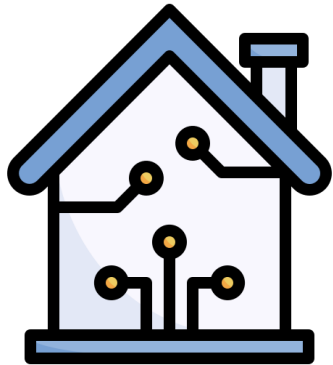


# Control in Context: How Smart Home Users Navigate Proxy-based Schemes

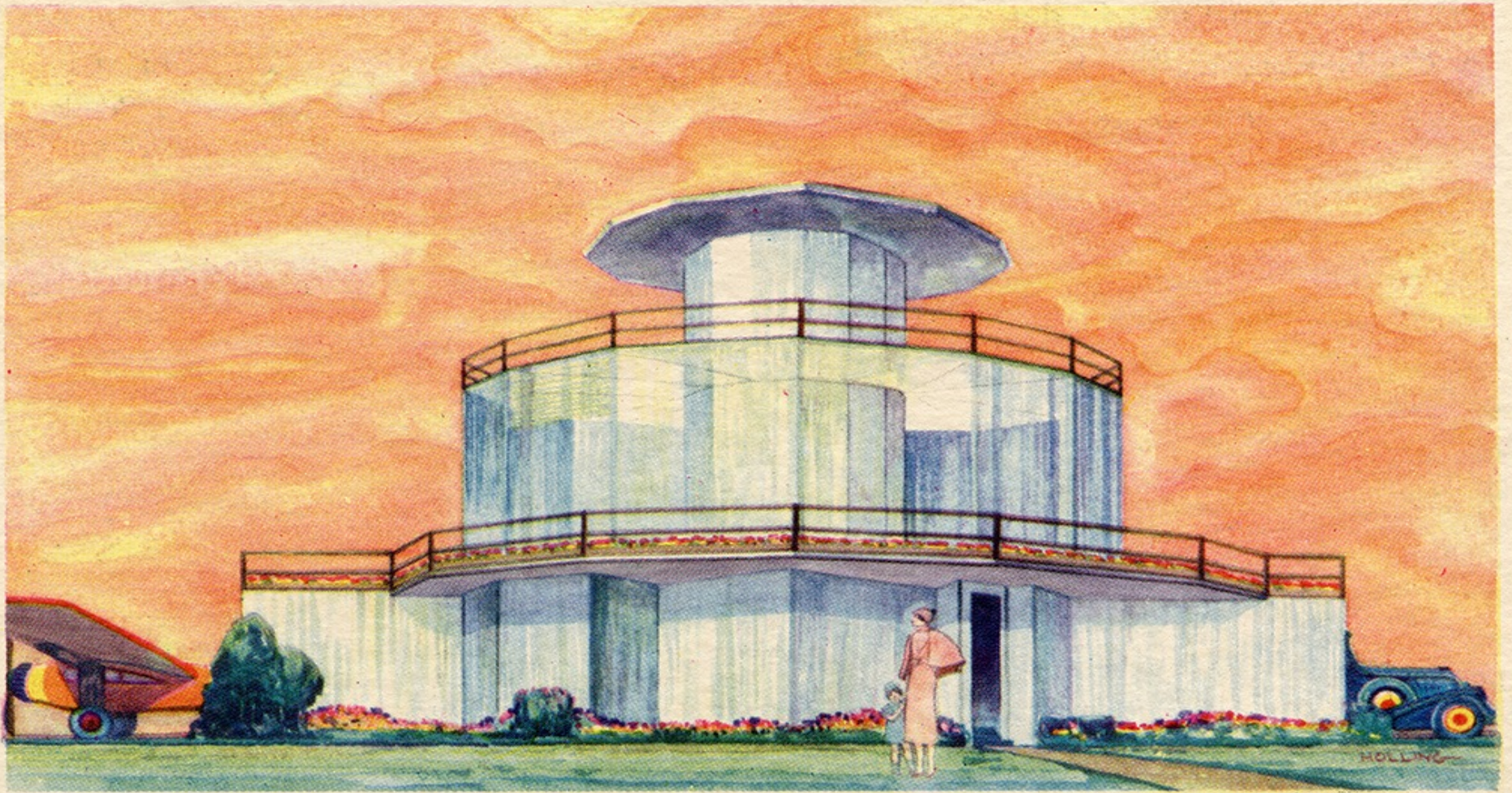
Ali Zaidi, Anna Karanika, Ti-Chung Cheng,  
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Indranil Gupta, Karrie Karahalios



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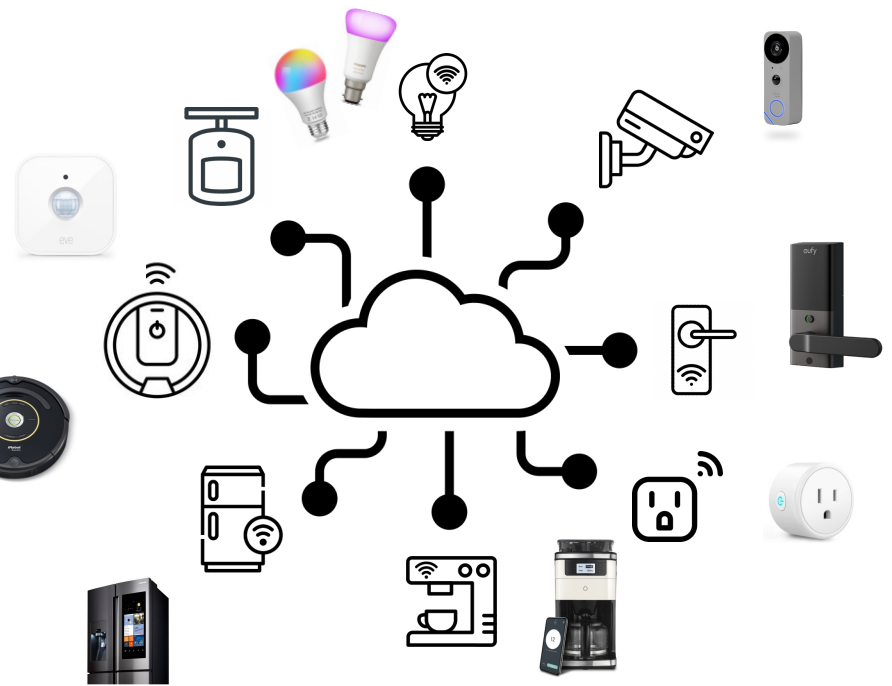


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THE HOUSE OF TOMORROW 2

# MANY INTERFACES, ONE HOME

- Homes expose **many control interfaces**:  
voice, hubs, apps, physical
- Most systems & studies focus on **one interface at a time**
- What's missing:  
**how users move between them**



# CONTROL: A SPECTRUM OF PROXIES



# HOW USERS NAVIGATE CONTROL IN SMART HOMES

## RQ1: Navigating Control

How do users combine & move across smart-home control schemes?

### RQ1a

*Factors shaping movements*

## RQ2: Responding to Failure

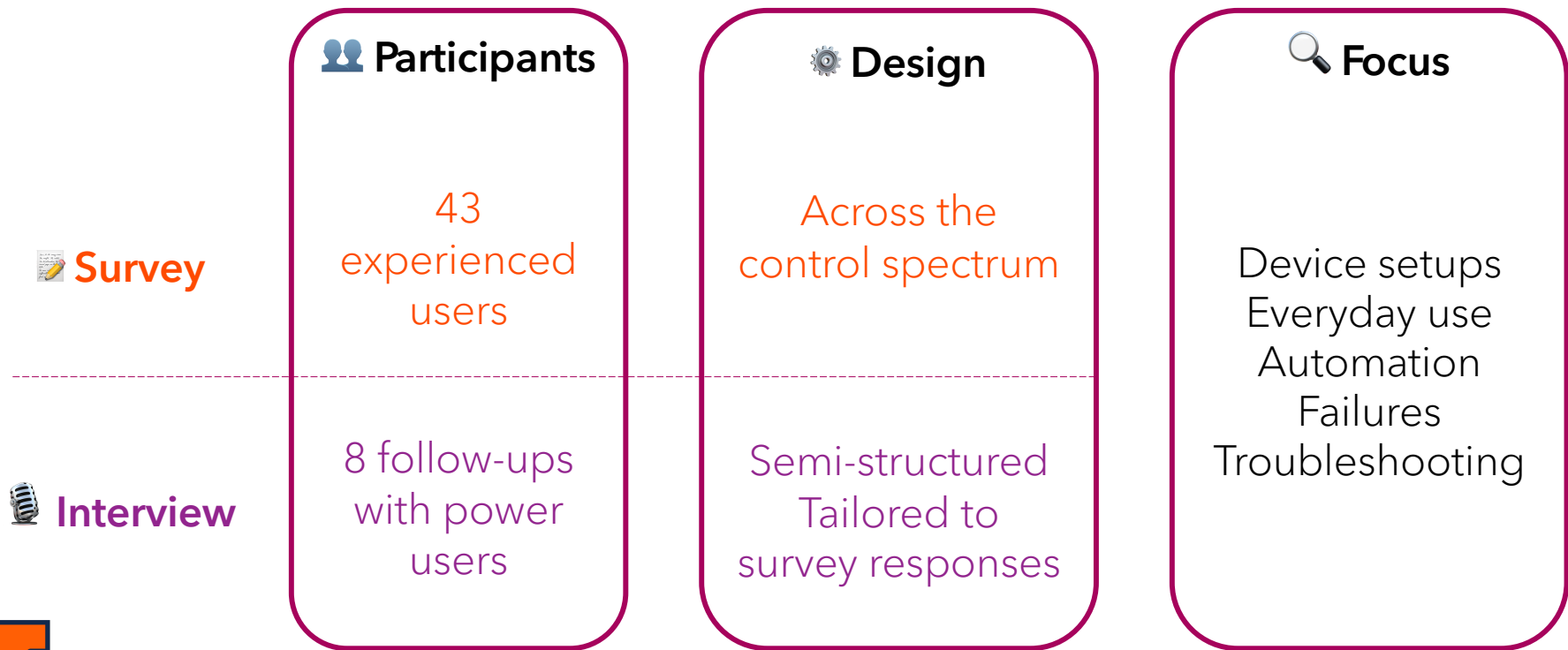
How do perceptions shape responses when interactions fail?

### RQ2a / RQ2b

*Effects on trust, preferences, and "seam practices"*

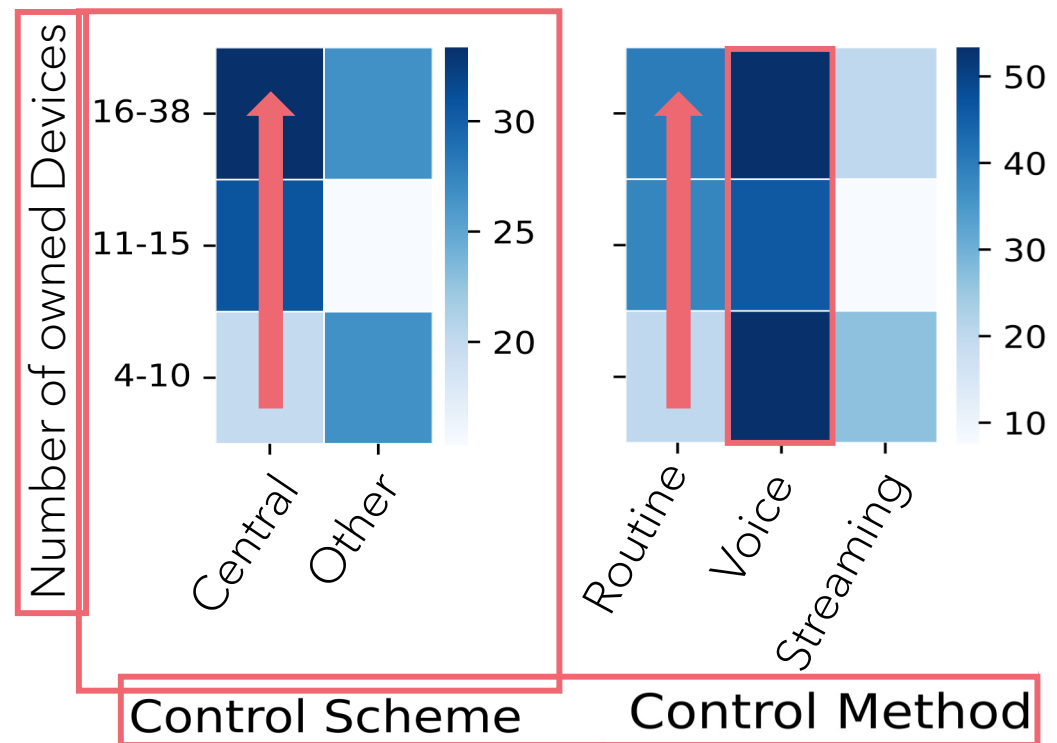


# MIXED METHODS



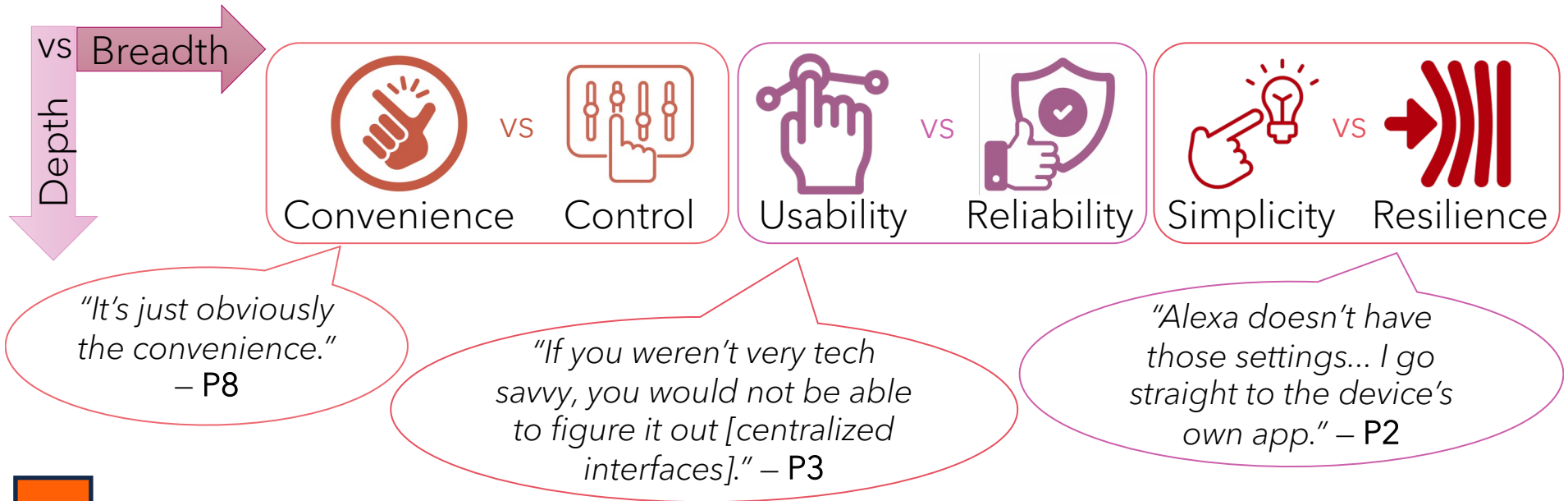
# RQ1: HOW DO USERS NAVIGATE CONTROL?

Control is  
fluid in practice



# RQ1A: WHAT SHAPES MOVEMENT ACROSS CONTROL SCHEMES?

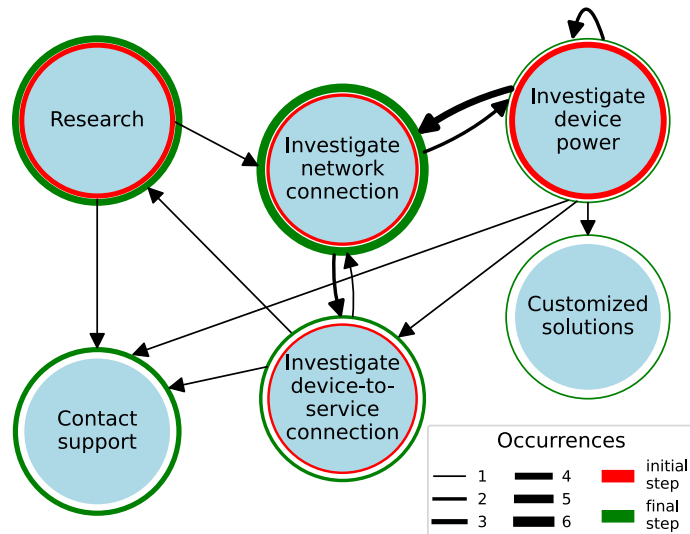
Users trade off:



**I**

# RQ2: WHEN CONTROL BREAKS

- Troubleshooting follows a **systematic pattern**:



- **Redundancy → Dependability**



# RQ2A: TROUBLESHOOTING DOESN'T JUST FIX PROBLEMS

 Failures reshape **trust in control proxies**

 Users **abandon** devices, **restructure** routines, and platforms

 Users forced into **unwanted control methods**

*"It was painful. So I ended up returning the device."  
– P5*

*"[I] resigned myself to just using the app."  
– P1*



# RQ2B: UNCERTAINTY PERSISTS ACROSS CONTROL PROXIES

 **Which proxy controls what**

*"In the Nest app you can see the history... but not on Google Home." – P5*

 **Hidden features**

 **Partial APIs**

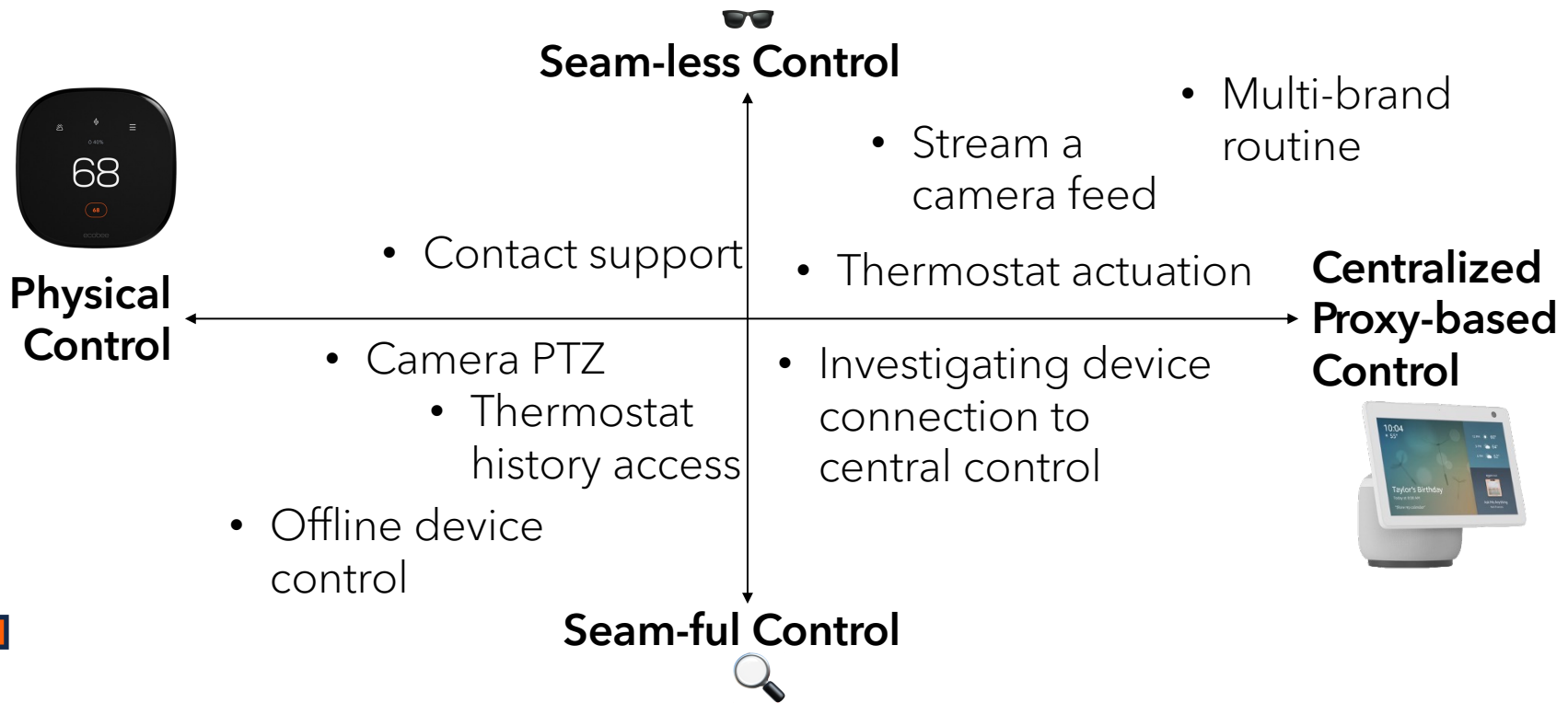
*"Every time I go to set a routine, I have to relearn it."  
– P3*

 **Multi-user confusion**

*"If I add a routine in the Tapo app, [my wife] can't change it."  
– P5*



# SMART HOME CONTROL: A DUAL SPECTRUM



# FROM BREAKDOWN TO NAVIGATION

Smart homes:  
**ecology**, not a single system

Device, routine and network additions, removals, failures (**changes**)



**re-balancing** across the dual spectrum

The shift: how devices **participate** in the home ecology



# DESIGNING FOR NAVIGATION, NOT JUST AUTOMATION

## Implication 1

Support **transitions**  
across control  
proxies

## Implication 2

Visualize **capability  
ceilings** (e.g., "*Device  
offline—try local control*")

## Implication 3

Design governance  
for **shared  
households**

**Open Questions:**

Measuring transition  
**quality**

Supporting **non-expert**  
users during **handoffs**



# CONTROL IN CONTEXT: HOW SMART HOME USERS NAVIGATE PROXY-BASED SCHEMES

## Control Is a Process, Not a Setting



Smart-home control is  
**distributed and proxied**



Goal changes and breakdowns turn  
control into **active navigation**



Resilience comes from  
supporting **fallback and transition**



Access the paper here!



Questions?

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