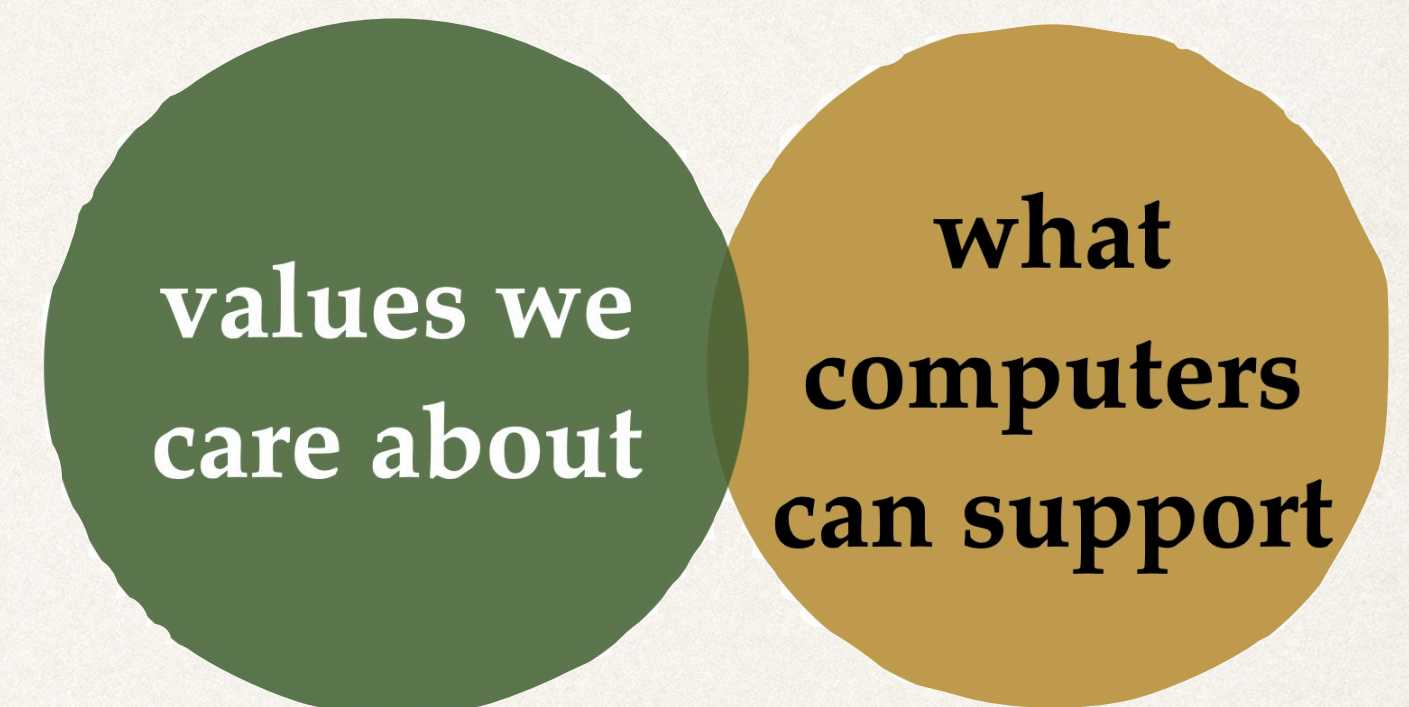


Computational Ecosystems

Advancing Human Values Through
Integrative Computing and Changing Practice



Haoqi Zhang

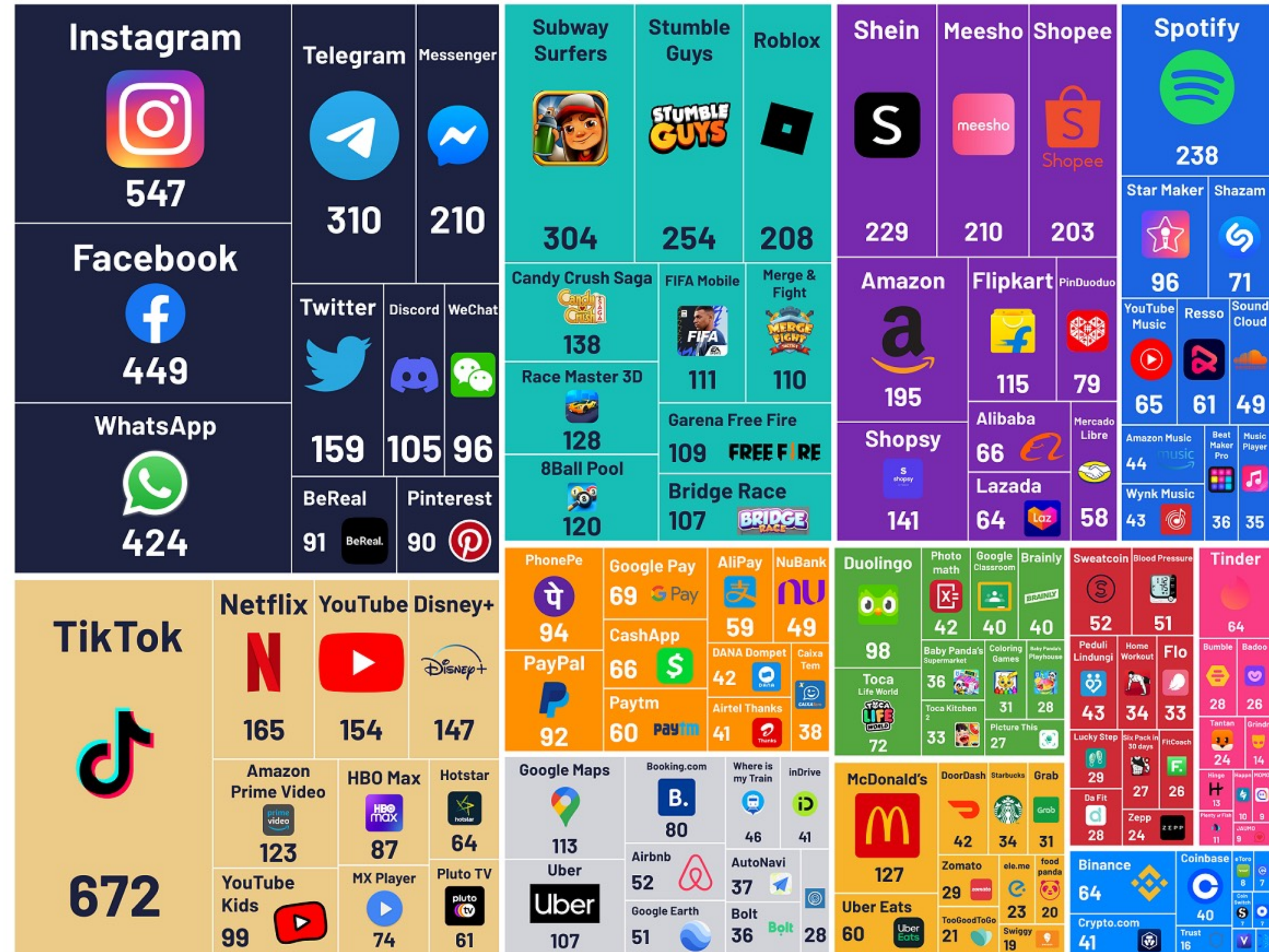
Design, Technology, and Research (DTR) | Northwestern University

slides+readings: haoqizhang.com

If impact = winning,
HCI already won.

Most popular apps worldwide

2022, by category (million downloads)



■ Social ■ Shopping ■ Entertainment ■ Music ■ Games ■ Money Transfer
■ Education ■ Health ■ Dating ■ Travel ■ Food ■ Crypto

Source: BusinessofApps

Created by genuine impact

More charts: genuineimpact.substack.com

How can we solve human problems and advance human values that remain unaddressed, even after decades of advances in computing and in HCI?



Design, Technology, and Research (DTR)

world. In this book I would like to contribute to a *critical technical practice* in which rigorous reflection upon technical ideas and practices becomes an integral part of day-to-day technical work itself.

Agre, *Computation and Human Experience*, 1997.

1. There are fundamental limitations in our current approach.
2. We cannot overcome these limitations with better technologies.
3. We need a new approach.
4. Enabling this new approach requires a radical rethinking of the entire sociotechnical configuration.

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PLANNING LARGE EVENTS

COORDINATING ON LOCAL PROBLEMS

CONNECTING FRIENDS AT DISTANCE

LEARNING TO BUILD SOFTWARE

INNOVATING THROUGH RESEARCH

PLANNING LARGE EVENTS



Paul André
CMU



Anant Bhardwaj
MIT



Lydia Chilton
UW



Juho Kim
MIT



Steven Dow
CMU



David Karger
MIT



Rob Miller
MIT



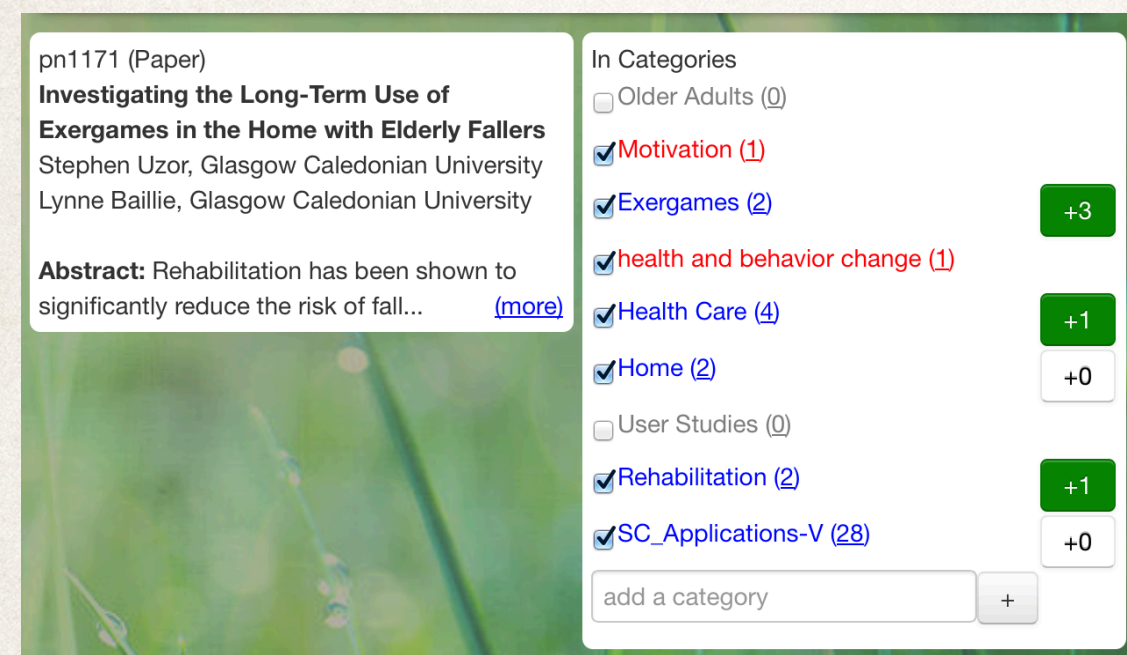
Haoqi Zhang
Northwestern



	X01 D	X02 E	X03 F	X04 G	X05 A	X06 B	X07 C	X08 Q	X09 H	1	X10 J	X11 K	X12 L	X13 M	X14 N	X15 O	P X16
Thursday	Award talks 2400	471 Int. Tech. + Dev.	Panels 481	452	424	Larger courses 207	Larger courses 207	424	257	219	400	400	393	Smaller courses 47	Smaller courses 40	Smaller courses 73	S16s
9:30- 10:50	Award lecture 1201	TOUCH TEXT ENTRY 1202	Panel-110 "Material Interactions" - From Atoms & Bits to Entangled Practices 1203 Michael Wiberg (M), Hiroshi Ishii, Daniela Rosner, Anna Vallgarda, Paul Dourish, Petra Sundström, Tobias Krenn, Mark Rolston	DO YOU SEE WHAT ORGANIZING THE EYE SEE? 1204 1205	cr124 From Discourse- based Models to UIs Automatically Optimized for Your Smartphone 1206 Hermann Kaindl	cr102 Agile User Experience and UCD 1207 William Hudson	TEACHING WITH NEW INTERFACES 1208	INTERACTIONS BEYOND THE DESKTOP 1209	1210	RIGHT WHERE I AM: UX IN COMPLEX ENVIRONMENTS 1211	HEALTH + CHILDREN 1212 alt.chi	cr125 Cognitive Crash Dummies: Predicting Performance from Early Prototypes 1213 Bonnie E. John	cr147 Designing for Persuasion 1214 Aaron Marcus	S16 1215	S16 1216		
11:30- 12:50	Video 1301	BIGGER IS BETTER: LARGE + MULTIPLE DISPLAY ENVIRONMENTS 1302	Panel-116 Politics, Power, and Passion: Engaging U.S. Policymakers 1303 Janet Davis, Harry Hochheiser, Juan Pablo Hourcade, Jeff Johnson	"WHAT A LOVELY LECTURE" 1304 1305	1306 CR 124 Unit 2 Kaindl	1307 CR 102 Unit 2 Hudson	BETTER TOGETHER 1308	MEET MY MOBILE 1309	1310	UNDERSTANDING GAMERS 1310	TIME + TASK: MANAGING WORK-LIFE 1312 alt.chi	CR 125 Unit 2 Bonnie John 1313	Methodology for Evaluating Experience of Mobile Applications Used in Different Contexts of Daily Life 1314	S16 1315	S16 1316		

New approach: community-informed planning

committeesourcing



make sessions

[Chilton et al., CHI '14]

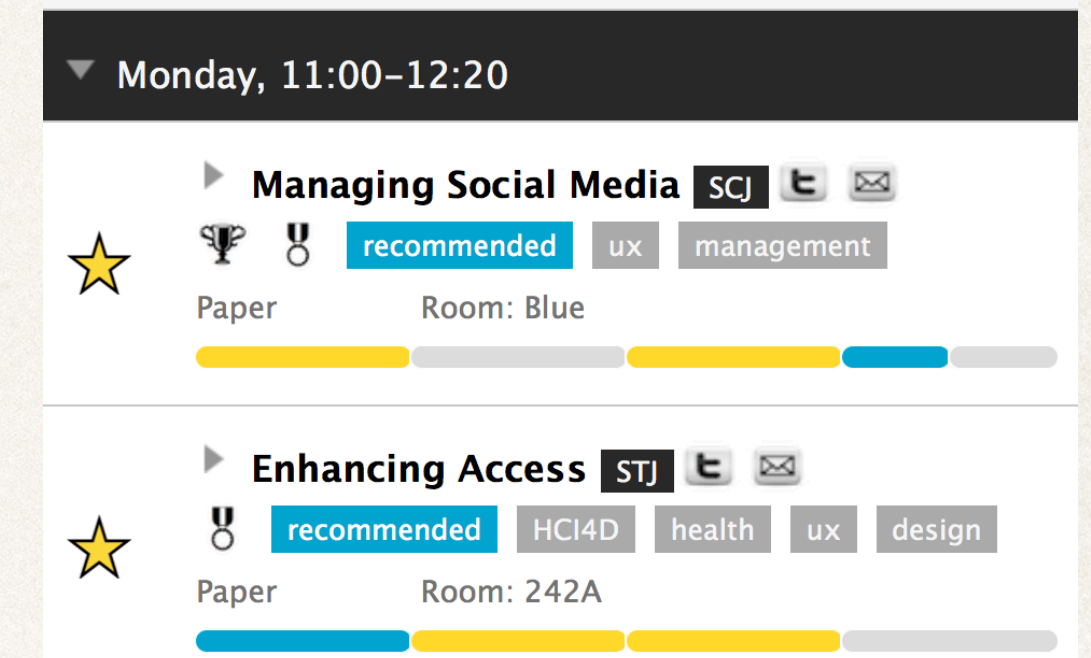
authorsourcing

A screenshot of a web form for authorsourcing. The title is "Your Paper: A Pilot Study of Using Crowds in the Classroom". The first question is "1. Tell us your name: (as it appears in the paper)" with a text input field. The second question is "2. We've identified 10 papers that may be similar to yours. Tell us how they would fit in a session with your paper:". Below this, there is a section titled "Crowdfunding inside the Enterprise: Employee-Initiatives for Innovation and Collaboration" with a link to the abstract. There are four radio button options: "Great in same session", "Okay in same session", "Not sure if it should be in same session", and "Should not be in same session".

collect affinities

[Andre et al., HCOMP '13]

attendeesourcing



collect preferences

[Bhardwaj et al., HCOMP '14]

Community-informed, mixed-initiative interface

[Kim et al, UIST 2013]

Cobi

search by session / paper / author name

Charles Carmichael

Select a session for scheduling options and more information.

Conflicts 121

High severity (63)

- papers of mutual interests in opposing sessions (37)
- authors with papers in opposing sessions (1)
- chairs with papers in opposing sessions (6)
- chairs with papers in their own sessions (19)

Medium severity (58)

- papers that don't fit well in the same session (48)
- topics of interest to a persona in opposing sessions (2)
- chairs who don't fit well in their session (1)
- chairs and their papers of interest in opposing sessions (7)

Preferences 343

View Options

- Conflict
- Preference
- Session Chair Conflict
- Session Chair Names
- Session Type
- Number of Papers
- Duration
- Best Paper
- Honorable Mention

Session Types

Personas

Communities

History 0

Unscheduled Sessions 8

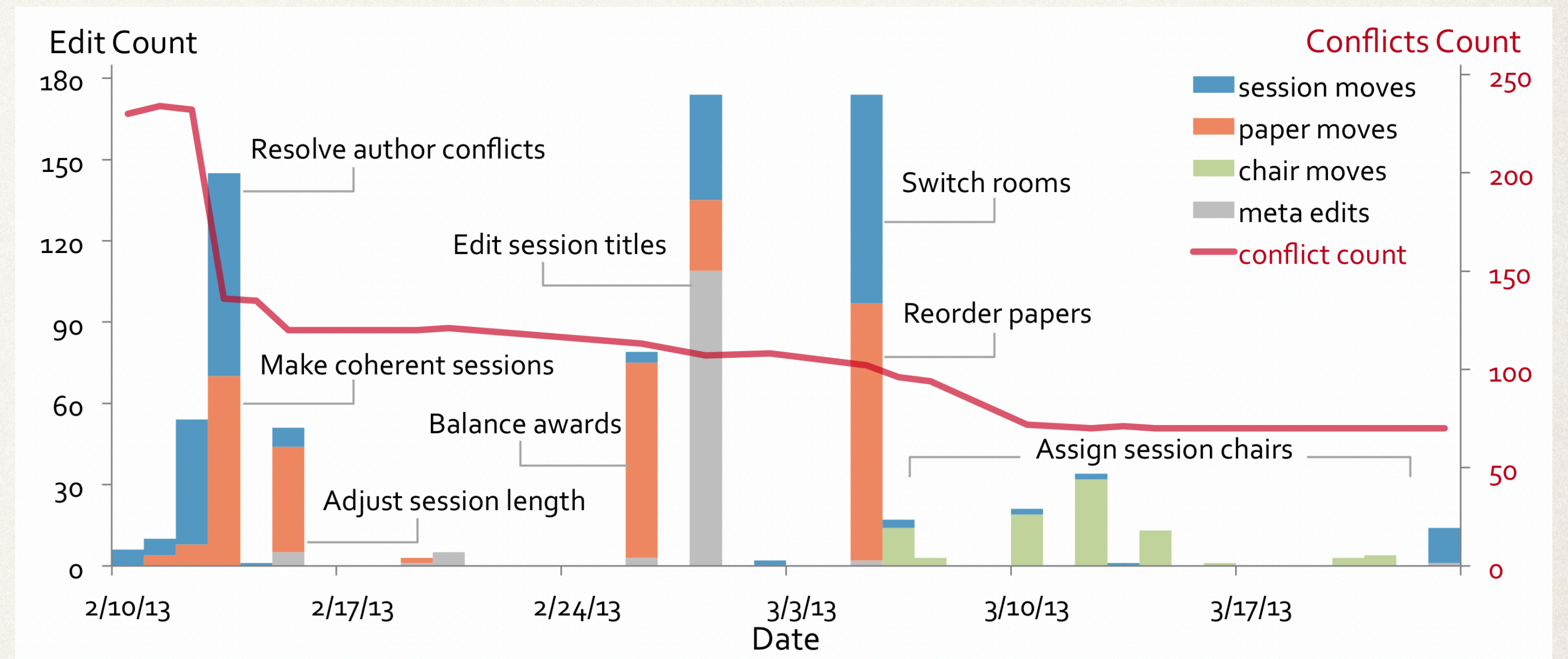
Unscheduled Papers 15

Unscheduled Chairs 65

Room/Time	Blue	Bordeaux	252B	352AB	Havane	241	342A	251	351	242A	242B	243	253	343	252A	361	362/363	221/221M
Mon 11:00-12:20	Navigating Data 2	Text Visualization 1	Call All Game Changers: BYOD (Bring Your Own Device) 1	Multi-touch and Gestures 1	Lifetime Research Award 1	Power to the People: utilizing crowdsourcing 1	Design and Design Lessons 1	Learning 1	Touching Experiences: tangible 1	Content, Creation, and Health 1		User Interface Design and Adaptation for 1	Six Steps to Successful UX in an Agile 1	Rapid Design Labs--A Tool to Turbocharge 1	Body, Whys & Videolaps: Applying 1	Designing Interactive Secure Systems 1	Human Computer Interaction for 1	Birds of a feather - session 1
Mon 14:00-15:20	Language 1	Gaze 1	Will Massive Online Open Courses 1		Enterprise and online communities 1	Hotkeys / Touch keyboards 2	Brain Interfaces 1	Design for the Classroom 1	Co-Design: Invoking perspective 1	Technologies for Life 1		Practical Statistics for User Experience 1	Agile User Experience and UCD 1/2 1	Rapid Design Labs--A Tool to Turbocharge 1	Speech-based Interaction: Myths, 1		The Role of Engineering Work in CHI 1	Birds of a feather - session 2
Mon 16:00-17:20	Management of Knowledge and Collaboration 1	Video 1	Theory and Practice in UX Research 1	Table and Floors 1	Smart Tools for Smart Work Environments 2	Large and public Displays 1	Case Studies in Innovating UCD Process 1	unused session 8 1	Mobile 2: Very Moving: reflection in 2	Nonkid Games 1		Practical Statistics for User Experience 1	Agile User Experience and UCD 2/2 1	Rapid Design Labs--A Tool to Turbocharge 1	Speech-based Interaction: Myths, 1	unused session 2 1	Enhancing the Research Infrastructure 1	Birds of a feather - session 3
Tue 9:00-10:20	Classrooms 1	Social Face: creativity unleashed 1	CHI at the Baricades -- an Activist 1	Interaction around Devices 2	Lifetime Practice Award 1	Gestures studies / empirical 2	Communities of practice 1	Embodied Interaction (and Thinking) 1	Evaluation Methods 1 2	Technologies for Life 2 2		User Experience Evaluation Methods -- 1	Choice and Decision Making for HCI 1	Cognitive Crash Dummies: Predicting 1	Analyzing Social Media Data 1/2 2	SIG: NUI (Non-Visual Interaction) 2	Managing UX Teams 1	Birds of a feather - session 4
Tue 11:00-12:20	Crowds and activism 1	Visualization 1 1	Gamification @ Work 1	Mobile Gestures and Grasp 1	Invited talk - Don Norman 1	Creating and Authoring 2	Design Ideation Methods 1	Online Classrooms 1	Ethics 1	Impairment and Rehabilitation 1		User Experience Evaluation Methods -- 1	Choice and Decision Making for HCI 1	Cognitive Crash Dummies: Predicting 1	Analyzing Social Media Data 2/2 1	Research-Practice Interaction: 1	Digital Art: Challenging Perspectives 1	Birds of a feather - session 5
Tue 14:00-15:20	cross-over work 1	Bodies Matter 1	UX Management: Current and 1	Multi-device Interaction 1	Design and Time: Long-term User 1	3D UIs 1	Case Studies in Novel Settings 1	Game Design 1	HCI Ethics 1	Health, Information, and 1		Practical Statistics for User Experience 1	Expert Reviews -- For Experts 1/2 1	Make This! Introduction to Electronics 1	Test Submission 1/2 1	Consumer Engagement in Health 2	Changing Perspectives on Sustainability: 1	Birds of a feather - session 6
Tue 16:00-17:20	Energy / Sustainability 3	Interaction Design for Social 1	Is My Doctor Listening to Me? Impact of 1	Bendable, Flexible 1	Design Research, Paradigm and 1	Displays in public space 1	Case Study of Changing the Way We Work 1	Exergames, Inclusion 1	Food 3	The Clinical Setting 1		Practical Statistics for User Experience 1	Expert Reviews 2/2 1	Make This! Introduction to Electronics 1	Test Submission 2/2 1	HCI with Sports 1	SIG NIME: Music, Technology, 1	Birds of a feather - session 7
Wed 9:00-10:20	Autism 2	Crowdsourcing Activism Volunteering 1	Exploring the Representation of Women 1	Touch 1	Social Impact Award 1	Shopping and Tagging 1	Place meets Engagement 1	Authentication 1	Automated Usability / Evaluation 1	Reflection and Evaluation 1		Sci-Fi and CHI in the Movies and Television 1	Interactive Walking in Virtual 1	Designing with and for Children in the 21st 1	Student Design Competition 1	unused session 4 1	CHI 2013 Human Work Interaction 1	Birds of a feather - session 8
Wed 11:00-12:20	Crime, Conflicts, and Revolution 1	How We Feel About Websites 1	Leveraging the Progress of Women in the 1	Haptics 1	Collaborative Technology: I share, you 1	Painting and Fills Law 1	Studies of the Use of Digital Artifacts 1	unused session 1 1	Evaluation Methods 2 1	Blindness and Design 1		Sci-Fi and CHI in the Movies and Television 1	Interactive Walking in Virtual 1	Designing with and for Children in the 21st 1	Student Research Competition 1		On Top of the User Experience Wave -- How is 1	Birds of a feather - session 9

Outcomes

1. engaged 1500 community members
2. reduced organizers' time from 100 hours to 5 hours
3. Resolved 100+ previously hidden conflicts



COORDINATING ON LOCAL PROBLEMS



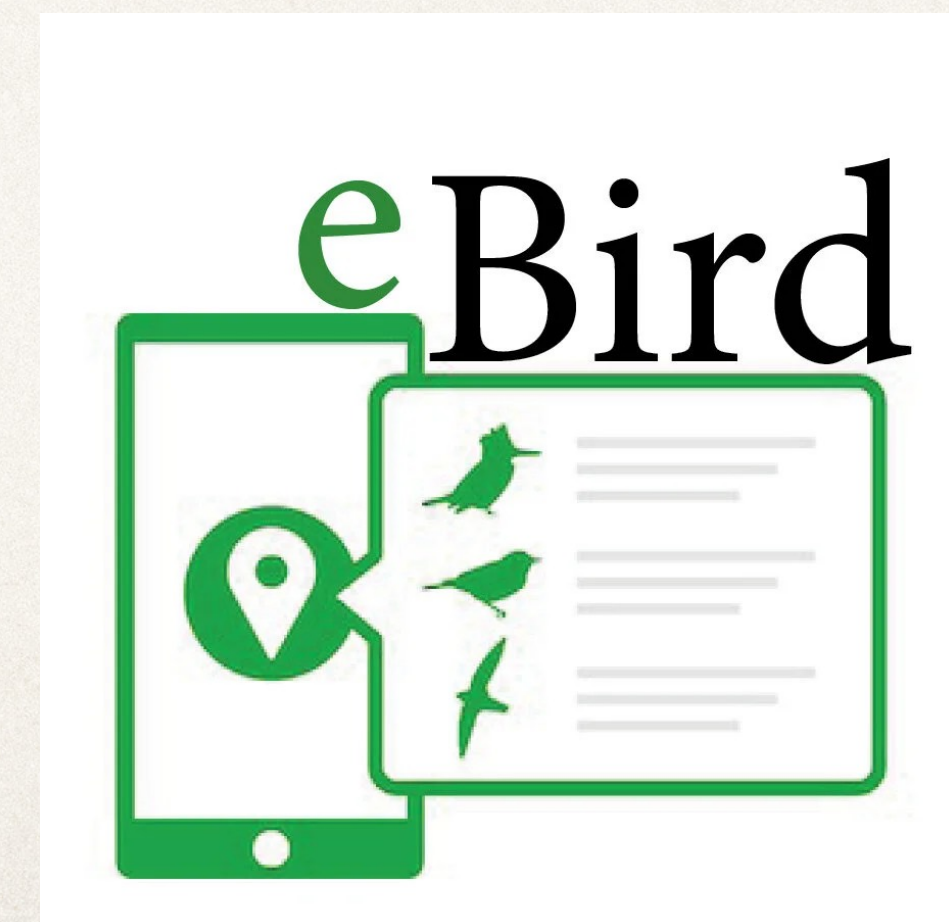
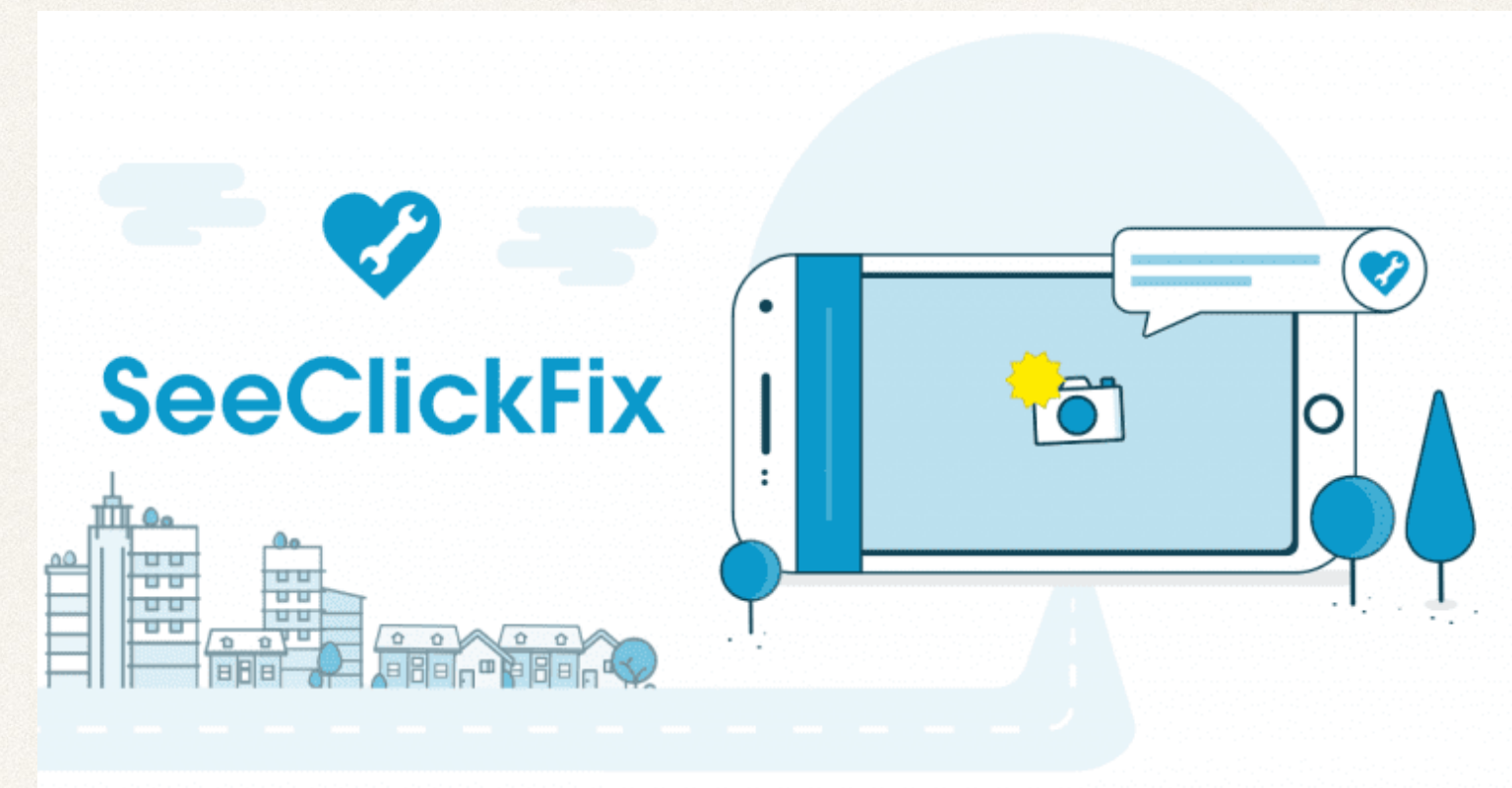
Yongsung Kim

Dissertation: Yongsung Kim. Designing Flexible Coordination Systems to Advance Individual and Collective Goals in Physical Crowdsourcing. 2021.

Funding: National Science Foundation, CHS: Small: Coordination of Opportunistic Actions to Produce Globally Effective Behaviors for Physical Crowdsourcing.

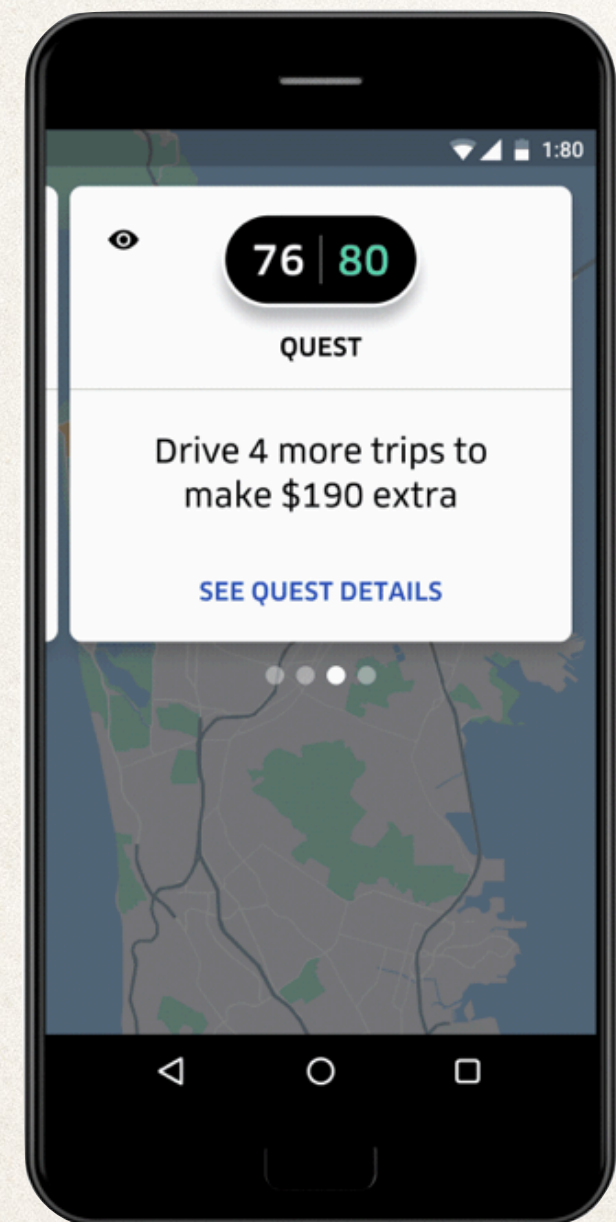
Microsoft FUSE Labs Research Award, Sharing Human-powered Mobility to Improve Societal Efficacy and Efficiency.

Mobilizing crowds to solve local problems



Two approaches to mobilizing crowds

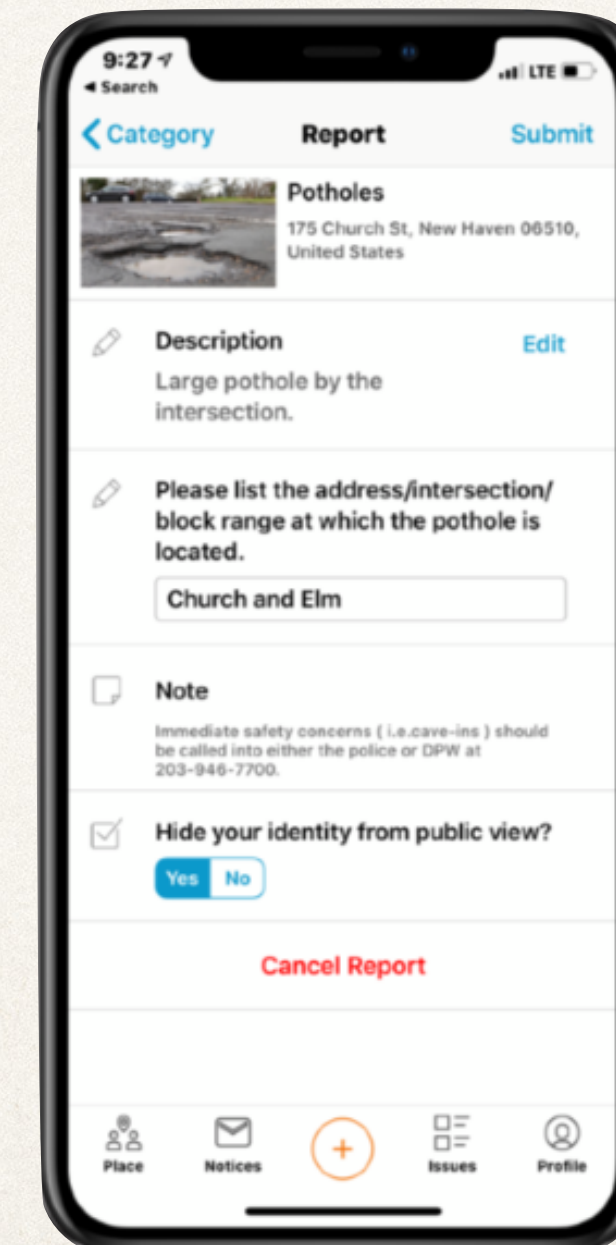
Directed



Achieve
system goals

Requires
strong
incentives

Opportunistic



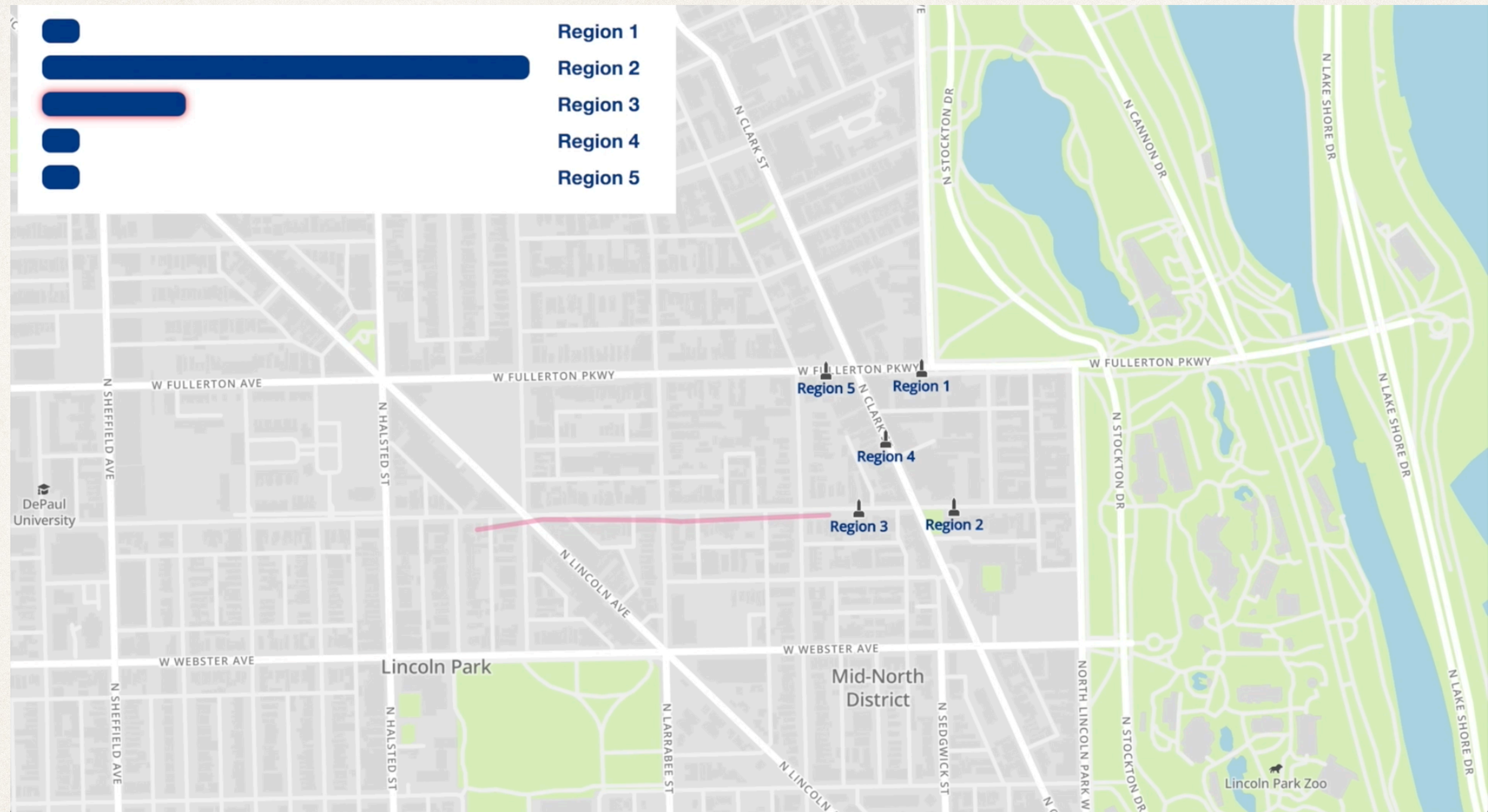
Mobilize many
volunteers

Hard to achieve
system goals

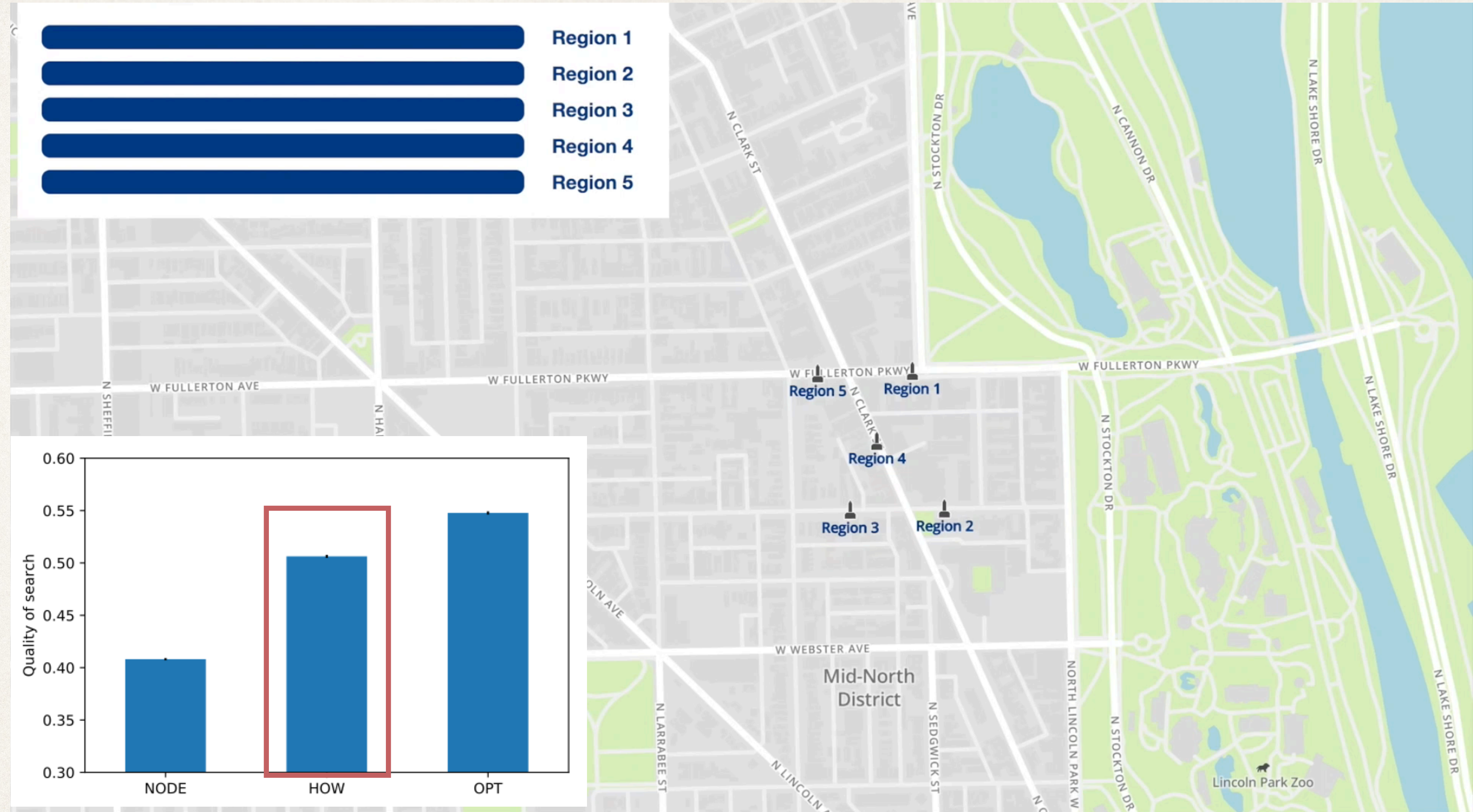
Flexible coordination [Kim, 2021]

- ❖ Ask for contributions from people on-the-go when it is:
 - ❖ Convenient and of interest to volunteers
 - ❖ Valuable for system goals



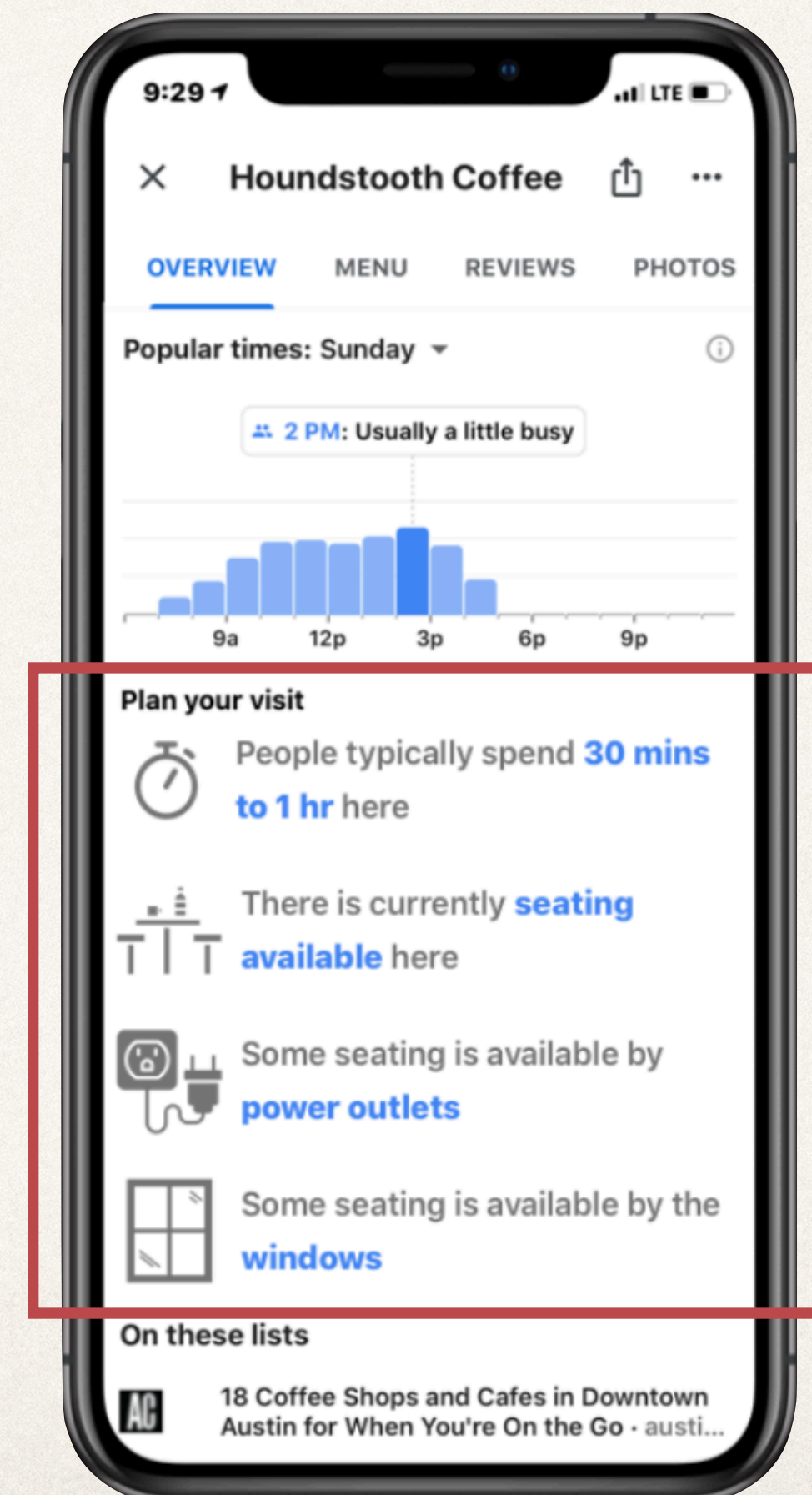
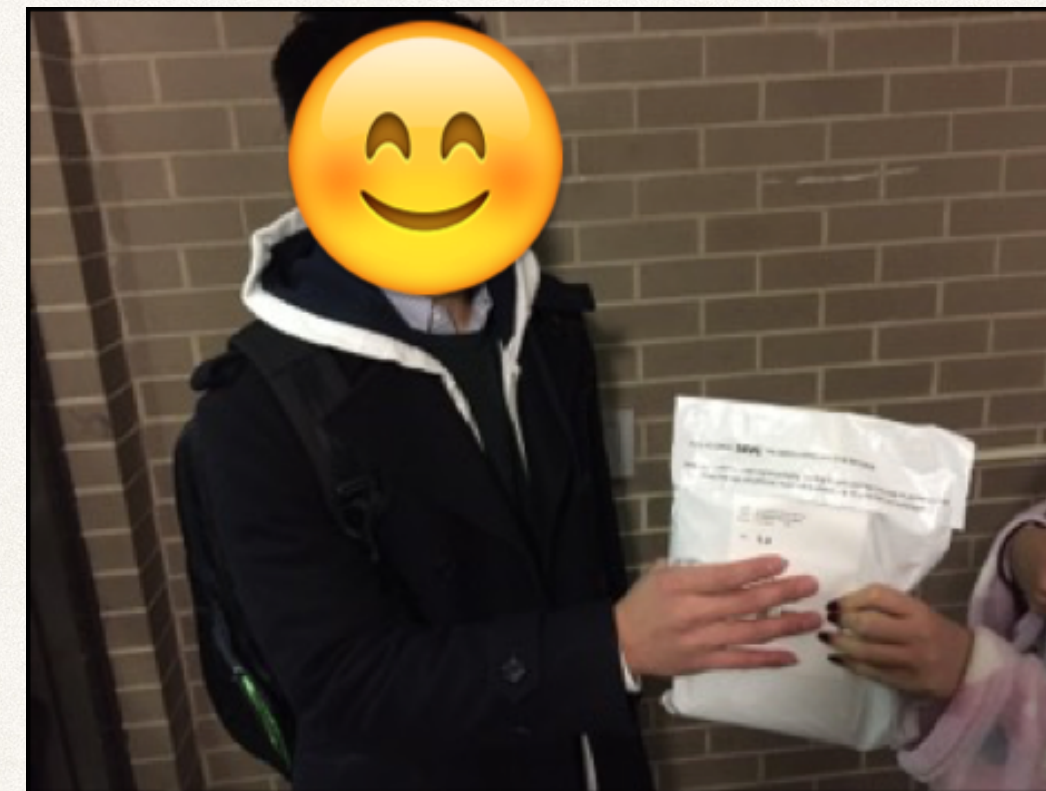


Hit-or-Wait, Yongsung Kim, Darren Gergle, Z., CHI 2018.



Hit-or-Wait, Yongsung Kim, Darren Gergle, Z., CHI 2018.

new forms of local services and communities



[Kapil Garg et al., CSCW 2019]

CONNECTING FRIENDS AT DISTANCE



Ryan Louie



Jennie Werner



Allison Sun

Dissertation: Ryan Louie. Human-AI Interface Layers: Enhancing Communication of Intent for AI-Assisted Creative Pursuits and Social Experiences, 2023.

Funding: Google Faculty Research Award, Computational Tools for Expressing Conceptually Rich Situations to Machines.



Opportunistic Collective Experiences [Louie et al., 2020]

Puddle Feet 1



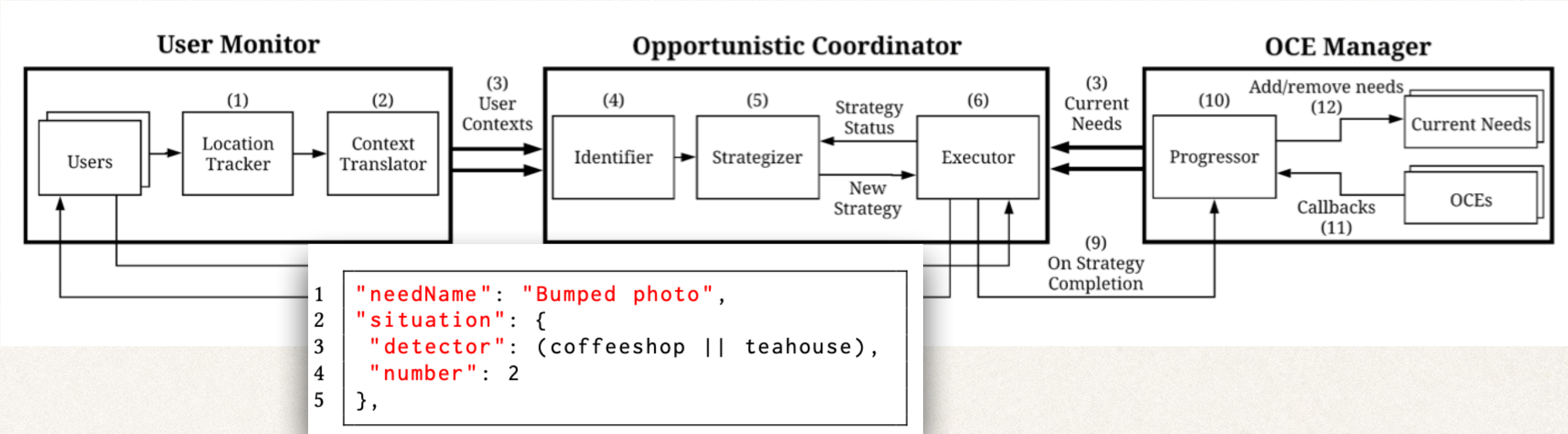
Grocery Buddies 2



Rethinking connecting at distance [Louie et al., 2020, 2022]



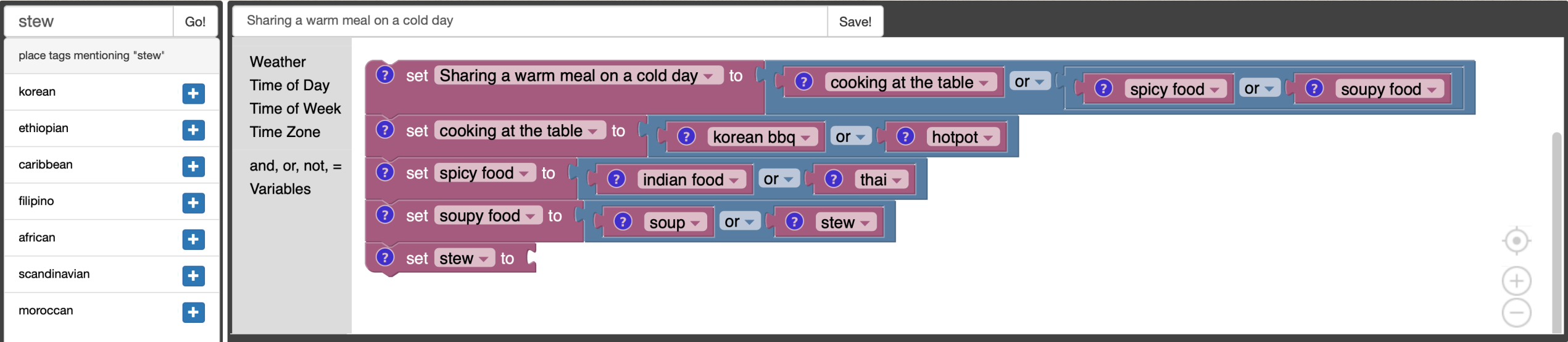
novel interaction model



OCE programming model & coordination engine

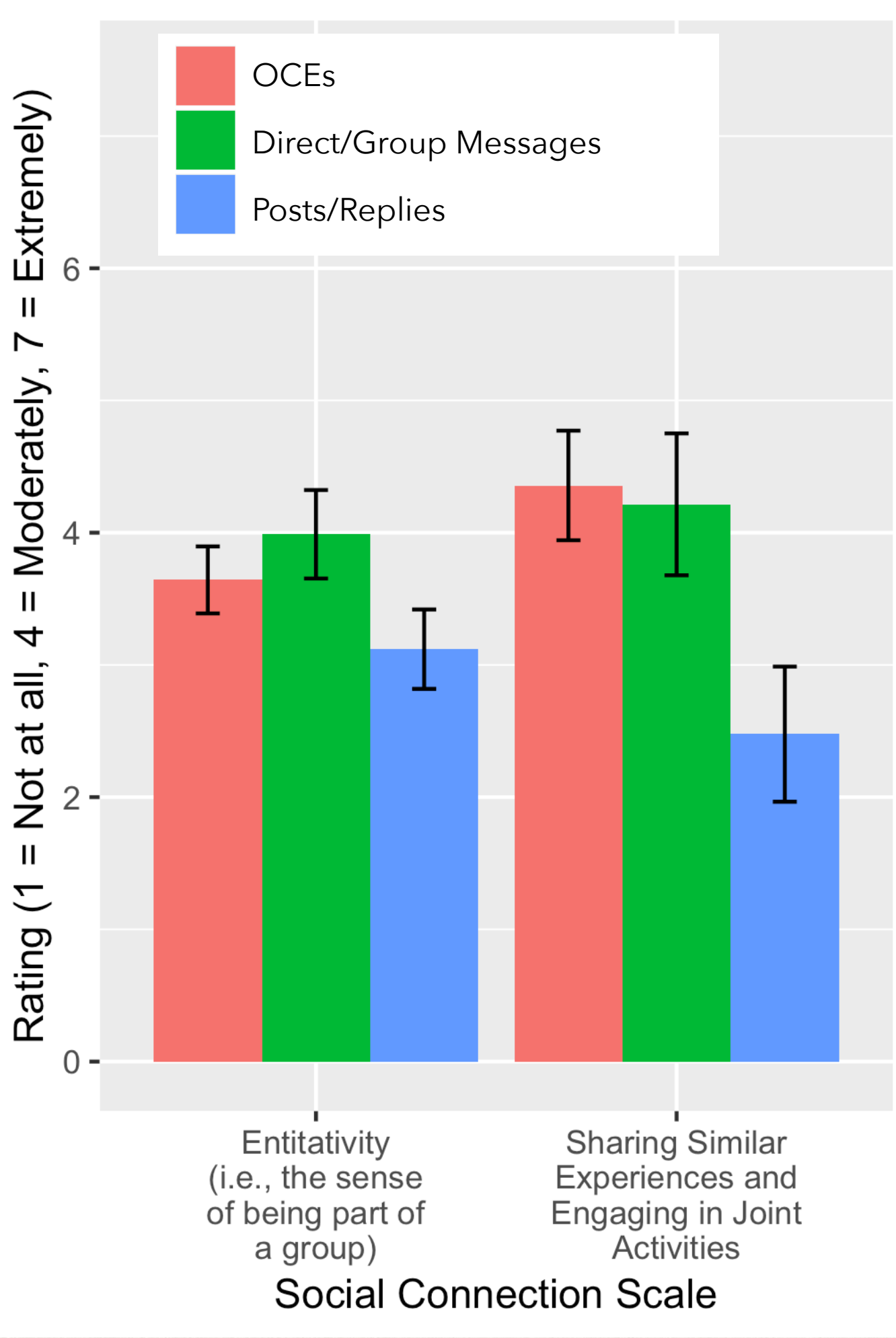
OCE Interaction Structures and Examples	Relevant Mechanisms	Design Guidelines
Shared Experiences: Connect People Who Are Doing Similar Activities in Similar Situations in Distributed Contexts 	<i>Shared attention to stimuli</i> , or awareness that others are attending to the same stimuli, promotes co-experiencing and thinking about co-experiencer. <i>Embodied mimicry and synchrony</i> , and the general coordination of movements, speech, and activity patterns, enhance the smoothness of interactions and foster liking.	Identify situations that provide a shared context for interacting and for joint actions, e.g., that contain common object affordances or afford similar actions across situations. Support people being aware of shared aspects of their individual situations and contexts to make co-referencing easy. Increase psychological proximity by using visual reminders to increase the salience of co-experiencing.
Interdependent Activities: Construct a Digital Artifact Together or Achieve Collective Goals by Making Contributions through People's Local Situations 	<i>Cooperation</i> , or working toward activities with shared achievements, supports bonding and a sense of being a part of a group. <i>Positive interdependence</i> in shared activities promotes meaningful interactions and increases social support and social closeness.	Create experiences in which the diversity of situations and contexts across people allows individuals to make unique contributions to achieving the interdependent activity. Create links across individual activities to increase positive interdependence and surface these links so people see how individual activities contribute to shared outcomes and artifacts.

theoretically-informed design principles



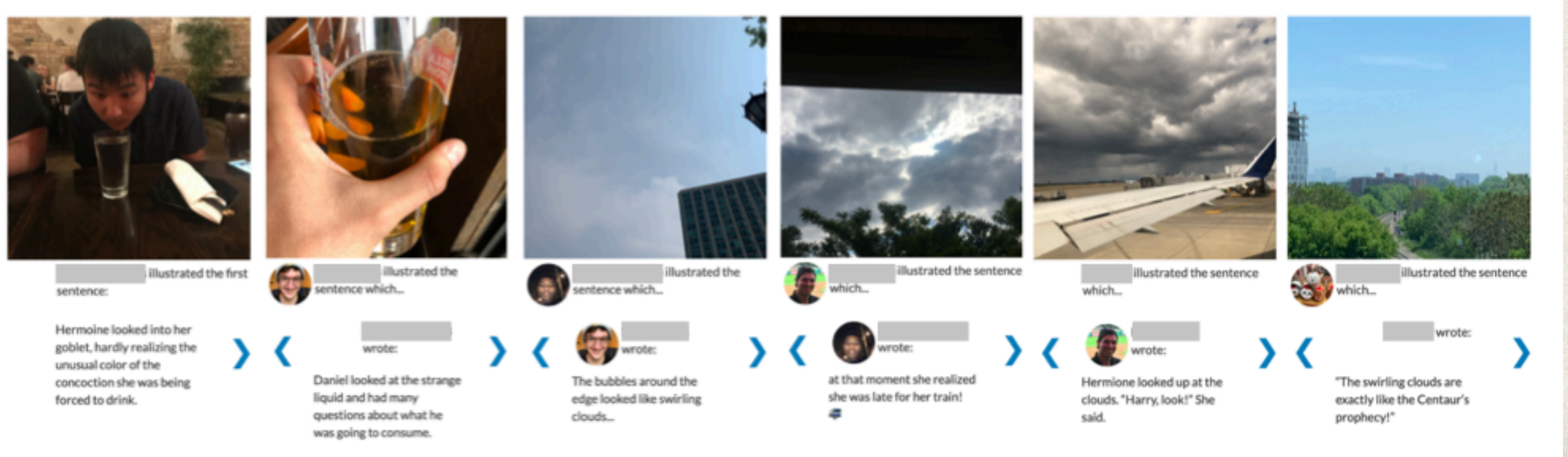
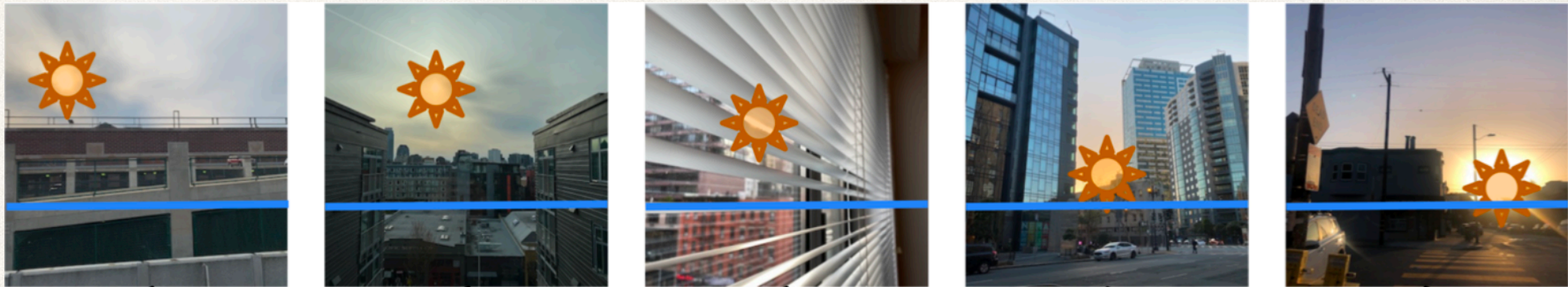
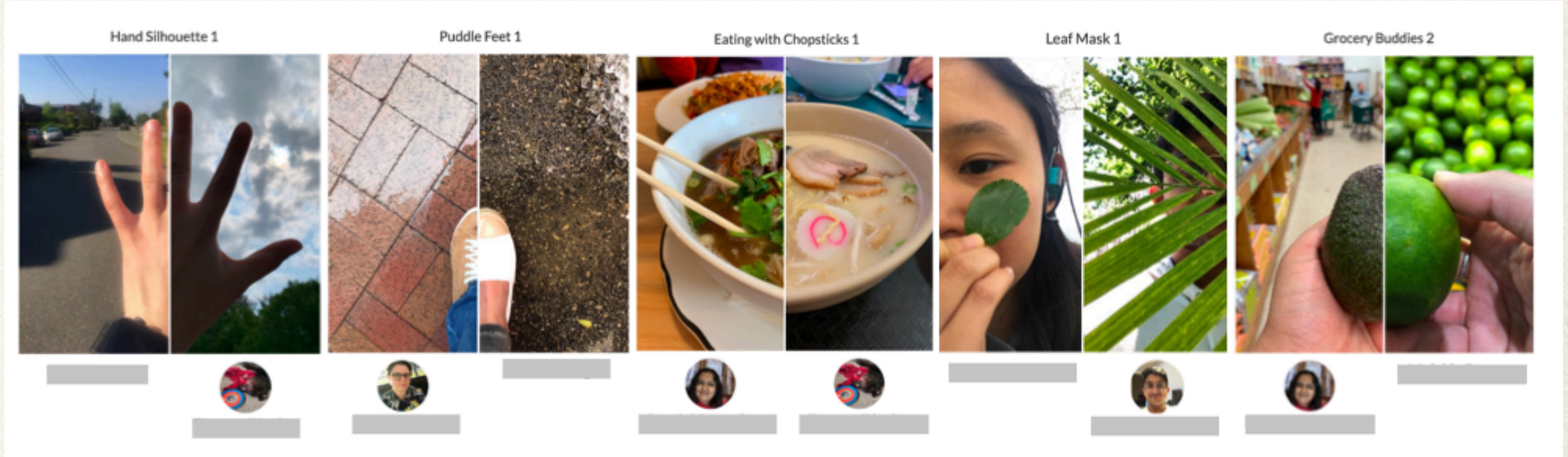
tools for expressing human situations to machines

Findings: More connecting, less barriers, and new experiences



...you're more involved in the other person's life.

Just knowing that what I was doing was explicitly something that [my friend] was doing as well... Not only was it a reminder of them, it's a reminder that I'm around too.



LEARNING TO BUILD SOFTWARE



Josh Hibsichman



Sarah Lim



Gobi Dasu

Dissertations: Josh Hibsichman. Readily Available Learning Experiences in Production Code, 2018.

Gobi Dasu. Process Management for Learning from Professional Source Code Cultivating Diverse Experts in the Age of AI, 2025.

Funding: National Science Foundation, Cyberlearning EXP: Readily Available Learning Experiences: Turning the Entire Web into Progressive Examples to Bridge Conceptual Knowledge Gaps for Novice Web Developers.

Tutorials aren't quite right.

Where

Destination, city, address

When

Check In → Check Out

Guests

1 Guest

Search

VS.

Basic hotel booking form

A PEN BY Andi Dysart

Fork

DETAILS

Arrive y

Depart /

People

Room

Bedding

Source: Codepen

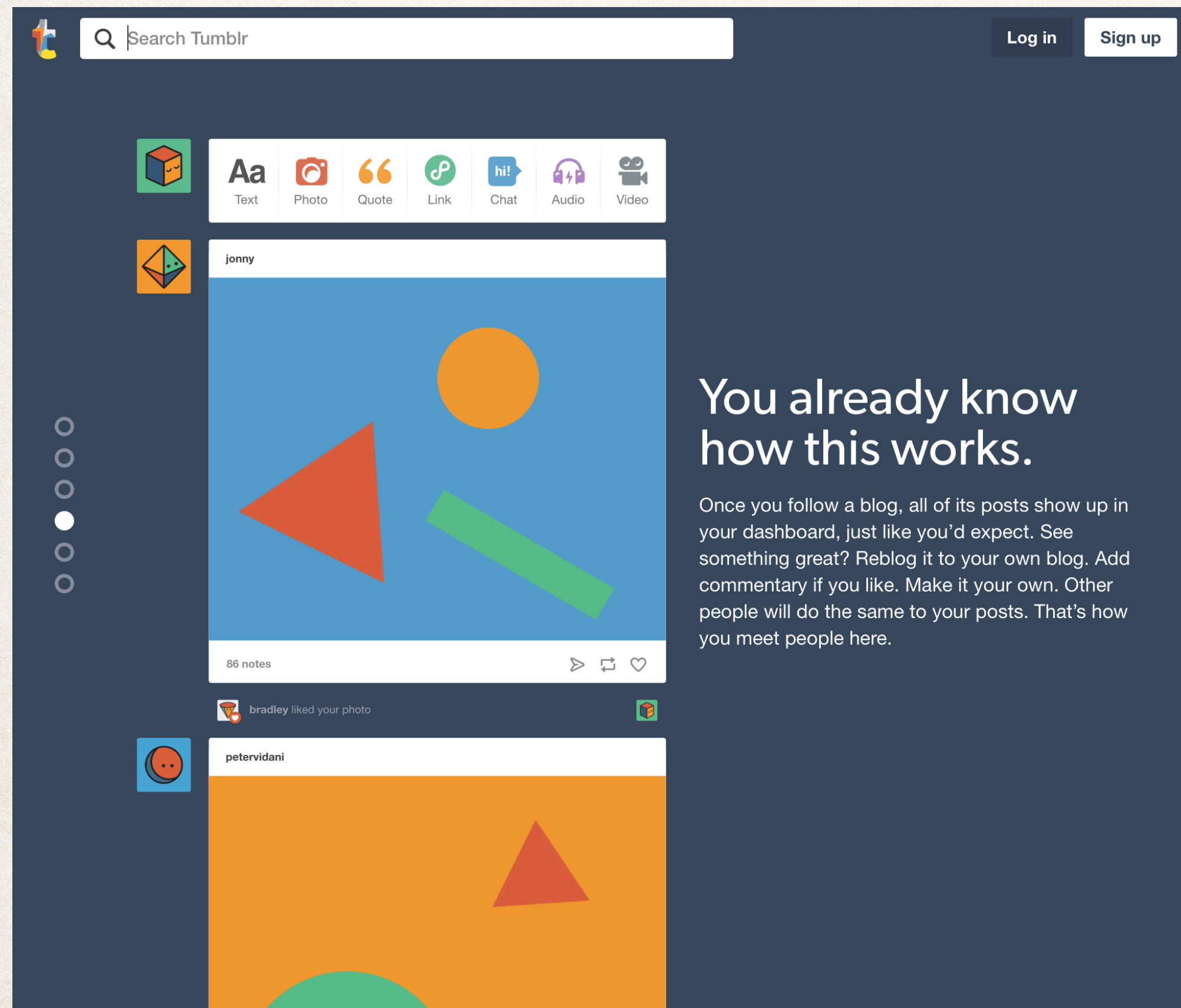
Any webpage can be inspected...

The screenshot shows a web browser displaying the Airbnb search bar. The developer tools are open, showing the React component tree on the left and the CSS styles on the right. The component tree shows the search bar is a `div.container_1jd16m3` with a `data-reactid="89"` attribute. The CSS styles on the right show the default styles for the search bar, including font-family, font-size, line-height, padding, border, and box-shadow.

But tools are overwhelming for novices

Readily Available Learning Experiences

[Hibschman, 2018]



Transform *all* professional websites into a learning resource.

Support novices making sense of complex code.

The **New** New York Skyline

Manhattan is in the midst of an unprecedented boom in tall buildings. Before 2004, Manhattan was home to 28 skyscrapers 700 feet and taller. Since then, an additional 13 have been built, 15 are under construction, and 19 are proposed—47 more in all. These additions are rapidly—and radically—changing the skyline.

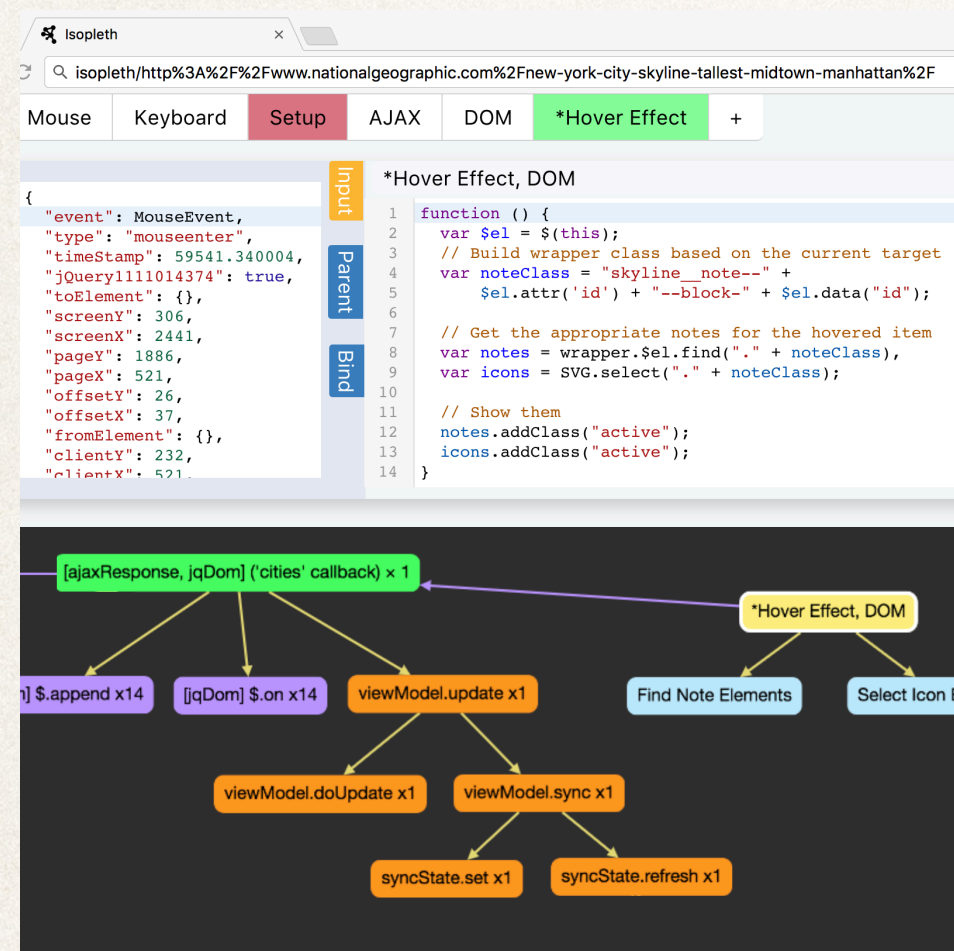
Scroll Down ↓



Isopleth, Josh Hibschan, Nell O'Rourke, Z., TOCHI 2019

Learner-centric developer tools

Isopleth [Hibschman et al., TOCHI 2019]



Novices learned complex interactive Javascript features.

31% improvement in conceptual models of code architecture

Ply [Lim et al., UIST 2018]

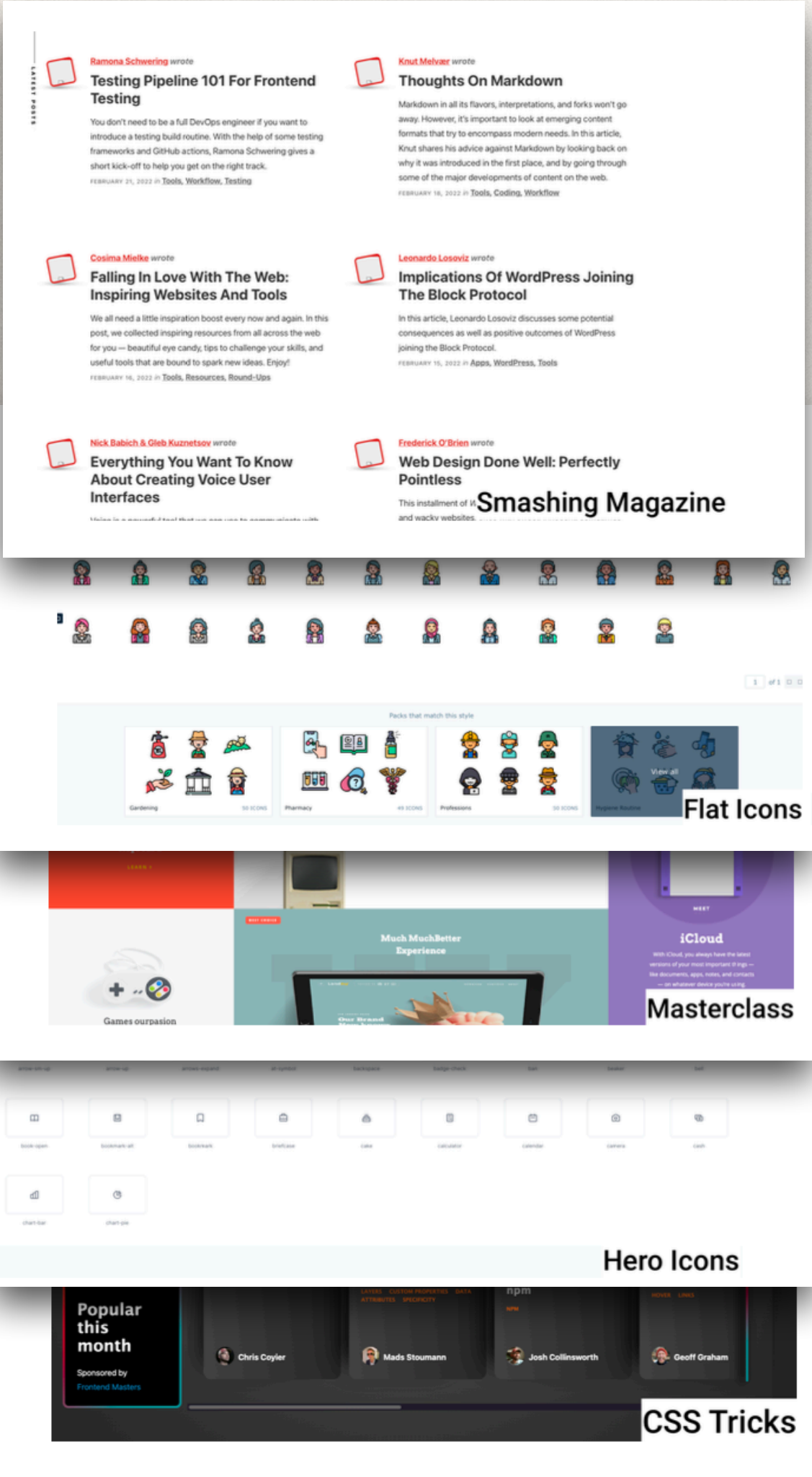
```
.container_1jdl6m3 {  
  font-family: Circular,-appl  
    system,BlinkMacSystemFon  
    serif !important;  
  font-size: 19px !important;  
  line-height: 24px !important;  
  letter-spacing: undefined !  
  padding-top: 0px !important  
  padding-bottom: 0px !import  
  color: ■ #484848 !important  
  border-radius: ▶ 4px !import  
  border: ▶ 1px solid ■ #DBDBD  
  box-shadow: 0 1px 3px 0px r  
  padding: ▶ 0px !important;  
}
```

Novices learned unfamiliar CSS concepts.

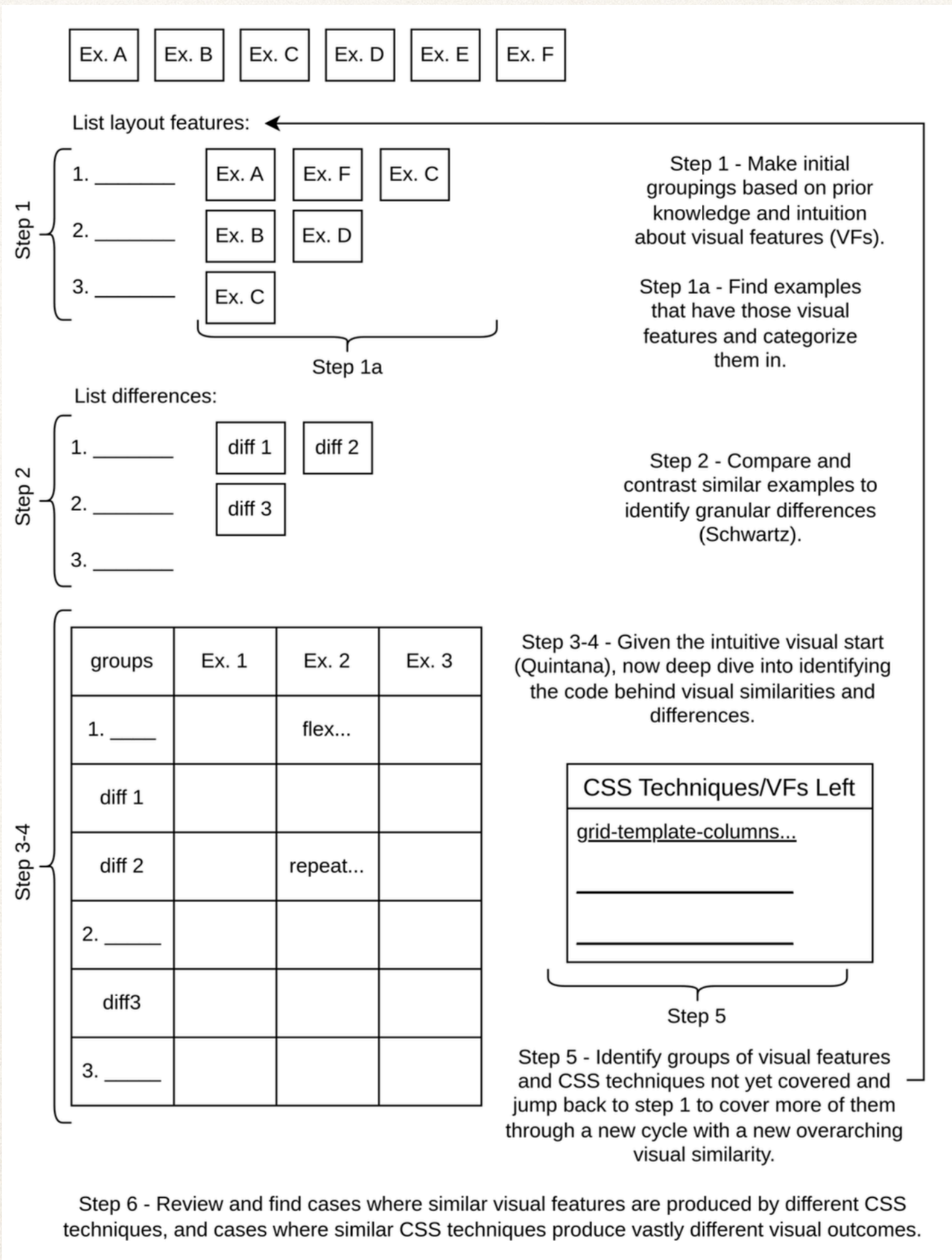
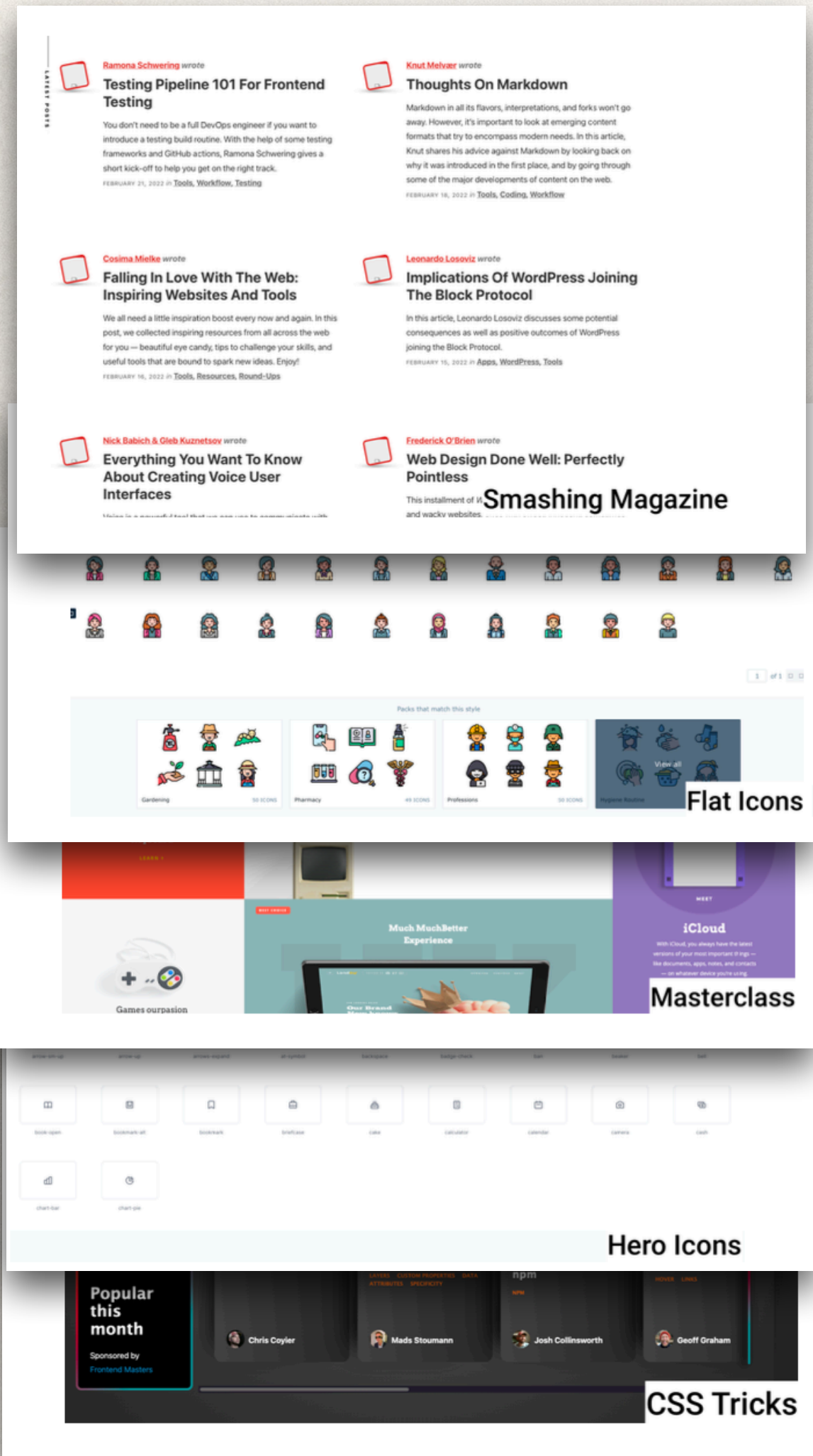
Replicated complex CSS features 50% faster than CDT.

now in all major browsers

Process Management for Learning from Professional Source Code [Dasu, O'Rourke, Z., under review]



Process Management for Learning from Professional Source Code [Dasu, O'Rourke, Z., under review]



Process Management for Learning from Professional Source Code [Dasu, O'Rourke, Z., under review]

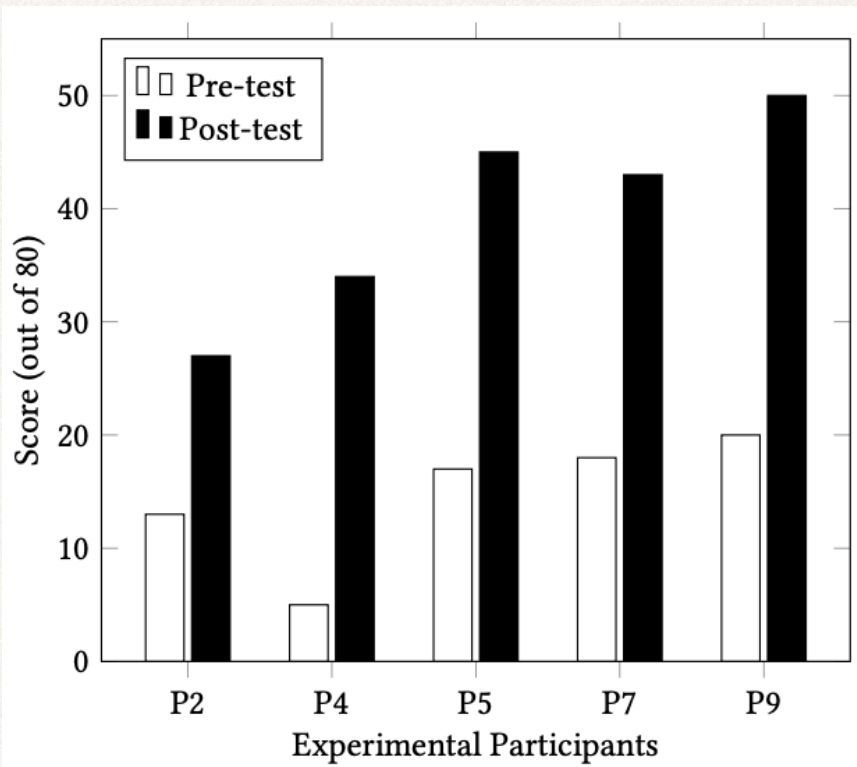
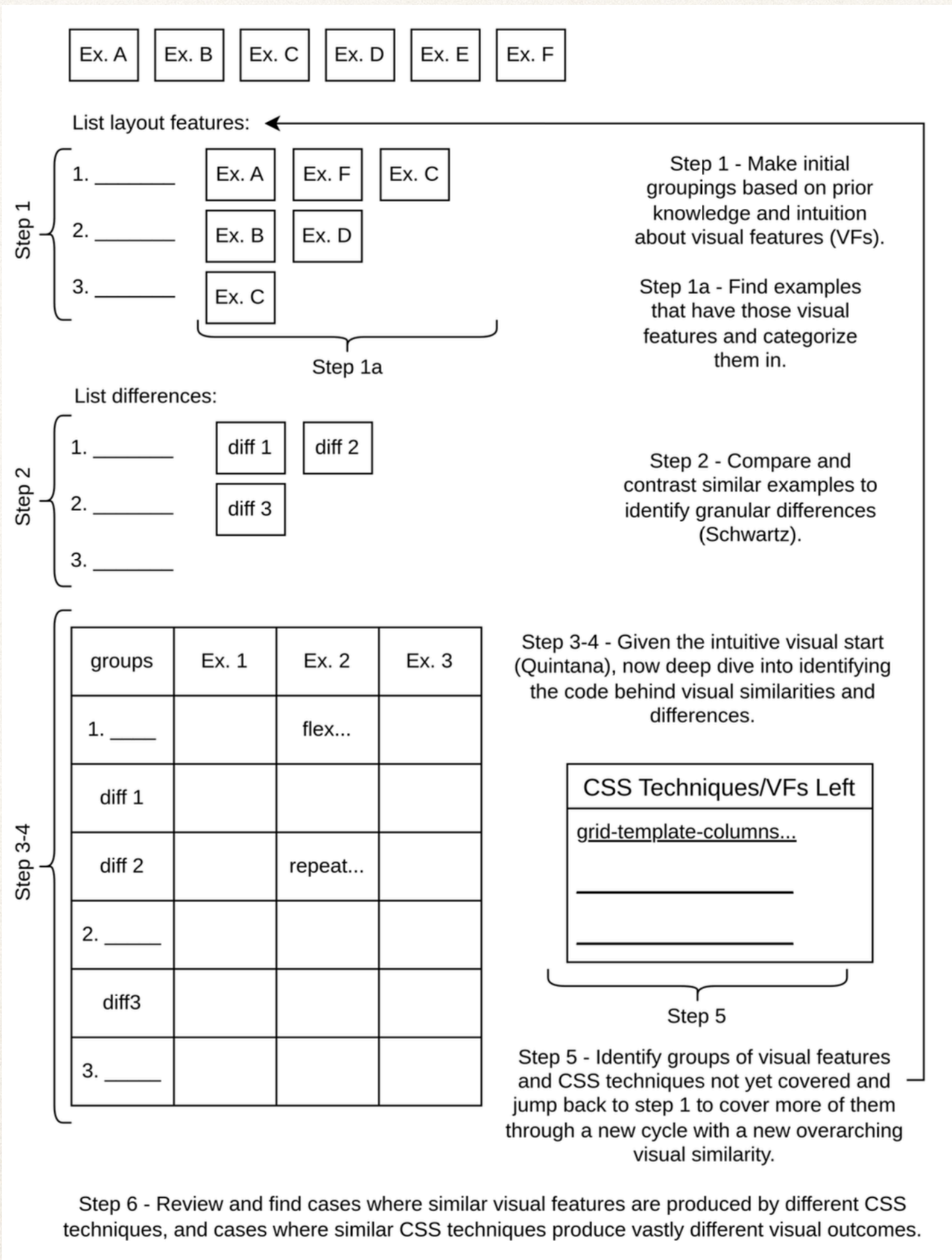
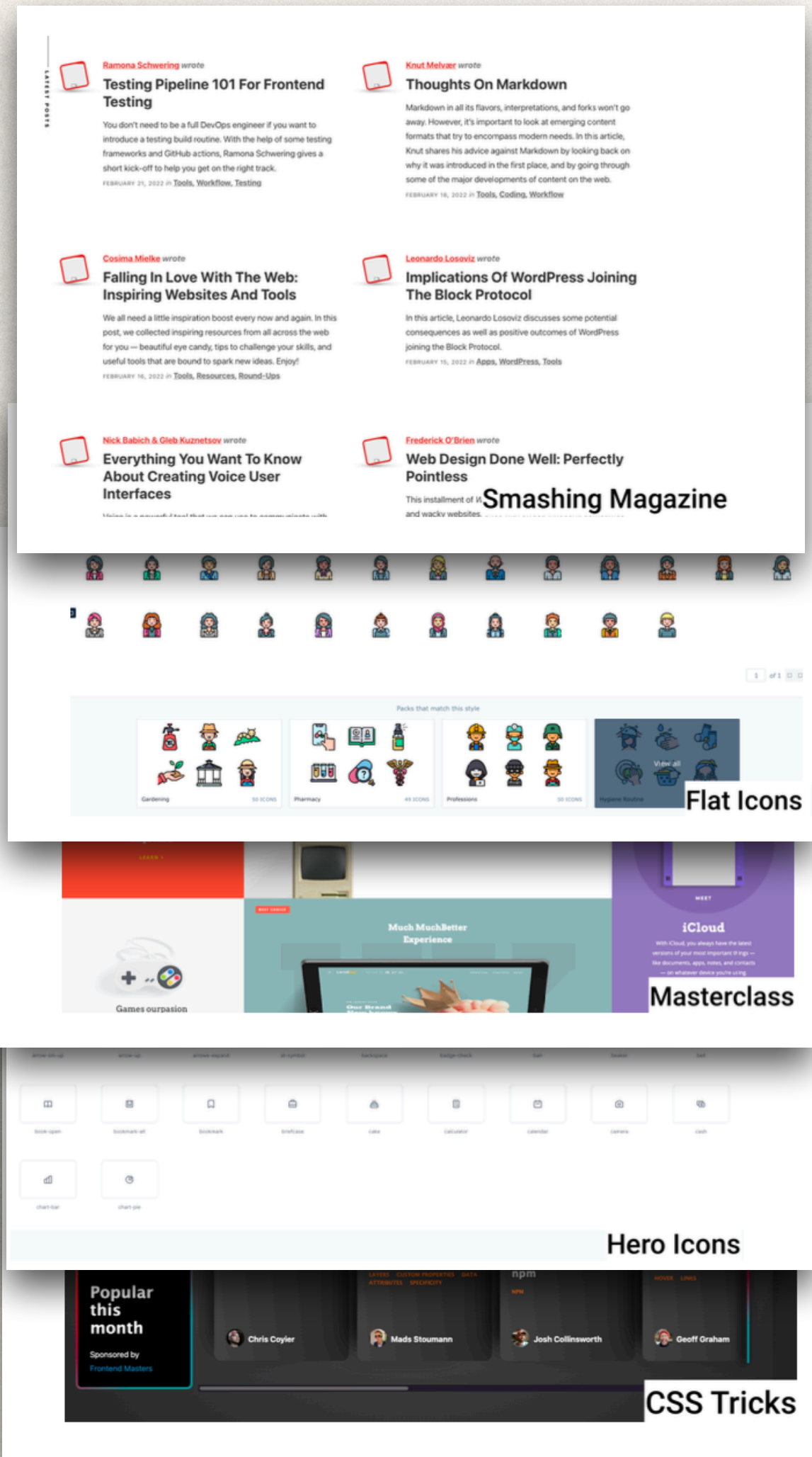


Fig. 28. Comparison of pre-test and post-test scores for experimental (KM) users.

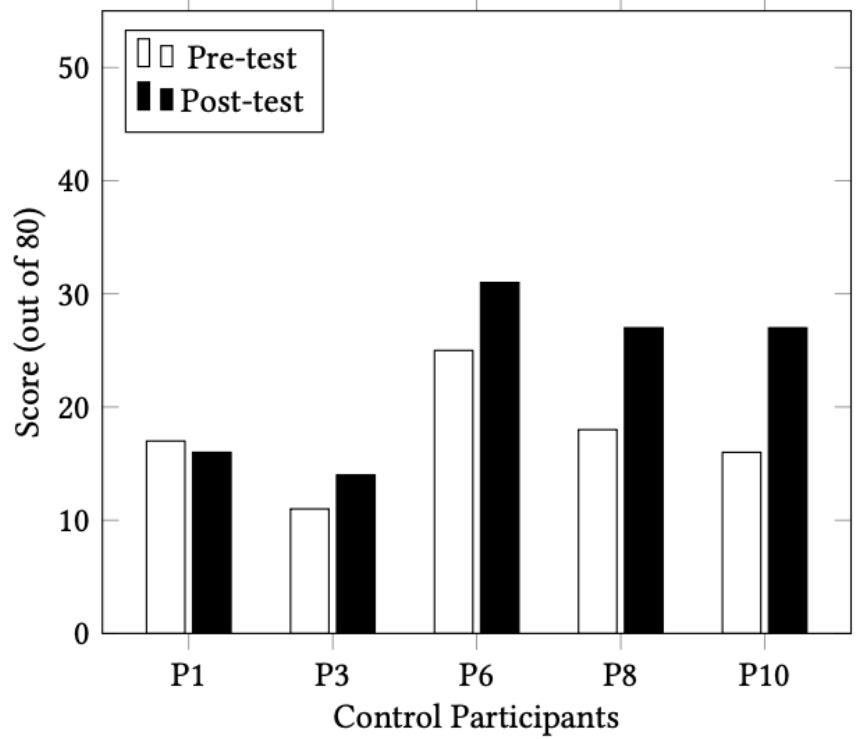


Fig. 29. Comparison of pre-test and post-test scores for control users.

Significant gains in conceptual understanding of professional code across Javascript, CSS, and Python.

INNOVATING THROUGH RESEARCH



Leesha Maliakal

Dissertation: Leesha Maliakal. Agile Research Studios: Learning Ecosystems to Scale Effective Research Training, 2023.

Funding: National Science Foundation, Cyberlearning EXP: Agile Research Studios: Scaling Cognitive Apprenticeship to Advance Undergraduate and Graduate Research Training in STEM.



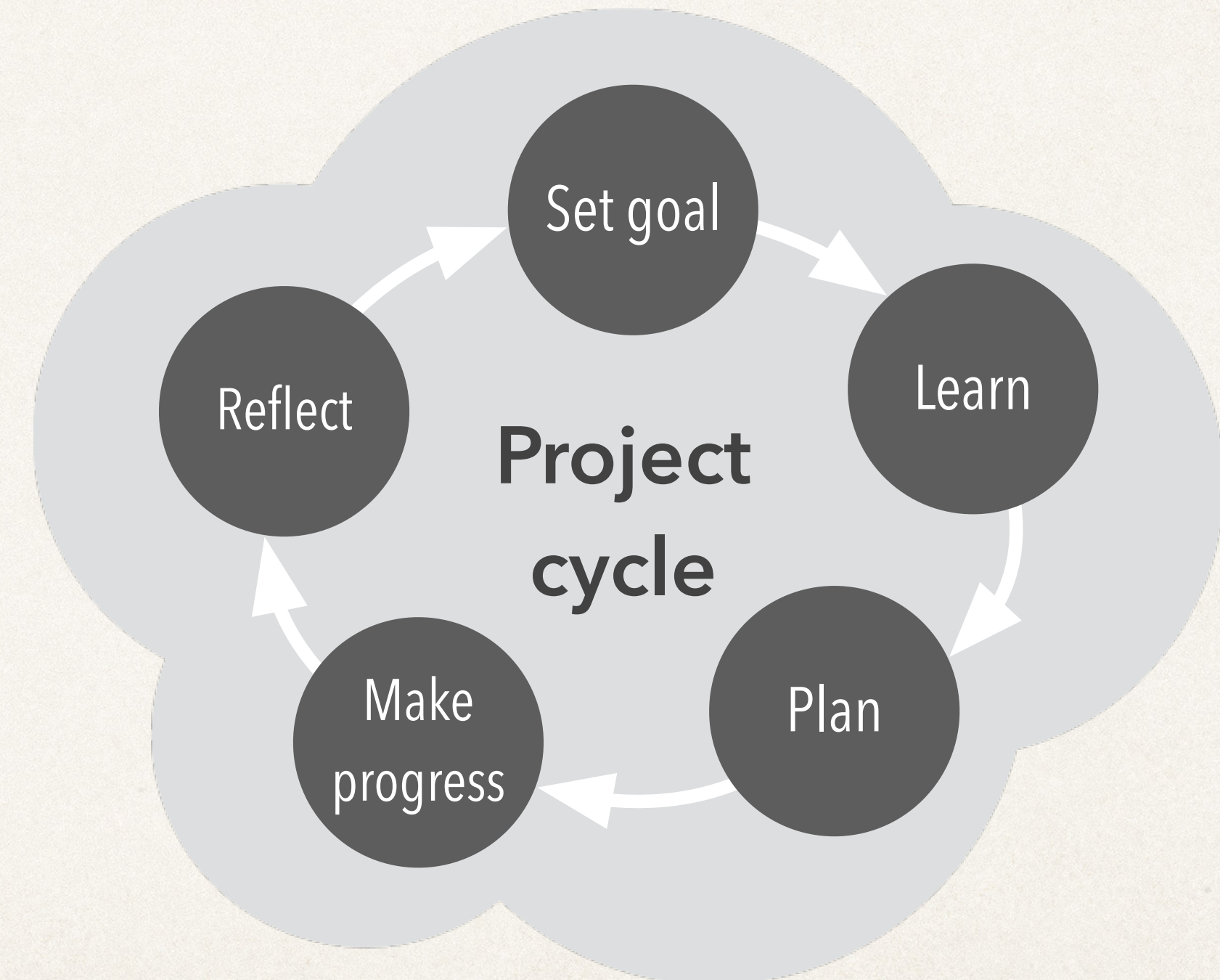
Design, Technology, and Research (DTR)

Students need regulation skills

- ❖ **Regulation skills:** cognitive, metacognitive, motivational, and emotional skills for reaching a goal *[Jarvela & Hadwin. 2013]*
- ❖ Independent research requires regulation skills including **planning** and **seeking help** to overcome challenges.
- ❖ Students lacking these skills are confined to rote tasks, or can struggle to make progress.

Agile Research Studio (ARS) [Z. et al., 2017]

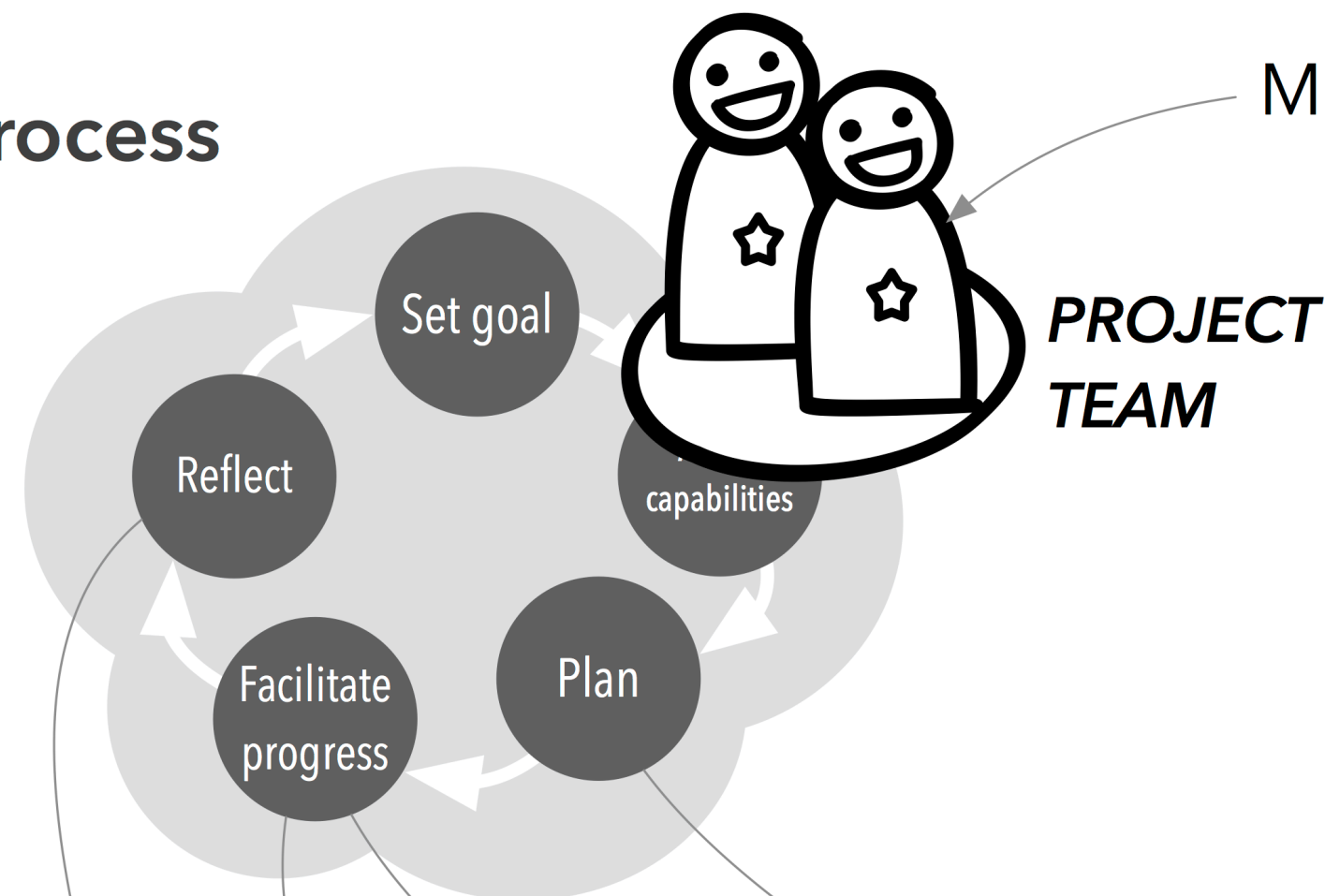
- ❖ Model for research training in a learning community
- ❖ All students, regardless of seniority, conduct independent research and receive authentic research practice.



ARS is a sociotechnical model for developing regulation skills

AGILE RESEARCH STUDIO

1. Agile Process

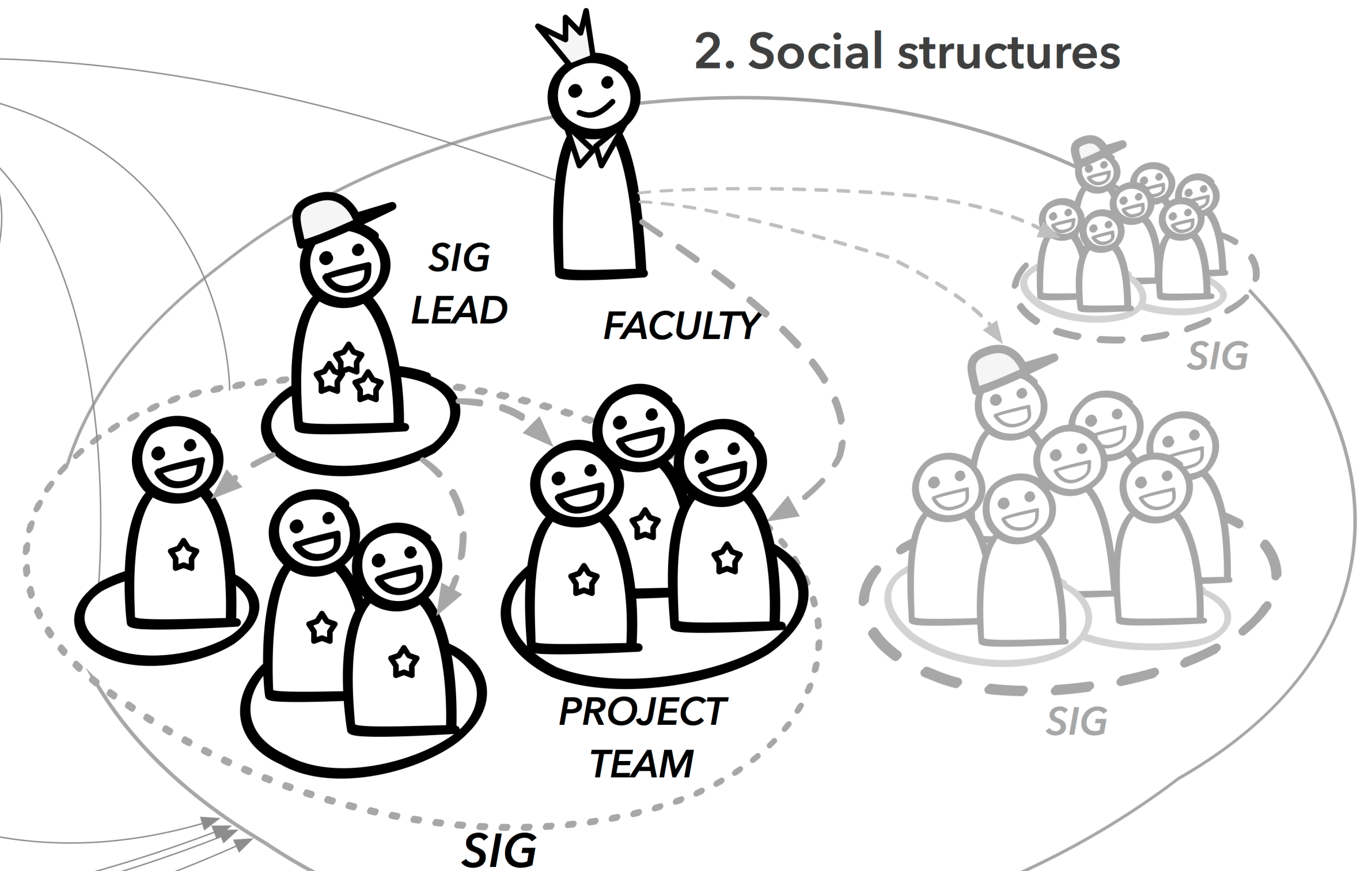


Mentoring

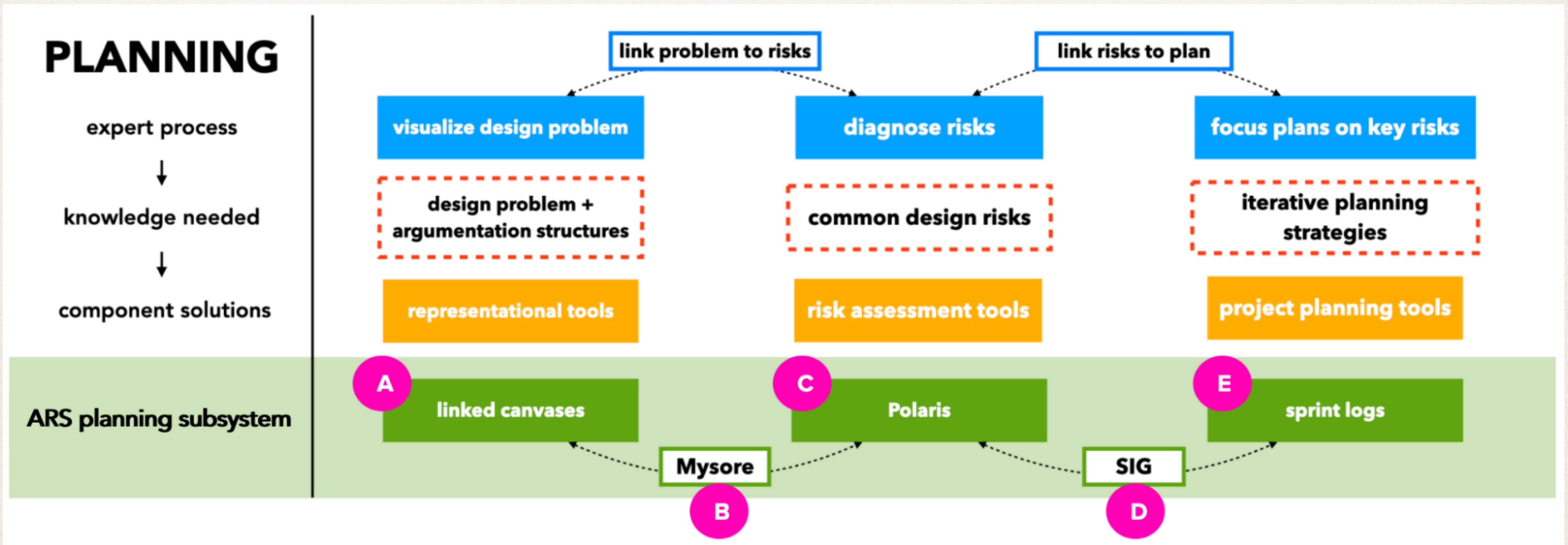
3. Virtual Studio Tools



2. Social structures

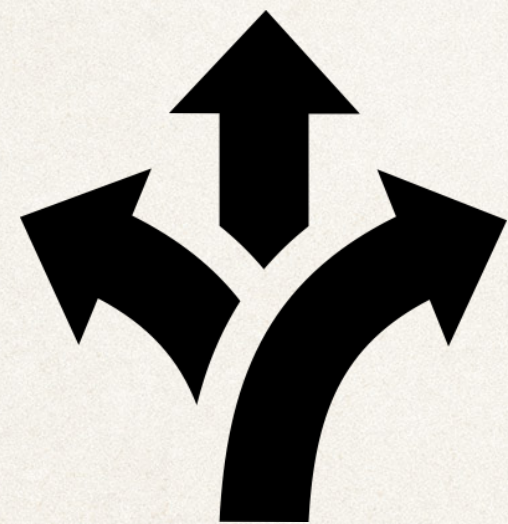


ARS: planning [Maliakal, 2023]

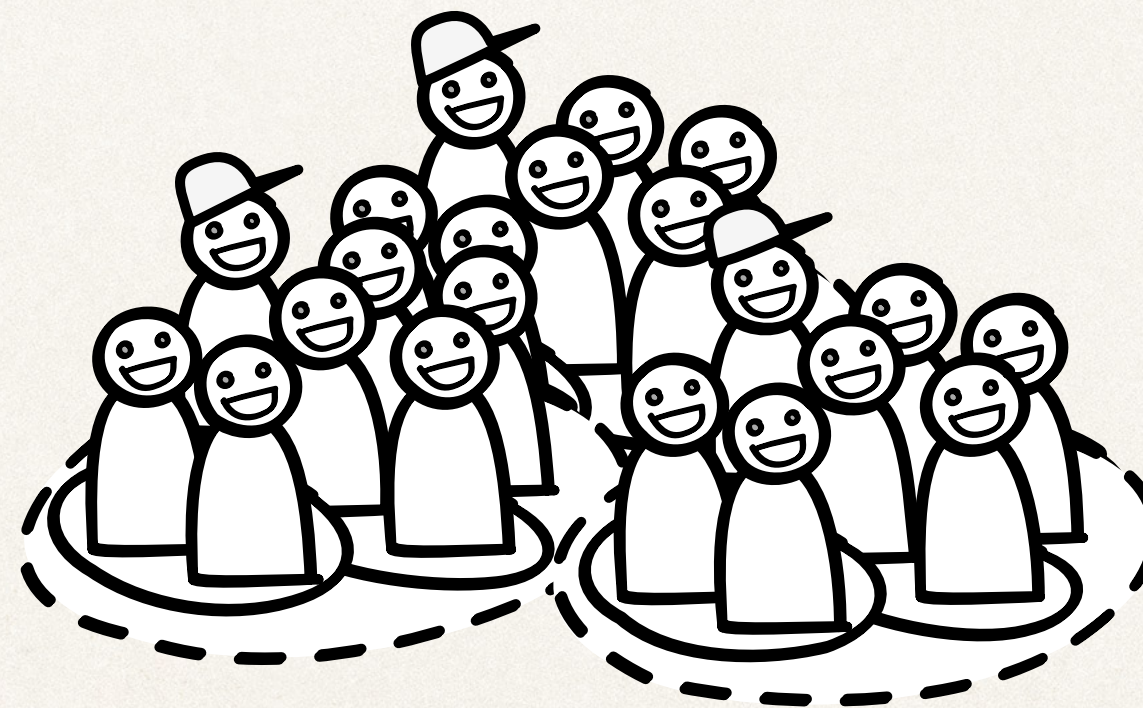


ARS: help & collaboration

Process:
Distributed help



Social structure:
Studio meeting



Studio tool:
Pair research

LEAVE POOL

RESET POOL

MAKE PAIRS

This is how you appear to others. [\(edit\)](#)



Help me with figures for my CSCW talk
Haoqi Zhang

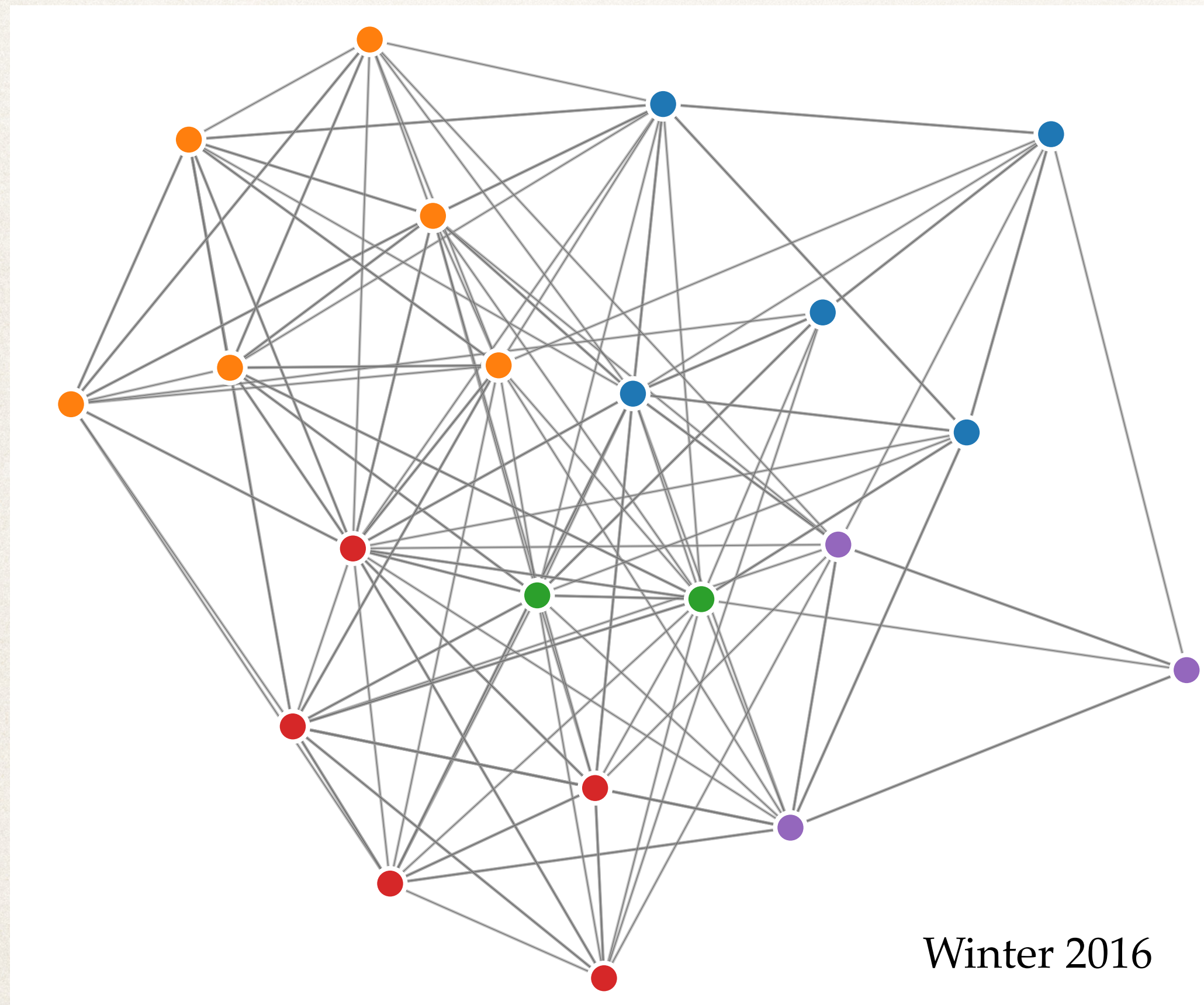
☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5

How much can you help with each of these tasks? (1: not at all, 5: totally)

SL	help me with relational information visualizations <i>Sarah Lim</i>	☐ 1 ☐ 2 ☐ 3 ☐ 4 ☒ 5
KG	Implementing iOS push notifications in Node <i>Kapil Garg</i>	☐ 1 ☐ 2 ☒ 3 ☐ 4 ☐ 5
AK	topcode schema development <i>Alex Kaldjian</i>	☐ 1 ☐ 2 ☐ 3 ☒ 4 ☐ 5
JW	getting iPhone motion activity type in Meteor <i>Cordova</i>	☐ 1 ☒ 2 ☐ 3 ☐ 4 ☐ 5

[Miller, Z., Gilbert, Gerber, CSCW '14]

Help & Help-seeking



"I can ask for help and that everyone asks for help and it doesn't make them stupid to need help."

Outcomes (11 yrs)

- ❖ 176 students (152 UG, 11 MA, 15 PhDs) who led 70+ research projects.
- ❖ 50% women!
- ❖ 73 undergraduate research grants
- ❖ 30+ papers & extended abstracts; 7 winners at major ACM Student Research Competitions
- ❖ Many DTR undergraduates placed at Apple, Google, Microsoft, Meta, Amazon, and OpenAI; others have founded their own companies.



Success beyond Northwestern

- ❖ Founded Agile Research University (ARU) to support 70+ faculty at universities across the world using the Agile Research Studios model (even in the humanities!)
- ❖ Produced the DTR documentary, *Forward*
See: <http://forward.movie>
- ❖ DTR annual letters to start deeper conversations on mentoring and learning
See: <http://dtr.northwestern.edu/letters>

Forward



A film about learning and growth.

Watch Trailer

Watch Film

PLAN LARGE EVENTS

COORDINATE ON LOCAL PROBLEMS

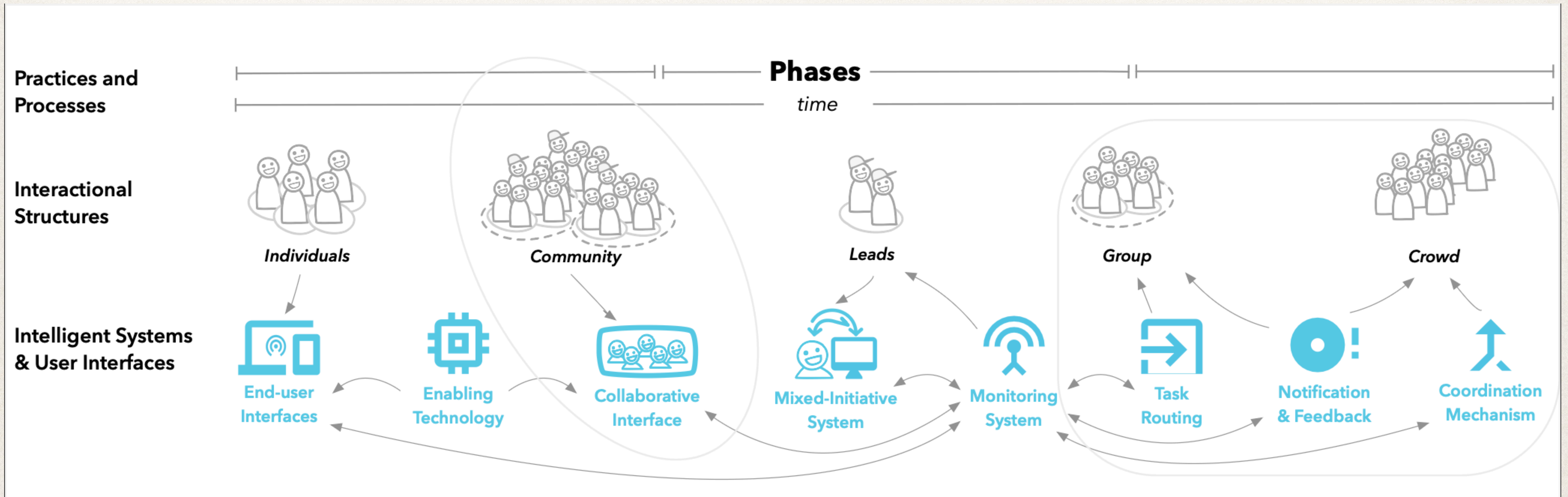
CONNECT FRIENDS AT DISTANCE

LEARN TO BUILD SOFTWARE

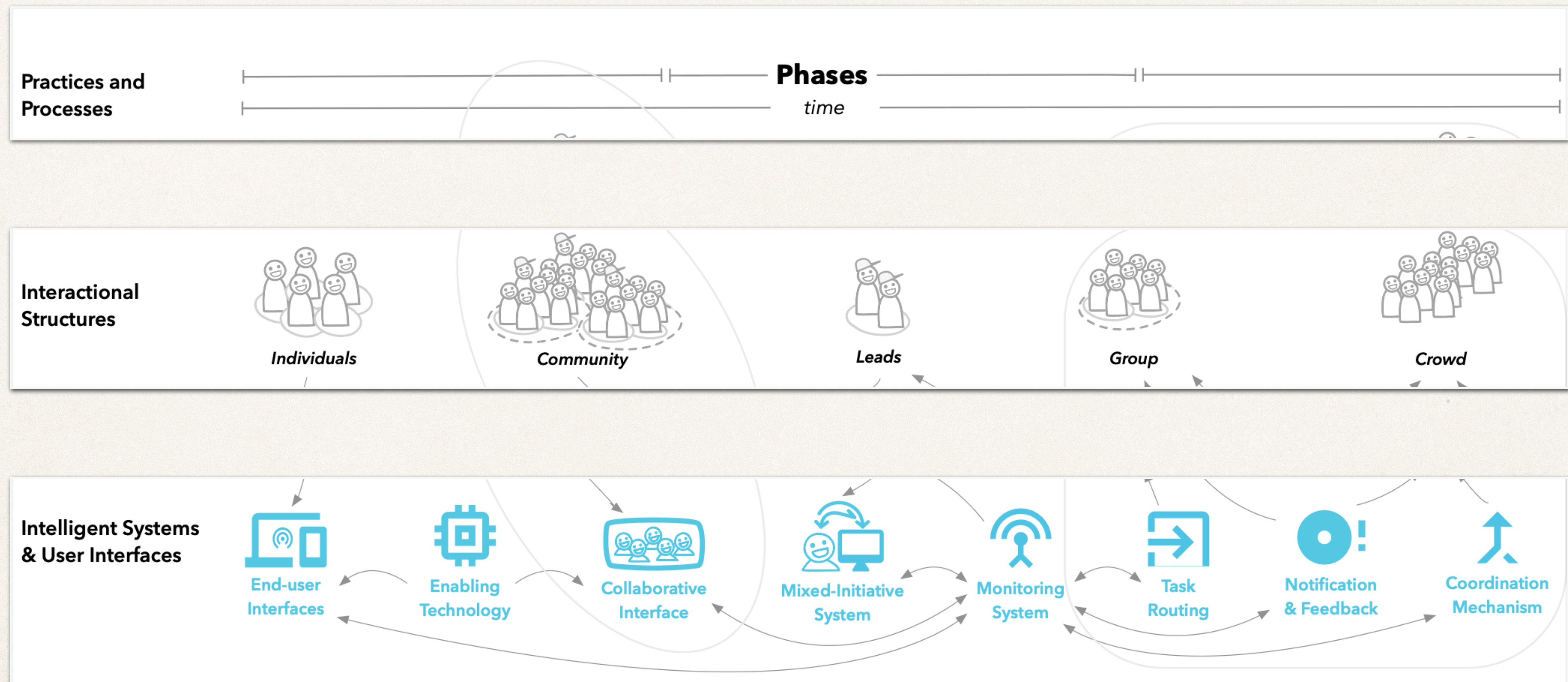
INNOVATE THROUGH RESEARCH

- ❖ There were fundamental limitations with existing approaches.
- ❖ These limitations could not be overcome with technology alone.
- ❖ We took a different approach.
- ❖ We created **entirely new sociotechnical configurations** to support it.

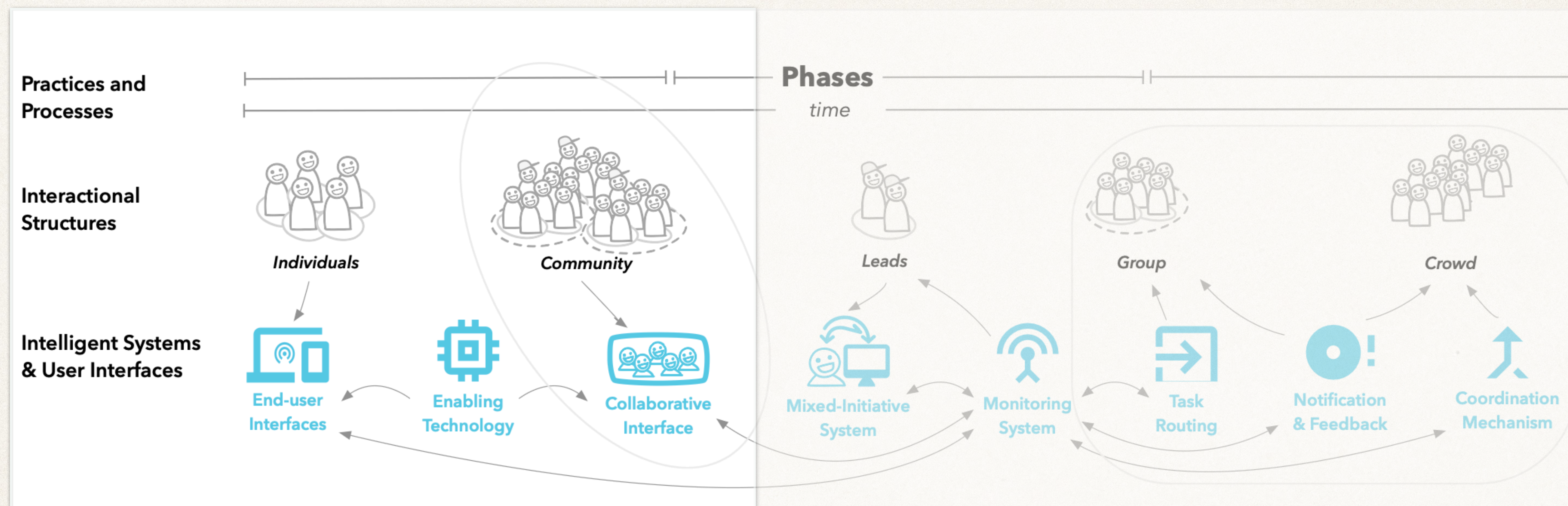
Computational Ecosystems



Typically...



Instead...



A call for systems: having great components is not enough.



Atul Gawande

"...We've been obsessed in medicine with components. We want the best drugs, the best technologies, the best specialists, but we don't think too much about how it all comes together. It's a terrible design strategy actually."

TED 2012

A call for systems: having great components is not enough.



Atul Gawande

"Making systems work is the great task of our generation of physicians and scientists. I would go further to say that making systems work - whether in health care, education, climate change, and making a pathway out of poverty - is the great task of our generation as a whole."

- ❖ There were fundamental limitations with existing approaches.
- ❖ These limitations could not be overcome with technology alone.
- ❖ We took a different approach.
- ❖ We created **entirely new sociotechnical configurations** to support it.

What are computational ecosystems **good for**?

DEVELOPING A SELF/PRACTICE



Kapil Garg

Dissertation: Situated Practice Systems: Developing Worker's Capabilities for Complex Work in Networked Workplaces, 2024.

Funding: National Science Foundation, RITEL: Collaborative Research: Situated Practice Systems: Supporting Coaches and Students to Develop Regulation Skills for Design, Research and STEM Innovation.



Design, Technology, and Research (DTR)

Thanks so much for
teaching me how to
advocate for myself &
my ideas, embrace failure &
inexperience & search for
truth rather than bullshit.

Developing regulation skills for building a self-directed (research) practice

Cognitive skills

- ❖ representing problem and solution spaces
- ❖ assessing risks
- ❖ critical thinking and argumentation
- ❖ core design, research, and STEM methods

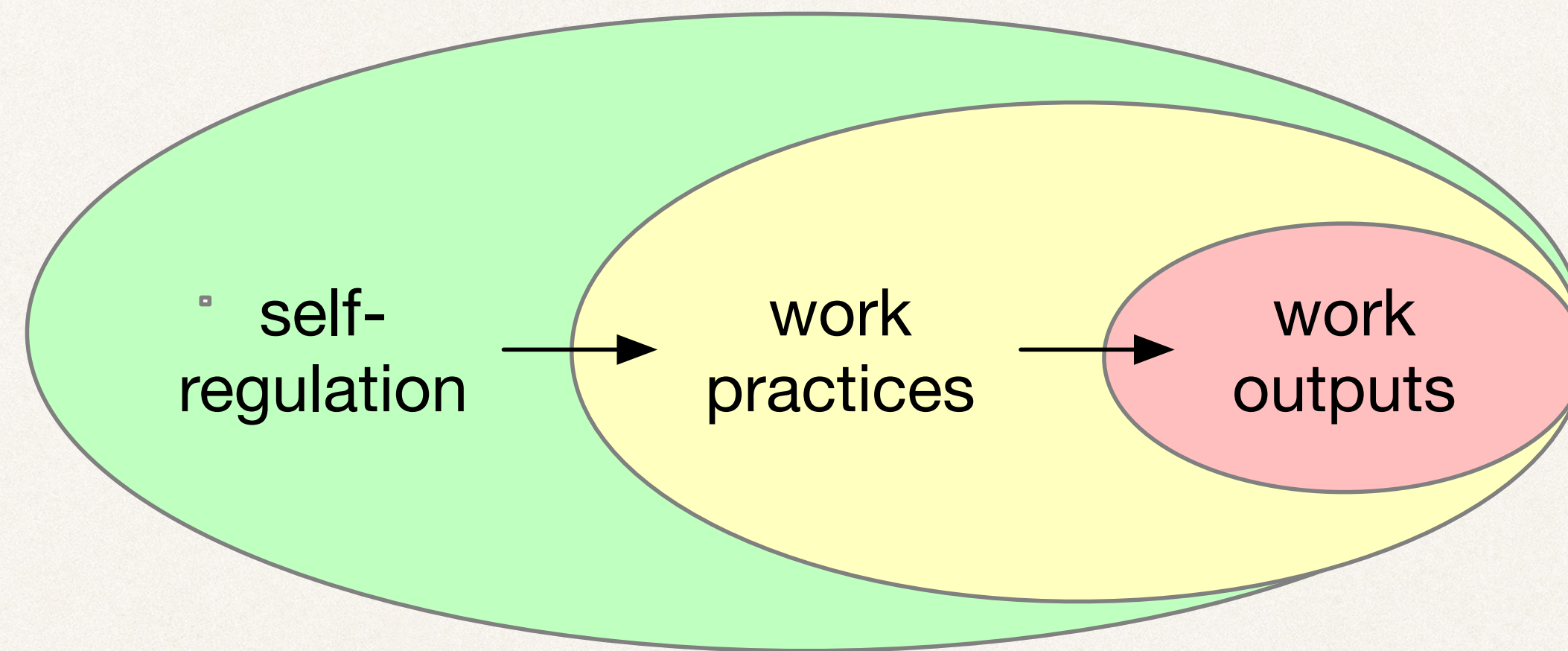
Metacognitive skills and dispositions

- ❖ planning: forming feasible plans and planning effective iterations
- ❖ help-seeking: leveraging resources; seeking help; communication skills
- ❖ reflection: awareness of one's own skills, abilities, and metacognitive blockers

Emotional regulation and disposition toward self and learning

- ❖ emotional regulation: understanding one's fears and anxieties
- ❖ disposition: dealing with failure, embracing challenges, embracing self-direction

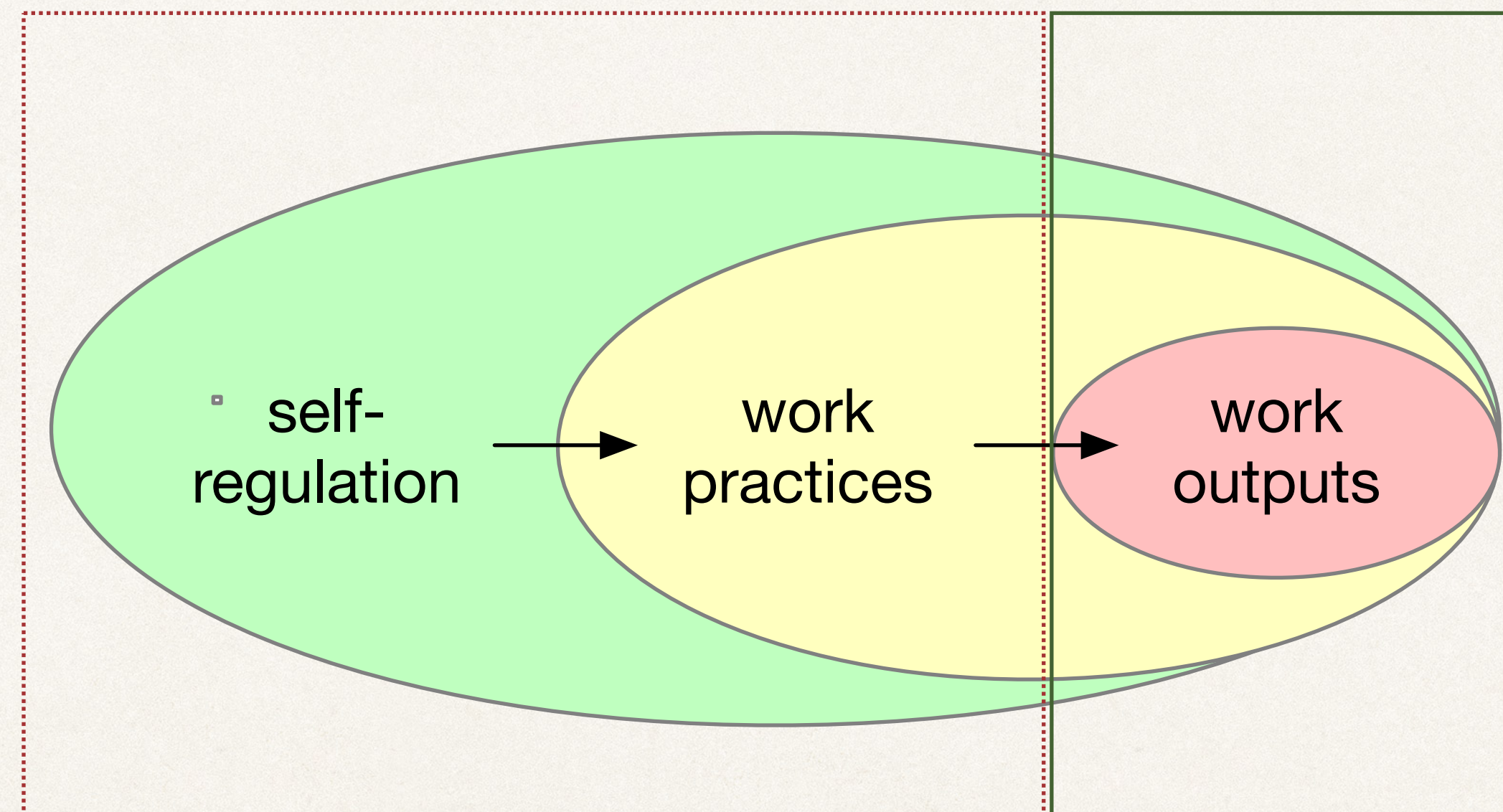
Challenge: understanding and addressing the gaps in students' practice and regulation is **really complicated**.



-  task-focused
-  practice-focused
-  regulation-informed practice

Challenge: understanding and addressing the gaps in students' practice and regulation is **really complicated**.

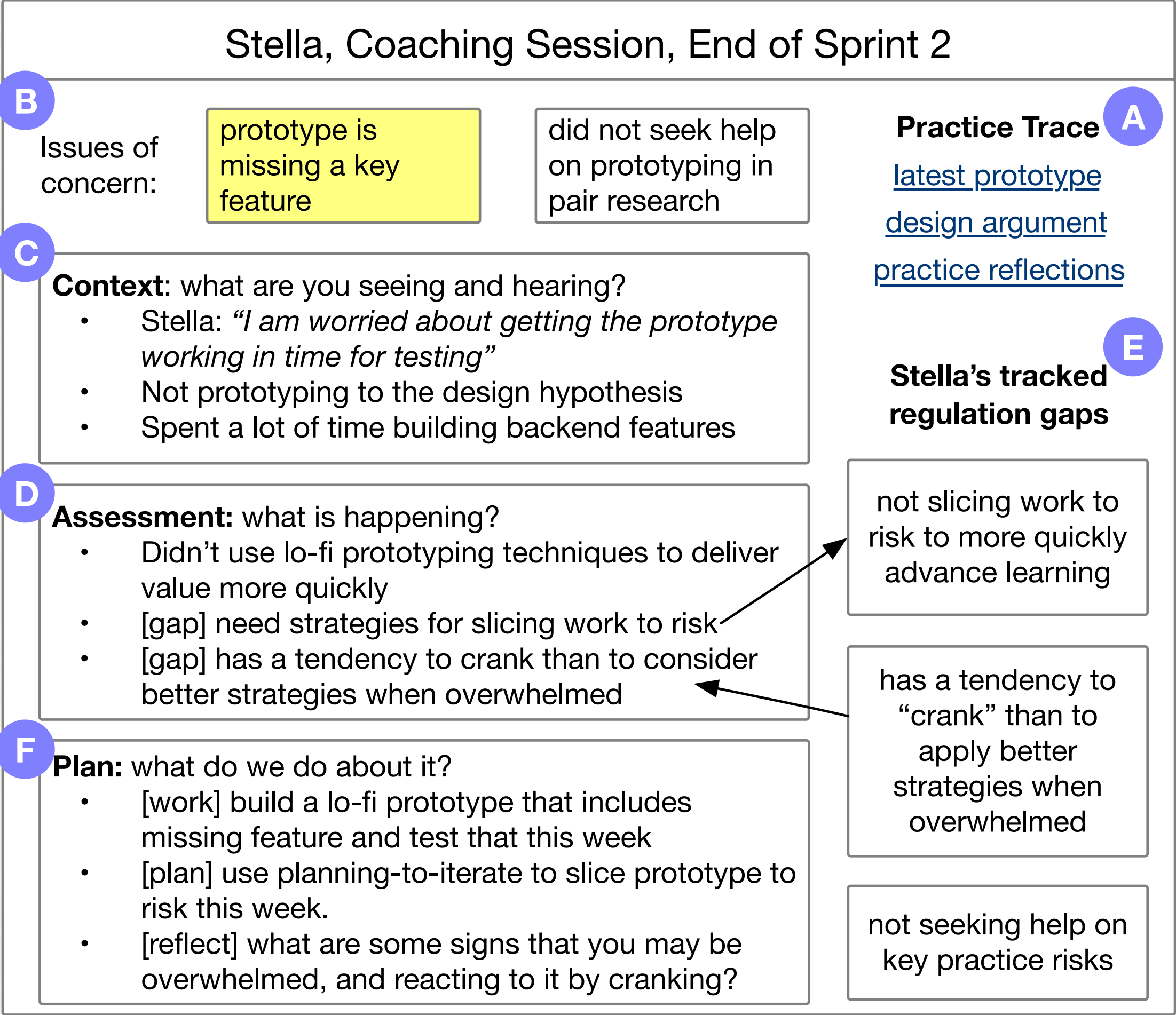
not enough attention here mostly here



-  task-focused
-  practice-focused
-  regulation-informed practice

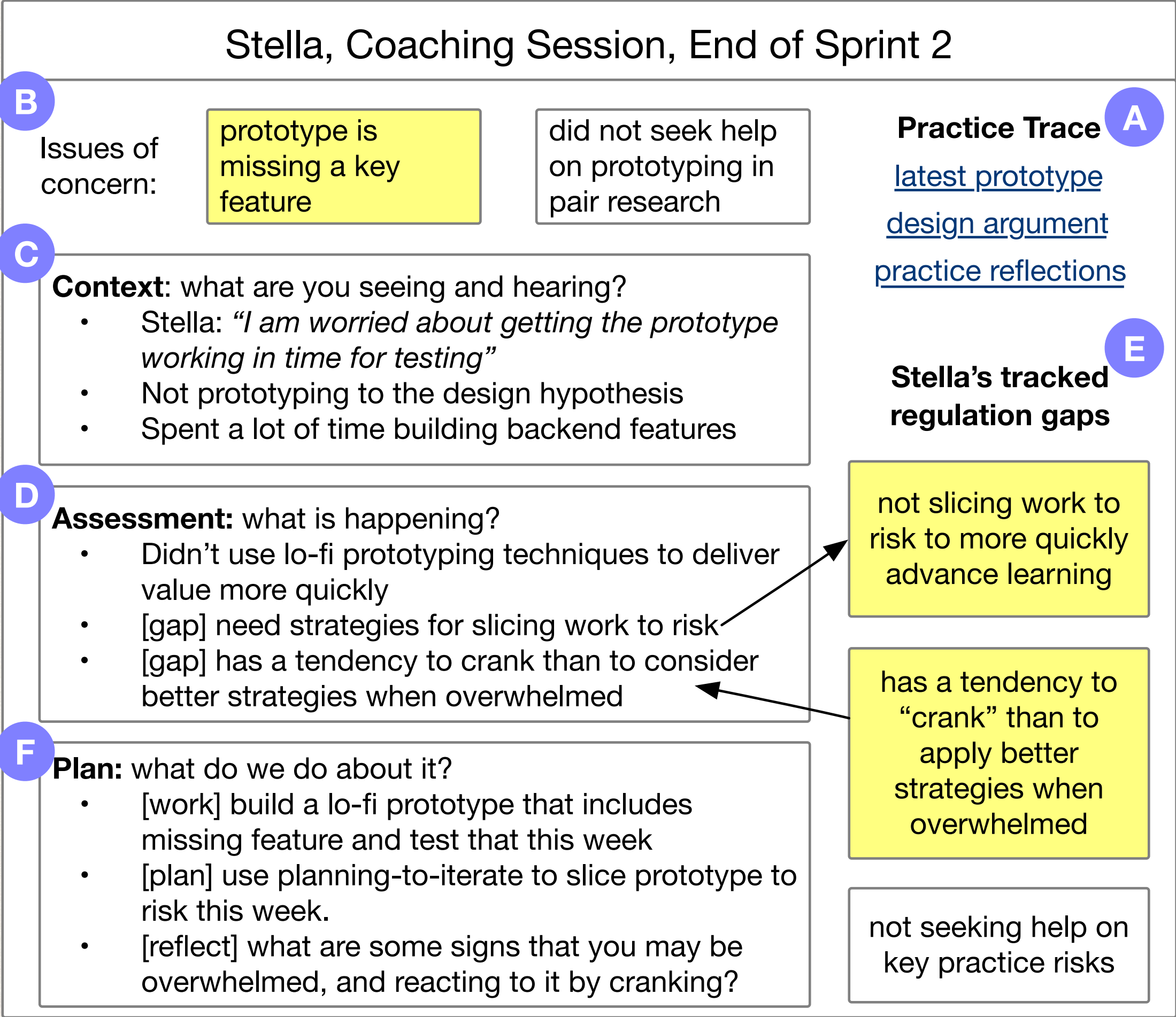
Interactive CAP Notes

[Garg, Gergle, Z., under review]



Interactive CAP Notes

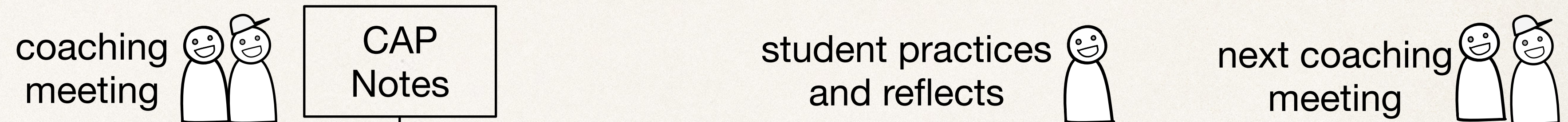
[Garg, Gergle, Z., under review]



Practice Objects for tracking practice and regulation

[Garg, Gergle, Z., under review]

Practice Object



Work Issues

Prototype missing key feature

didn't seek help on prototyping

Tracked Regulation Gaps

slicing work to risk

...

cranking out work

Regulation Gaps

need strategies for slicing work to risk

tends to crank than use better strategies

Suggested Practices

use planning-to-iterate to slice prototype to risk

reflect: what are signs that you're cranking?

Practice Traces

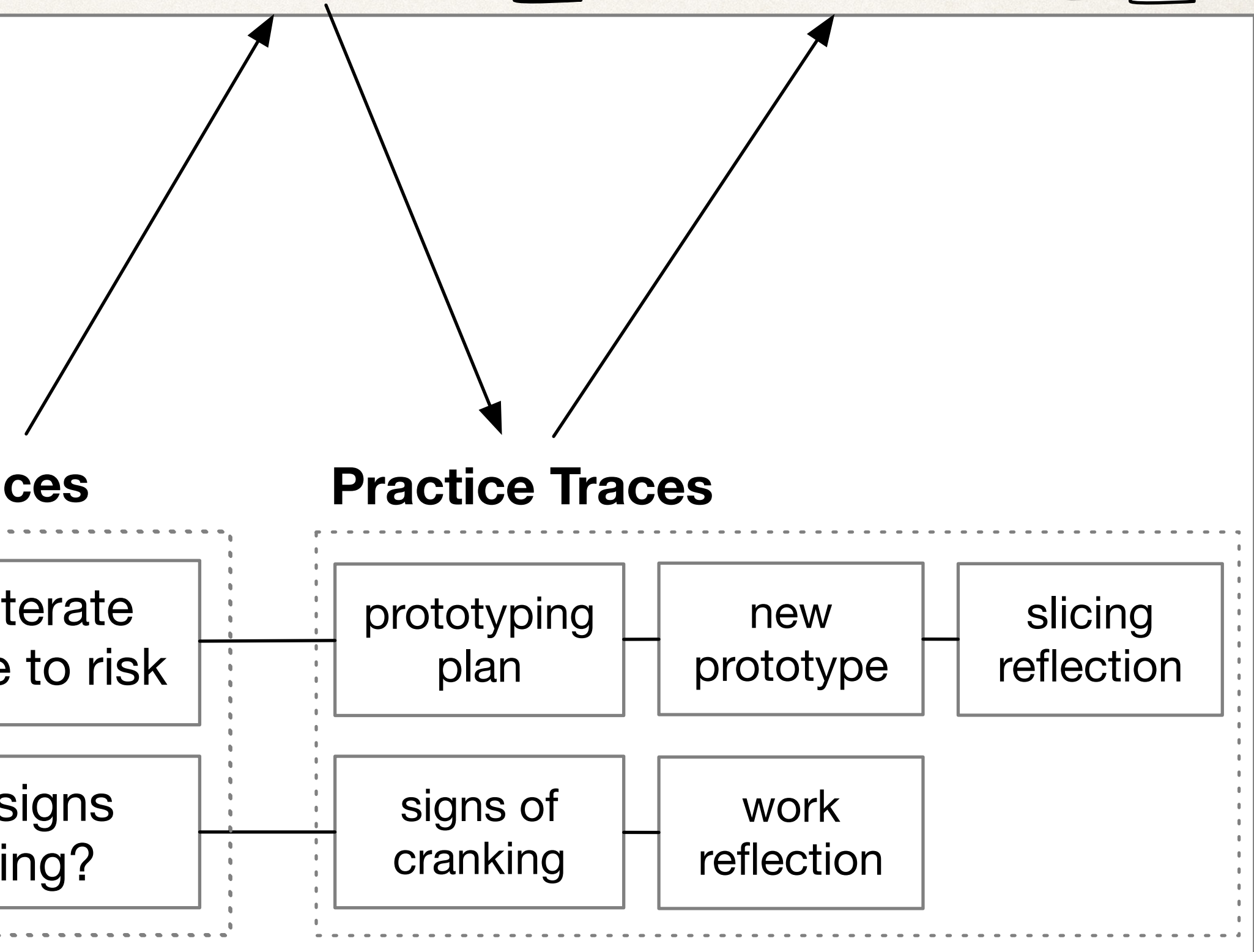
prototyping plan

new prototype

slicing reflection

signs of cranking

work reflection



Creating space for learning about one's self

- ❖ See students and build strong relationships
- ❖ Hold space for reflection, sharing, and acceptance
- ❖ Recognize that patterns + beliefs recur, and can be quite sticky
- ❖ Value developing regulation skills over production
- ❖ Problematize how students approach problems and look at themselves (see “Interruption, Discord, and Drama” in 2025 DTR letter)

Challenge #2: seeing and acting on the *good* of engaging in research

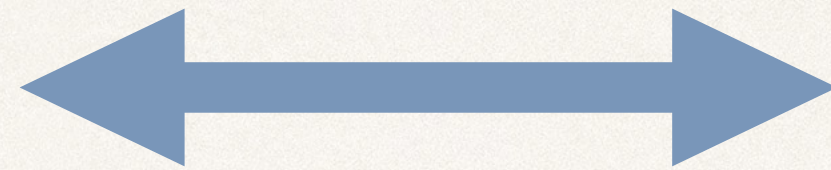
- ❖ Dancing with not knowing
- ❖ Re-examining phenomenon
- ❖ Re-examining beliefs and worldviews
- ❖ ...

see: “The Good” and
“Beyond Production” in
the 2024 & 2025
DTR annual letters

These goods are largely not about producing research,
but about how we engage with it, deeply.

Learning to engage deeply in research

Personal
Growth



Deepening
Engagement

Fear of not being good

<==>

Production-Orientation

Fear of imperfection

<==>

Running away from what's
actually important in the research

Fear of not knowing

<==>

Grasping onto existing
ways of doing and knowing

Until DTR, I had no awareness of how I was tormenting myself or how closed off I was from the world. I came in ~~the~~ needing desperately to prove myself, telling myself that I ~~NEEDED~~ To get somewhere! It never occurred to me that a gentler approach was even possible, let alone effective. You taught me to pay attention & help me become more perceptive of the wonderful world around me. Thank you for giving ^{me} the tools to become more self-aware & be able to reflect more meaningfully on what it means to be true to myself.

SUPPORTING HUMAN EXPERIENCES



Jackie He



Shirley Zhang

Dissertation: [yes please!]

Funding: Center for Advancing Safety of Machine Intelligence,
Human-AI Tools for Expressing Human Situations and
Contexts to Machines.

The Internet Is Very Flat, And We're Used To It

yelp

Cafes

Seattle

Yelp for Business

Write a review

Restaurants

Home & Garden

Auto Services

Health & Beauty

Travel & Activities

All

Price

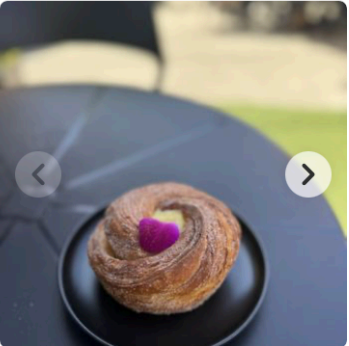
Open Now

Offers Delivery

Offers Takeout

Free Wi-Fi

Outdoor Seating



1. Café Hagen

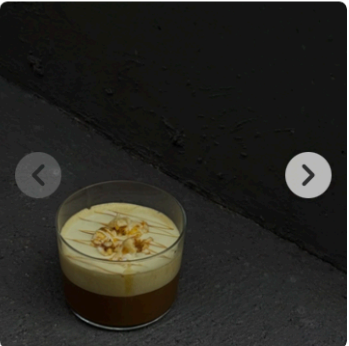
4.4 (596 reviews)

South Lake Union • \$\$ • **Open** until 6:00 PM

“Totally loved the ambience, it's is very hygge and beautiful ! Folks who love a **cozy cafe** with...” [more](#)

Scandinavian

Cafes



2. Plus 84

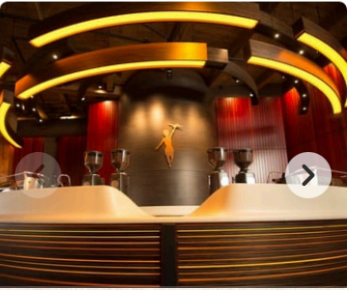
4.6 (116 reviews)

Belltown • **Open** until 10:00 PM

Locally owned & operated • Family-owned & operated

“A super aesthetic and **cozy cafe** (that's now open late too)! Stopped by with my boyfriend to try out...” [more](#)

Coffee & Tea



3. Storyville Coffee Company

4.5 (2.5k reviews)

Downtown • \$\$ • **Open** until 4:00 PM

On their website: **cafe**

“A very **cozy cafe** overlooking pike place market, I really enjoyed talking to the welcoming barista...” [more](#)

yelp

Cafes

New York, NY

Yelp for Business

Write a review

Restaurants

Home & Garden

Auto Services

Health & Beauty

Travel & Activities

All

Price

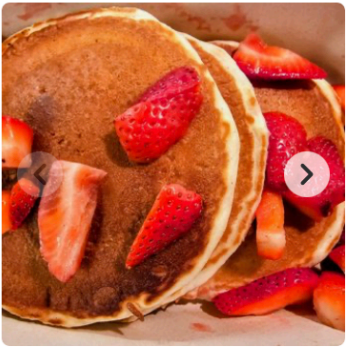
Open Now

Reservations

Offers Online Waitlist

Offers Delivery

Offers Takeout



1. Little Collins

4.4 (1.4k reviews)

Midtown East • \$\$ • **Open** until 8:00 PM

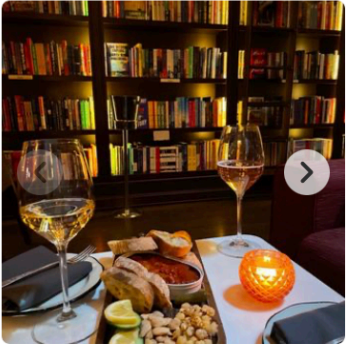
“Nice **cozy cafe** often packed. I'm from Melbourne and specially travelled for coffee which was great...” [more](#)

Coffee & Tea

Breakfast & Brunch

Sandwiches

Order



2. Bibliotheque

4.3 (112 reviews)

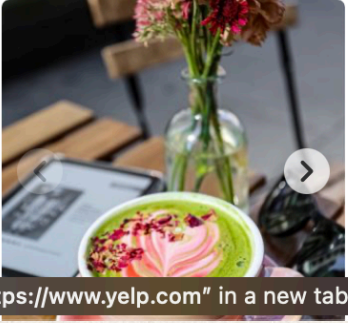
SoHo • **Open** until 10:00 PM

“Bibliotheque is a unique **cafe**, bookstore and wine bar after 5pm. It's located on Mercer Street in...” [more](#)

Cafes

Wine Bars

Bookstores



3. Remi Flower & Coffee

4.5 (723 reviews)

New York • \$\$ • **Closes in 28 min**

“This **cozy cafe** has an inviting and charming atmosphere that's perfect for a quick coffee break or...” [more](#)

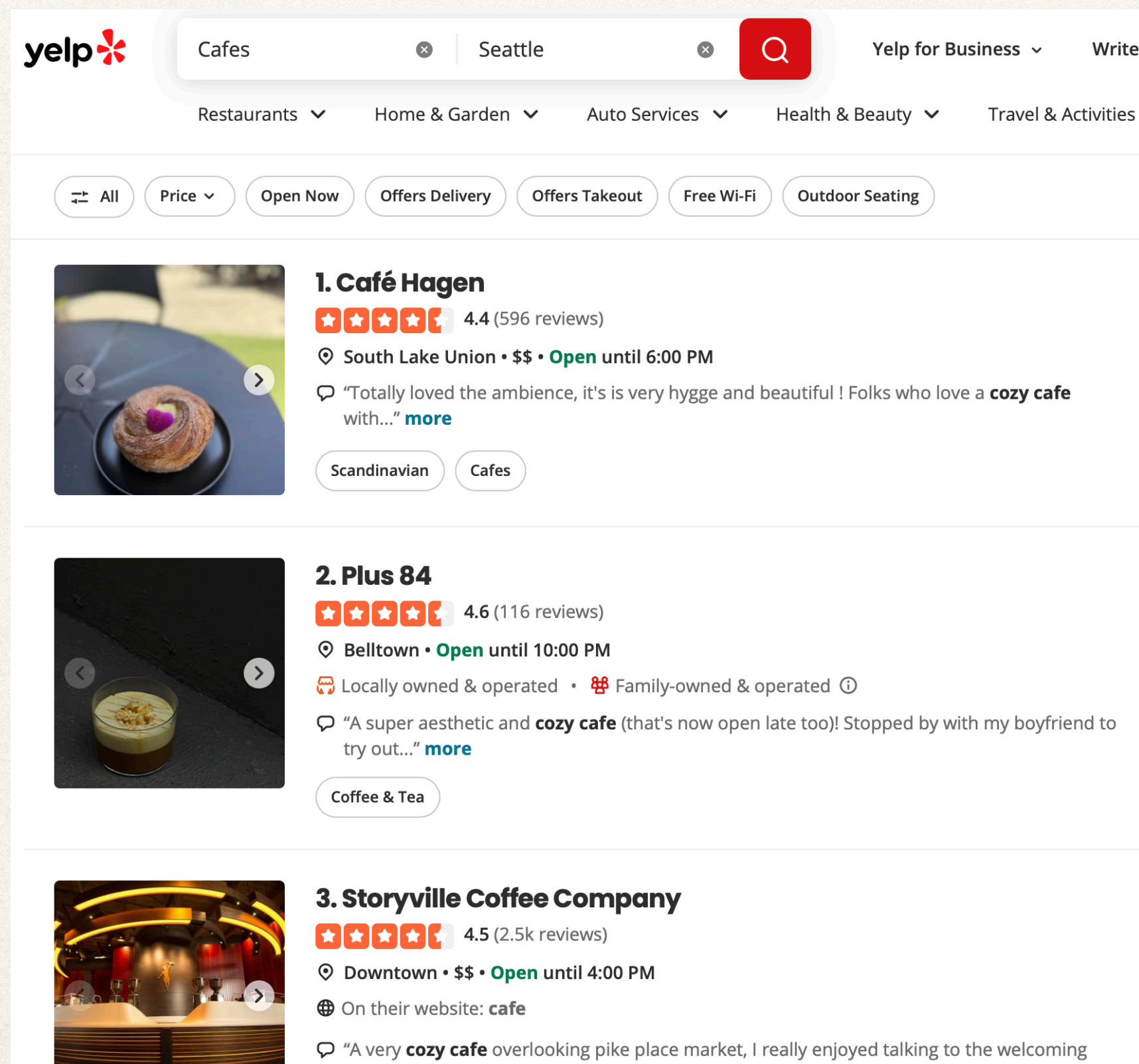
Coffee & Tea

Florists

Floral Designers

Order

The Cost of Ubiquity

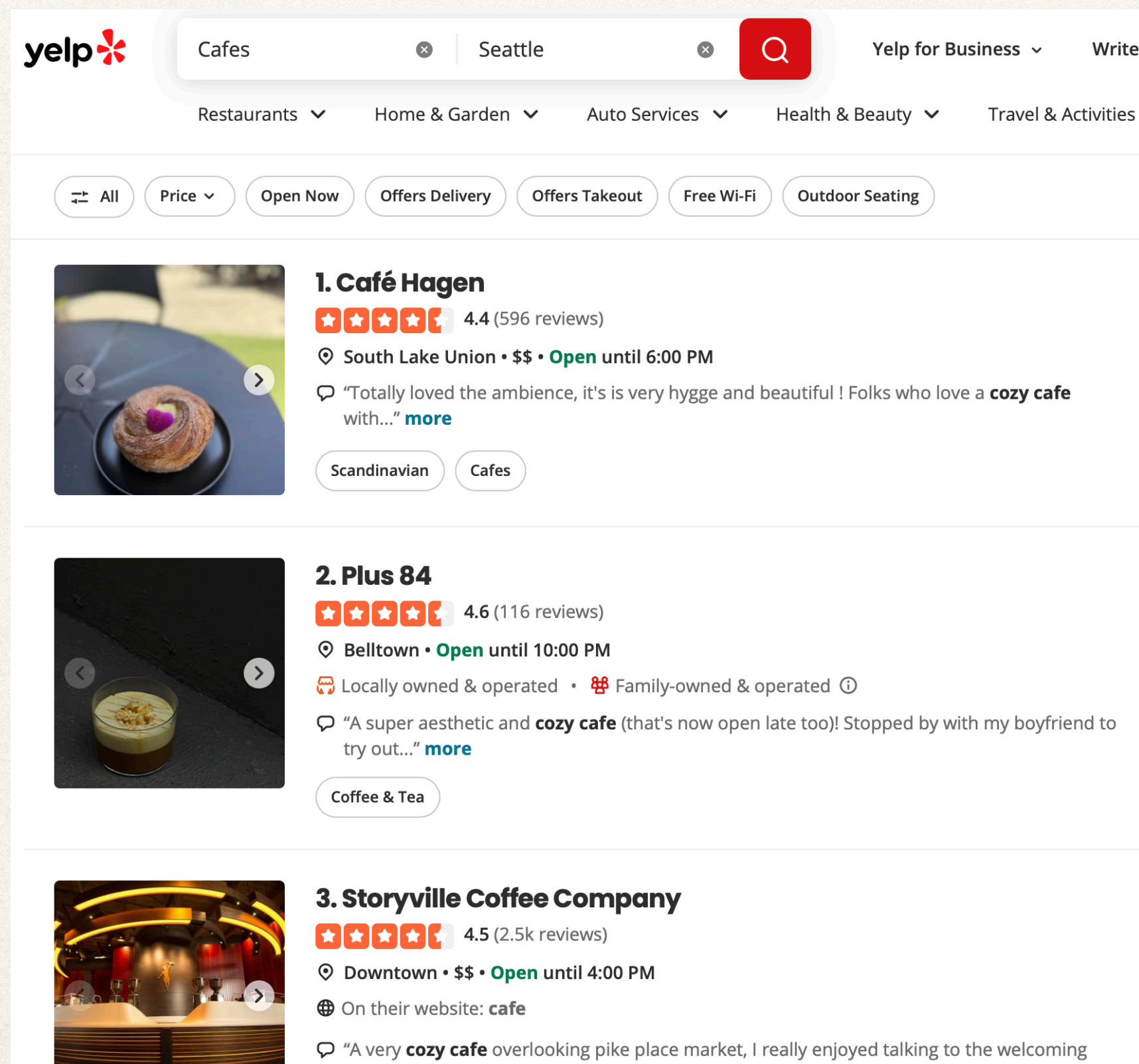


What makes a place special?

What experiences does it afford,
and for whom?

How does that differ across user
populations, geographies,
cultures?

The Cost of Ubiquity



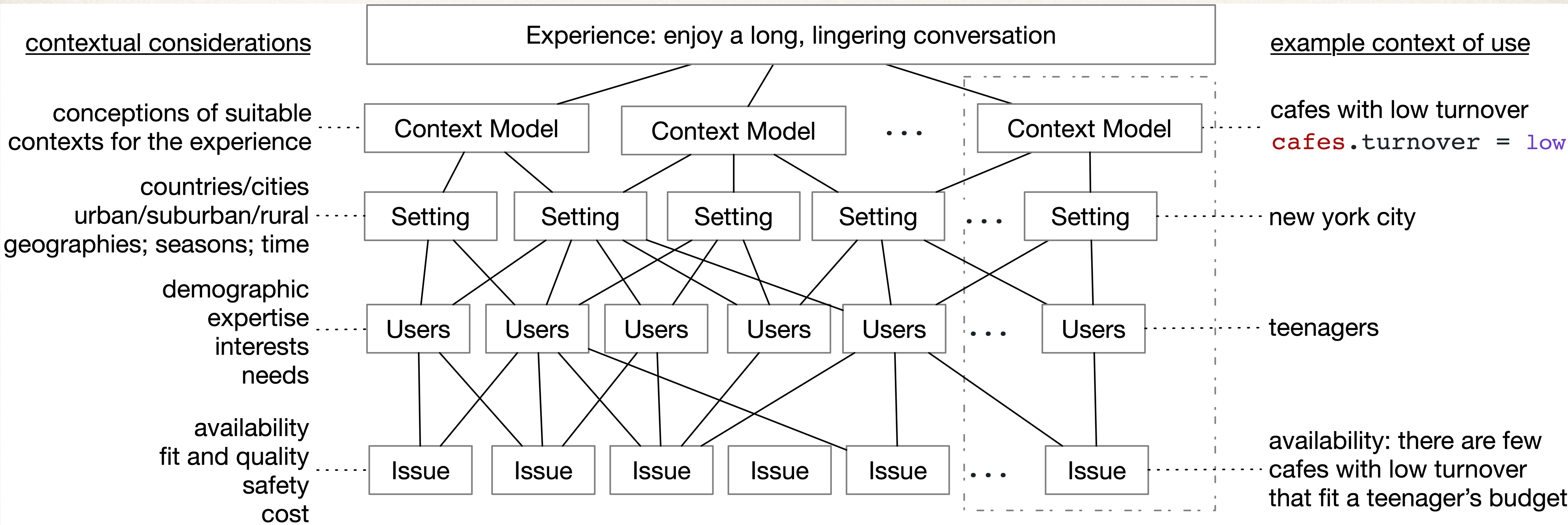
What is the best?

Computational Understanding of Human Experiences

*“an increasing understanding on the part of system developers that human activities are enmeshed in a variety of [cultural and social] practices and relations that make them **meaningful** by setting a context within which they can be understood...”*

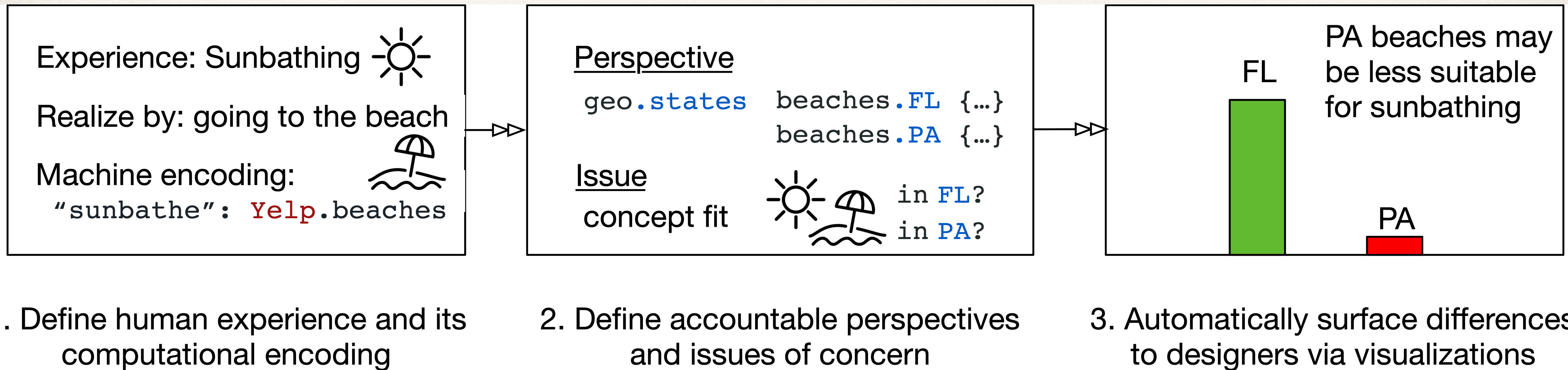
Seeking a Foundation for Context-Aware Computing
Paul Dourish, **2001 (!!)**

Conceptualizing a human experience across many contexts is a really complex problem



Differ: An Experiential Computing Platform

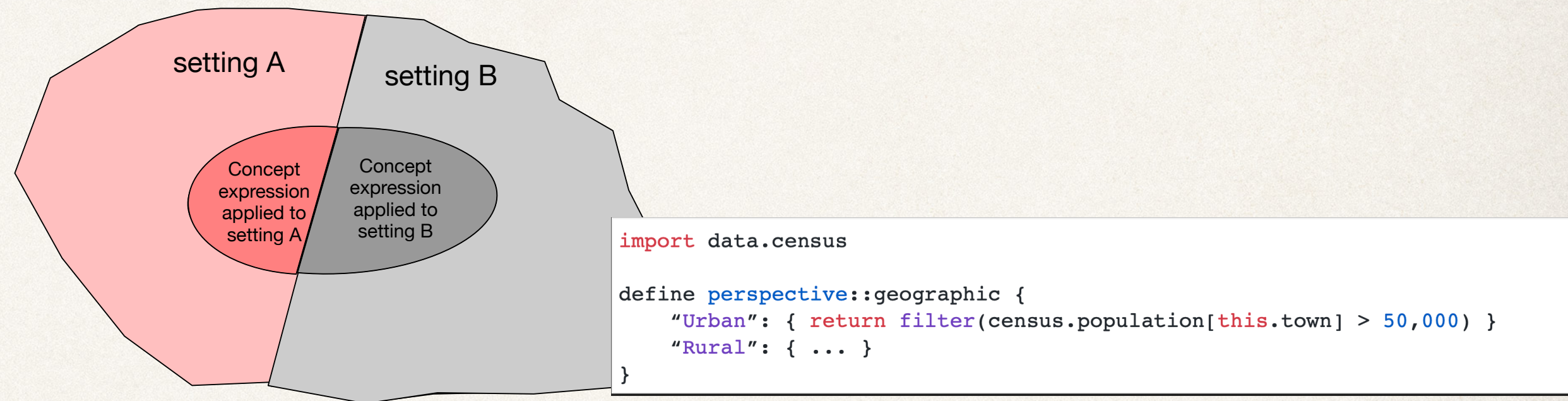
[He, Zhang, Gergle, Z., under review]



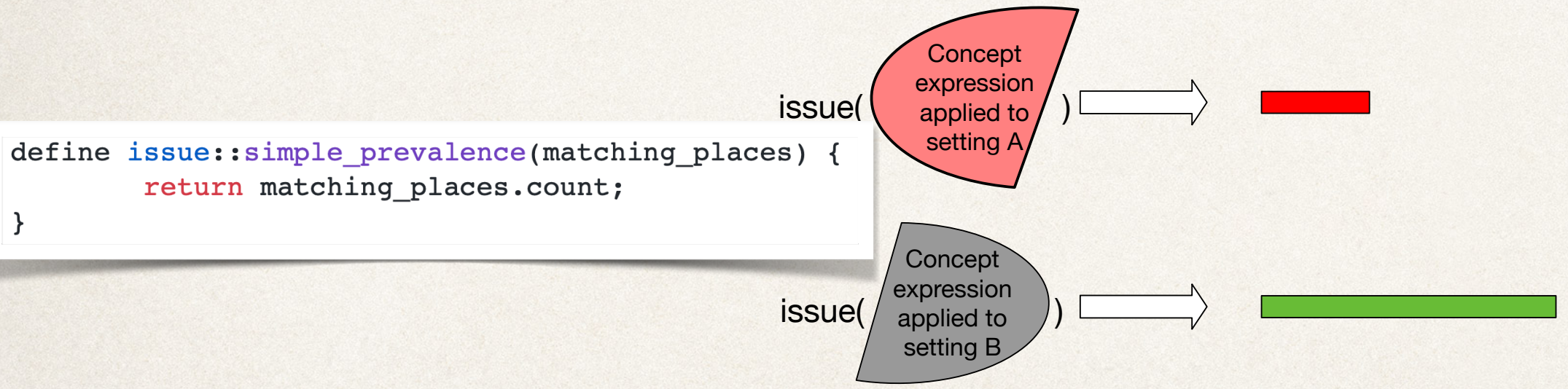
Computational Abstractions for Reasoning about Human Experiences [He, Zhang, Gergle, Z., under review]



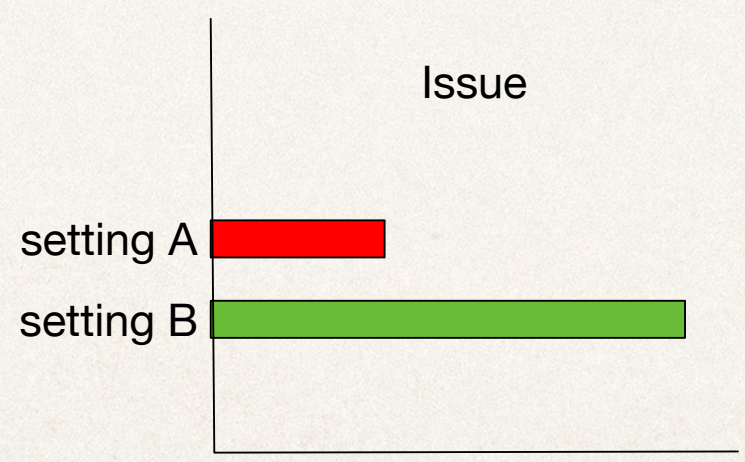
(a) A *concept expression* encodes the ways of realizing an experience. It can be applied to a universe of realizers (e.g., places to have an experience) to compute the set of places that may be appropriate for realizing the experience.



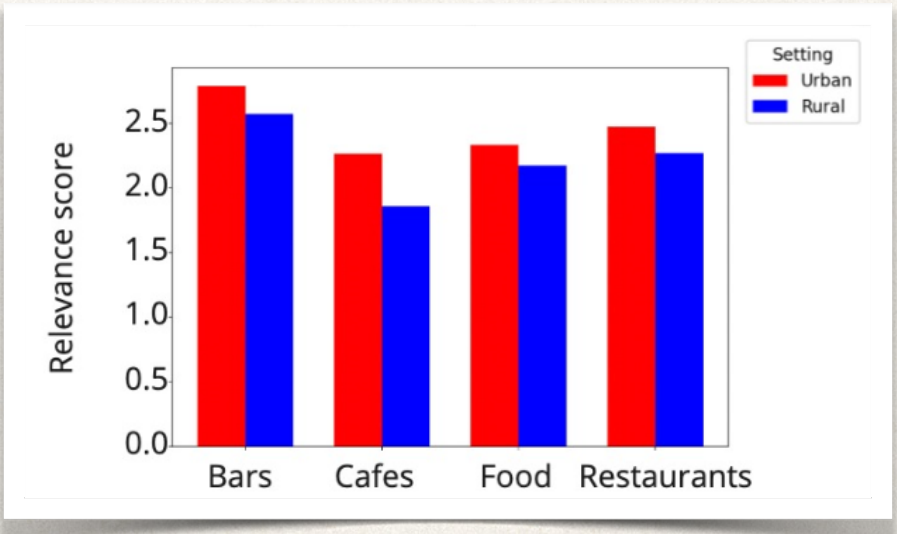
(b) An *accountable perspective* is used to filter the universe to the set of places that are available to different user groups or settings. Applying the concept expression to it provides the set of places in a setting that can realize the experience.



(c) An *issue of concern* is defined to provide a measure of whether the concept expression as defined is likely to work well for realizing the experience, when applied to different settings within an accountable perspective.



(d) Given an accountable perspective and issue, which together forms a *reference system*, implemented *visualization* and *explanation* types help to display potential issues to designers.

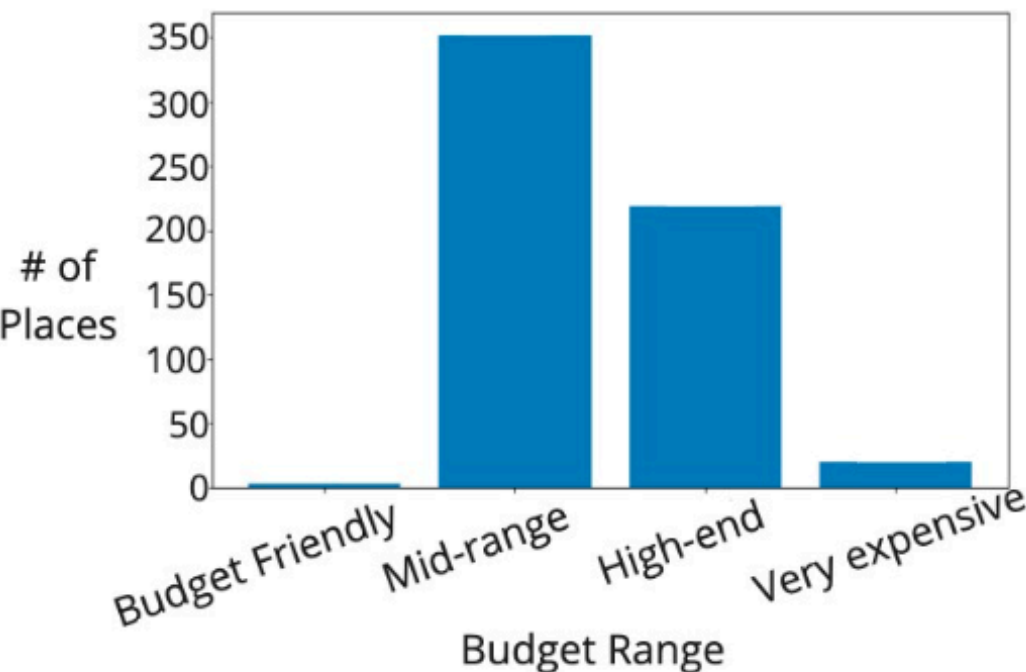


Example: Going on a first date

Experience: Going on a First Date over Food or Drinks
Definition: Places that are not very loud, that are romantic, and that serve food or drinks.
Machine Definition:

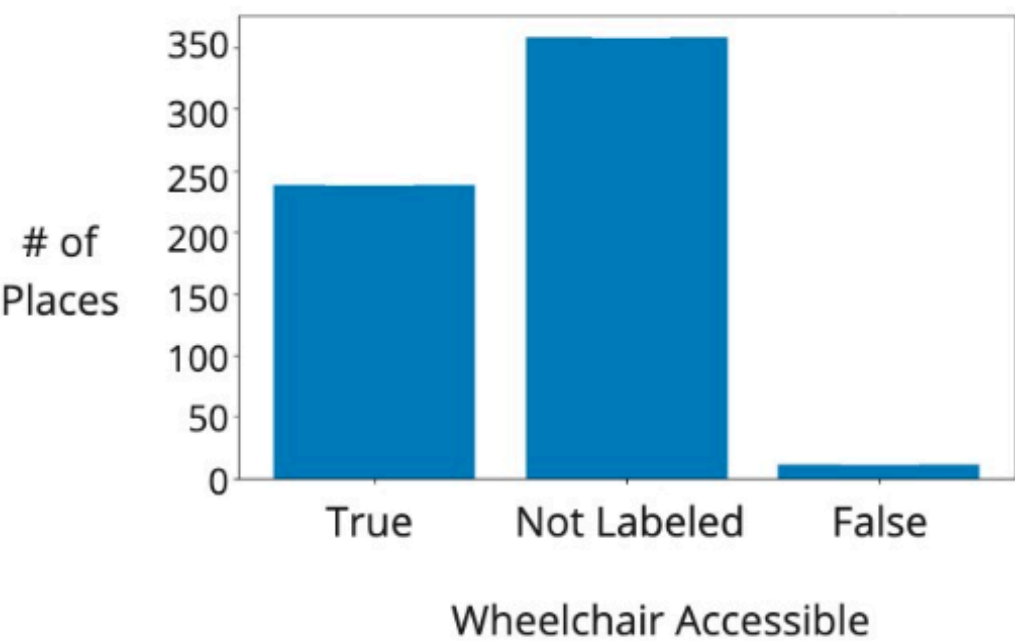
```
{
  this.business_type matches ["Restaurants", "Bars", "Cafes", "Food"] and
  this.noise_level matches ["Quiet", "Average"] and
  this.ambiance matches "Romantic"
}
```

Number of Places Good For First Date Experience
Across Budget Ranges



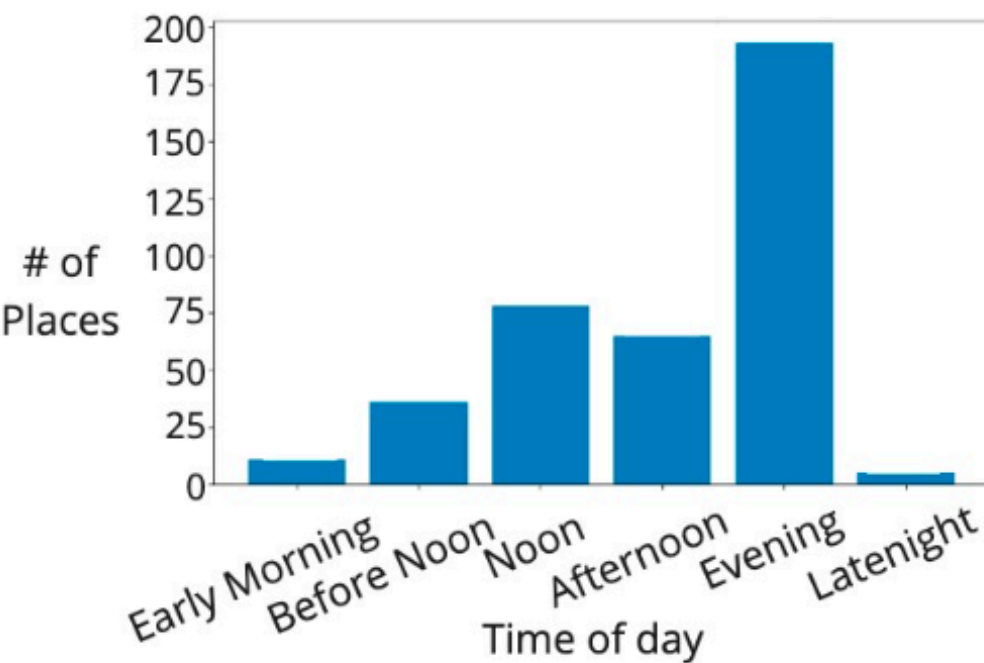
(a) Budget Range, Prevalence

Number of Places Good For First Date
Experience Across Wheelchair Accessibility



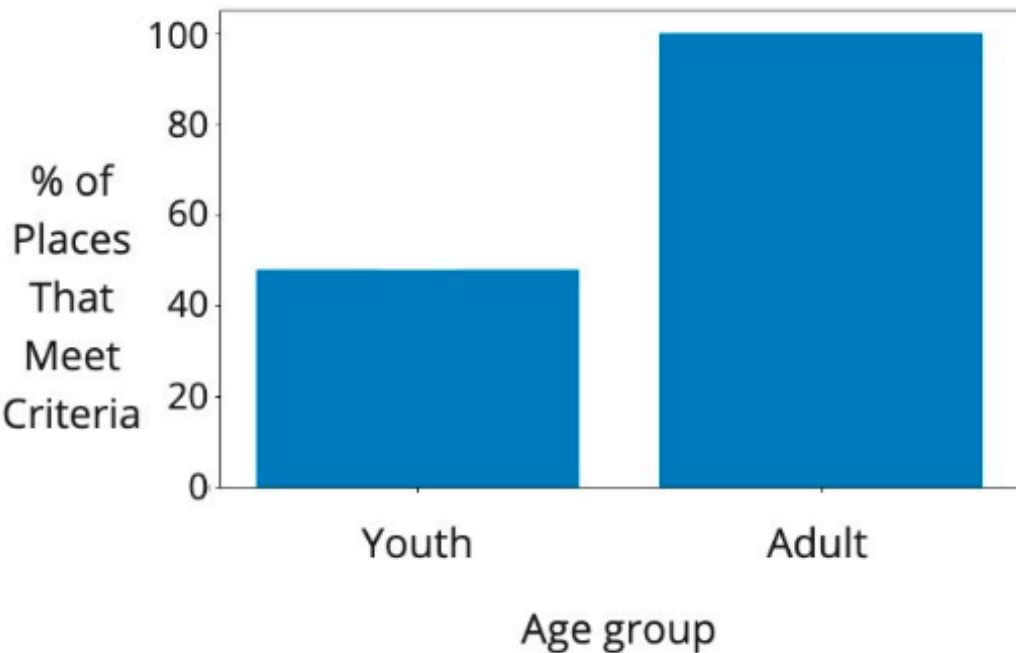
(b) Wheelchair Accessibility, Prevalence]

Number of Places Good For First Date Experience
Across Time of Day



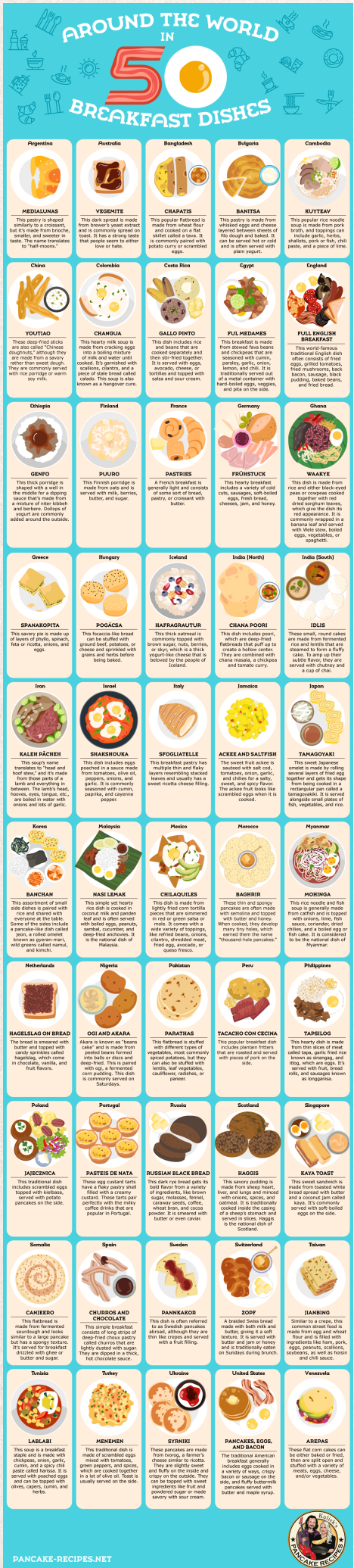
(c) Time of day, Prevalence

Percentage of Places Good For First Date
Experience Across Age Groups



(d) Age group, Prevalence

Vision: Experiential Computing



How can computers help us to navigate the world in ways that better reflect our shared experiences, and our differences?

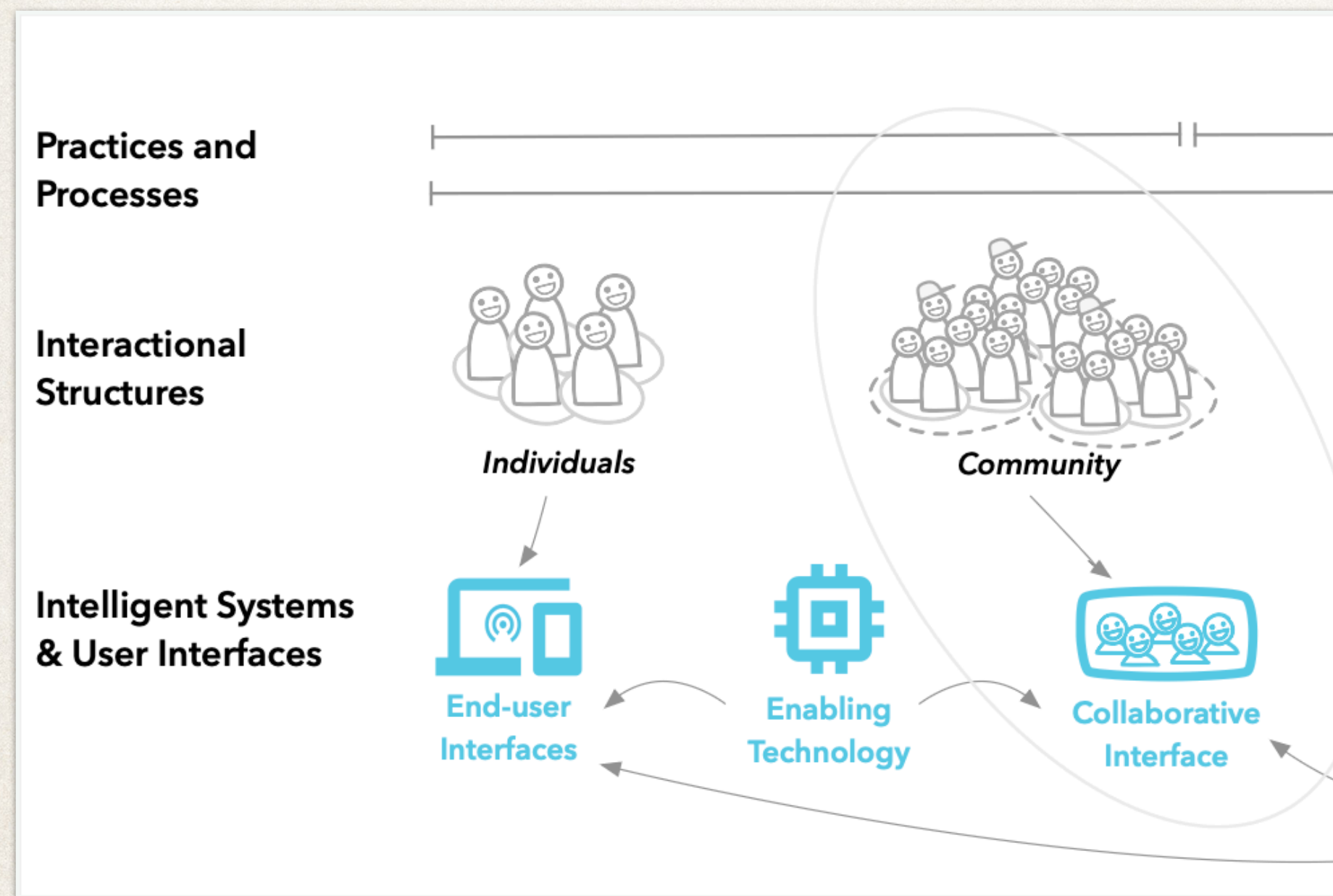


(Limited) role of technology in advancing human values



- ❖ Advancing individual technologies is insufficient
- ❖ We need computational ecosystems not just for consequential aims, but for advancing human values

Computational ecosystems rethink the entire sociotechnical configuration to enable better practices



PLAN LARGE EVENTS

COORDINATE ON LOCAL PROBLEMS

CONNECT FRIENDS AT DISTANCE

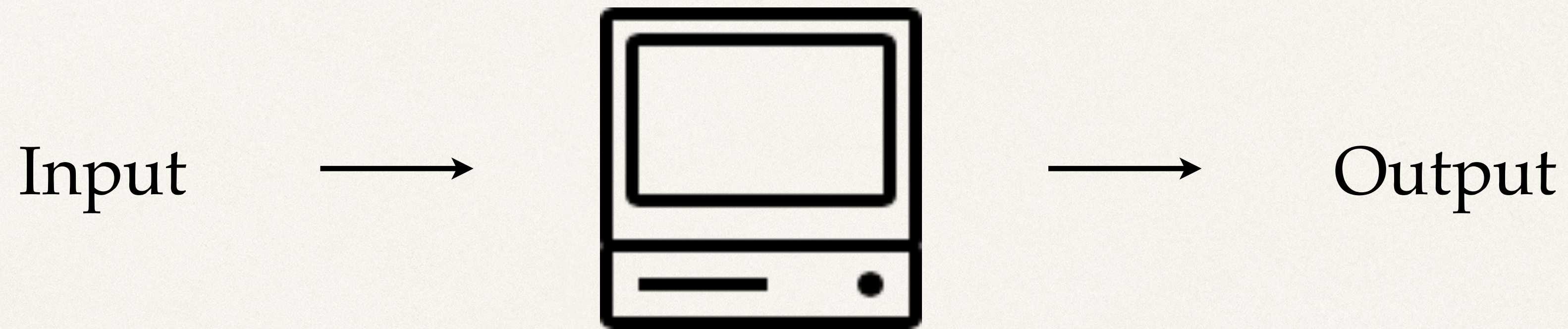
LEARN TO BUILD SOFTWARE

INNOVATE THROUGH RESEARCH

DEVELOP A SELF/PRACTICE

SUPPORT HUMAN EXPERIENCES

Understand the limitations of computers as consequentialist machines



Computers reliably produce desired consequential outcomes

Computers can never be the be-all and end-all to promoting human values rooted in *intrinsically valuable human activities*

[Z., CHI 2024]

Searching for the Non-Consequential: Dialectical Activities in HCI and the Limits of Computers

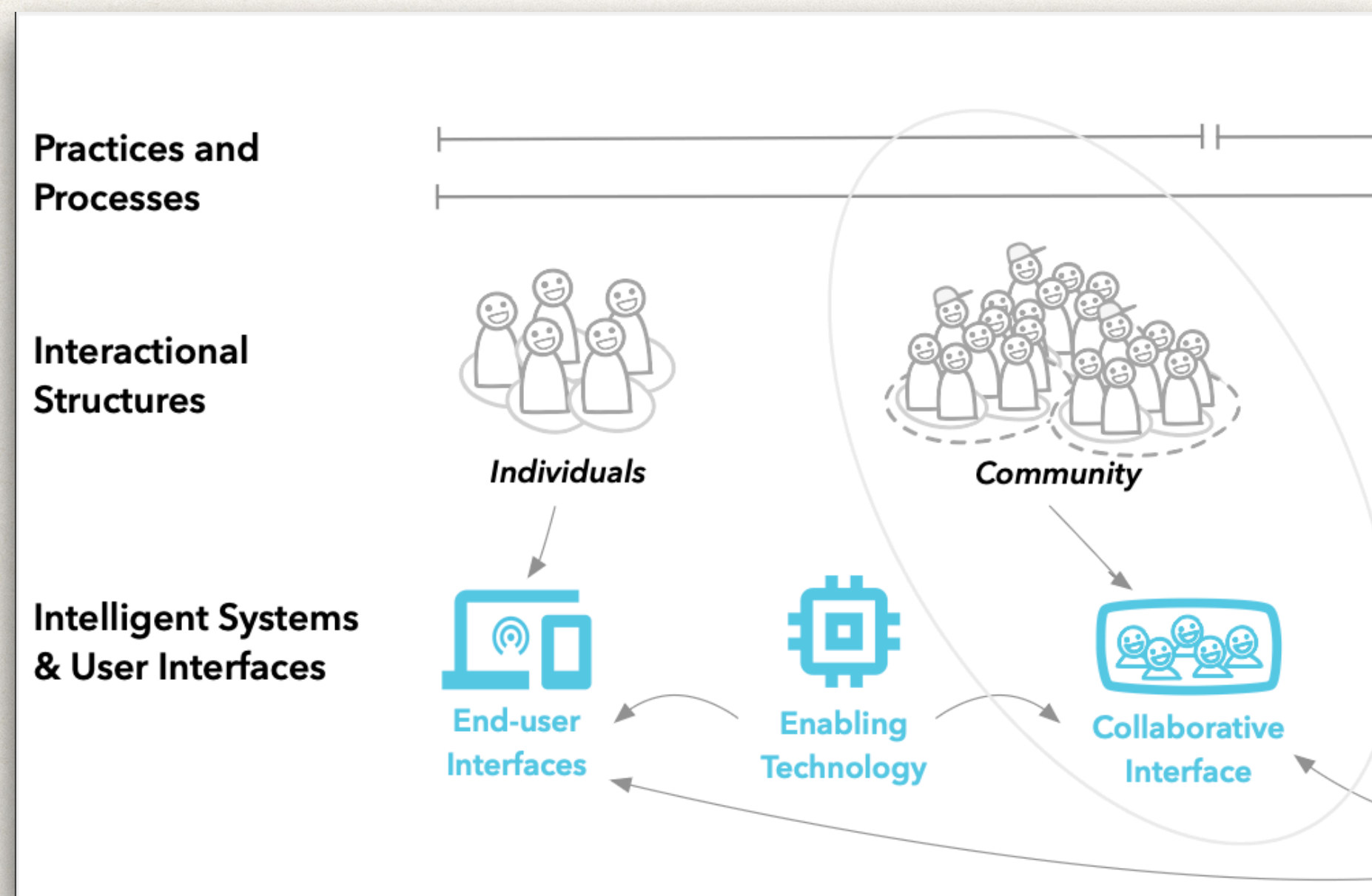
Haoqi Zhang
Northwestern University
Evanston, IL, USA
hq@northwestern.edu

ABSTRACT

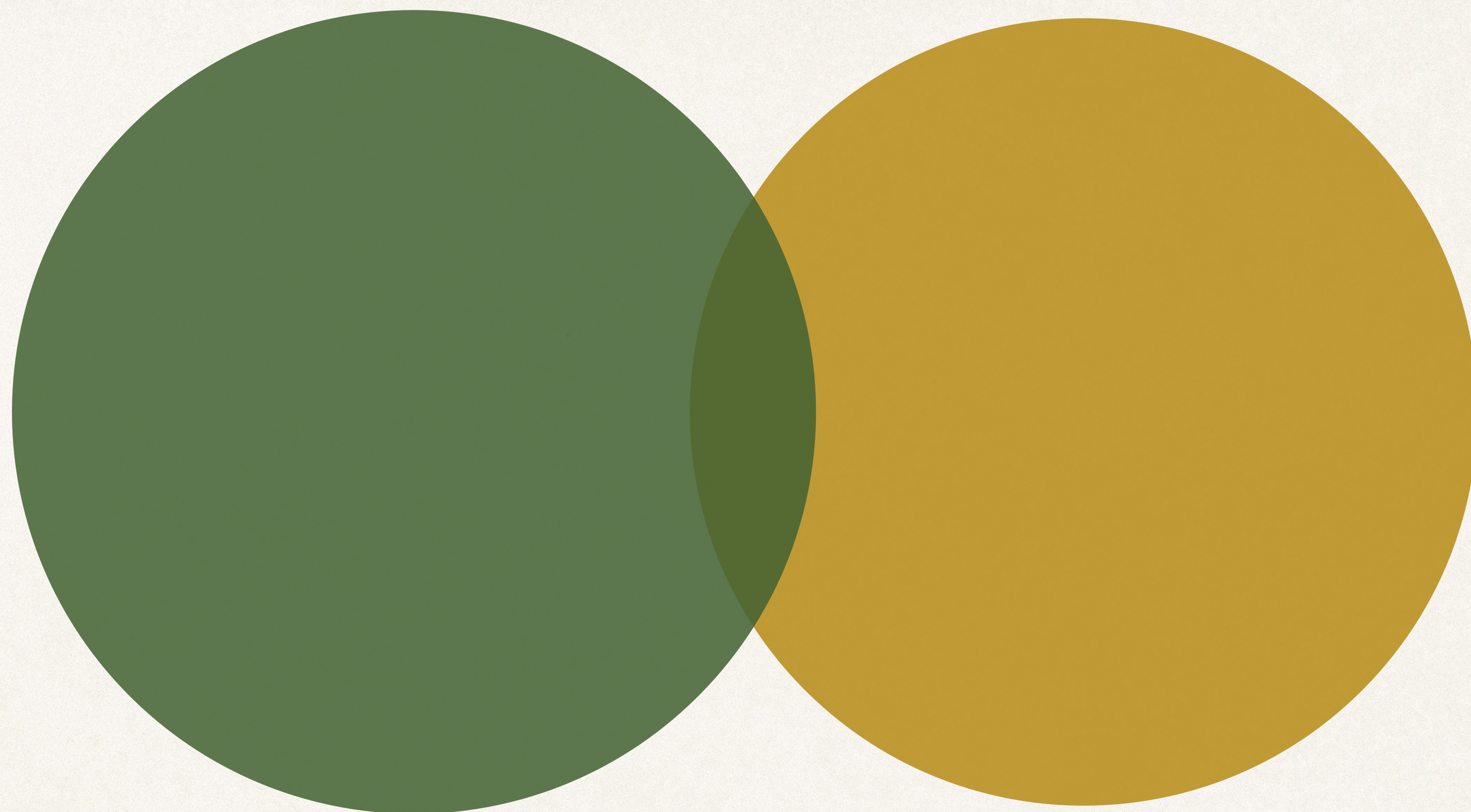
This paper examines the pervasiveness of consequentialist thinking in human-computer interaction (HCI), and forefronts the value of non-consequential, dialectical activities in human life. *Dialectical activities* are human endeavors in which the value of the activity is intrinsic to itself, including being a good friend or parent, engaging in art-making or music-making, conducting research, and so on. I argue that computers—the ultimate consequentialist machinery for reliably transforming inputs into outputs—cannot be the be-all and end-all for promoting human values rooted in dialectical activities. I examine how HCI as a field of study might reconcile the consequentialist machines we have with the dialectical activities we value, and propose *computational ecosystems* as a vision for HCI that makes proper space for dialectical activities.

But while the HCI mission of using computational technologies to shape the world to meet our needs and desires rolls on full steam, questions to the very idea of focusing on the production of desired ends remain largely unanswered. As is the case in our culture, much of HCI research and practice is rooted in *consequentialist thinking*: reasoning about actions as means for achieving desired outcomes and ends. But as philosophers have contested across millennia, certain quintessential human values, activities, and ways of being cannot be easily reconciled nor understood through the consequentialist lens. For instance, *dialectical activities* [25], or activities whose values are rooted in the intrinsic nature of the activity itself and that are revealed only through repeated engagement with the activity—such as parenting, being a good friend, engaging in art-making and other creative pursuits, conducting research—do not easily reduce to producing certain desired outcomes. Continued

The real value of computational ecosystems is not “merely” consequential [Z., CHI 2024]

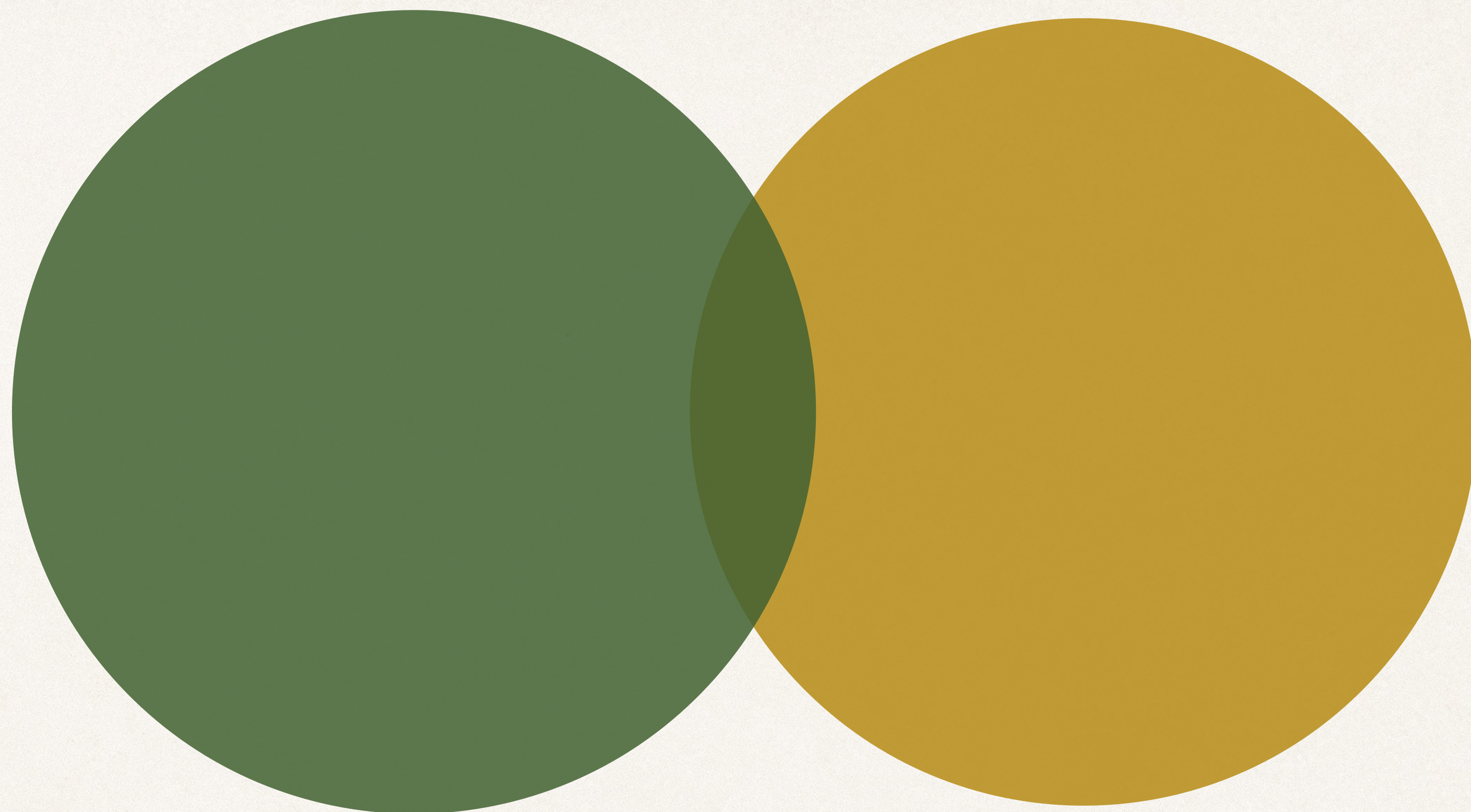


- ❖ Computational Ecosystems produce desired goods and services; they solve consequential problems
- ❖ Computational Ecosystems also promote engagement in intrinsically valuable human activities

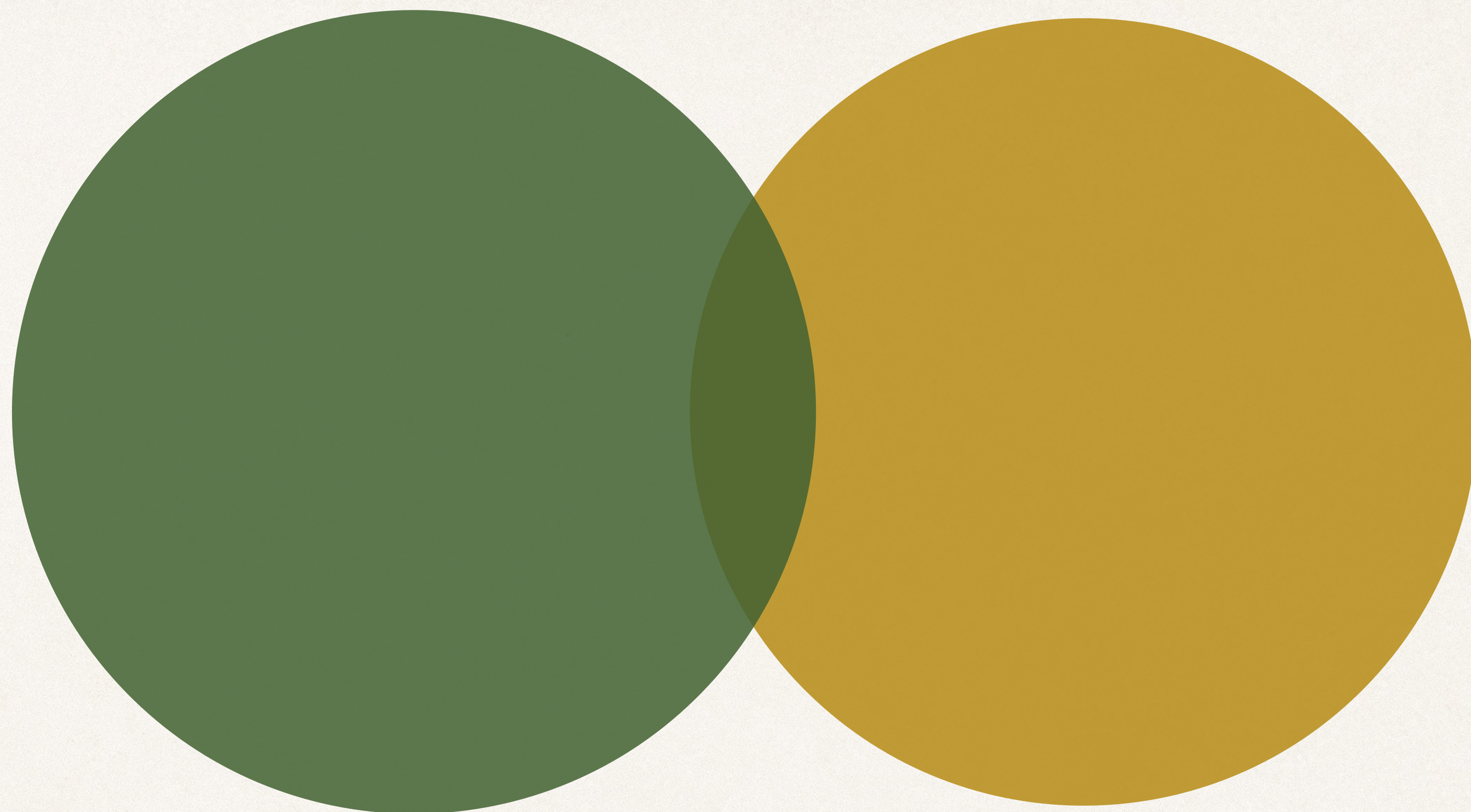


**Your
values**

**Technological
solutions**

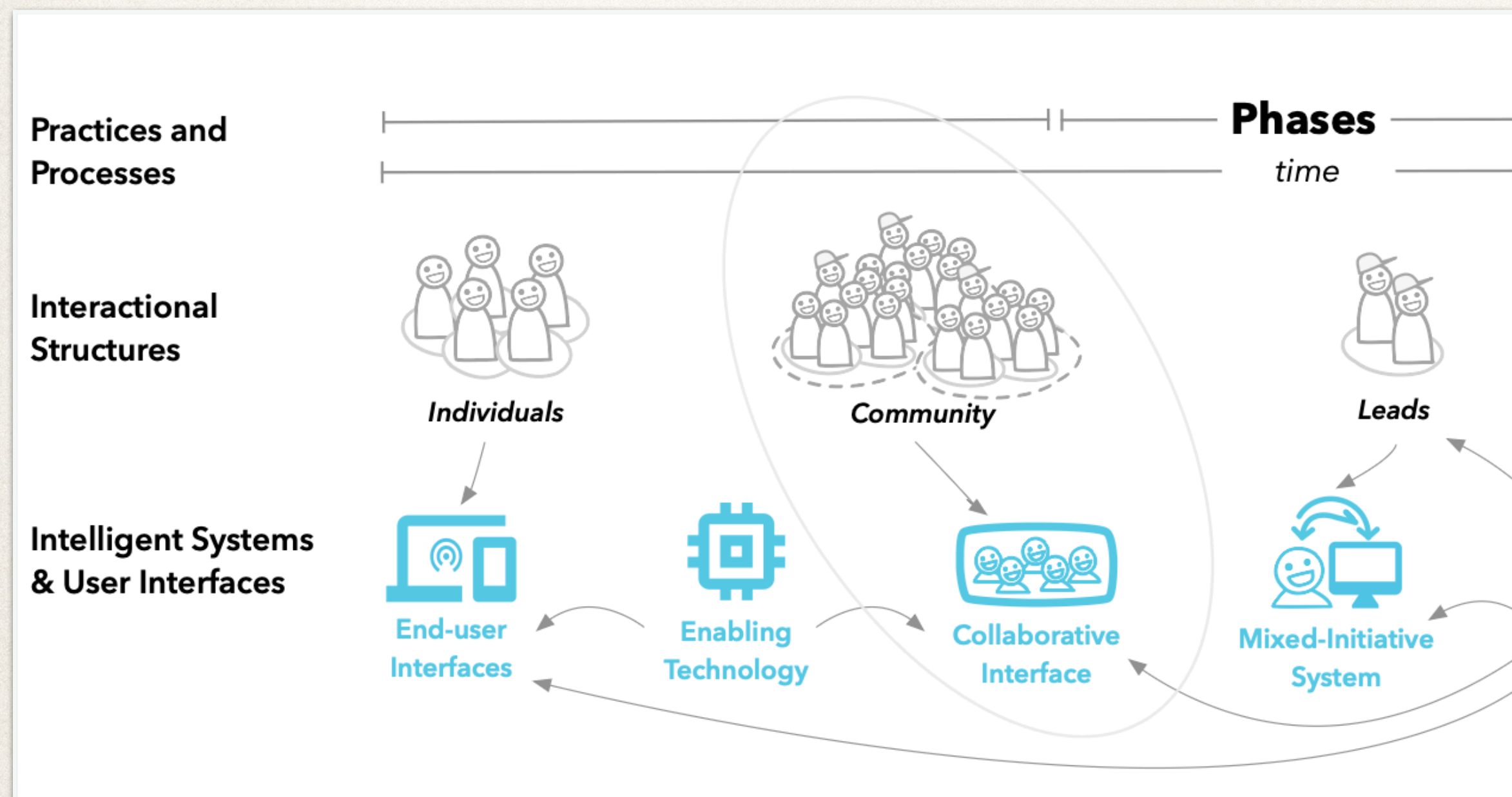


“Technological values”



**Your
values**

Hold onto our values.
Know the limits of technology.
Build entirely new ecosystems.



- ❖ **Computational thinking:** combining wedges of human and machine intelligence to make effective practices feasible
- ❖ **Ecological thinking:** creating processes, interactions, and communities that sustain and deepen practice

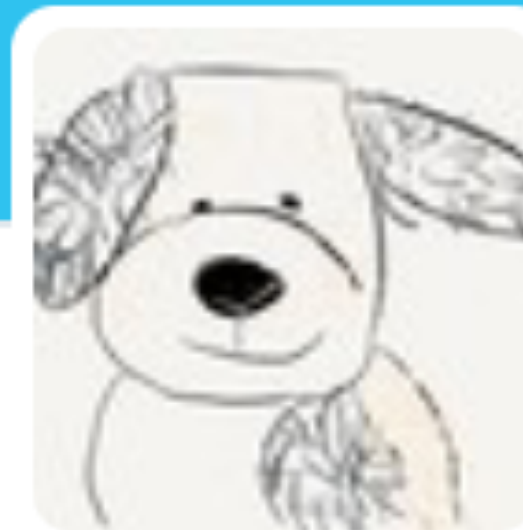
thank you

dtr.northwestern.edu/letters

forward.movie

agileresearch.io

dtr.northwestern.edu



Haoqi Zhang

@hqz

slides+readings: haoqizhang.com

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- ❖ Ryan Louie. Human-AI Interface Layers: Enhancing Communication of Intent for AI-Assisted Creative Pursuits and Social Experiences. Northwestern Doctoral Dissertation, 2023.

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