IN4MATX 231:
User Interface Design & Evaluation

Class 20:
HCD as a research method
and wrap-up

Daniel Epstein

Announcements

- Poster session: Wednesday, December 11 in DBH 5011

    - Setup 2:15, session 2:30-4:30

    - Open to anyone

    - Who has a monitor in DBH that they could temporarily relocate?

Announcements

- Final report: due end of the day Friday, December 13

  - Summarize your methods, what you learned in each stage, and how that impacted your design

  - Aim for slightly more formal than your component reports

  - Length flexible, write appropriate to your content

  - SIGCHI proceedings format

Today's goals

By the end of today, you should be able to…

- Differentiate how Human-Centered Design is applied in research and in practice

- Discuss some best practices for applying each stage of HCD in research

- Summarize what you learned in this course
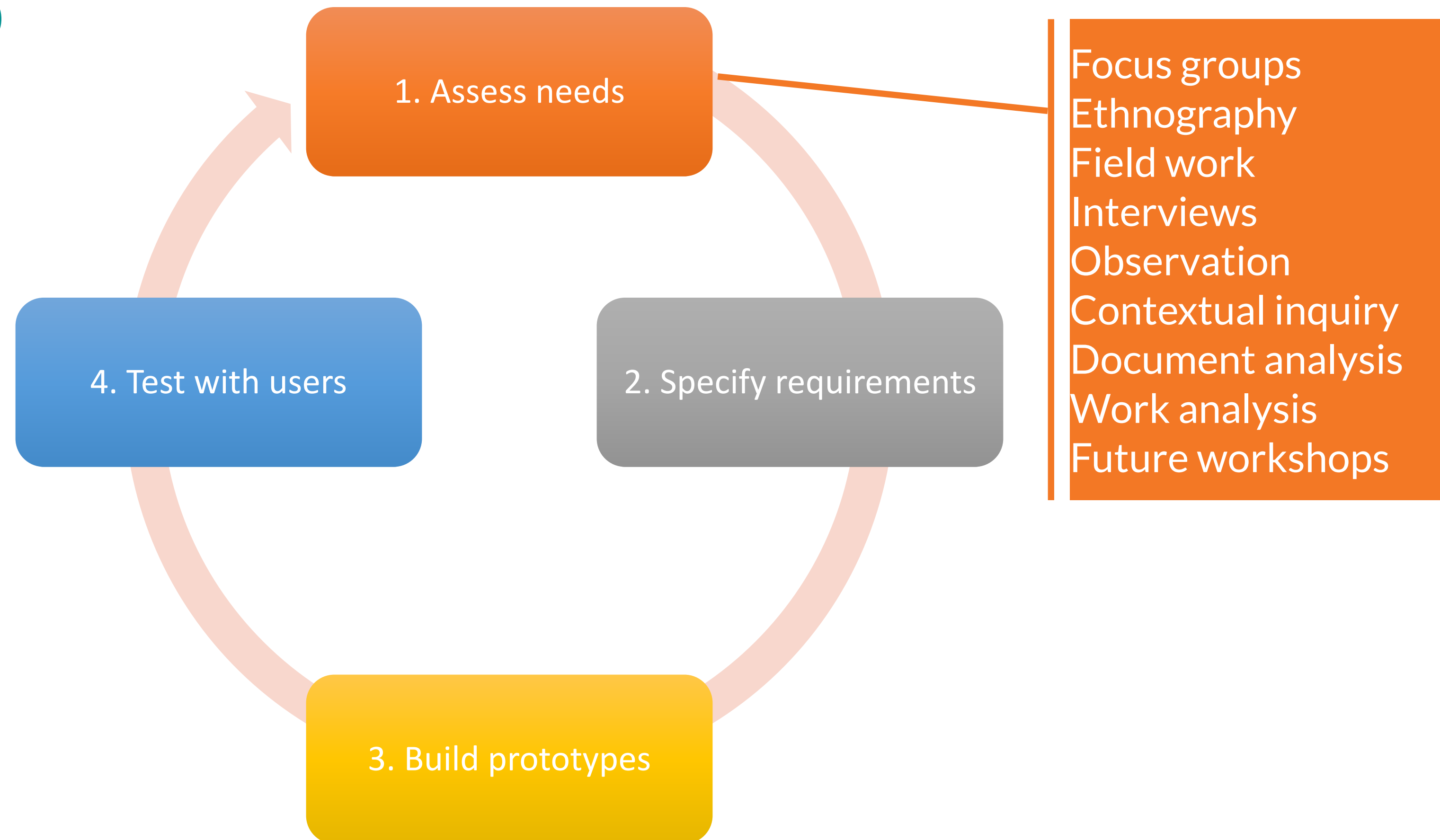
Applying Human-Centered Design

Phases of HCD

- 1. Assess needs
- 2. Specify requirements
- 3. Build prototypes
- 4. Test with users
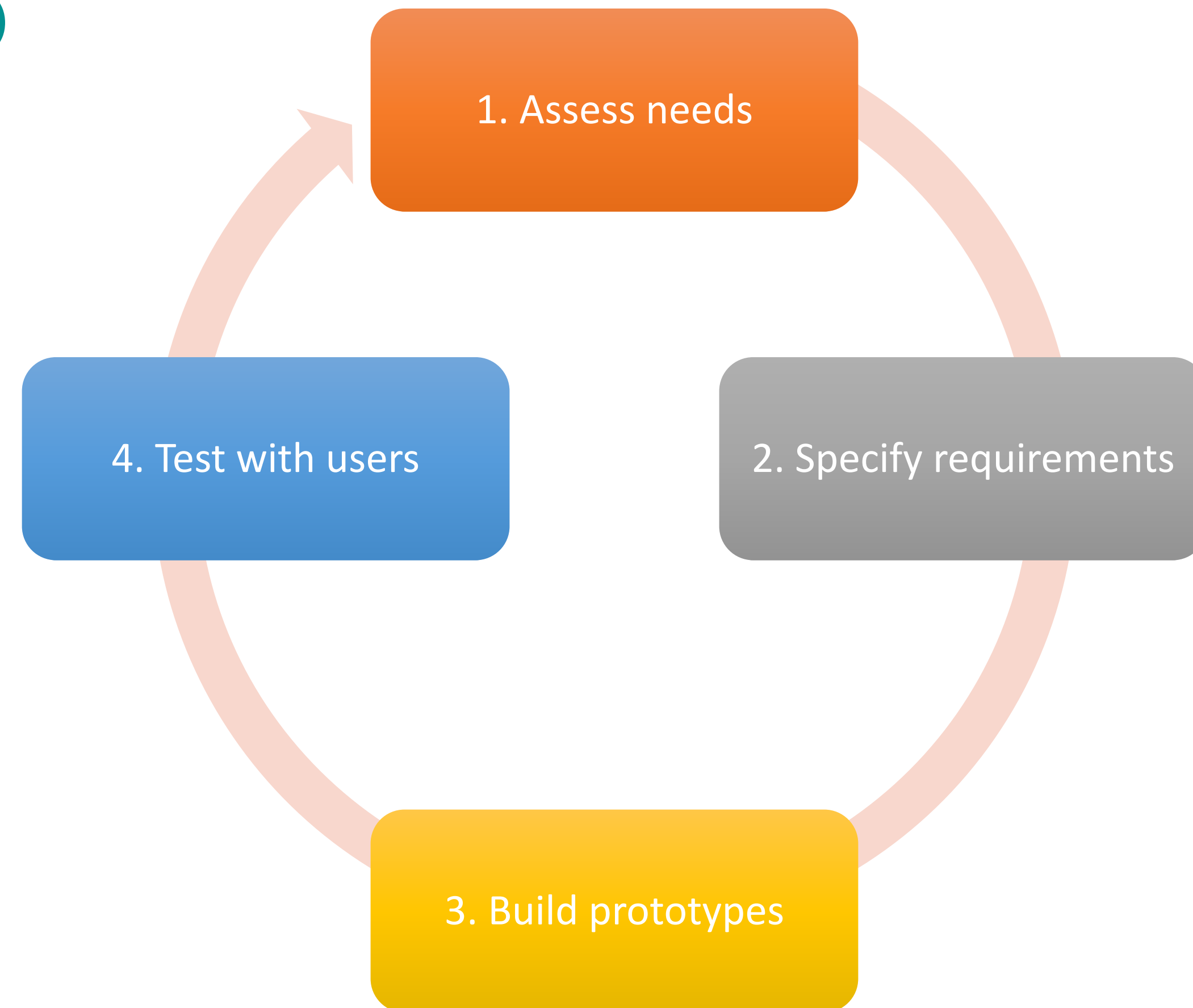
HCI research takes parts from all stages of HCD

Applying HCD methods

- Many papers focus on a single stage of the HCD process

  - Needfinding through interviews

  - Requirements analysis through scenario development

- Others combine a few stages

  - Designing a high-fidelity prototype and evaluating it

  - Using formative surveys to inform persona development

Applying Human-Centered Design

Phases of HCD

1. Assess needs

2. Specify requirements

3. Build prototypes

4. Test with users

Focus groups
Ethnography
Field work
Interviews
Observation
Contextual inquiry
Document analysis
Work analysis
Future workshops

Applying HCD methods

Assessing needs

- Often works nicely as a standalone research contribution (e.g., paper)

  - When presented with "design implications"

  - Often "triangulated" across multiple methods (surveys and interviews, forum discussions and observations)

Applying HCD methods

Assessing needs

- Strategy 1: information gathering

  - Interviews, surveys, etc. to understand people's practices or thoughts

- Strategy 2: co-design

  - Conduct some sort of participatory design activity to elicit needs and requirements

Applying HCD methods

Assessing needs

Applying HCD methods

Assessing needs

- Presenting as a standalone contribution requires greater depth

  - Hearing from more people

  - Hearing from people with more diverse backgrounds

  - More rigorous methods (grounded theory, inductive/deductive coding)

  - Connecting with a theoretical foundation to explain results or develop new theory (social learning theory, behavior change theory, queer theory…)

Applying Human-Centered Design

Phases of HCD

1. Assess needs

2. Specify requirements

3. Build prototypes

4. Test with users

Participatory design
Scenarios
Personas
Use cases
Vignettes
Storyboards
User stories
Workflow diagrams
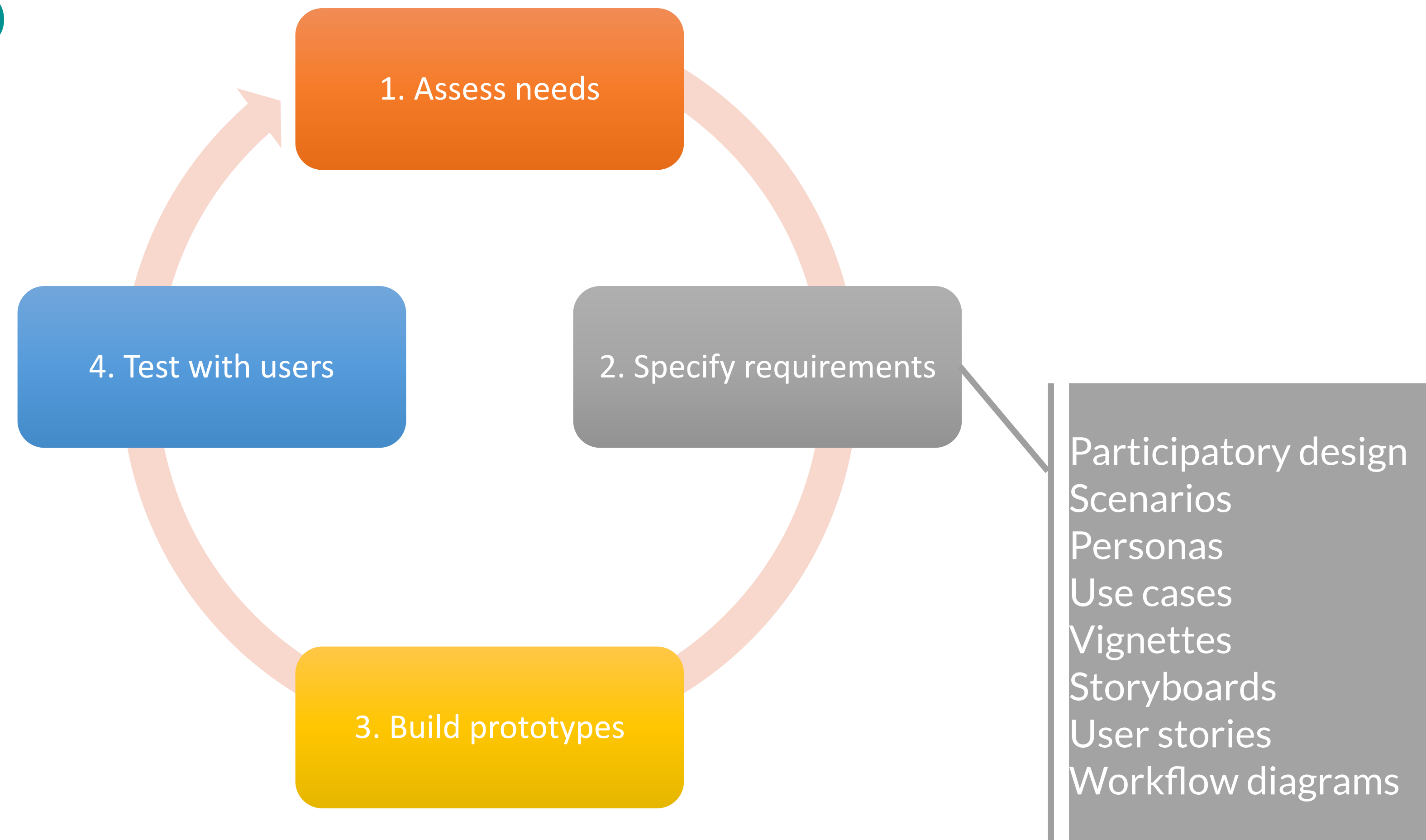
Applying HCD methods

Specify requirements

- Can be the primary contribution of a research paper, if in an area where personas/scenarios can help other researchers

- But usually still incorporated with other methods

  - Assessing needs work to determine the requirements

  - Evaluative work to determine the usefulness of the personas/scenarios

Applying HCD methods

Specify requirements

Pat (Patricia) Jones

- 43 years old
- Employed as an Accountant
- Lives in Cardiff, Wales

Pat loves public transportation and knows at least three routes to get there from home. When she arrives at work, she scans all her emails first to get an overall picture before answering any of them. (This extra pass takes time but seems worth it.) Some evenings she plays computer puzzle games like Sudoku before bed.

Background knowledge and skills
- Pat works as an accountant in a consulting firm. She just moved to this employer 1 week ago, and their software systems are new to her. She describes herself as a "numbers person". She is not a professional programmer but she writes and edits spreadsheet formulas in her work.
- Pat has a degree in accounting, so she knows plenty of Maths and knows how to think in terms of numbers. She's never taken any computer programming or IT systems classes.
- Even though she's an accountant and deals with numbers all day at work, she likes working with numbers in her free time, too. She especially likes Sudoku and other computer games that involve puzzling.

Motivations and Strategies
- **Motivations:** Pat is proficient with the technologies she uses. She learns new technologies when she needs to, but she doesn't spend her free time exploring technology or exploring obscure functionality of programs and devices that she uses. She tends to use methods she is already familiar and comfortable with to achieve her goals.
- **Information Processing Style:** Pat leans towards a *comprehensive information processing style* when she needs to gather information to problem-solve. That is, before following any option that seems promising, she first gathers information comprehensively to try to form a complete understanding of the problem before trying to solve it. Thus, her style is "burst-y"; first she reads a lot, then she acts on it in a batch of activity.
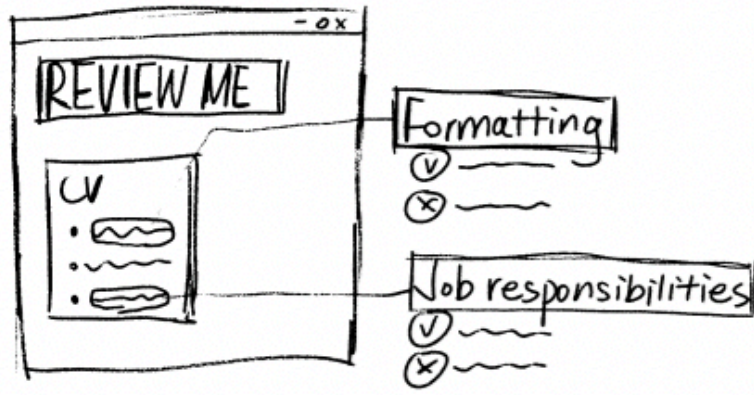
Attitude to Technology
Pat is generally comfortable using familiar technology, but she does not get a big kick out of obtaining the latest gadgets or learning how to use them. She prefers to stay with the technologies for which she has already mastered the peculiarities.
- **Computer Self-Efficacy:** Pat has medium computer self-efficacy, meaning that she has some self-confidence in performing computing tasks other than the ones she is familiar with. This has a variety of impacts on how she uses software. For example, she will keep on trying to figure out how to achieve what she has set out to do for quite awhile; she doesn't give up right away when computers or technology present a challenge to her.
- **Attitude toward Risk:** Even so, Pat is risk averse when she uses computers to perform tasks. When confronted with new software features, Pat worries that she will spend time on them and not get any benefits from doing so. She prefers to perform tasks "the safe" (ie, familiar) way if possible, even if less familiar features might promise a more direct solution.
- **Willingness to Explore and Tinker:** When Pat sees a need to learn new technology, she does so by trying out new features or commands to see what they do and to understand how the software works. When she does this, she does so purposefully; that is, she reflects on each bit of feedback she gets along the way to understand how the feature might benefit her. Eventually, if she doesn't think it will get her closer to what she wants to achieve, she will revert back to ways that she already knows will work.

Applying HCD methods

Specify requirements

Joe is creating his CV and is unsure what he should include.

Joe's friend tells him about *Review-Me*; a tool that provides feedback on resumes.

Joe submits a rough draft of his CV, and receives specific details about how to rephrase his job responsibilities and improve the formatting of his CV.

After making the changes, Joe has a CV that better highlights his job responsibilities and is easier to read.

Applying Human-Centered Design

Phases of HCD

1. Assess needs

2. Specify requirements

3. Build prototypes

4. Test with users

Rapid prototyping
Iterative design
Paper mockups
Wireframes
Balsamiq
Interactive designs
Axure
InVision
WIX
Moqups
HTML/JS
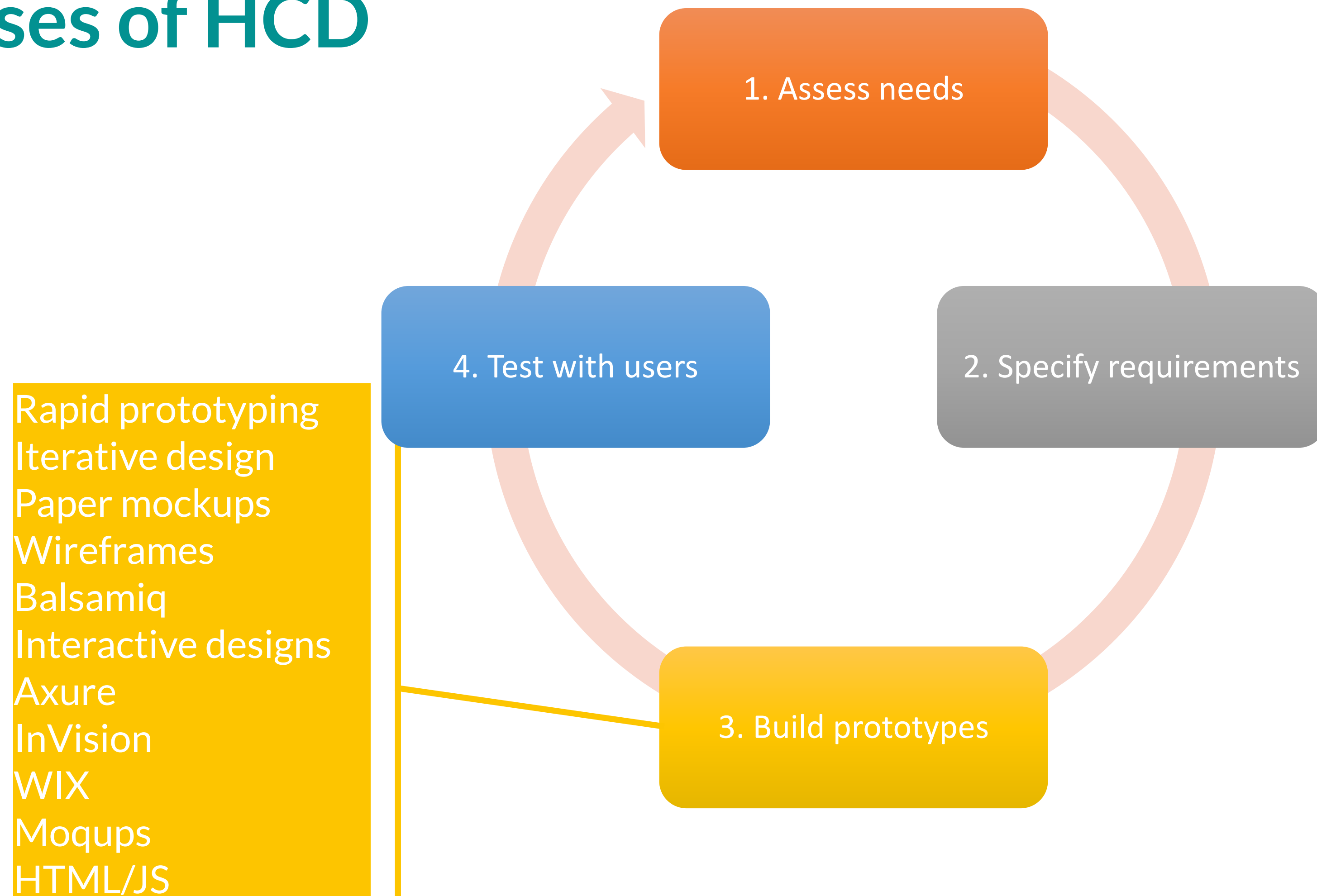
Applying HCD methods

Build prototypes

- Many papers present novel low- or high-fidelity prototypes alongside participant feedback

- The design typically embodies some novel idea or approach

- The feedback usually points to design implications or feedback given that idea

Applying HCD methods

Build prototypes
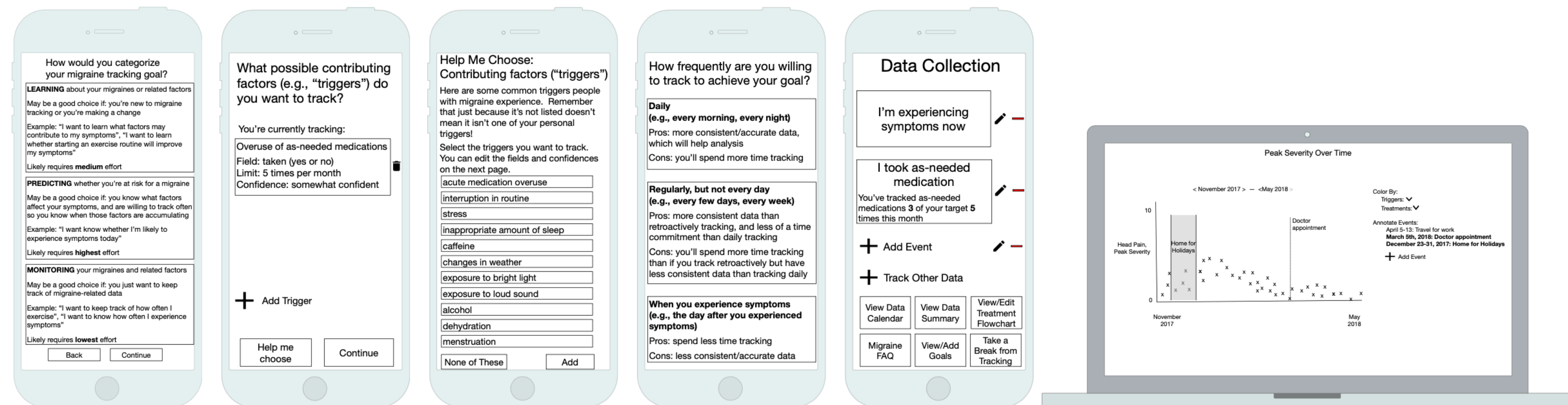
Fig. 1. Our paper prototype walks people through selecting a goal, configuring tracking towards that goal, and collecting and interpreting data for that goal. The full prototype can be found in the supplementary materials.

Jessica Schroeder, Ravi Karkar, Natalia Murinova, James Fogarty, Sean A. Munson. 2020. Examining Opportunities for Goal-Directed Self-Tracking to Support Chronic Condition Management. In Proceedings of ACM Journal on Interactive Mobile Wearable Ubiquitous Technology (IMWUT), 3, 4. ACM, https://doi.org/10.1145/3369809

Applying Human-Centered Design

Phases of HCD

Usability testing
Heuristic review
Wizard of Oz
Cog. walkthrough
Think-aloud
Inspection methods
Task analysis
Field testing
Remote testing

1. Assess needs

2. Specify requirements

3. Build prototypes
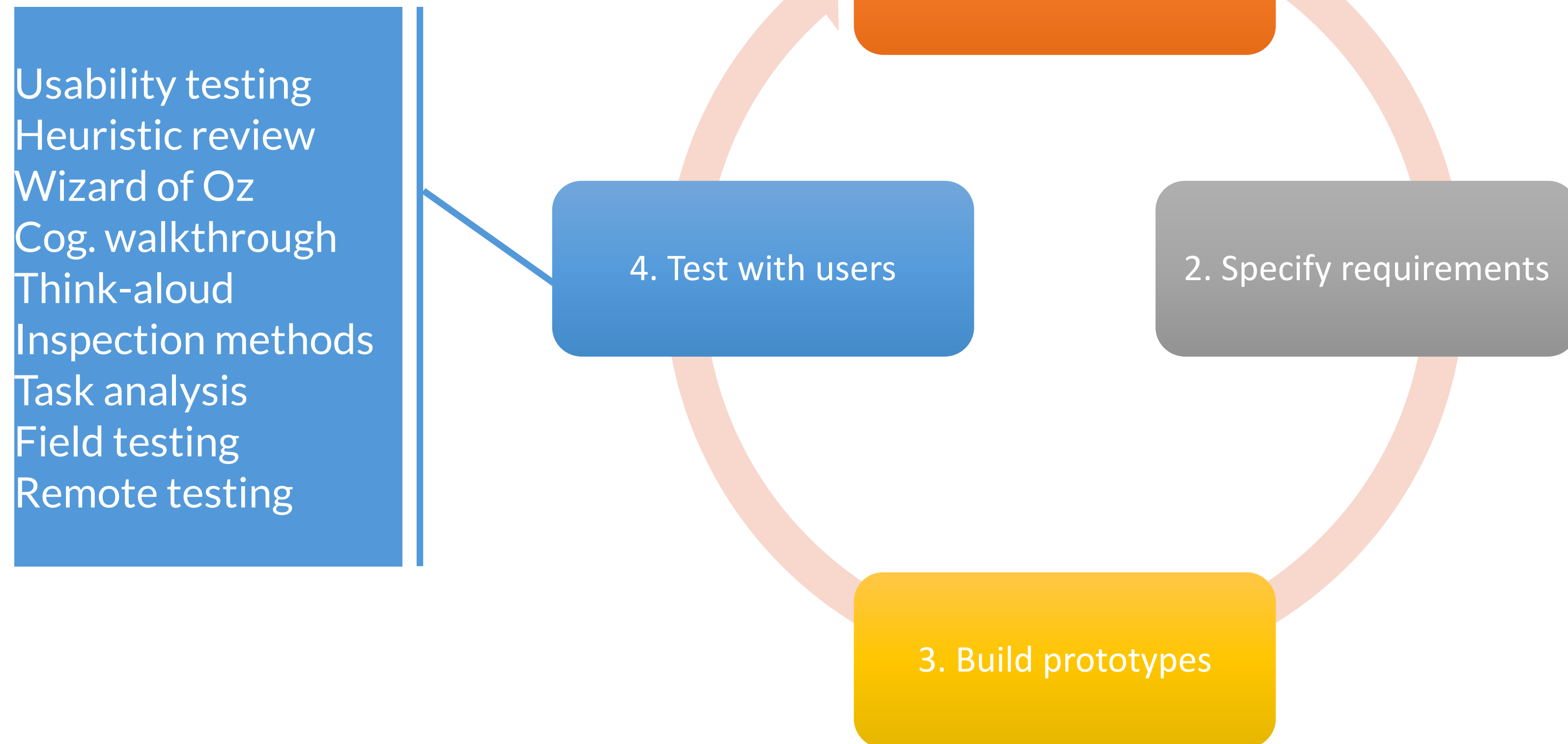
4. Test with users

Applying HCD methods

Test with users

- Some studies evaluate a novel design through a field deployment or a lab study, like the readings

- But testing is often done throughout/alongside the other phases

Testing with users

- For the research papers you read:

  - How did they assess needs?

  - How did they specify requirements?

  - What prototype did they build?

  - How did they test with users?

Testing with users

- For the research papers you read:

  - Lightweight formative interviews (or deep ethnographic involvement)

  - Motivating scenarios or simple personas

  - Design rationale or explicit design guidelines

  - Qualitative outcomes (versus experimental ones)

  - Multiple phases of iteration

  - Recommendations for future designs and systems

Putting it all together

- Some papers go through all phases of the HCD process

- A "holistic" research contribution is often trickier to make

  - Time burdens lead to sacrificing depth at each phase

  - Space burdens lead to unclear requirements or design novelty

  - Easy for reviewers to tear apart methods and results based on the above

- In my opinion, a holistic contribution makes more sense for radical redesigns than iterative improvement of preexisting ideas

Putting it all together

- For a novel system, is there a "known" problem you can motivate from?

  - Maybe another paper outlines needs or requirements

- Do your prototype need to be developed or at high fidelity
  to answer your research questions?

  - "Is this design a good idea" or "which design idea is best" may be answerable through low-fidelity mockups

- Can your build out a single feature in your prototype?

- Can you build on existing technical solutions?

Putting it all together

	iterate			iterate	
1 Devise design goals	**2** Choose existing site	**3** Gauge critical mass	**4** Build prototype on site	**5** Deploy & manage prototype	**6** Collect feedback & metrics
Decide on research and specify target population.	Study the API and figure out what data can be obtained.	Find if there are enough target users on the site.	Code social features and interactivity of the prototype.	Monitor user responses & follow ethical standards.	Send surveys, collect data, compile user reactions.
Example					
How do we design a platform for collaborative translations?	Twitter is used in multiple languages and the data is public.	Find bilingual users on Twitter. Are there enough of them?	Code an algorithm that groups English/Dutch speakers.	Tweet a sentence in English to the groups from the algorithm.	See how the users achieve consensus through tweet replies.

Catherine Grevet and Eric Gilbert. 2015. Piggyback Prototyping: Using Existing, Large-Scale Social Computing Systems to Prototype New Ones. In Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems (CHI '15). ACM, New York, NY, USA, 4047-4056. DOI: https://doi.org/10.1145/2702123.2702395
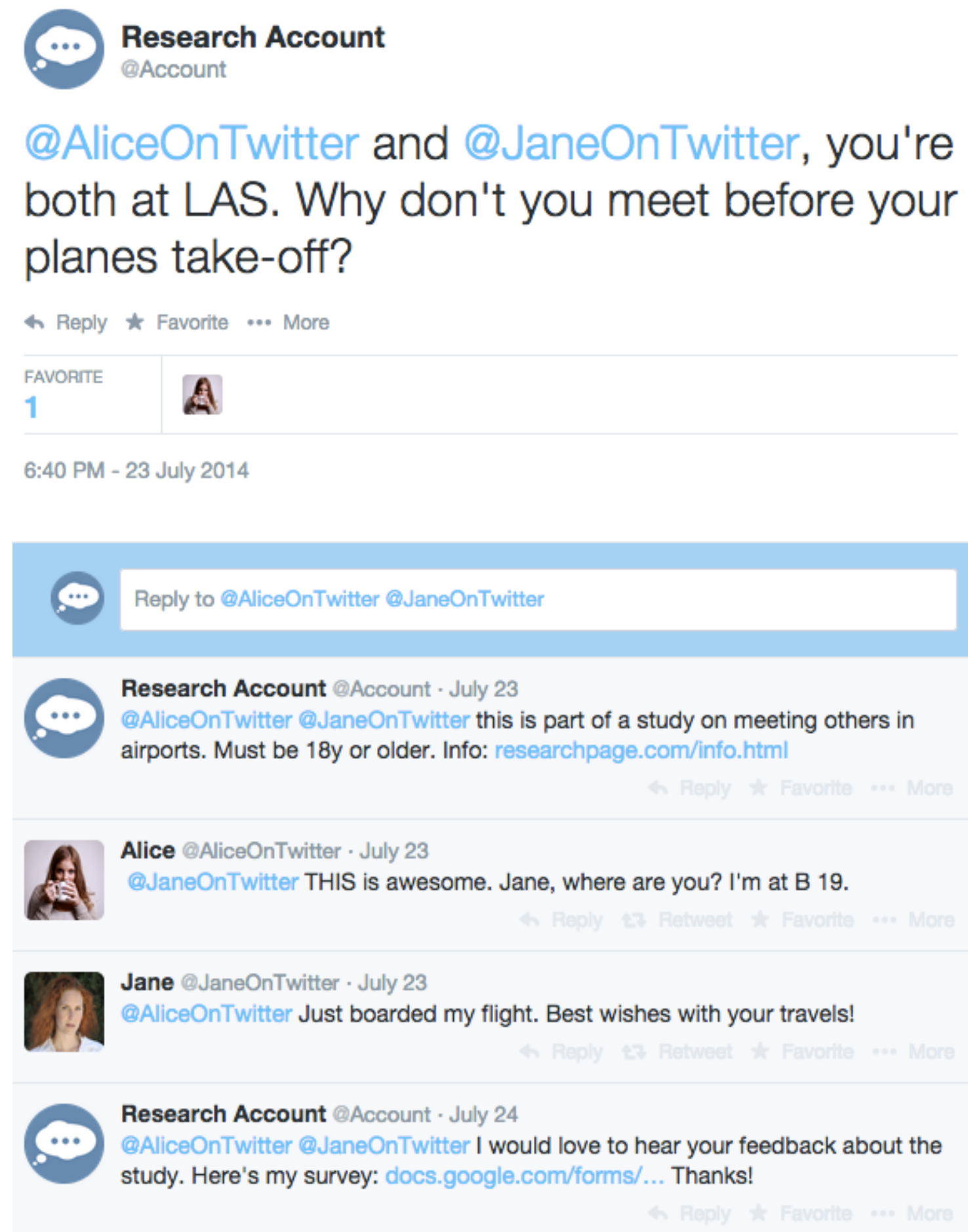
Putting it all together

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I've been impressed with your progress this quarter!

Your progress

- Needfinding methods

  - Contextual inquiry

  - Surveys

  - Interviews

  - Focus groups

  - Diary studies

  - Many more…

Your progress

- Requirements elicitation

  - Task analysis

  - Personas

  - Scenarios

  - Participatory design

Your progress

- Prototype development

  - Sketching

  - Storyboarding

  - Video prototyping

  - Paper prototyping

  - High-fidelity prototyping

  - Development tools

Your progress

- Test with users

  - Usability evaluation

  - Cognitive walkthrough

  - Heuristic evaluation

  - Field studies

Your progress

- Generalizable principles

  - Interface design patterns

  - Human performance

  - Accessibility

  - Applications to mental health

  - HCD in research

Human-centered design is a set of tools

Human-centered design tools

- You have many methods available in each stage

- There is rarely a "right" method or an "ideal" method

- As a designer, your job is largely to make informed decisions based on your context or task

  - And translate the insights you gain into a design
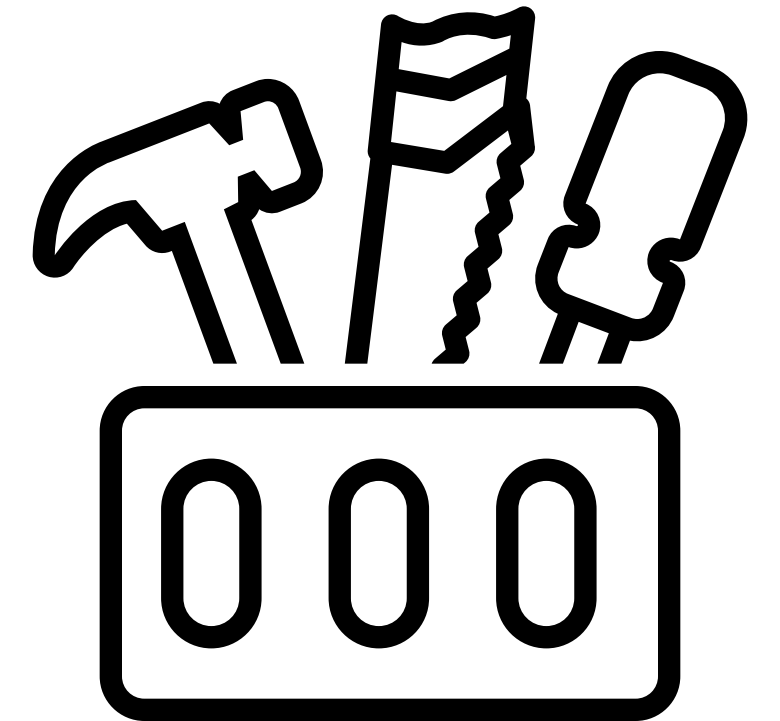
It's been an honor to work with you this quarter.

I look forward to seeing what you design next!

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- Summarize what you learned in this course

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