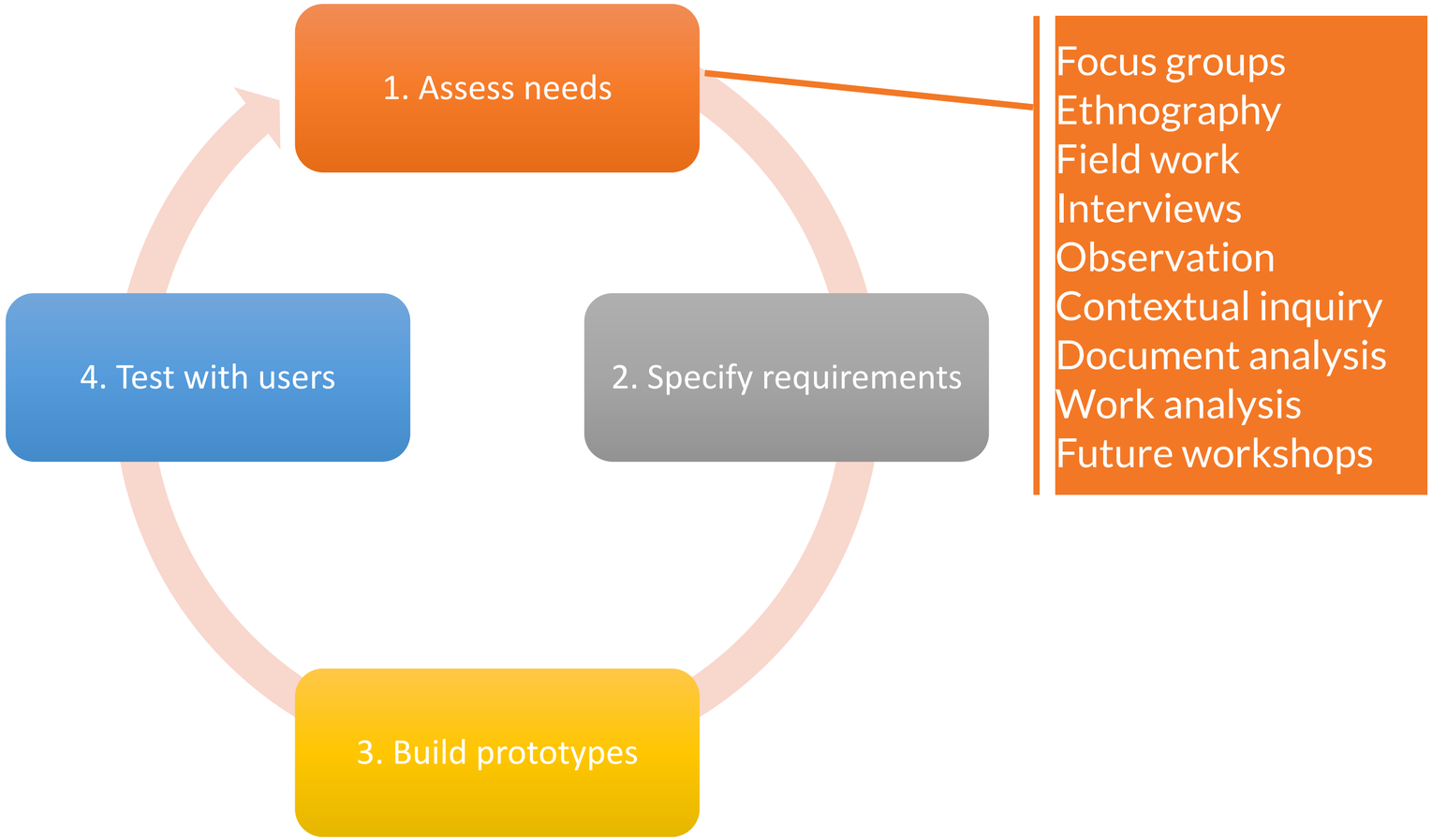
Applying Human-Centered Design

Phases of HCD



Applying Human-Centered Design

Phases of HCD



Applying Human-Centered Design

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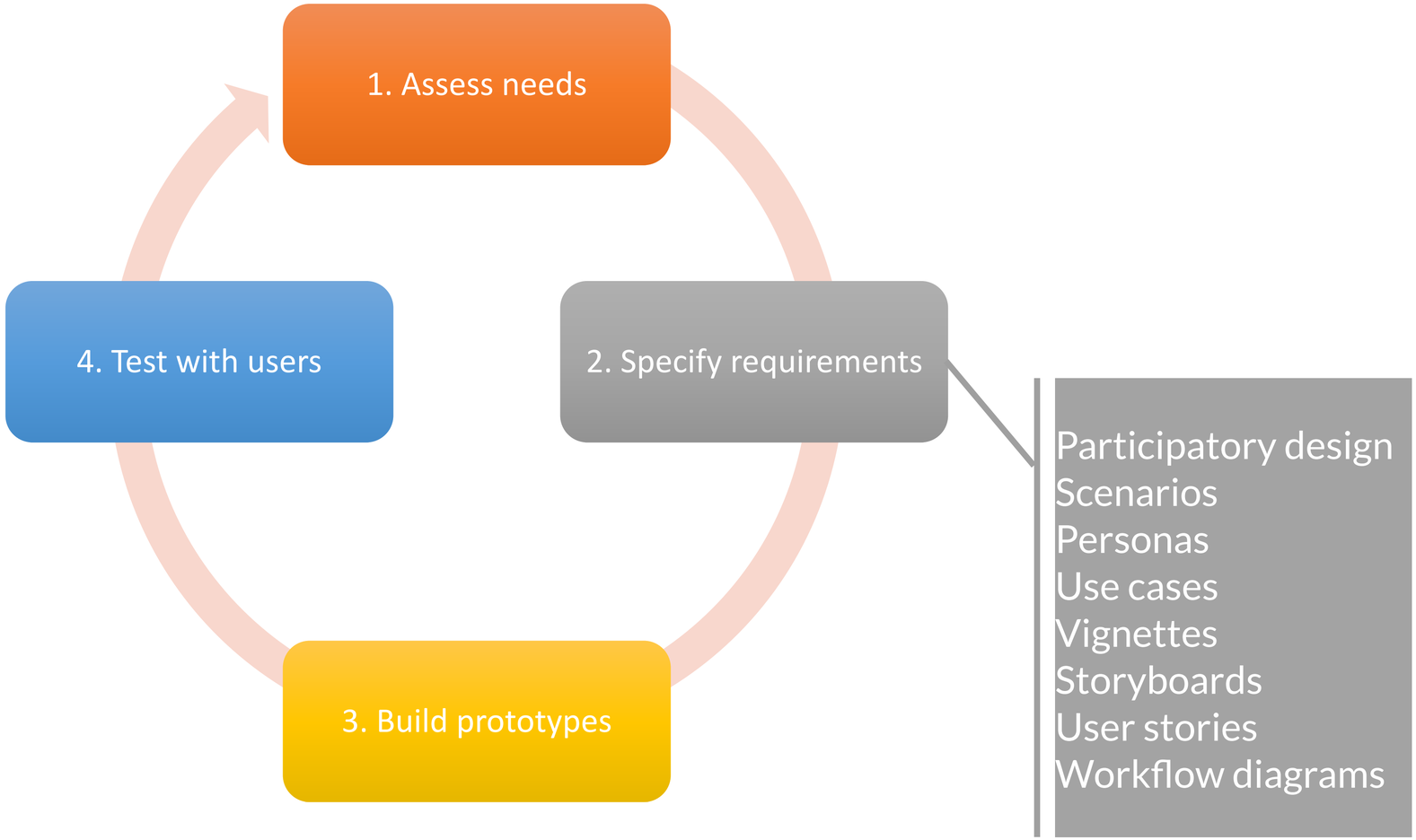

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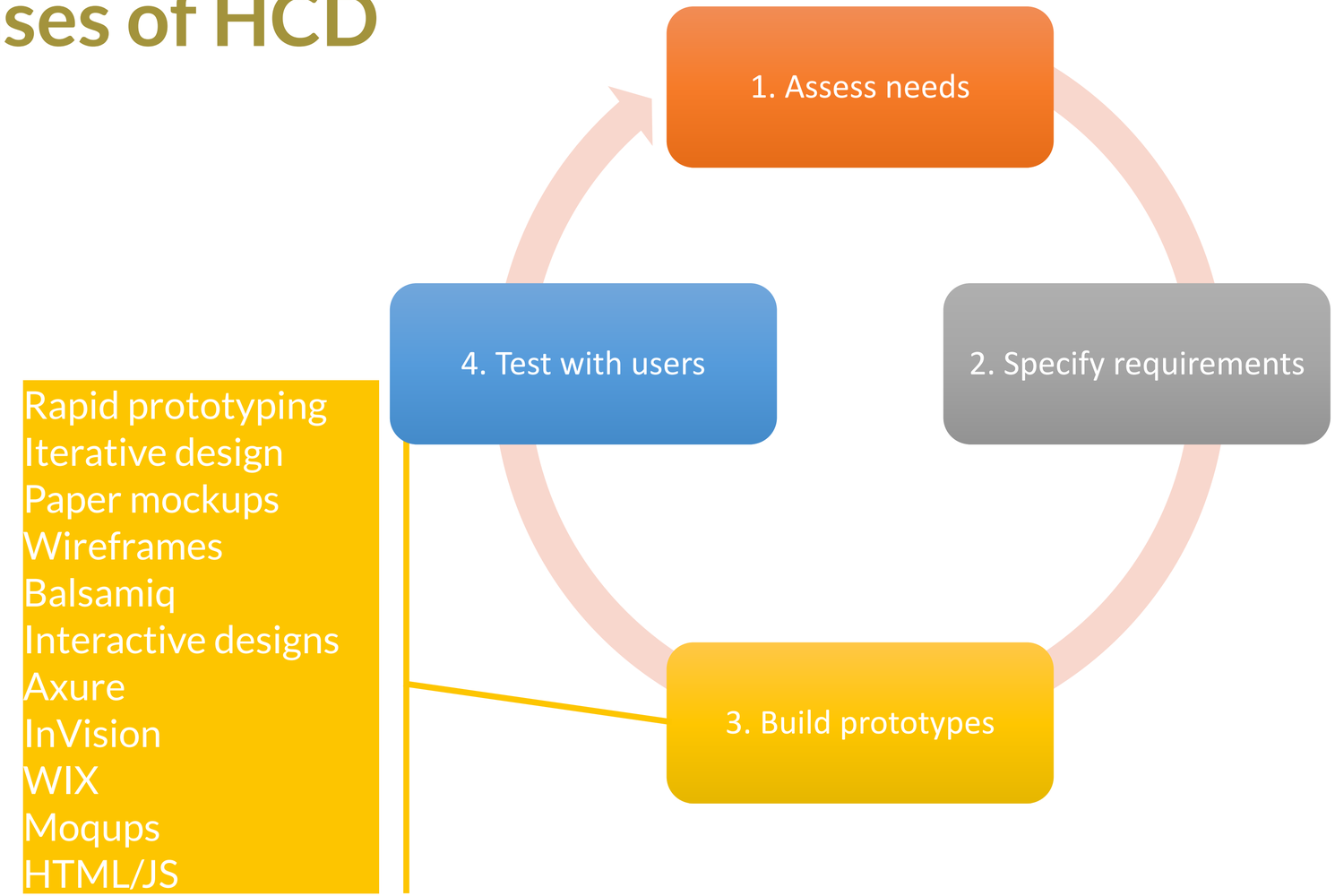

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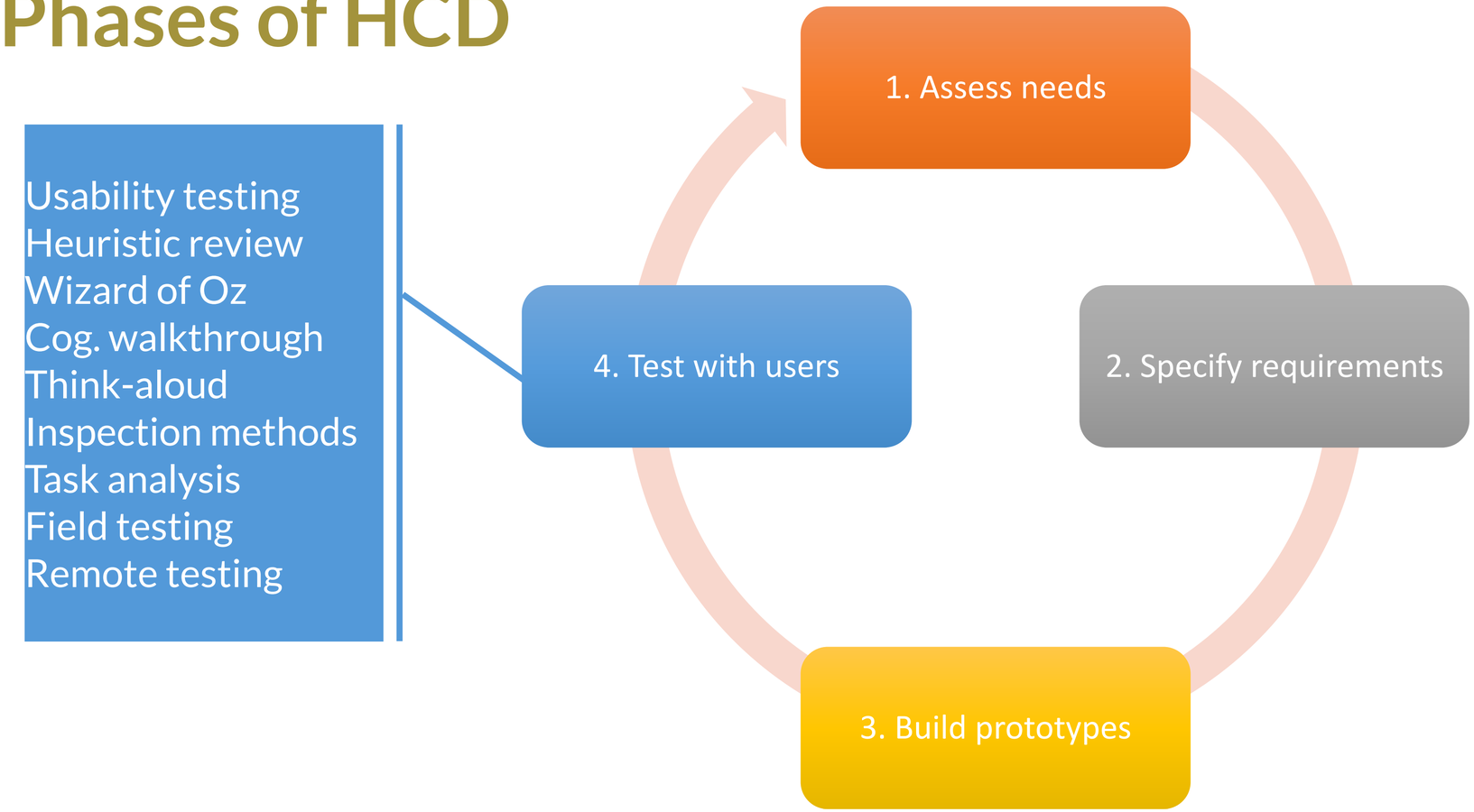


Types of empirical methods

Types of empirical methods

- We see both qualitative and quantitative methods frequently in HCI, as well as mixed-methods studies
- Qualitative work *tends* to be done for contributions earlier in the design process, while quantitative work *tends* to be done for contributions later
  - Needfinding interviews and surveys, evaluative experiments, use log analysis
- But there are many methods which break this norm
  - Heuristic evaluation, interviews at the end of a deployment

Log analysis

Log analysis

- Traces that capture and record user activity
  - Sensors, keystrokes, search queries, videos, audio…
- Importantly, these measures are *objective*, and in-the-wild
- Can you do a log study of a research system?
  E.g., one that is not publicly available?
  - Probably not, since there's bound to be researcher influence
  - Therefore, log studies primarily exist within or in collaboration with industry
  - But much of the principles apply in field studies or other methods

Log analysis

- One key component: you need to think about data quality
  - How are you going to collect the data?
  - How might you “clean” the data, and how do you differentiate intended from unintended “dirtiness”?
  - Are outliers events worthy of further inquiry, or ones which throw off your analysis?

Log analysis

- Important questions about ethics and consent
  - IRBs often argue that “the logs” are the objects of study, rather than “the people”. These kinds of studies often do not undergo IRB review
  - The research community is becoming increasingly skeptical that consent is given in these sorts of studies
  - One advantage is the results are highly aggregated, so there’s anonymity even if not consent

Technical HCI

Technical HCI

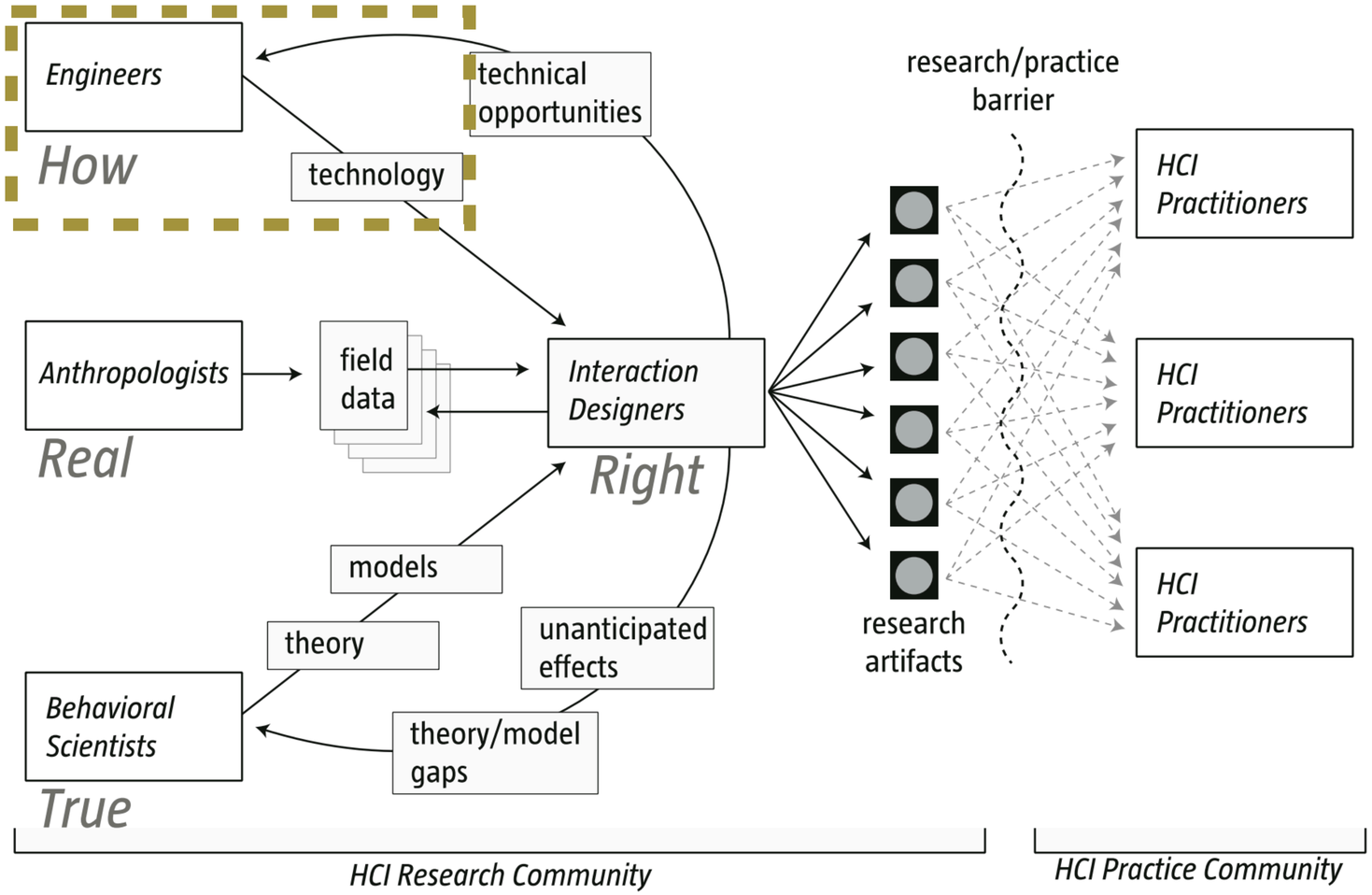


Fig. 5 Our model of research through design within HCI

Technical HCI

- Invention as discovery
  - Principles need to be reusable in some other format or for some other purpose
- Not development of product, where knowledge might not be reusable
  - E.g., how to implement something with a particular library or for a particular OS
- But, in developing, you will learn *something*. Then the challenge becomes articulating what you've learned in a way that's useful for others

Technical HCI

- Direct creation: there's a well-understood problem, your approach solves it
- Enabling research: your work makes it easier or more possible for someone to do creation work
  - Tools: make it easier to make a certain set of things
  - Systems: bring together capabilities which have not been combined before
  - Basic capabilities: advancing underlying technical problems which enable new inventions

Technical HCI

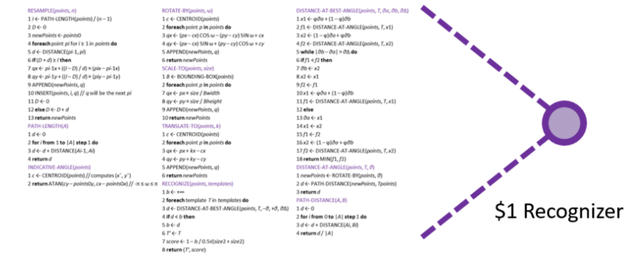


Figure 1: The $1 Recognizer's contribution closely corresponds to its code, allowing re-use of its solution to a technical problem.

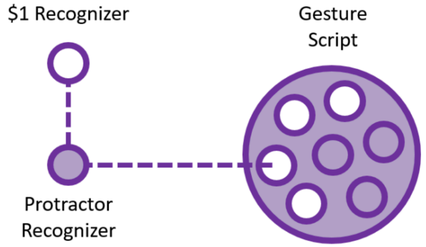


Figure 2: Protractor extends techniques introduced in the $1 Recognizer. It is therefore novel (i.e., filled), while also replicating and extending the $1 Recognizer (i.e., now shown as empty). Gesture Script then directly replicates Protractor as part of a larger system that also includes other components. Some of those are already known (i.e., are also empty), while some are novel (i.e., filled). The overall functionality presented by Gesture Script is also novel (i.e., the large circle is filled).

Figure 3: Interactive systems that include both novel functionality (i.e., the outer *what*) and novel techniques (i.e., the inner *how*) can often be motivated and validated in either contribution.

Figure 4: When underlying techniques are known (i.e., the inner *how*), the question is whether their combination in new functionality is a significant contribution (i.e., the outer *what*).

Figure 5: When applied in known overall functionality (i.e., the outer *what*), the question is whether implications of novel inner techniques are a significant contribution (i.e., the inner *how*).

(i.e., introducing novel outer functionality and then novel inner techniques required to achieve that functionality). At the scale of a paper, validation can often focus on either the outer circle (i.e., the *what*) or the inner (i.e., the *how*). Researchers therefore have flexibility in deciding what to highlight. Individual reviewers may prefer novelty with regard

https://homes.cs.washington.edu/~jfogarty/publications/workshop-chi2017-codeandcontribution.pdf

Technical HCI

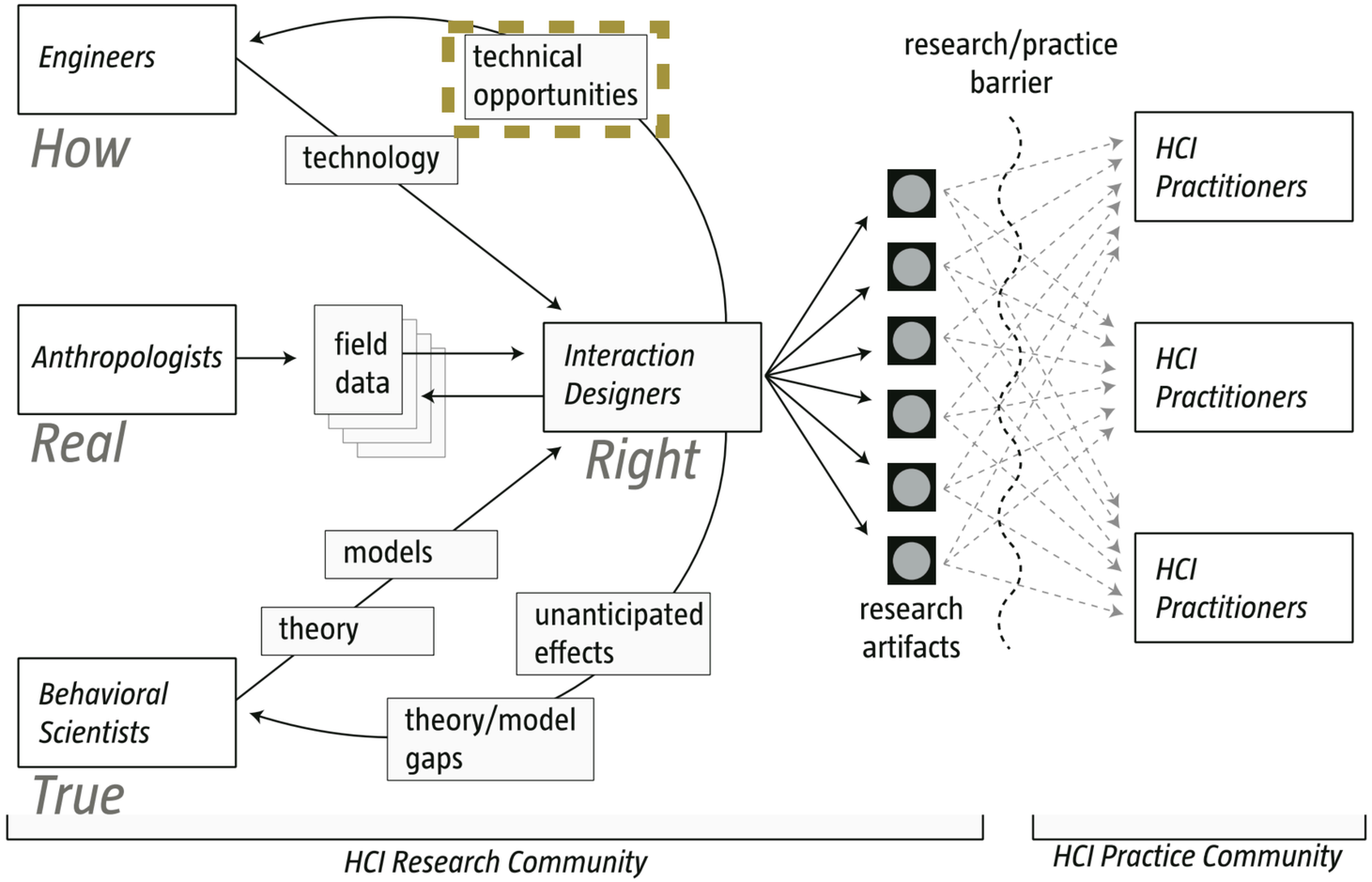
- Validation: building a proof-of-concept
  - You might not formally evaluate it
  - “Does it work?” Becomes “Does it work *well enough*?”
  - But they argue this is bad, since it requires a clear problem space etc.
- It may be valuable to validate with humans, such as in a usability test, but only when it serves the research goal
  - E.g., when the argument is, “this thing we built is more usable”

Research through design

Research through design

- Sometimes, we need the *thing* before we can have the *theory*
  - We needed a sketch-like tablet before we could name direct manipulation
- Research through design provides a method for creating these things
- Inherently speculative, trying to identify a better future

Research through design



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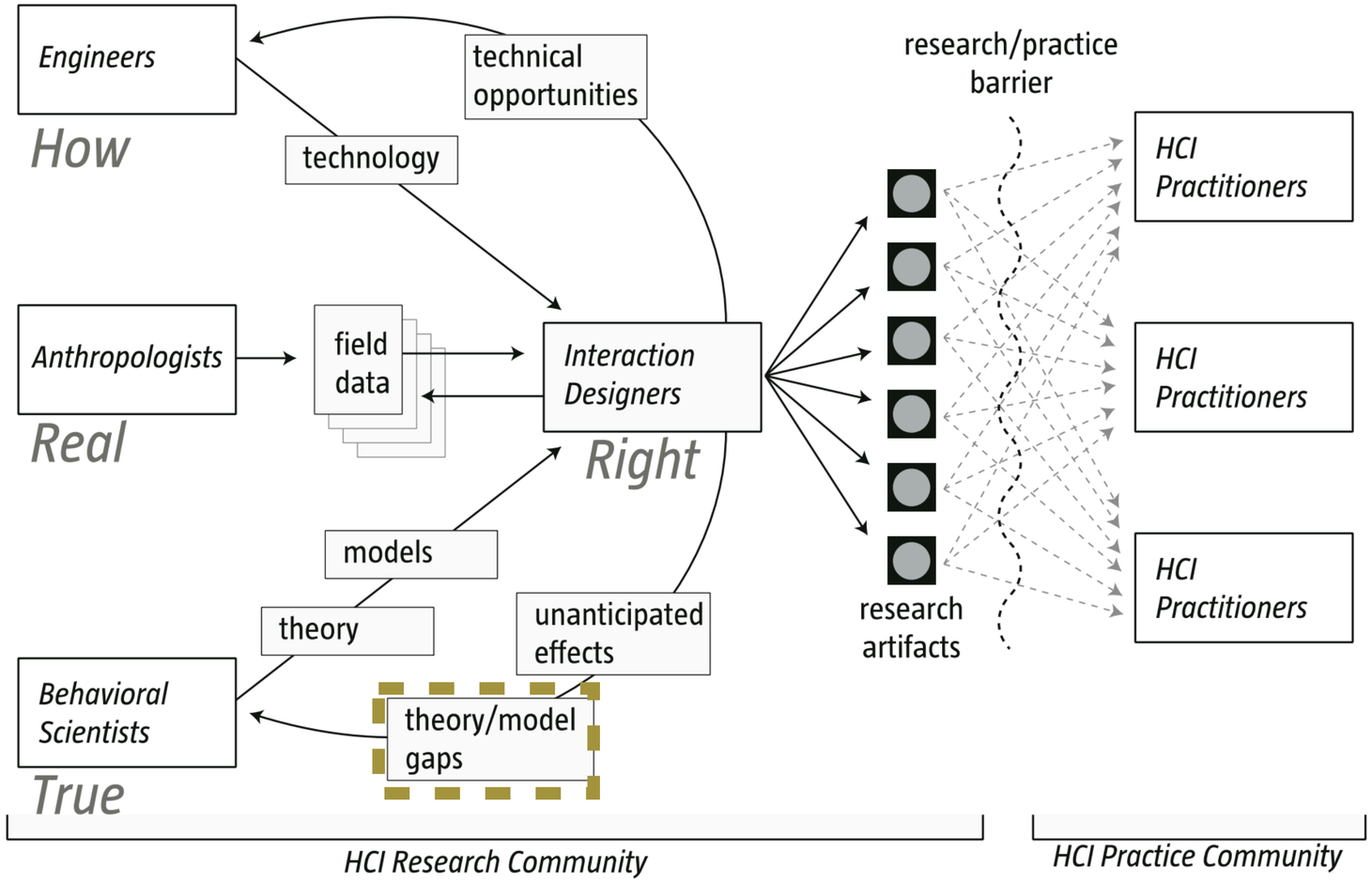
Research through design



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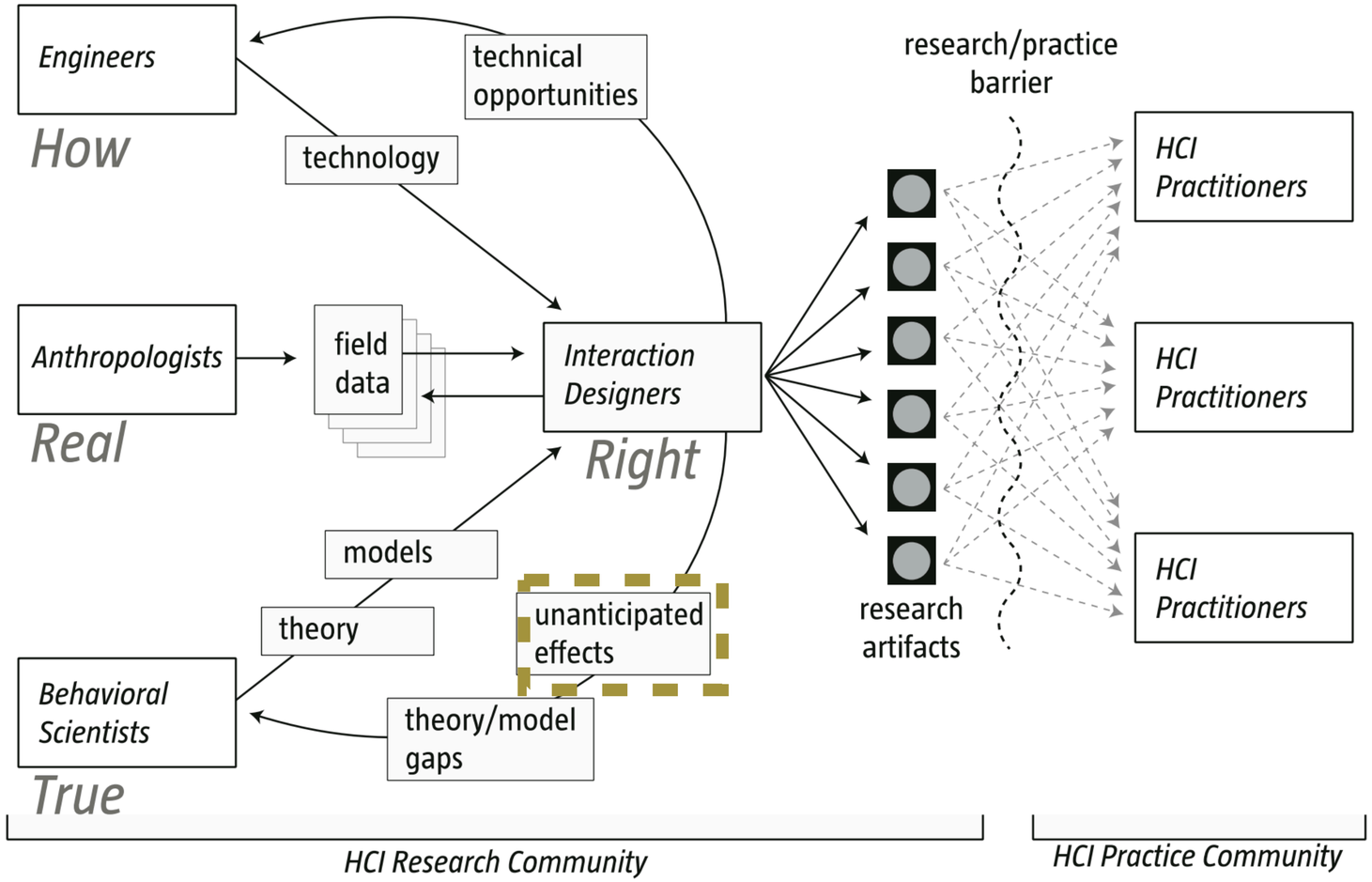

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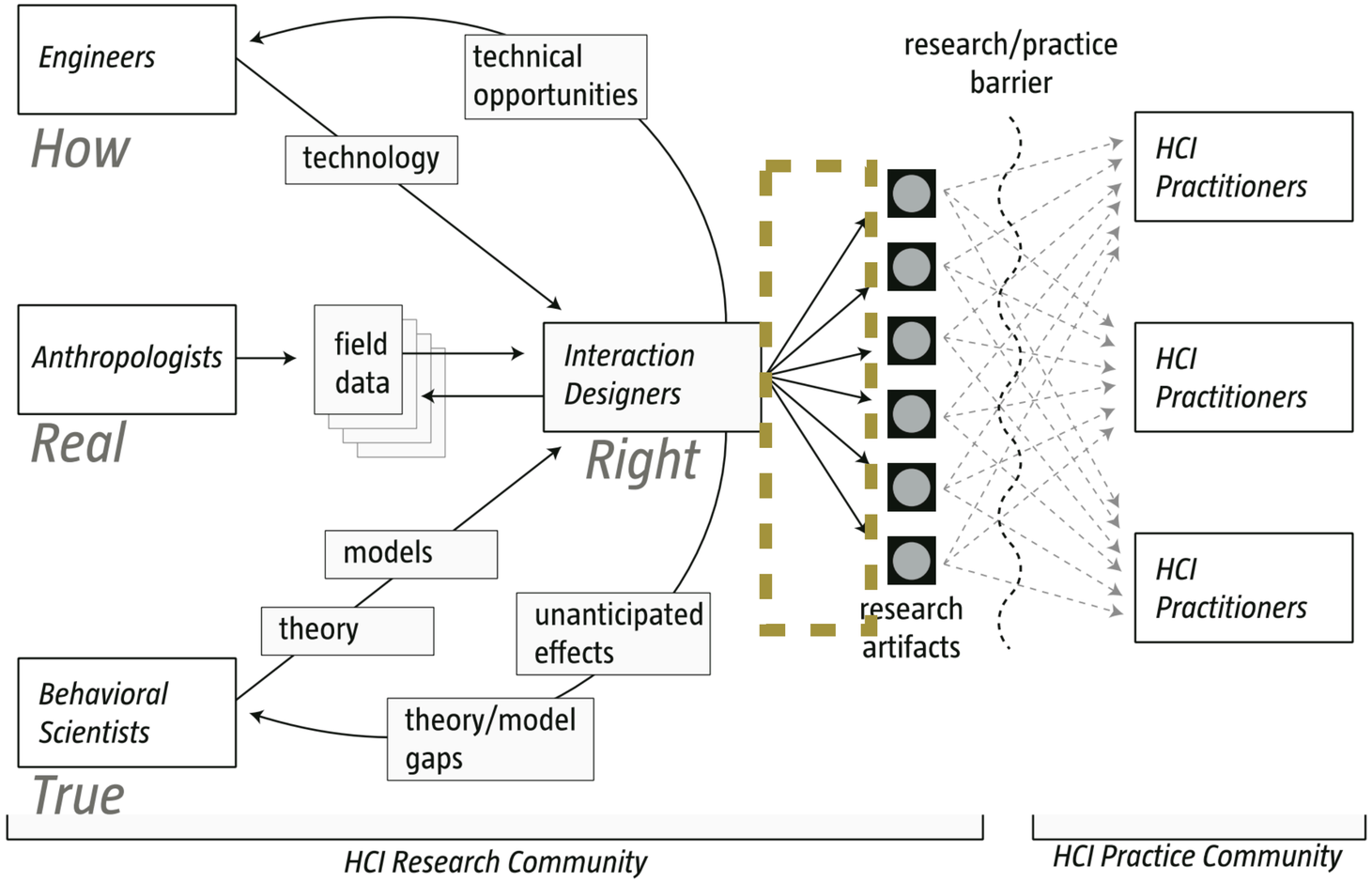

Fig. 5 Our model of research through design within HCI

Research through design

- Level of polish: high enough fidelity that they can be evaluated in their intended environment

- At the point of evaluation, tends to inherit other research empirical methods like observation, interviews, etc.

Methodological division by subcommittee

Methodological division by subcommittee

- Given methodological expertise…
  - How are reviewers assigned?
  - How do you know which subcommittee will recognize your work?
- It’s messy and socially constructed, insiders know how to play the game
  - And hopefully I can impart some of that knowledge this quarter
  - Most HCI scholars only submit to a one or a few subcommittees

Other things

Other things

- Human factors: deeply ergonomic. HCI for plane cockpits, submarines, NASA mission administrators, etc.
  - As these were among the early people using computers
- Replicability: not that common within HCI.
  - Relates to last class, HCI tends to be a “breadth” field with few agreed-upon problems and questions

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