

# Three Years in the Startup Trenches: Reflections on People, Product, and Software Evolution

**Andy J. Ko**, Ph.D.

Associate Professor, The Information School  
Co-Founder & Chief Scientist, AnswerDash



# About me



- I've been a professor for 9 years
- I've been doing research about programming and software engineering for 18 years, inventing new developer tools and studying teams.
- Up until 2012, I'd never **worked** as a developer, I'd only ever **studied** developers.
- This is a talk about what I learned after finally engaging in practice, but with a **research lens**.

# Background

- In 2013, I co-founded a startup based on my lab's research.
- I had three goals:
  1. Disseminate my lab's research
  2. Learn why research rarely makes it into practice
  - 3. Reflect on software evolution by embedding myself in a software startup**

# We know *how* developers work

- Hundreds of research papers **describe what developers do:**
  - Questions developers ask
  - Information they need
  - Coordination they require
  - Factors that affect productivity

# *Why* do we work this way?

- Very hard to observe decisions longitudinally
  - Interviews/surveys rely on human memory
  - Field observations are time-consuming and can't observe individual decision making
  - Repository mining only sees a partial trace of a subset of decisions

# Method

- Participation observation (from anthropology)
  - Founded a software company, worked as CTO full time, 60 hours per week, for three years
  - I wrote daily in diary, reflecting on *“What structured today’s decisions and why?”*
  - Captured 15,000 emails with employees and customers
  - Interviewed co-founders and other executives for triangulation



- Raised ~\$2.5 million in venture capital with co-founders Jake Wobbrock & Parmit Chilana
- 20+ full-time employees, 100,000+ lines of code, customers big and small
- I managed 8 engineers, managed product, conducted sales, shaped marketing, architected system, wrote a *lot* of code



Bill details : Oct. 16

Sep. 17 - Oct. 16, 2015

[Back to summary](#)

Account

About account charges

Account charges either apply to multiple lines or do not apply to any individual line on your account.

Changes  
\$0.00

There were no account level changes.

Equipment Installment Plan (EIP)

YOUR EIP BALANCE: \$917.79

You can pay off the plan at any time, or make extra payments and reduce the number of payments left.

[View Details](#)

Service prior to Oct 17

OTHER CHARGES AND CREDITS

Zeroed Int - Emp (\$238.16)

Subtotal: (\$238.16)

Service from Oct 17 to Nov 16

PLAN

SimpleChoice Val FAM UnitT+D \$80.00

Subtotal: \$80.00

T-Mobile fees and charges & Government taxes and fees

Charges based on the following address: 4231 1/2 NE 113TH ST, SEATTLE WA 98125-5856

T-MOBILE FEES AND CHARGES

Federal Universal Service Fund \$1.43

Utility Use \$3.24

GOVERNMENT TAXES AND FEES

Utility Use \$3.24

GOVERNMENT TAXES AND FEES

Powered by AnswerDash

AnswerDash



Questions about your Bill?

Bill details : Oct. 16

# Contextual FAQ

[Back to summary](#)

Account

About account charges

Account charges either apply to multiple lines or do not apply to any individual line on your account.

Changes  
\$0.00

There were no account level changes.

Equipment Installment Plan (EIP)

YOUR EIP BALANCE: \$917.79

You can pay off the plan at any time, or make extra payments and reduce the number of payments left.

[View Details](#)

Service prior to Oct 17

OTHER CHARGES AND CREDITS

Zeroed Int - Emp (\$238.16)

Subtotal: (\$238.16)

Service from Oct 17 to Nov 16

PLAN

SimpleChoice Val FAM UnitT+D \$80.00

Subtotal: \$80.00

T-Mobile fees and charges & Government taxes and fees

Charges based on the following address: 4231 1/2 NE 113TH ST, SEATTLE WA 98125-5856

T-MOBILE FEES AND CHARGES

Federal Universal Service Fund \$1.43

Utility Use \$3.24

GOVERNMENT TAXES AND FEES

Utility Use \$3.24

GOVERNMENT TAXES AND FEES

Powered by AnswerDash

Click this, then click anything in the page to get Q&A about it.

Popular Questions Search all questions

▼ How do I view my bill history?

You can view your last 12 months' worth of bills by selecting the bill cycle you want to view from the drop down selector at the top-right of the Billing Summary page. The screen shot highlights the drop down selector below:

Pop out Was this helpful? Yes No

- ▶ How do I set up a payment arrangement?
- ▶ How do I see my detailed bill?
- ▶ How do I make a bill payment?
- ▶ What are Account charges?
- ▶ Why is my bill higher than last month?
- ▶ See all questions...

Questions about your Bill?

Search all questions

Billing

- How do I view my bill history?
- How do I see my detailed bill?
- Why is my bill higher than last month?
- How do I save a copy of my PDF bill?
- How do I see a breakdown of the bill

[See all questions...](#)

My Account

- How do I find my account number?
- What are Data Passes?
- How can I remove the PHP warranty?
- Who is the primary account holder?
- How do I view my plan details?

[See all questions...](#)

Payments

- How do I set up a payment arrangement?
- How do I make a bill payment?
- What is an Equipment Installment Plan?
- How can I make larger payments on my phone?
- How do I make an extra Equipment Installment Plan (EIP) payment?

[See all questions...](#)

My Device

- How do I view calls made on my phone?
- How do I purchase equipment insurance?
- How do I view my call history?

[See all questions...](#)

Charges & Fees

- What are Account charges?
- What are Third-party services?
- What are T-Mobile purchases?
- What is an EIP additional payment offset?
- Is my EIP included in the monthly bill?

[See all questions...](#)

[View Details](#)

Utility Use \$3.24

GOVERNMENT TAXES AND FEES

Powered by AnswerDash

# Contextual Browsing

Bill details : Oct. 16

# Selection-based search

[Back to summary](#)

Account

About account charges

Account charges either apply to multiple lines or do not apply to any individual line on your account.

Changes  
\$0.00

There were no account level changes.

Equipment Installment Plan (EIP)

YOUR EIP BALANCE: \$917.79

You can pay off the plan at any time, or make extra payments and reduce the number of payments left.

[View Details](#)

Service from Oct 17 to Nov 16

OTHER CHARGES AND CREDITS

Zeroed Int - Emp (\$238.16)

Subtotal: (\$238.16)

Service from Oct 17 to Nov 16

PLAN

SimpleChoice Val FAM UnitT+D \$80.00

Subtotal: \$80.00

T-Mobile fees and charges & Government taxes and fees

Charges based on the following address: 4231 1/2 NE 113TH ST, SEATTLE WA 98125-5856

T-MOBILE FEES AND CHARGES

Federal Universal Service Fund \$1.43

Utility Use \$3.24

GOVERNMENT TAXES AND FEES

Powered by AnswerDash

How do I view my bill history?

You can view your last 12 months' worth of bills by selecting the bill cycle you want to view from the drop down selector at the top-right of the Billing Summary page. The screen shot highlights the drop down selector below:

Was this helpful? Yes No



# Analysis

- Synthesized diary, emails, and interviews into **claims** about engineering decisions
- Distilled into **claims** and a **theory** of software evolution decision-making

I challenges

with a point>

c. And where my feet will be less sweaty. They're quite sweaty.

you, our capable CTO, my co-founder, and someone who has to be more of an asshole:

any factors, some of which were outside your control (heartbleed, server port, additional hire), we have to accept. And Jake isn't being enough of an asshole, either."

can't create a culture, engineering or otherwise, that is comfortable with slipping. We must hit our market. We must be "hit" effectively a week or two in advance of actually shipping. We knew we wouldn't do that, but we didn't know we wouldn't do that.

doesn't view slipping as something to never, ever, ever, ever let happen. (I have worked in engineering for a long time. I know an effective one we respected and did not hate.) There's a subtle mentality around these things and, for a long time, we've created a "slipping is kinda okay" mentality. It's subliminal, but it is real. We must not underestimate the power of slipping.

happen in the all-hands meeting. I kept it light. I asked about the weekend. I let you indicate that if you're not shipping, it's a message to the engineering team. It doesn't communicate that we're on the brink and the founders will be disappointed.

must impress upon you that we MUST ship on or before next Wednesday. Not Thursday, not Friday, not Saturday. Otherwise, we're just in this "ongoing deadline, no deadline" state that is poisonous to hitting market.

Monday night; Tuesday latest. That's what it'll mean to ship Wednesday.

with respect and love for you and your efforts, I leave you with this video clip as homework. The hairy one is soft-spoken, cautious, and not-an-asshole, and here is what Erlich tells him is required to be an engineer.

s

I have to become more of an asshole.

Wednesday. Full stop.

with a point>

)14

cal search bug, and two first-use orange-arrow bugs (that's prob. the same bug, I realize).

idly, focus on quality, not rushing things. And yet these two issues are pretty significant, and went unnoticed until now. I'm sorry about the bugs. I'm sorry about the debugging work.

advisory board member. That's embarrassing to me.

# Results

- Decisions were ultimately structured by a collective effort to **define product value**
- **Product value proposition**: an explanation for *why* software is valuable to stakeholders such as end users or customers
- Multiple factors structured the evolution of this proposition, which then structured the evolution of software

# 6 (of 9) factors...

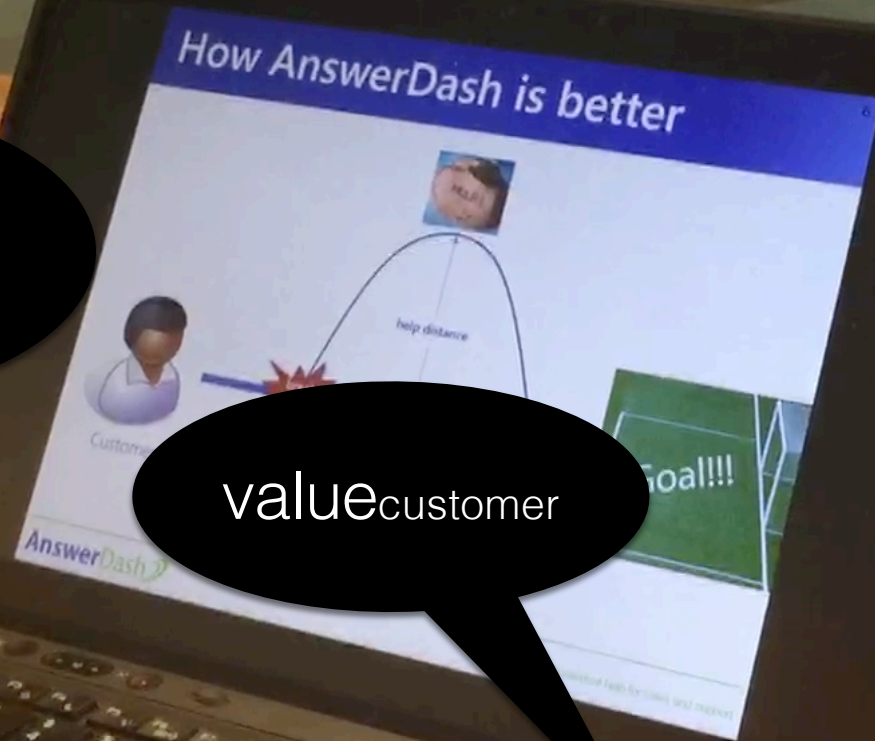
Read the paper for the other three...

*<http://faculty.uw.edu/ajko/publications/answerdash>*

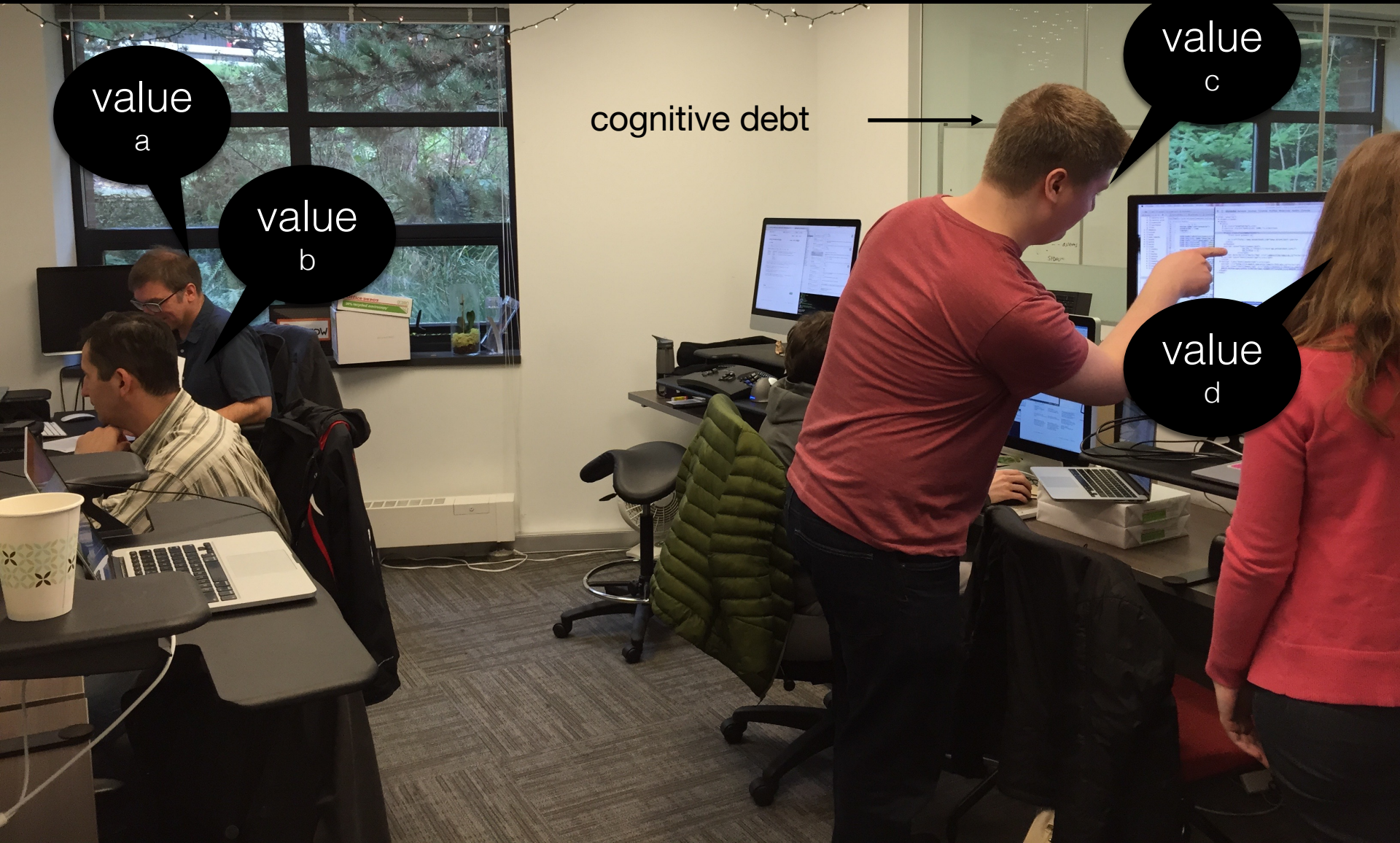
# Diffusion of power constrained collective agreement of value

value<sub>answerdash</sub>

value<sub>customer</sub>



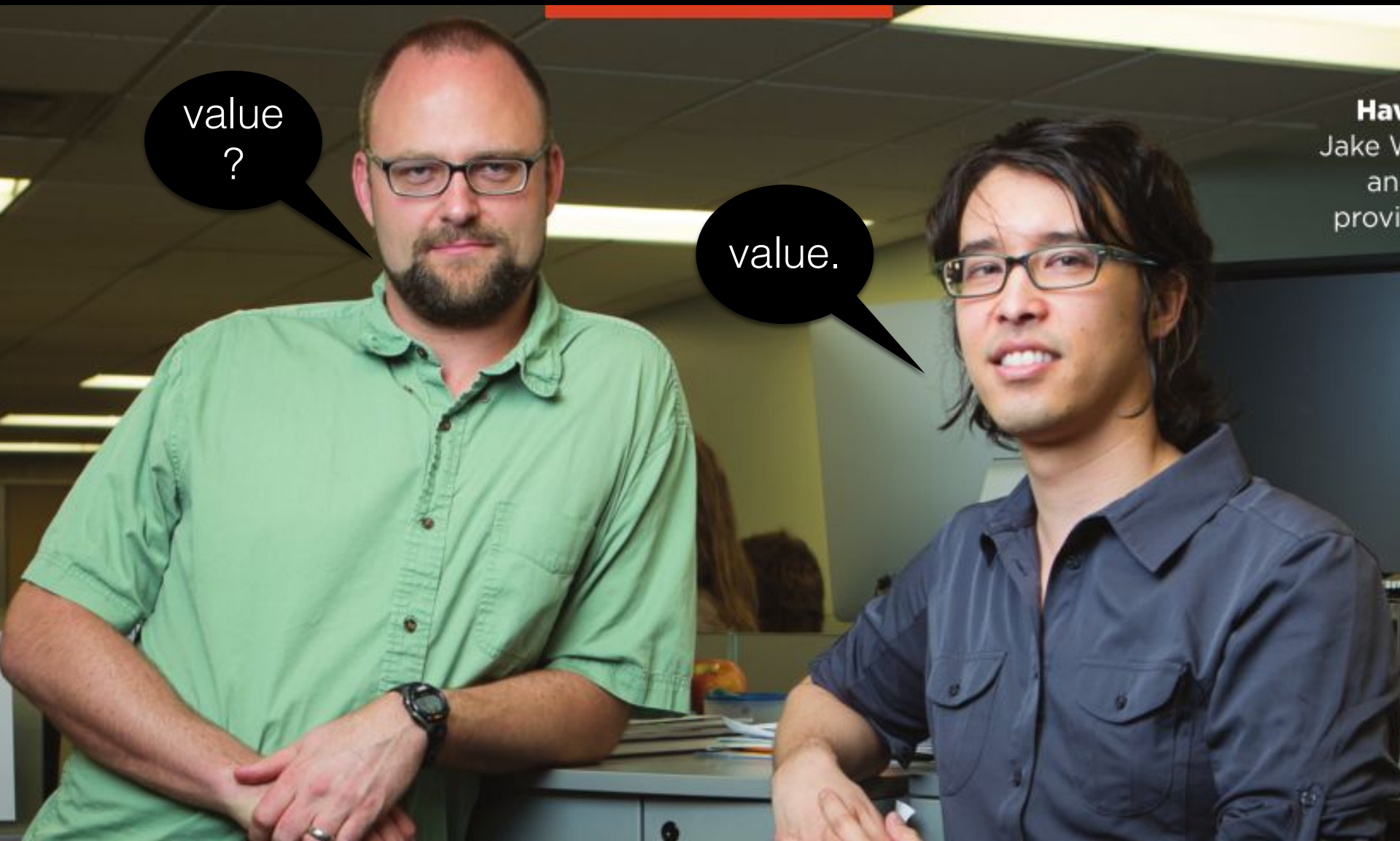
Consistent engineering of value required  
required consistent understanding of value



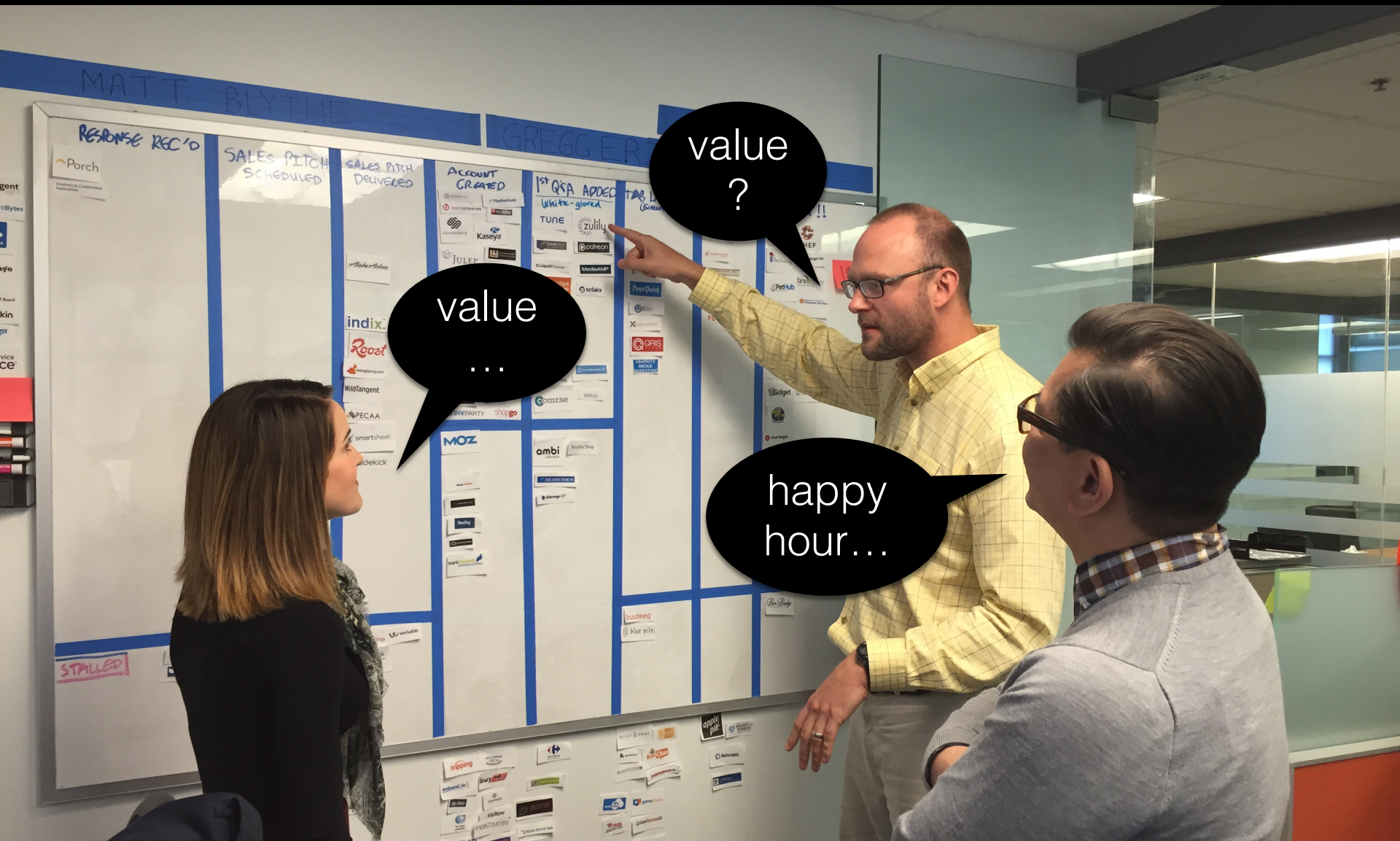
# Prosocial communication streamlined communication of value



# Cross-discipline implementation of value required trust in expertise



# Social decision fatigue under uncertainty limited value consensus





# Expression of value in code was lossy



val

value

# A theory of software evolution decisions...

*Software evolution is structured by the frequent, collective communication and agreement of a coherent proposition of a product's value across design, engineering, product, marketing, sales, support, users, and customers.*

Decisions in software evolution are primarily about **shaping and communicating product value**, not about code.

# Implications

- Product management and process were far more important than languages, tools, infrastructure in shaping how, why, and when software evolves
- Developers needed to excel at understanding, communicating, and translating value into code
- Tools might help developers enforce, check, communicate, prioritize, and filter representations of value in code

# Open questions

- Does this theory hold in other settings?
- What is the effect of inconsistent understanding of product value propositions on defects?
- When a value proposition changes, how can teams disseminate the change and reflect it in code?
- How does value proposition *ownership* affect software evolution?
- How should engineering balance product value-driven and engineering-driven decisions?

# Questions?

Andy J. Ko, Ph.D.

Associate Professor, The Information School  
Co-Founder & Chief Scientist, AnswerDash



**Research takeaway:** Software evolution is structured by the frequent, collective communication and agreement of a coherent proposition of a product's value across design, engineering, product, marketing, sales, support, users, and customers.

**Practice takeaway:** engineering isn't just about great code, it's about translating and expressing a value negotiated across multiple disciplines.