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Human-Centered Systems

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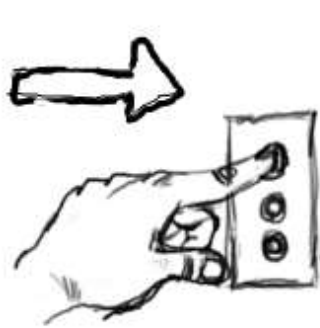
Help teams reduce risk



Consider changes over time



Make better design choices



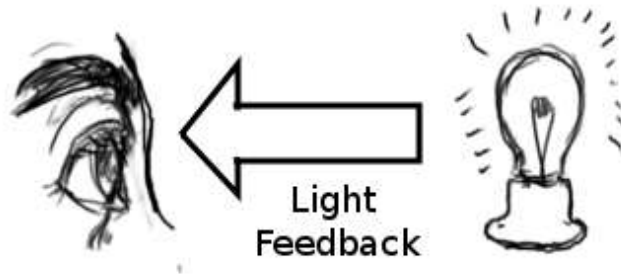
Button - Push



Switch - Flip



Knob - Rotate



Light
Feedback

Drawings of Affordance: <http://paaralan.blogspot.com/2010/09/affordance-and-educational-games.html>

Usability

Degree to which something is easy to use and a good fit for the people who use it.

Creating a good user experience.



Definition from UXPA Usability Body of Knowledge: <http://usabilitybok.org/glossary/19#letteru>

Aspects of good usability

- **Enable people to...**
- **Effective**
- **Efficient**
- **Learnable**
- **Memorable**
- **Engaging**
- **Feeling of control and support**

Benefits of good user experience

- **Increased usefulness**
- **Increased efficiency and productivity**
- **Reduced mistakes and risk**
- **Improved acceptance**

Understand people in context



Different needs, goals, purpose...



Start with basic questions

What is the problem?

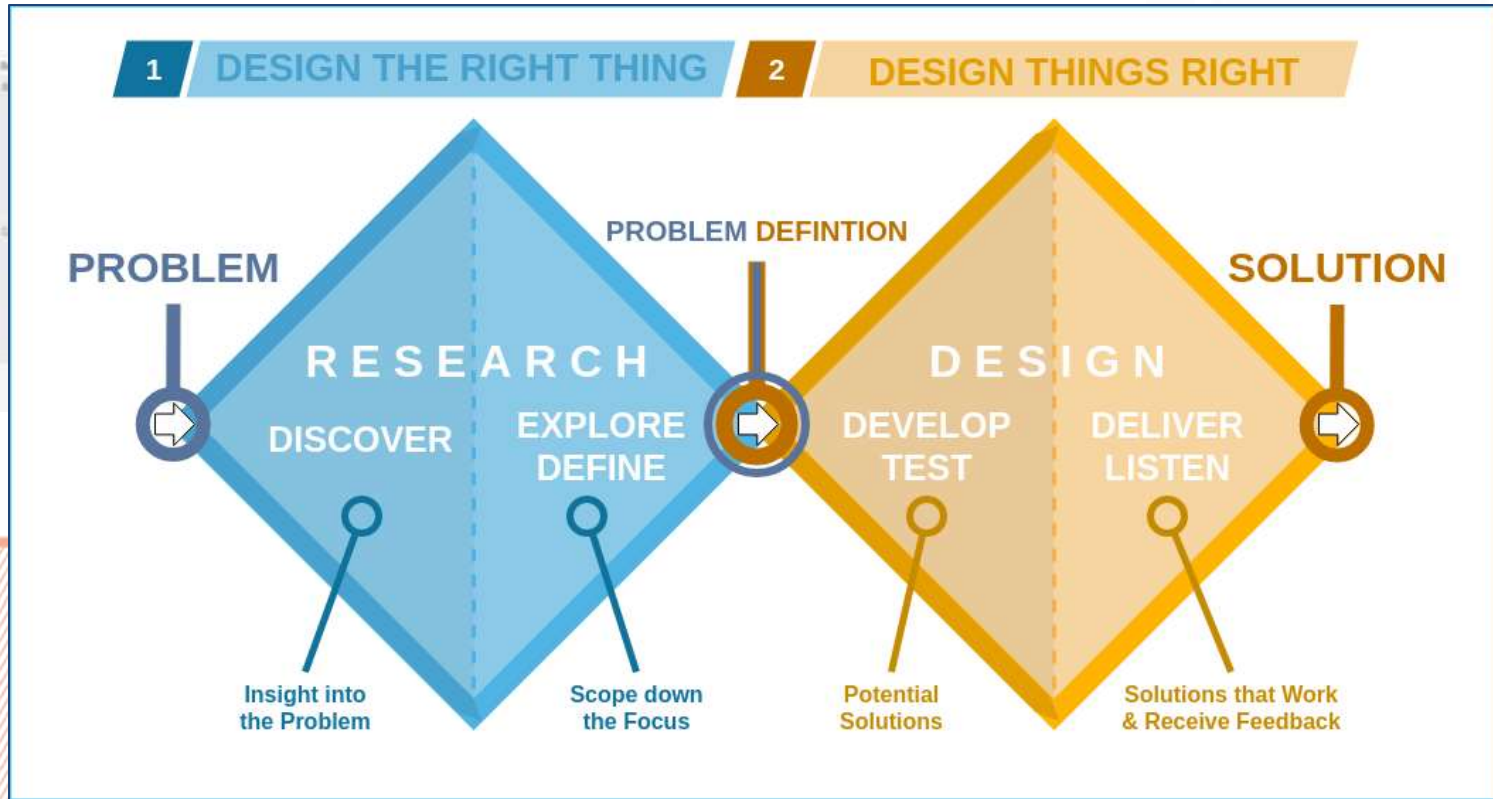
Who is involved and what are their needs?

What kind of improvements are expected?

What are the benefits and risks?

How will we know we've made improvements?

Iterative Processes



ACTIVITIES
<ul style="list-style-type: none"> Find allies Talk with experts Follow ethical guidelines Involve stakeholders Hunt for data sources Determine UX metrics
ACTIVITIES
<ul style="list-style-type: none"> Follow Tag's principles of GD Use evidence-based guidelines Design for universal access Give users control Prevent errors Improve error messages Provide helpful defaults Check for inconsistencies Map features to needs Make software (software) easy Plan for recall and repeating Investigate Consider diverse contexts Look for genuine incentives Consider social implications
ACTIVITIES
<ul style="list-style-type: none"> Protect personal information Keep data safe Deliver built quality and build new Track usability over time Include diverse users Track usability bugs Make training information
ACTIVITIES
<ul style="list-style-type: none"> Pay attention to user sentiment Balance the need for training Communicate future directions Recruit people for future research

Understand Complexity of Context



User Experience Honeycomb
Peter Morville, et al.

Sources of Complexity

Environmental context

Human capabilities

Information

Research to understand
and changes over time



Complex Systems



Video: Tesla Autopilot in Heavy LATraffic by Scott Kubo <https://youtu.be/m3-QzTFxoUg?t=14>

Complex Decisions





What is a tomato?
Fruit?
Vegetable?

Bias in Image Recognition

Training data



Data encountered



Use case courtesy of Dr. Eric Heim, CMU SEI
<https://resources.sei.cmu.edu/library/author.cfm?authorid=542374>

Only know what taught

Training data



Unrepresentative
or incomplete training data

Data encountered



Unlikely to recognize

All systems have some form of bias

Complete objectivity is misleading.

Unintended and purposeful bias

- **Bias can have purpose**
- **Bias can be helpful**

Reduce unintended/unwanted and/or harmful bias.

**“Data is a function of our history...
The past dwells within...
Showing us the inequalities
that have always been there.”**

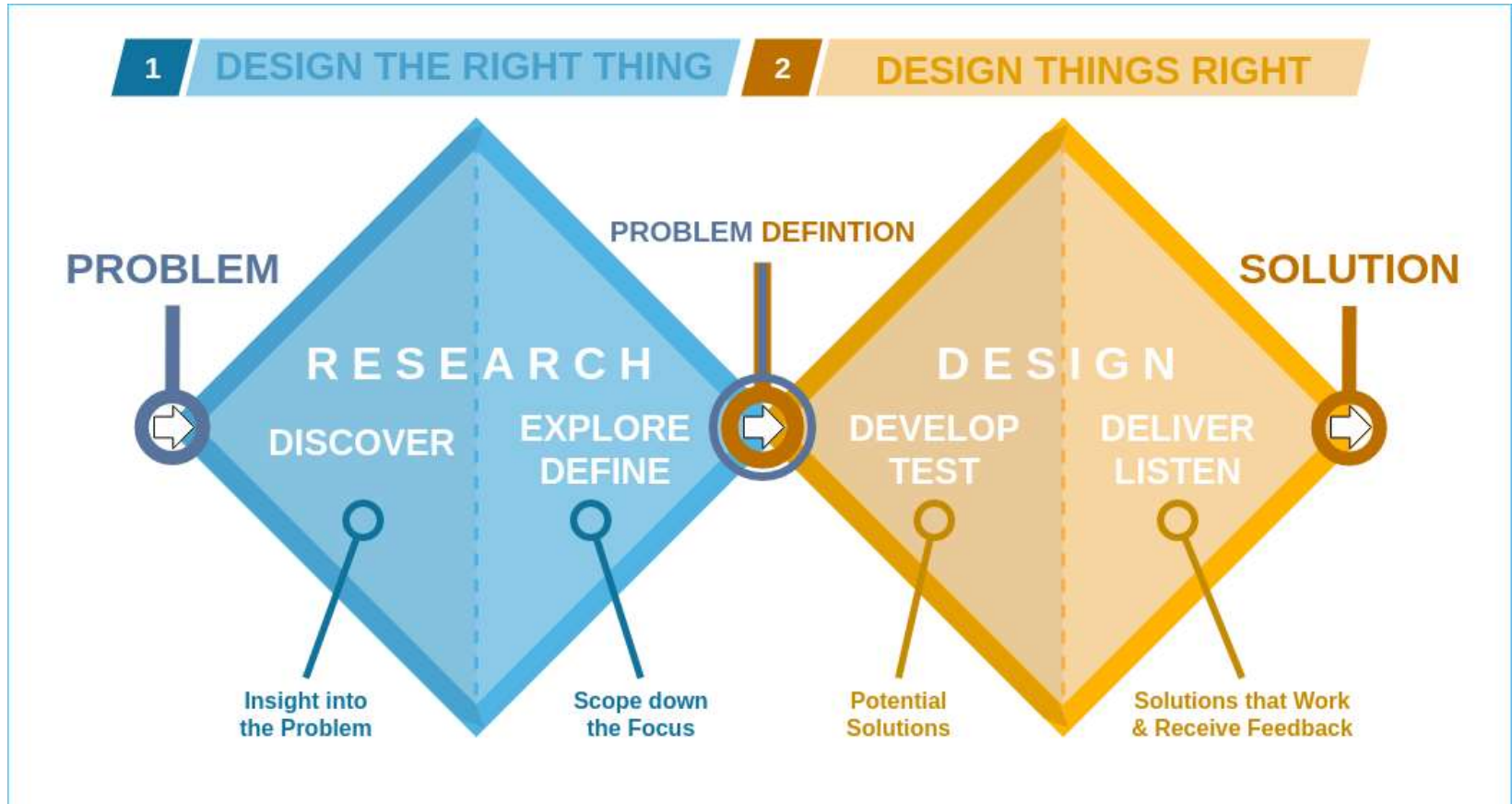
**Joy Buolamwini, Algorithmic Justice League
Coded Gaze
Movie: Coded Bias on Netflix**

Photo: Joy Buolamwini on The Open Mind: Algorithmic Justice.
Jan 12, 2019. <https://www.youtube.com/watch?v=hwHnXdoSSFY>

THE
OPEN MIND



Design to work with, and for, people



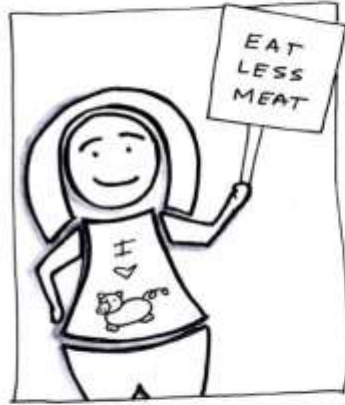
Identify the person using the system – Conduct UX research



Analyze and synthesize research

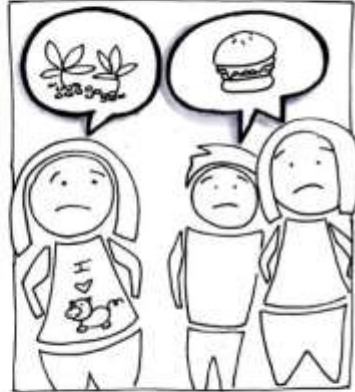


HOW MIGHT RESTAURANTS CATER TO BOTH VEGETARIANS & MEAT LOVERS WHILE INCREASING SALES?



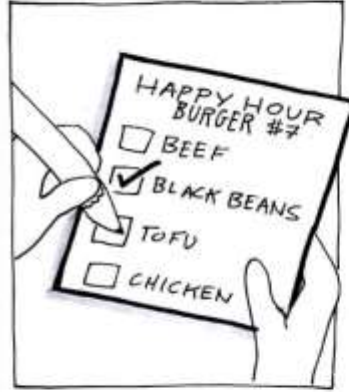
Laura recently became a vegetarian but wants to go out to eat with her friends.

Context



She finds it hard to locate a restaurant that suits her vegetarian diet and her friends' love for meat.

Problem



Laura invites her friends to Union Grill's new daily Happy Hour, where the chefs prepare signature burger patties based on their patrons' checklists.

Solution



Union Grill has increased sales during Happy Hour. Both vegetarians and meat-lovers enjoy delicious, customized burgers.

Resolution

Capitalize on human strengths

**Humans are (still) better
at many activities:**

Exposing Bias

Identifying downstream impacts

Judgment

Recognizing Bias

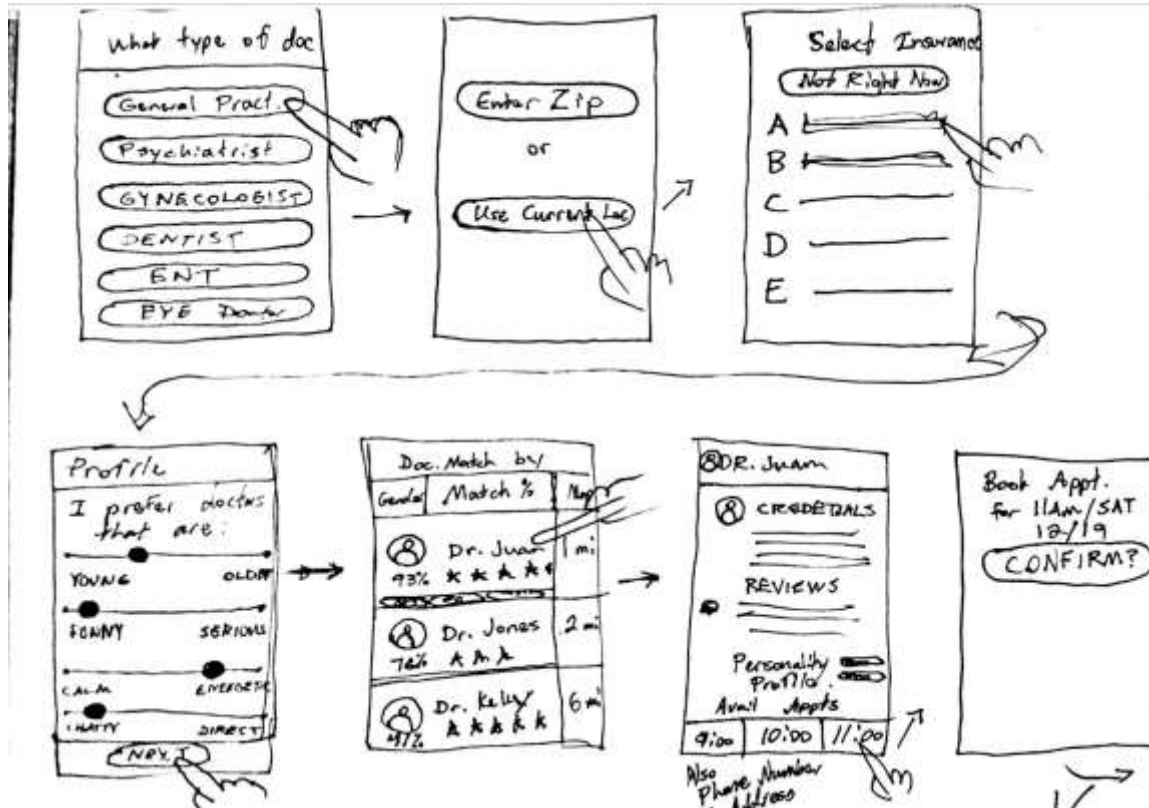
Responding to change

Socio-political nuance

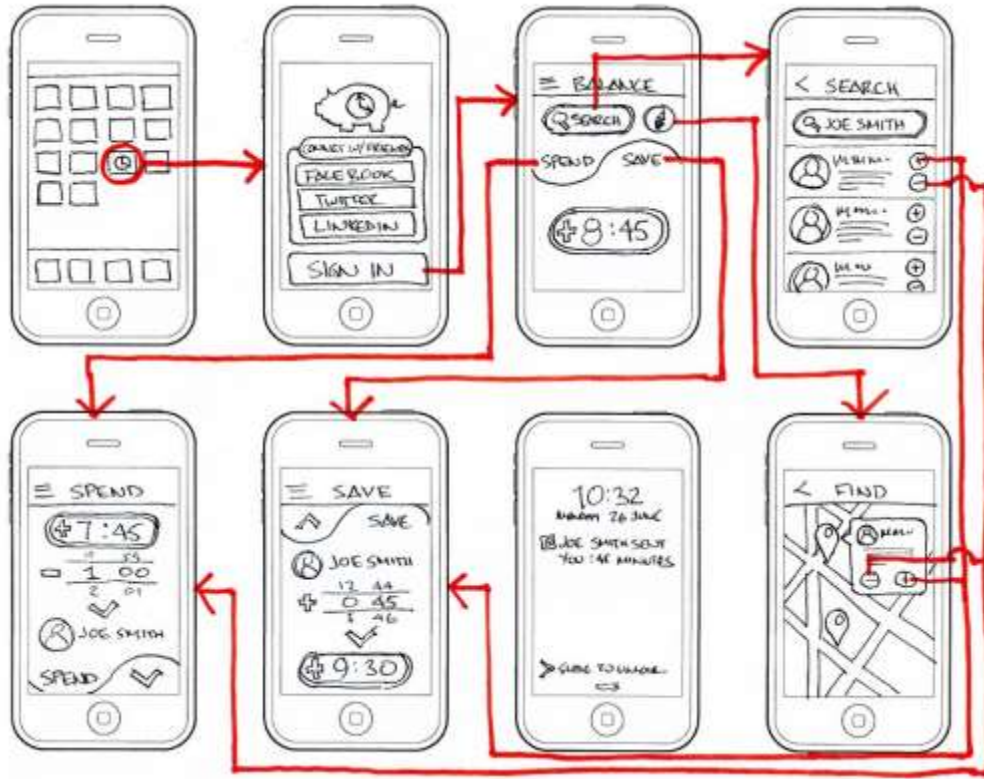
Taking context into consideration

Amanda Muller and Carol Smith. 2022. Perceptions of Function Allocation between Humans and AI-Enabled Systems. UXPA 2022 (pre-print).
<https://uxpa2022.org/sessions/perceptions-of-function-allocation-between-humans-and-ai-enabled-systems/>

Start with rough ideas



Think about how it will be used (Context)



Human-centered design

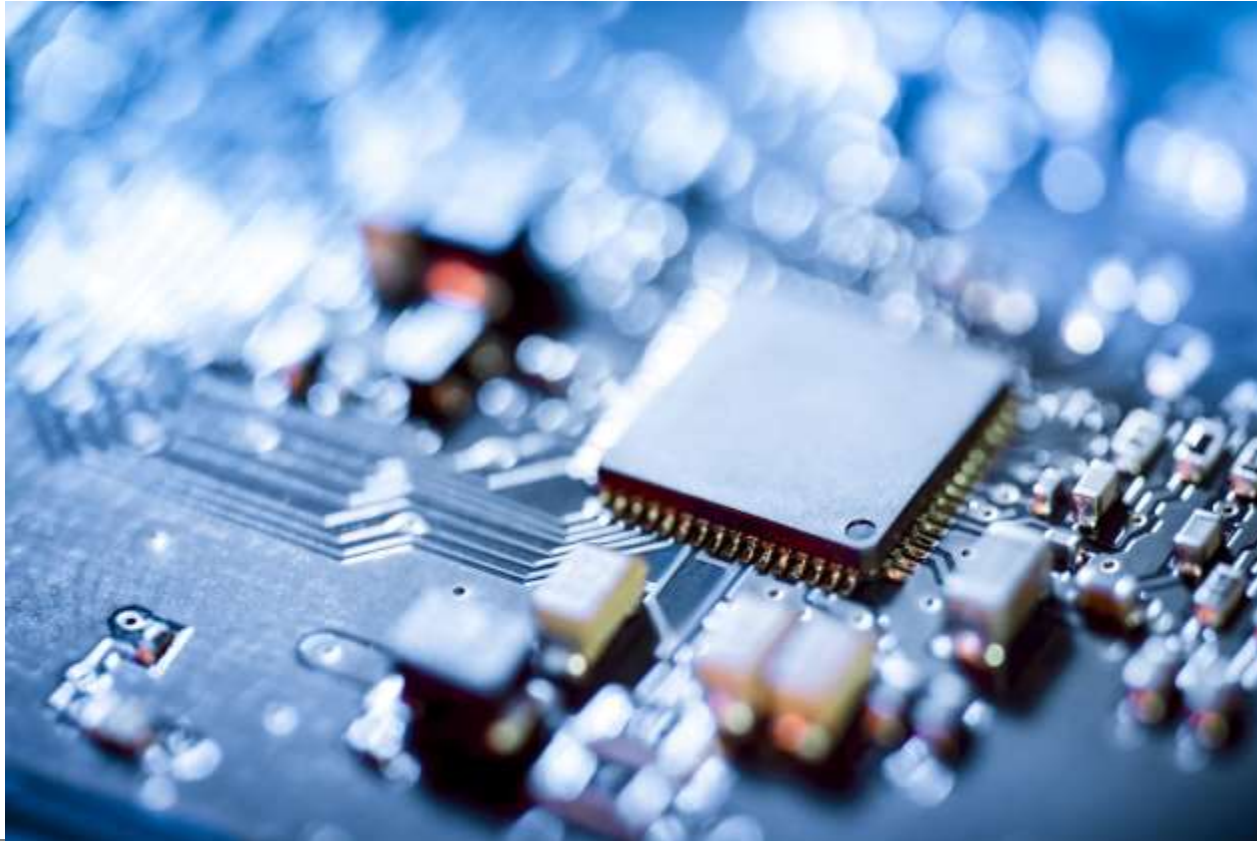
People and machines interacting and augmenting each other.

Complex systems need to be

- Usable
- Understandable
- Provide evidence of capabilities



Appropriate evidence



Match evidence with user



Human trust is personal, based on evidence

Calibrated based on personal experiences, current context, and the available evidence of the system's capability and integrity.

Distrust

Trust falling short of system capabilities
- may lead to disuse.

Calibrated Trust

Trust matches system capabilities - leading to appropriate use.

Over Trust

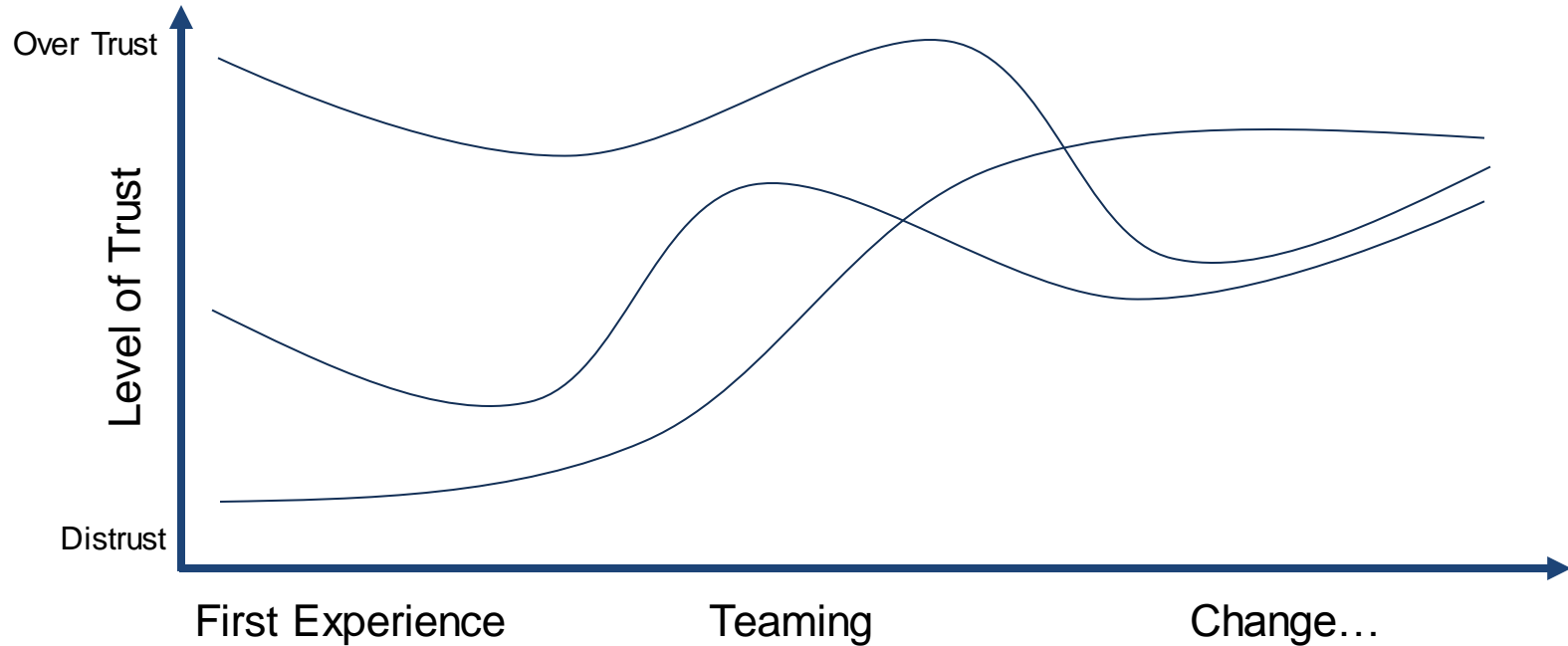
Trust exceeding system capabilities - may lead to misuse.



Rejection.

Automation bias.

Trust changes over time



Kun Yu, Shlomo Berkovsky, Ronnie Taib, Dan Conway, Jianlong Zhou, and Fang Chen. 2017. User Trust Dynamics: An Investigation Driven by Differences in System Performance. *IUI 2017* (March 2017), 307-317. DOI: <http://dx.doi.org/10.1145/3025171.3025219>

Test progress - Usability Testing

Test prototype



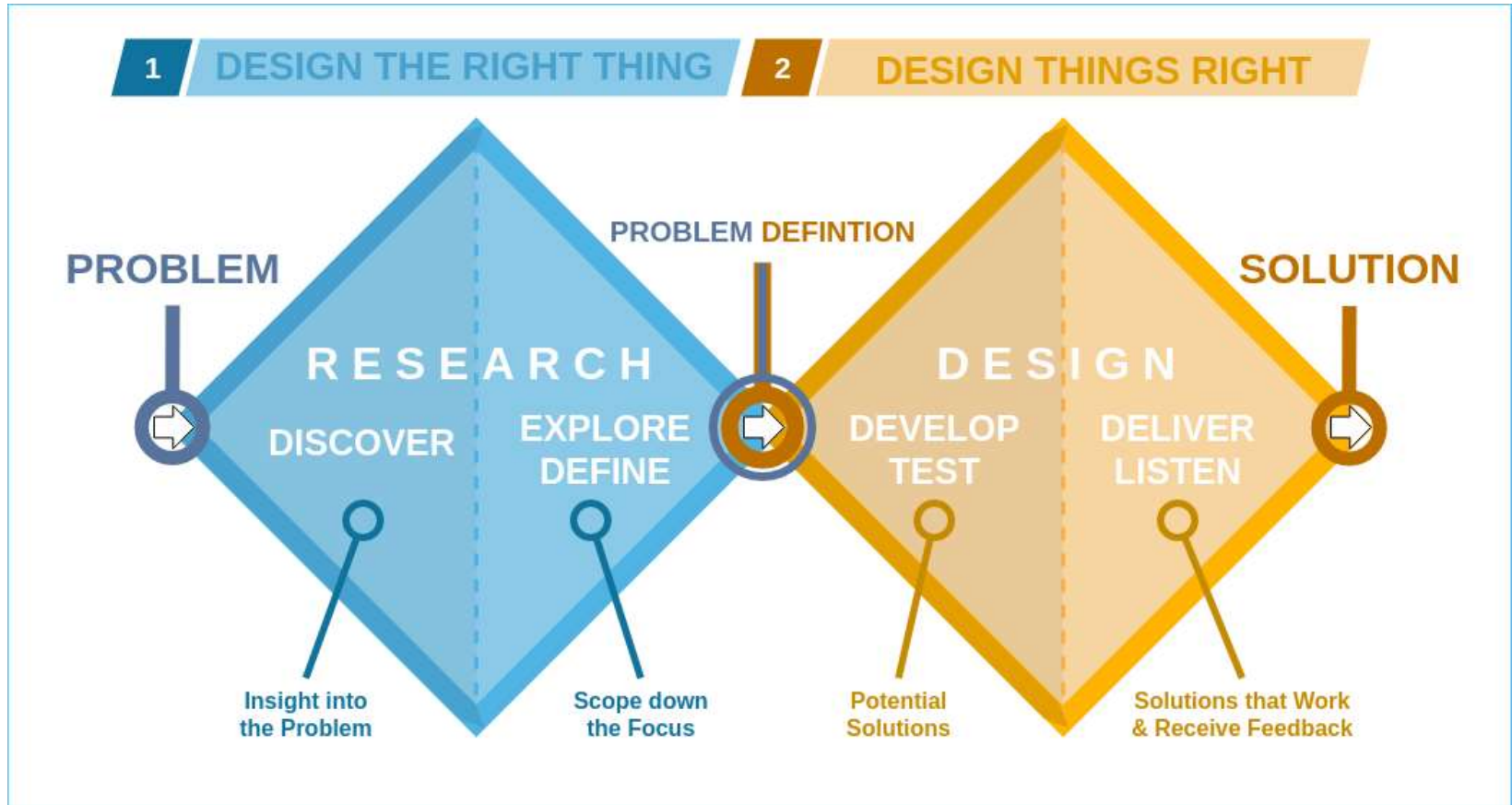
Learn and improve



Test again



Continue to learn and improve





“Ensure humans can unplug the machines”

– Grady Booch



TED Talk, Grady Booch, Scientist, Philosopher, IBM'er

https://www.ted.com/talks/grady_booch_don_t_rear_superintelligence

Conversations for Understanding

Difficult Topics

- What do we value?
- Who could be hurt?
- What lines won't our system cross?
- How are we shifting power?*
- Perspective of frequently marginalized groups

*"Don't ask if artificial intelligence is good or fair, ask how it shifts power." Pratyusha Kalluri.

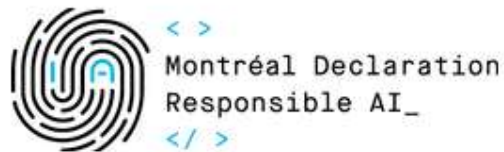
<https://www.nature.com/articles/d41586-020-02003-2>

Photo by Pam Sharpe https://unsplash.com/@msgrace?utm_source=unsplash&utm_medium=referral&utm_content=creditCopyText On Unsplash - https://unsplash.com/s/photos/business-woman-smiling?utm_source=unsplash&utm_medium=referral&utm_content=creditCopyText



Adopt Technology Ethics

- Harmonize cultural variations
- Balance to pace of change, industry pressure
- Explicit permission to consider and question breadth of implications



An initiative of Université de Montréal



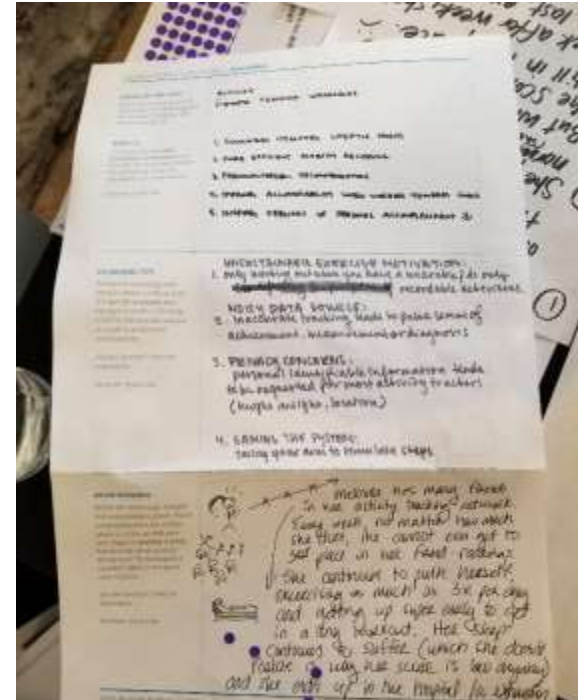
Speculate to keep people safe - Activate Curiosity

Conduct UX research to understand people.

Speculate about misuse and abuse.

Potential severe abuse and consequences.

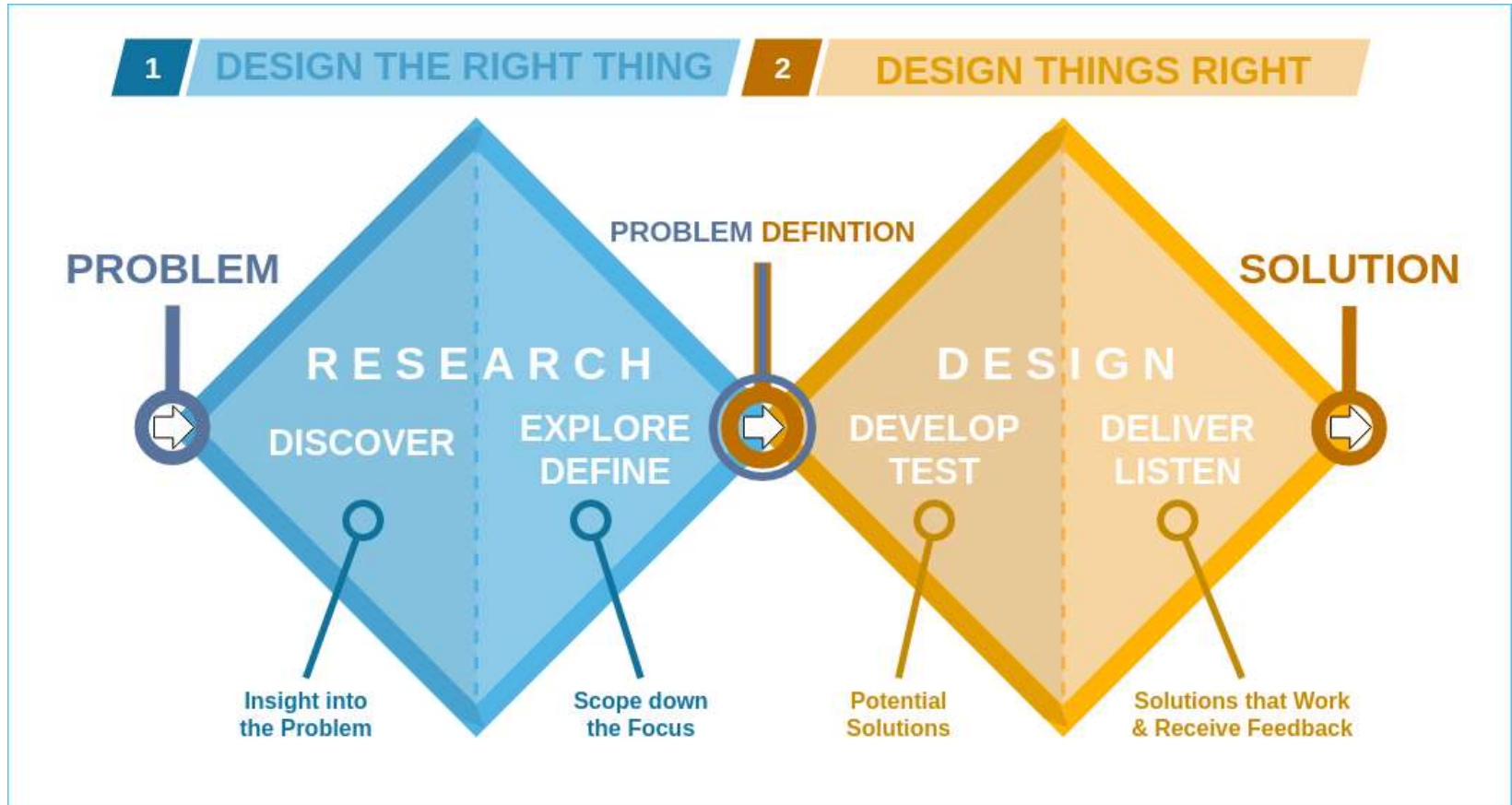
Perspective of people in frequently marginalized groups.



Template by: Anna Abovyan & Allison Cosby, IxDA Pittsburgh, Sep 2019

Designing Trustworthy AI for Human-Machine Teaming. By Carol Smith. Software Engineering Institute Blog. March 9, 2020.

Design to work with, and for, people



Make better experiences





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**CMU Software Engineering Institute
AI Division**