Fighting Software Entropy

December 2022

YOW!

REA Group

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(Exec Mgr, Architecture)

Image credit: http://www.thenegativepsychologist.com/

Alison Rosewarne

Hi! 👋 We've been at this awhile...

Stewart Gleadow

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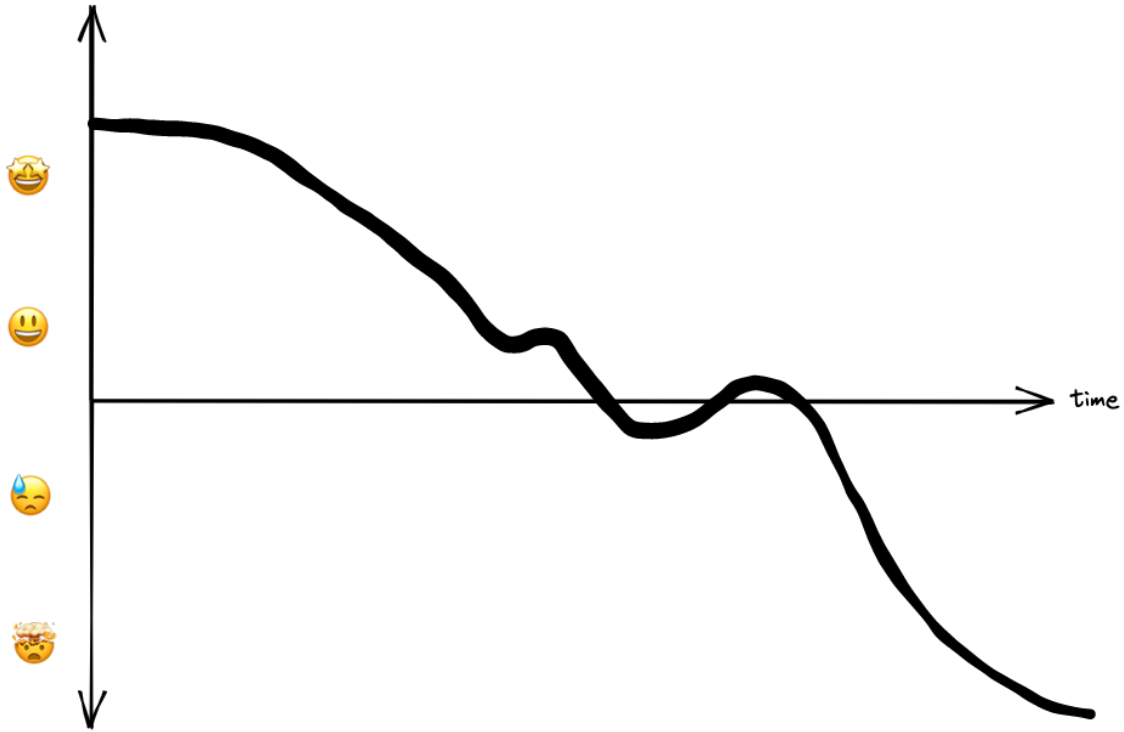
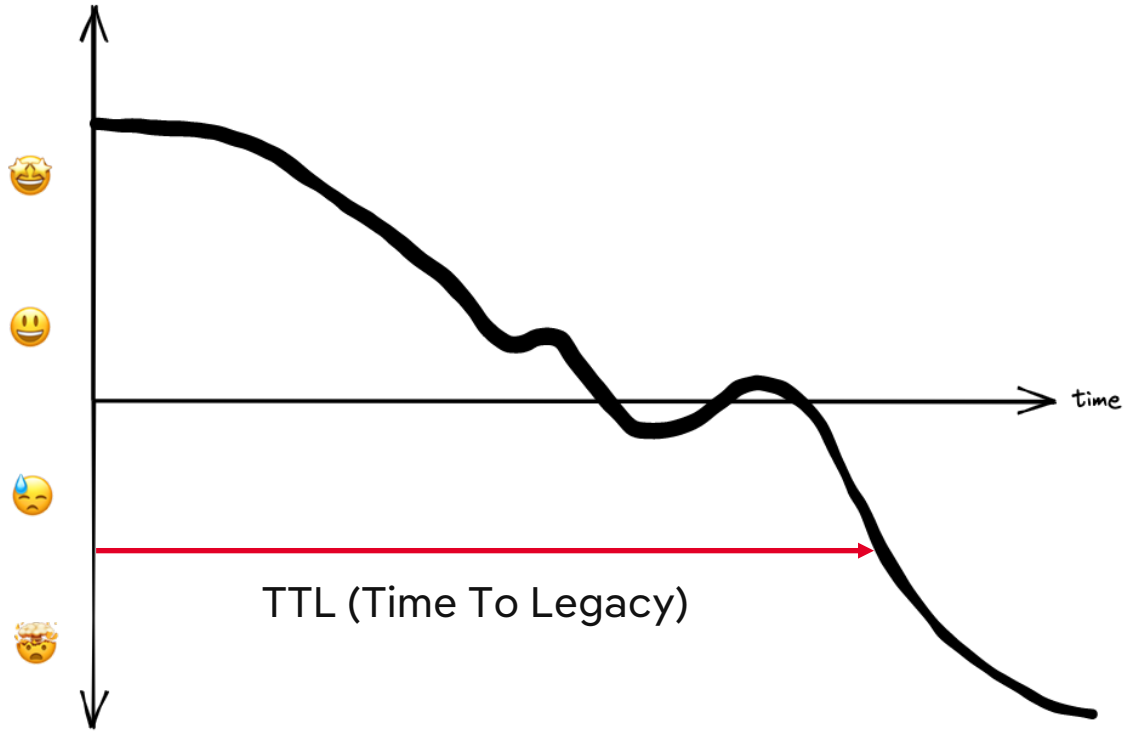


The life of successful software



The life of successful software

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Physics Lesson:

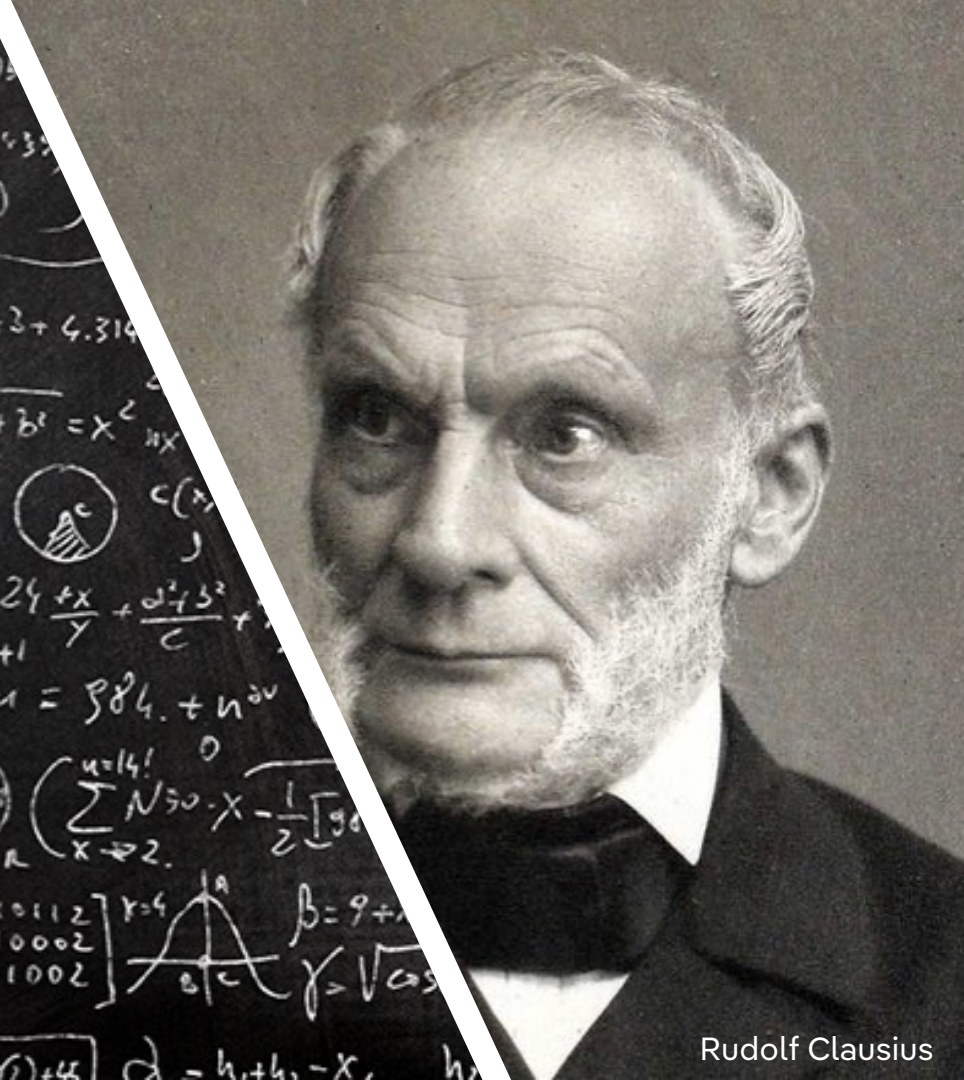
What is entropy?

Entropy, as described in the 2nd Law of Thermodynamics

- The **measure of disorder** of a system.

Characteristics of entropy:

- Systems inherently **move to disorder**.
- The more disorder that is present, the **less energy is available to do work**.



Rudolf Clausius

Structured systems have lower entropy

Photo by Aaron on Unsplash

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Alison Rosewarne

YOW! Lesson:
What is software entropy?

Entropy, as described by Stew and Alison

- The **measure of disorder** in software.

Characteristics of software entropy:

- Software inherently **moves to disorder**.
- The more disorder that is present, the **less energy is available to do work**.

Photo by Markus Spiske on Unsplash

Structured software has lower entropy

It's our **software architecture** that defines the **modularity** and **interaction** between systems.

"...**high-performing teams** were more likely to have **loosely coupled architectures**."

Source: State of DevOps Report, 2017.

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Why does software decay?

- Compromises are made
- Dependencies date
- Approaches change
- Shared understanding is lost

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[Some of]

The laws of software evolution

- Continuing Change
- Increasing Complexity
- Continuing Growth
- Declining Quality

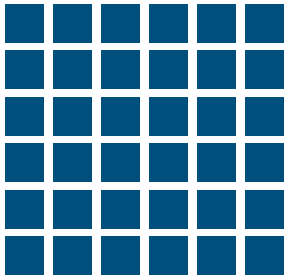
Confirmed by IBM researchers Meir M Lehman & Laszlo Belady

Software entropy affects internal quality

"With most software systems, it becomes **harder to add new features over time**."

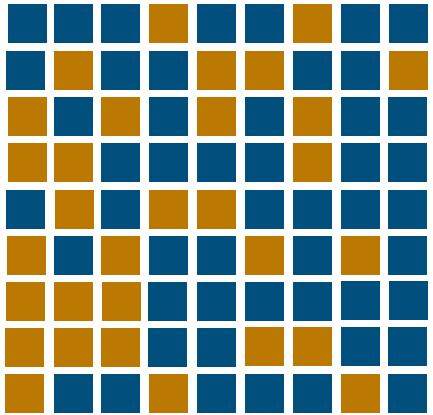
Martin Fowler, 2019

Clean system



Time to market

Crufty system



Time to market

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Why should you care about **deteriorating structure** and **quality**?

Do you agree with the following statement?

"I would like to **tear up** all of our organization's **core systems**."

Source: Digital Decoupling: U.S. Federal Survey Results, Accenture, 2018.

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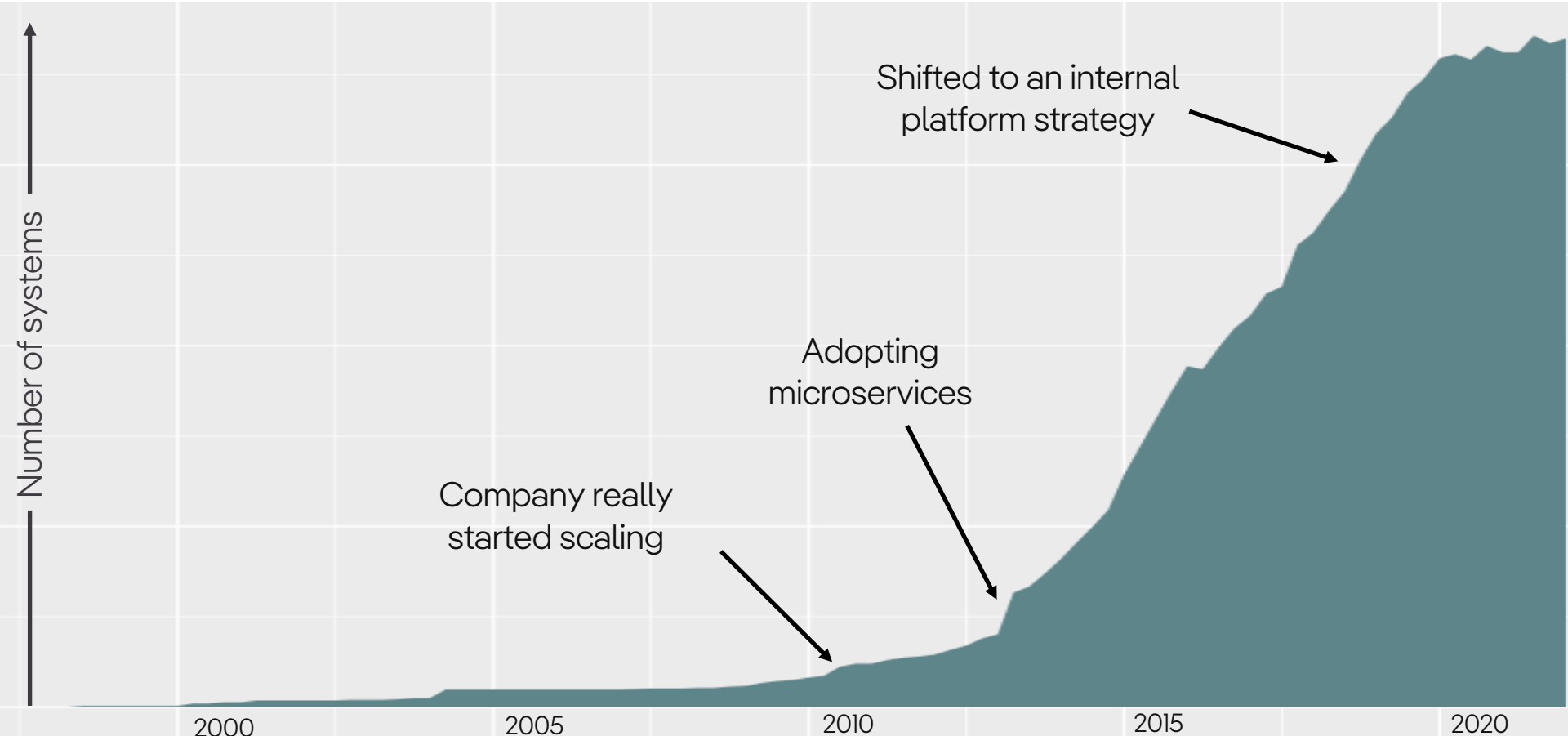
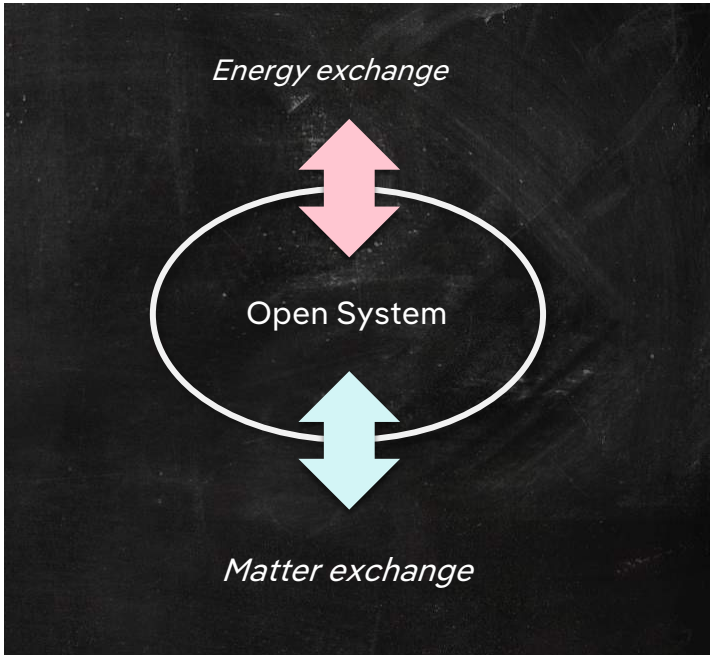
More **software** increases **entropy**



Varying **technologies** increases **entropy**

Decreasing entropy is possible ...
in **open systems**



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How can we fight software entropy?

1. Define the **structure**

2. Add the **energy**

Photo by Daiga Ellaby on Unsplash

Architecture practice

- Engineering excellence
- Continuous improvement
- Adopting platforms

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arch-i-tec-ture *n*
the design and structure of a computer system

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Principle Name

What – a short explanation

Why – articulates the value

In Practice

- Examples of how this shows up
- Aiming to simplify adoption

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Keep it clean

Constant cleaning is part of work well done.

Incremental improvement, no matter how small, adds up.

This is a healthy habit.

- Add or improve documentation.
- Fix static analysis violations.
- Increase test coverage.
- Tune monitoring.

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Our architectural principles

Adopt the platform

Build security in

Make it approachable

Manage your data

Keep it clean

Map the business domain

Deploy continuously

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Other mechanisms to improve architecture

- Technology strategy
- Decision making frameworks
- Knowledge management
- Sensible defaults

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“People who have **no choice** are generally unhappy. But people with **too many choices** are **almost as unhappy** as those who have no choice at all.”

- Ellen Ullman

Support **freedom from choice** with an internal **tech radar**.

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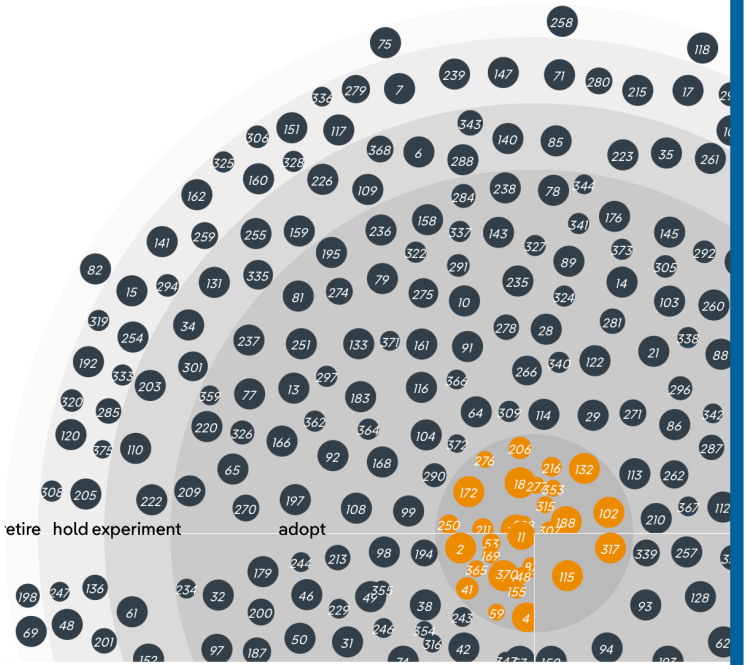
Volume highlights pdf

REA

React

Filter by tags



287. React

Ring: ADOPT - blip permalink

React is a JavaScript library for building user interfaces.

Its declarative, component-based approach makes it easier to reason about and debug UI code. React is a foundational technology that our Web Platform (Argonaut) and Design System (Construct Kit) are built on top of. React is the sensible default for building user interfaces at REA.

Edit in Git


Photo by Joshua Gaunt on Unsplash

We also need to add energy to our architecture

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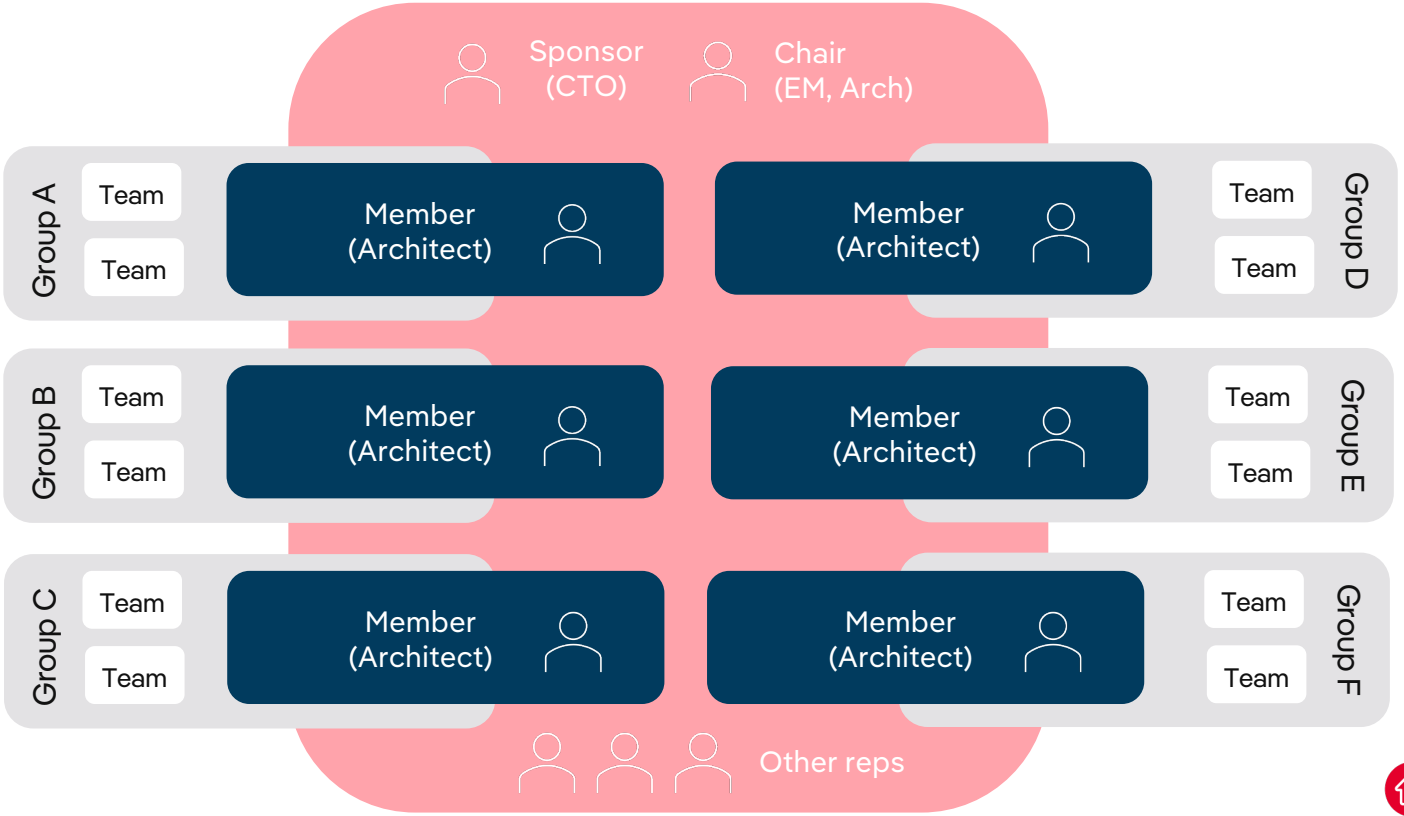
Architects from across our business work together with dedicated capacity



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Key takeaways

Architectural alignment decreases software entropy

Principles increase consistency of decisions

Freedom from choice reduces cognitive load

Dedicated time is required to drive outcomes

Photo by Rudolf-Peter Bakker on Unsplash

Architecture practice

Engineering excellence

Continuous improvement

Adopting platforms

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Photo by Daiga Ellaby on Unsplash

What even is good software?

Photo by Kelli McClintock on Unsplash

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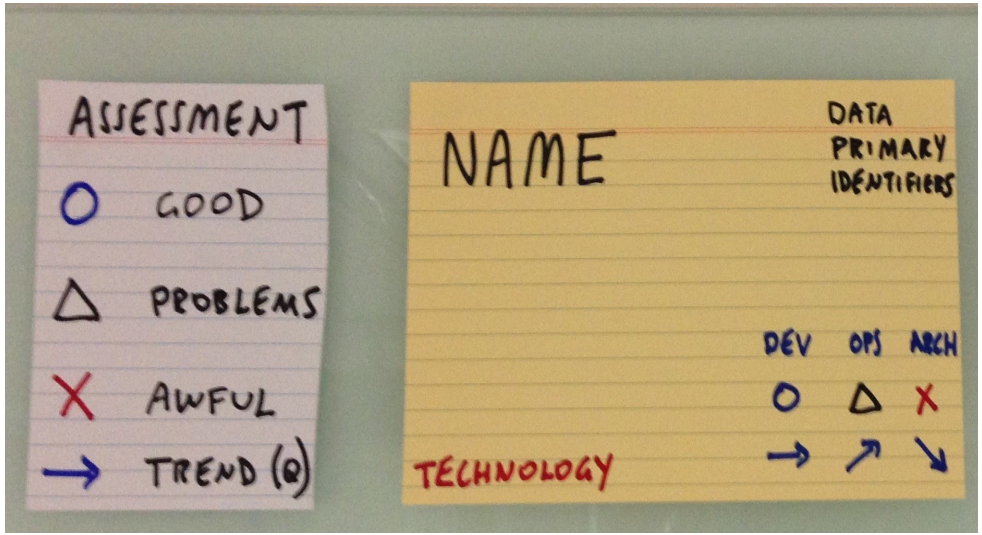

First, we started with opinions

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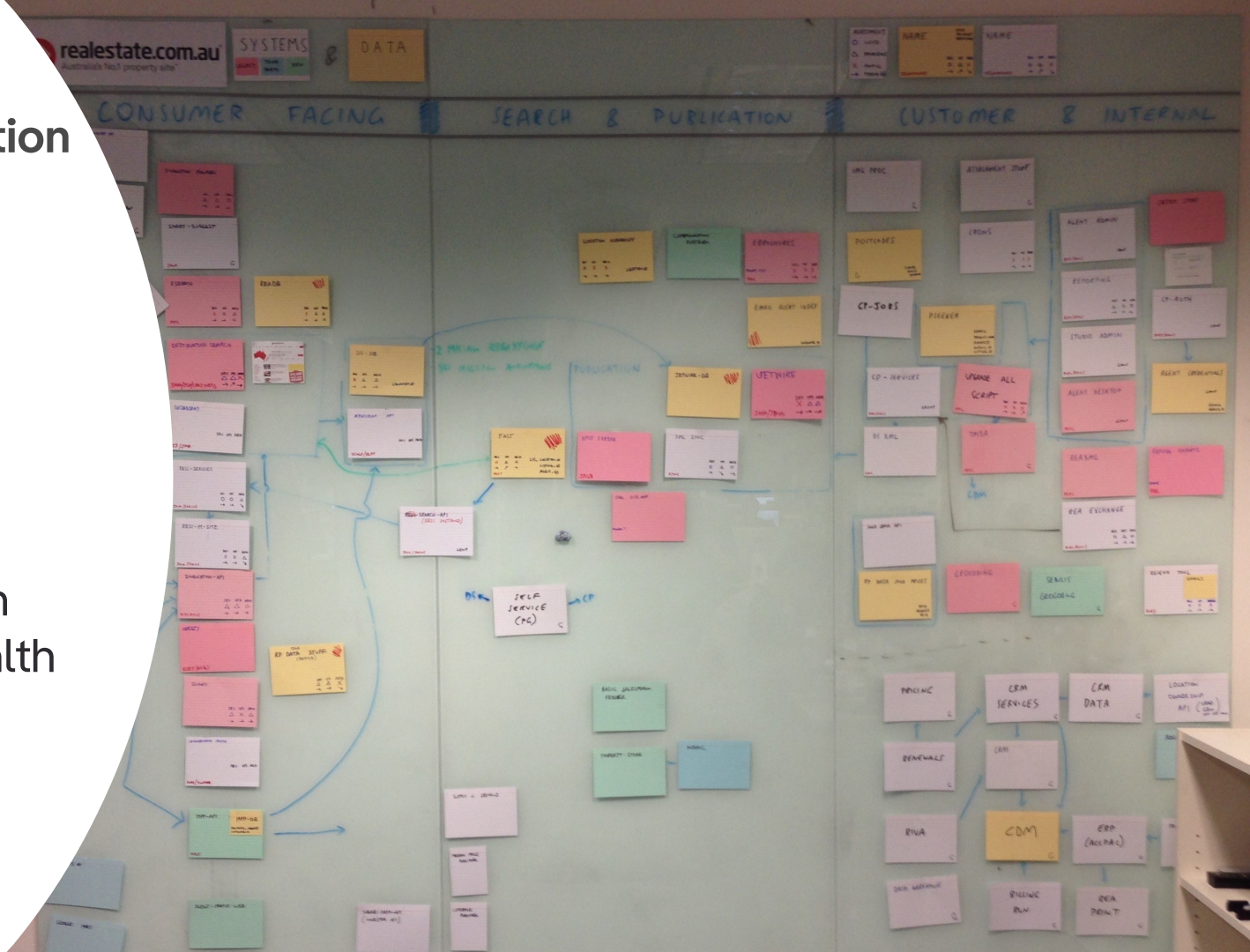
Radiating information

Visualisation was powerful

Changing the language from tech debt to system health was important



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Remove ambiguity to be really clear about the state you are after

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Development
Can I confidently and safely make changes?

Operations
Can I support the system and confirm acceptable production behaviour?

Architecture
Is the design extensible and fit for purpose?

Photo by Maxim Abramov on Unsplash

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Adding structure to our expectations

(START HERE)

DEVELOPMENT

(START HERE)

OPERATIONS

(START HERE)

ARCHITECTURE

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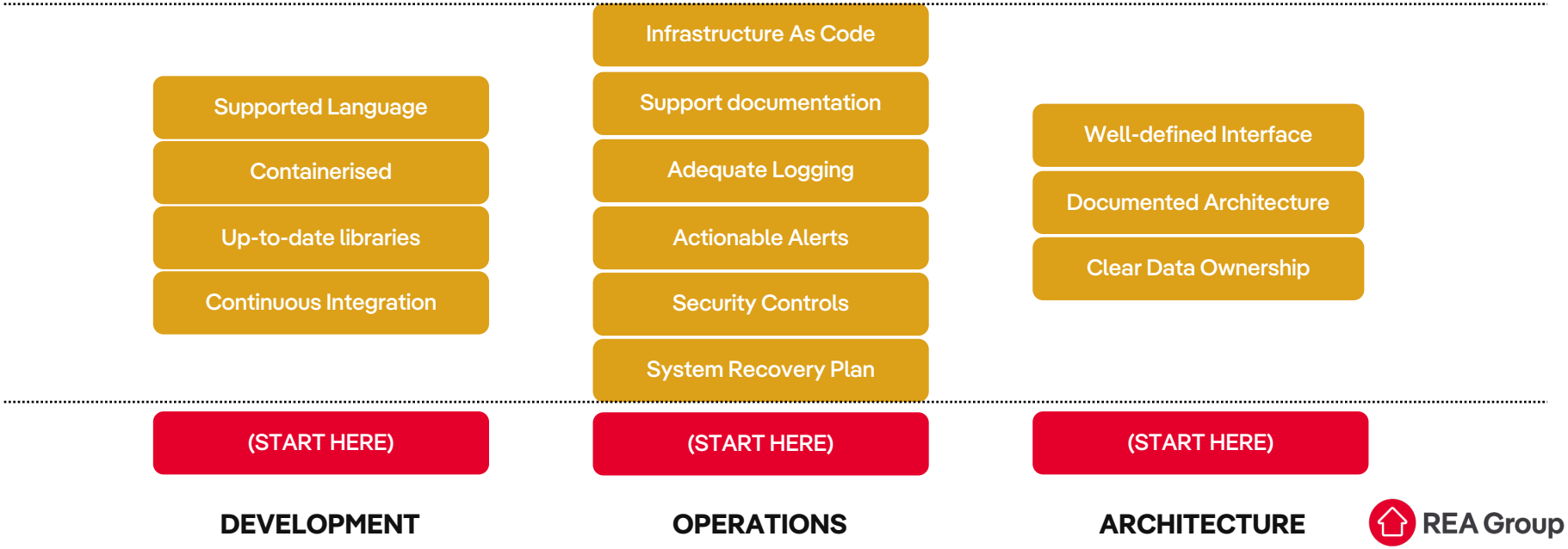
Supported Language
Containerised
Up-to-date libraries
Continuous Integration
Infrastructure As Code
Support documentation
Adequate Logging
Actionable Alerts
Security Controls
System Recovery Plan
Well-defined Interface
Documented Architecture
Clear Data Ownership
(START HERE)
(START HERE)
(START HERE)
DEVELOPMENT
OPERATIONS
ARCHITECTURE
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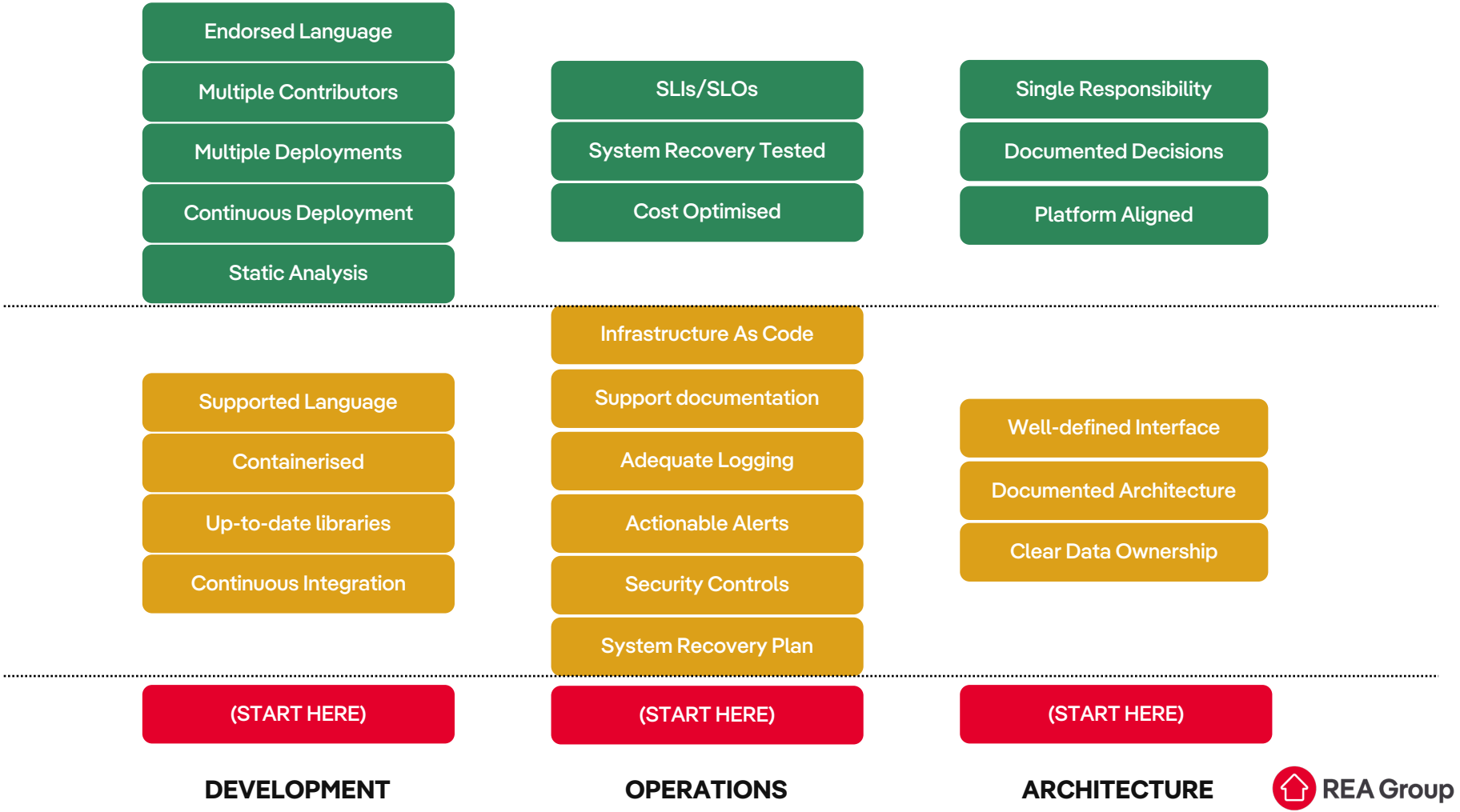
Endorsed Language
Multiple Contributors
Multiple Deployments
Continuous Deployment
Static Analysis
SLIs/SLOs
System Recovery Tested
Cost Optimised
Single Responsibility
Documented Decisions
Platform Aligned
Infrastructure As Code
Supported Language
Support documentation
Containerised
Adequate Logging
Up-to-date libraries
Actionable Alerts
Continuous Integration
Security Controls
System Recovery Plan
Well-defined Interface
Documented Architecture
Clear Data Ownership
(START HERE)
(START HERE)
(START HERE)
DEVELOPMENT
OPERATIONS
ARCHITECTURE
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Photo by Ussama Azam on Unsplash

Don’t forget to add a little energy...

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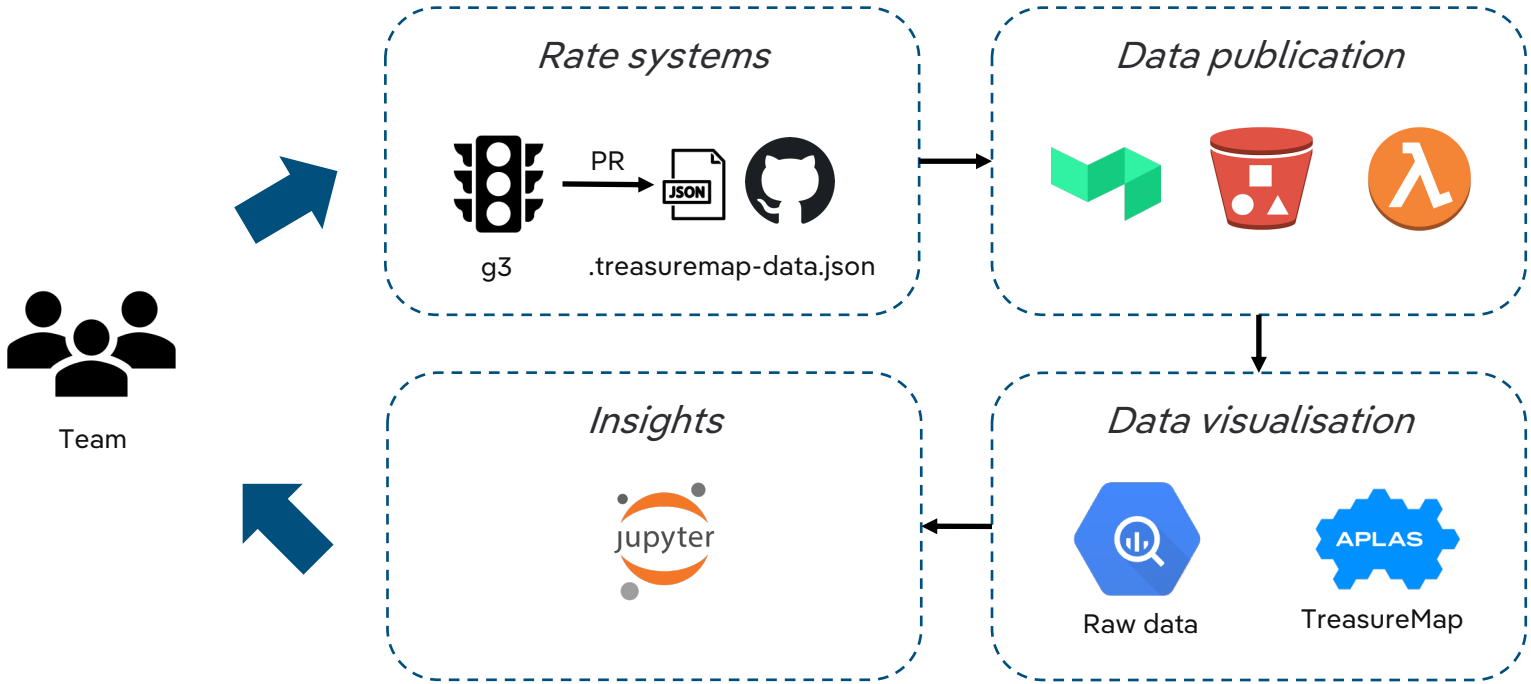
Rating workflow



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“All anyone asks for is a chance to work with pride.”

- W. Edwards Deming

Key takeaways

Agree what engineering excellence means to you

Radiate information and build shared understanding

Use objective measurements as a baseline for improvement

Build a culture of engineering excellence

Photo by Rudolf-Peter Bakker on Unsplash

Architecture practice

Engineering excellence

Continuous improvement

Adopting platforms

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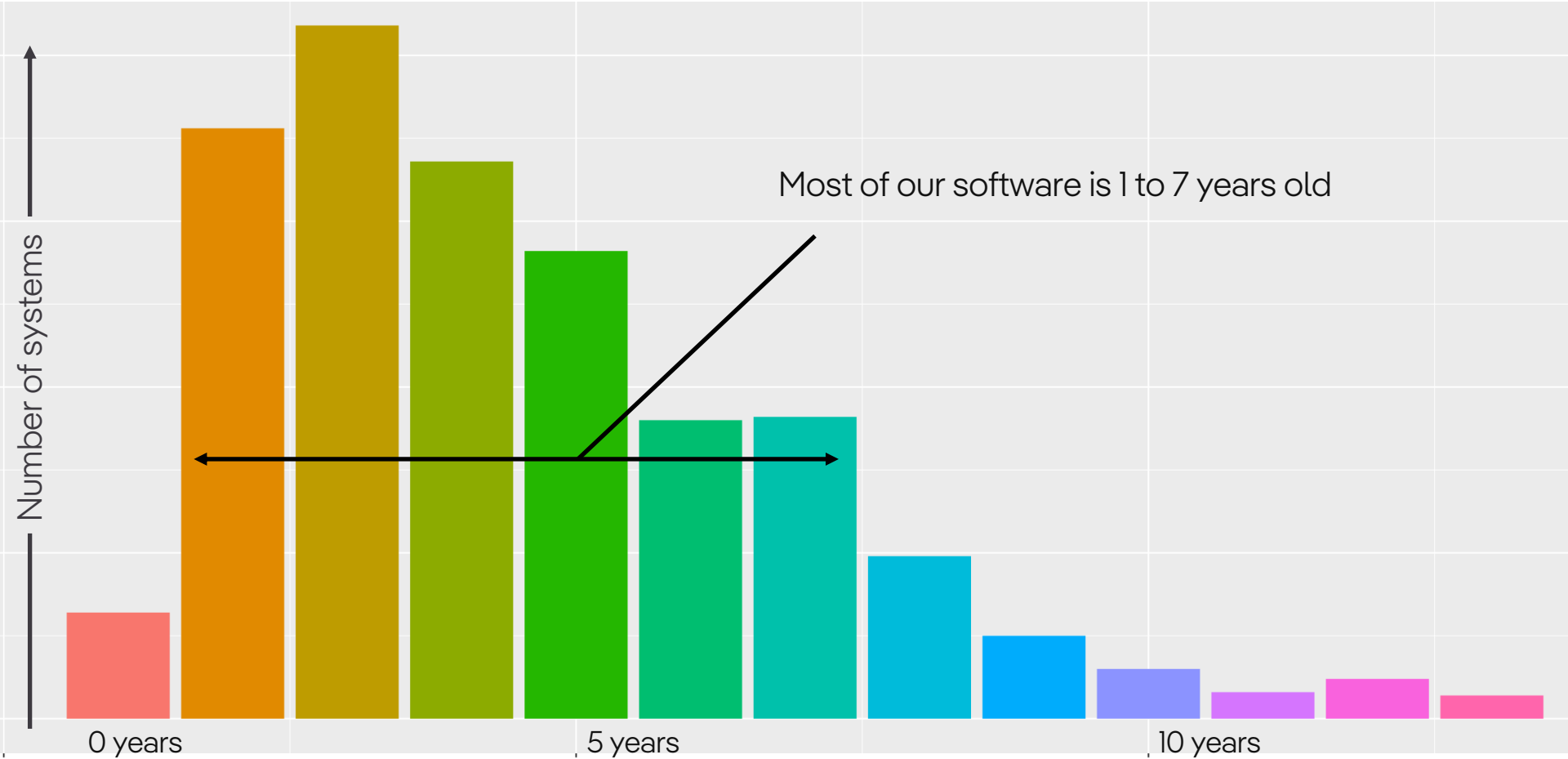
Photo by Daiga Ellaby on Unsplash

The passage of **time** increases **entropy**



“The deal with engineering goes like this.

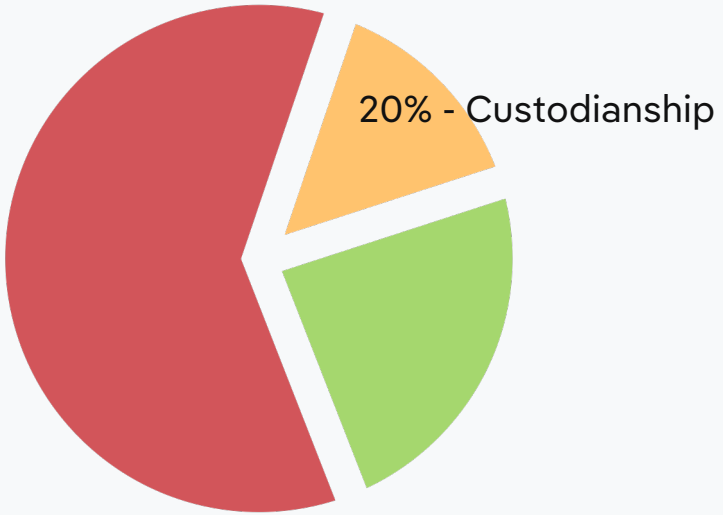
Product management **takes 20% of the capacity** right off the table and gives this to engineering to spend as they see fit”

“If you’re in really bad shape today, **you might need to make this 30%** or even more”

Marty Cagan, 2007

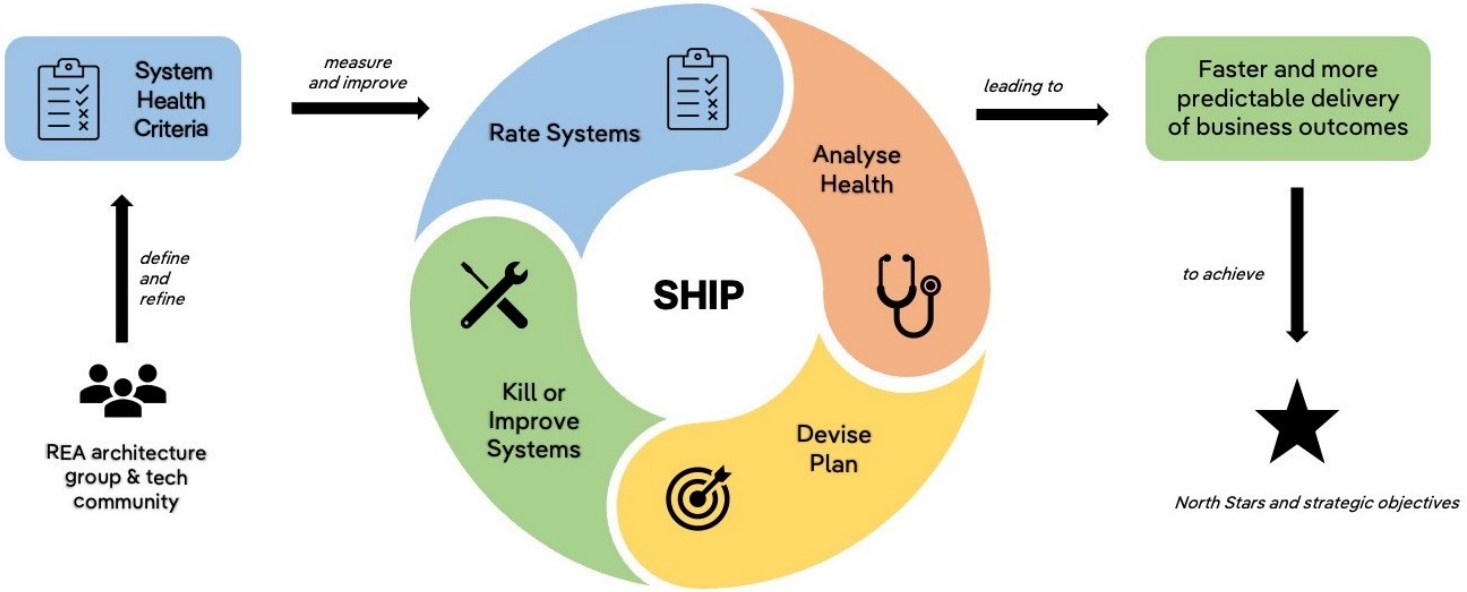
Custodianship: putting the energy in

1. Reducing risk
2. Paying down tech debt
3. Lowering total cost of ownership



Rudolf Clausius

Adding structure to custodianship



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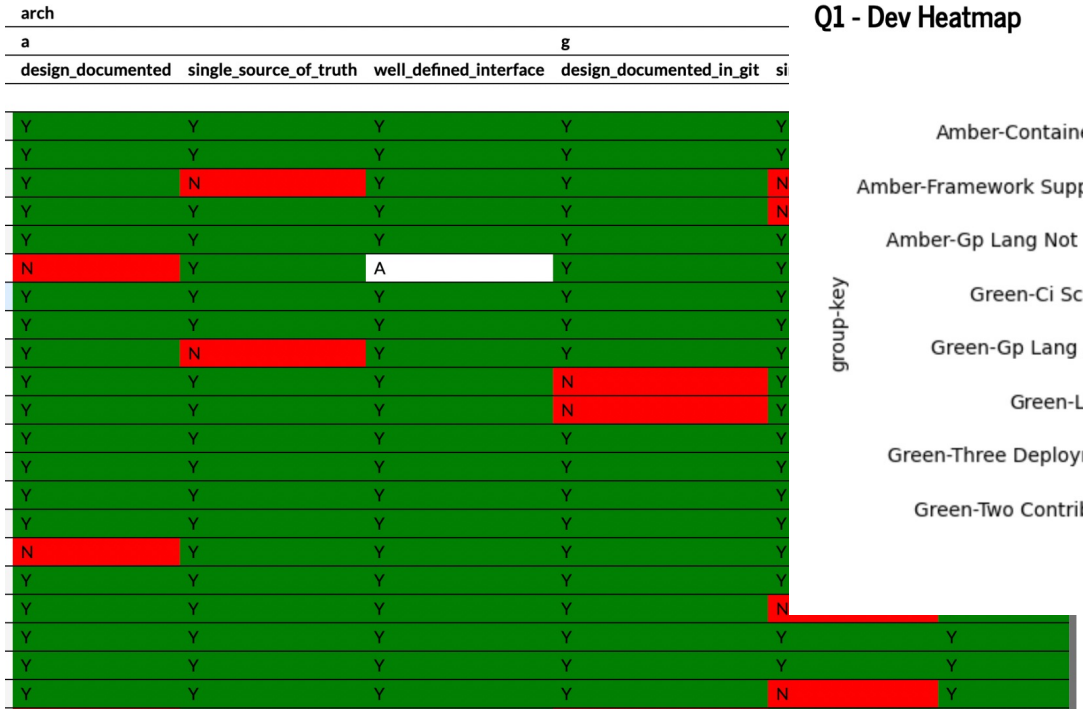
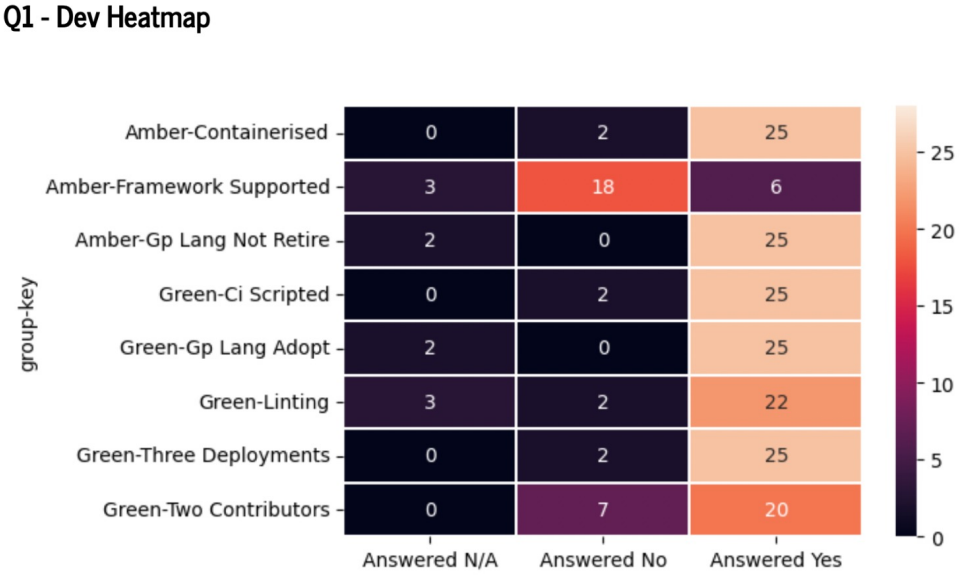
Analysis of health data guides custodianship





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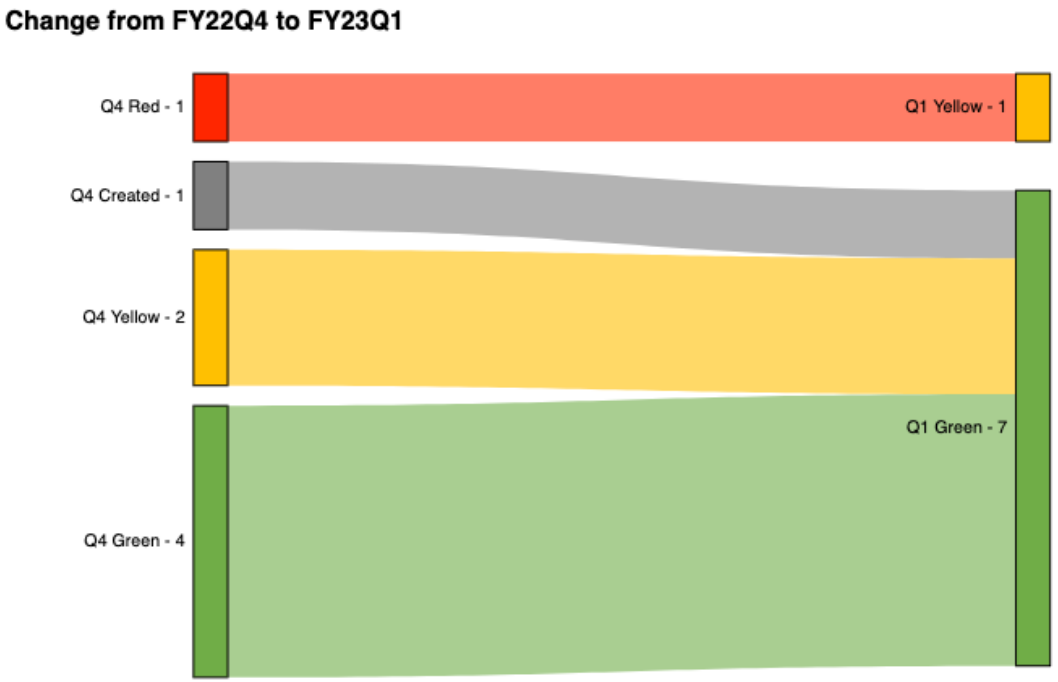
Sample outcome of SHIP work



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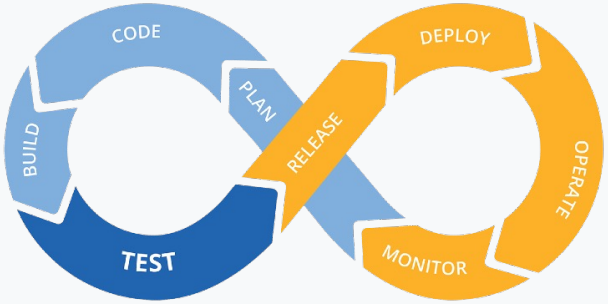
Investing in automation is highly recommended



Renovate

Automated dependency updates

Buildkite

Scheduled CI/CD builds

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Company level OKR: Improve System Health by 40%

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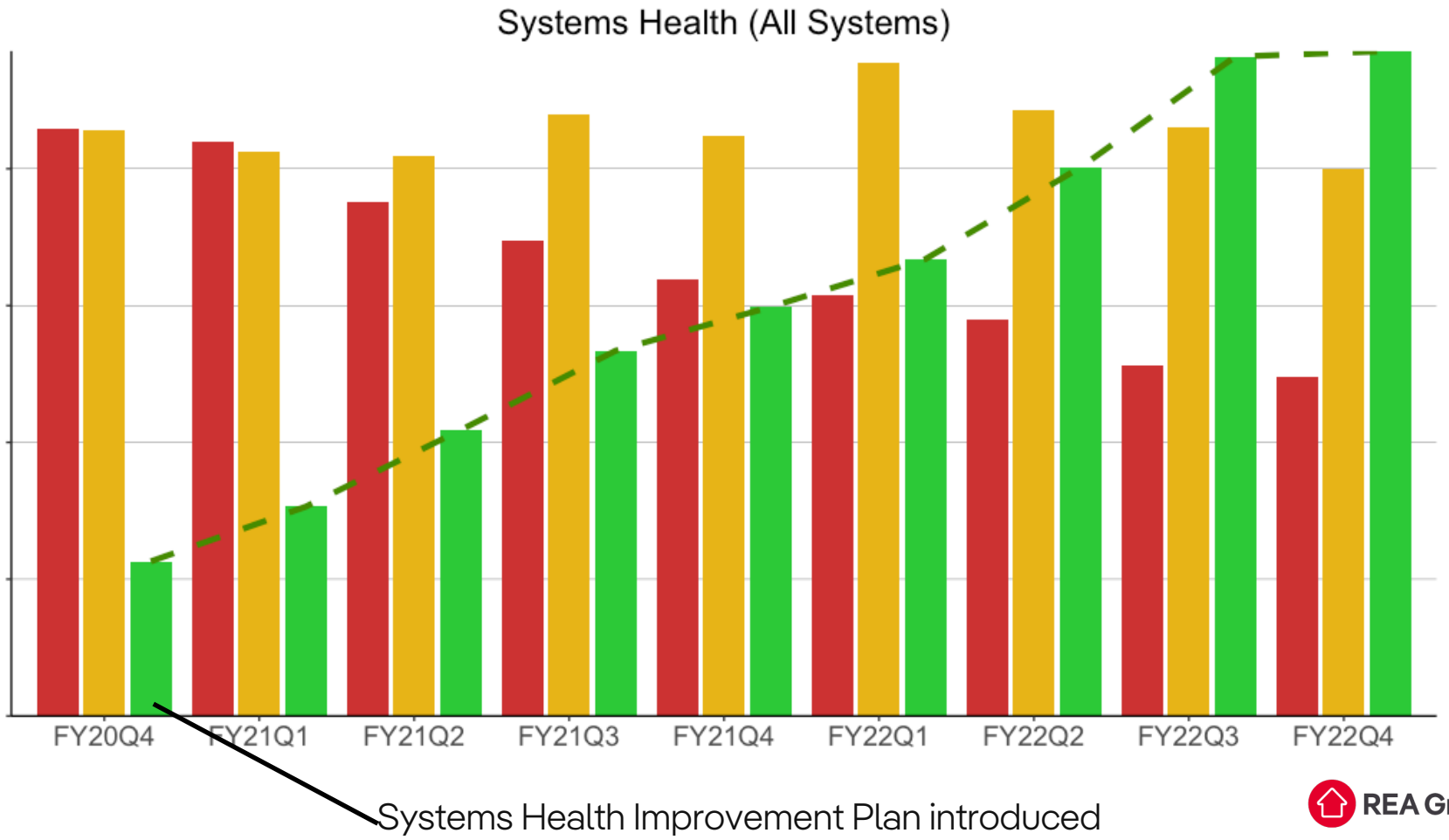
Systems Health (All Systems)
FY20Q4
FY21Q1
FY21Q2
FY21Q3
FY21Q4
FY22Q1
FY22Q2
FY22Q3
FY22Q4
Systems Health Improvement Plan introduced

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Key takeaways

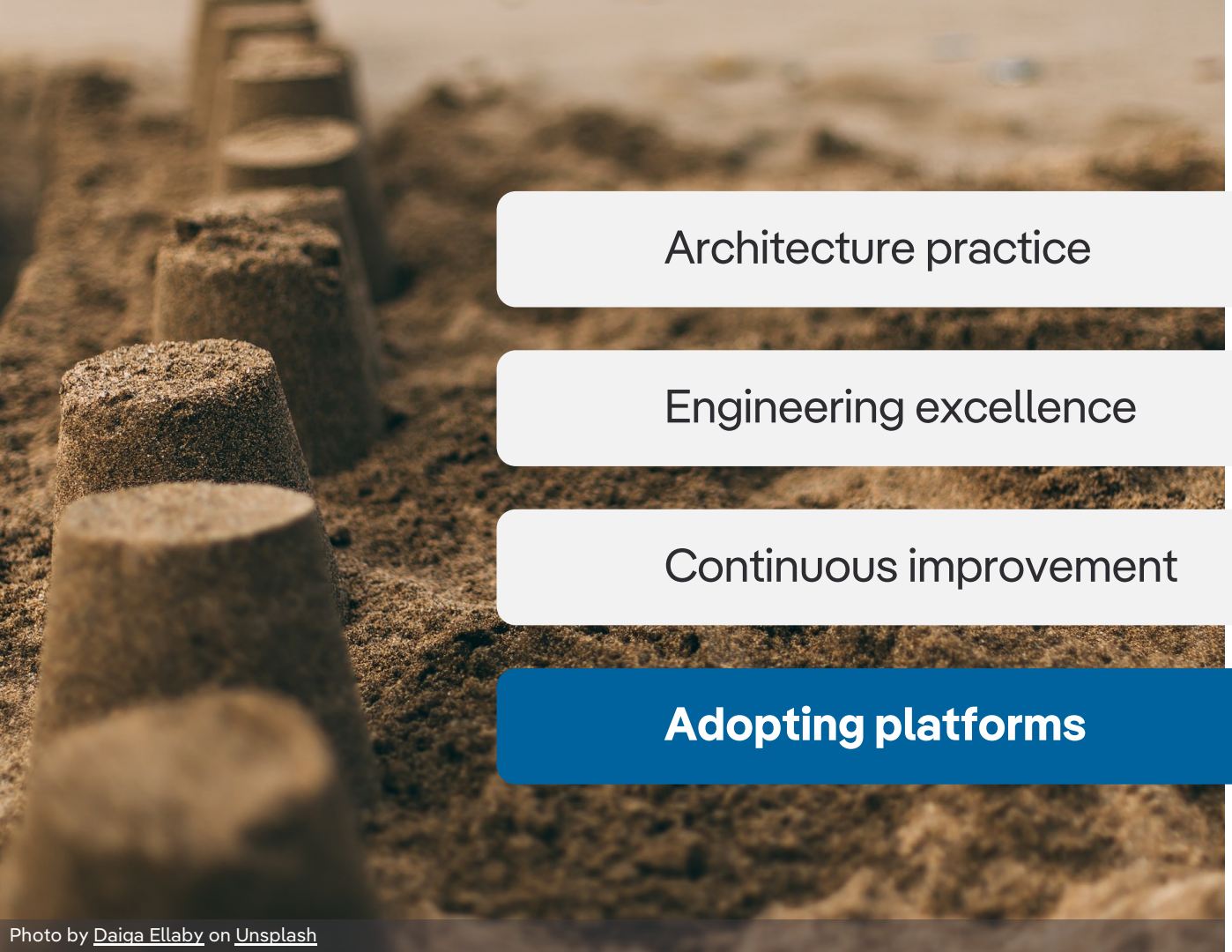
There is a constant minimum investment required to fight software entropy

We default to 20% of a team's capacity and plan this carefully

Automation allows you fight entropy with much less ongoing effort

Broadcast system health to get buy in at all levels

Photo by Rudolf-Peter Bakker on Unsplash



Architecture practice

Engineering excellence

Continuous improvement

Adopting platforms

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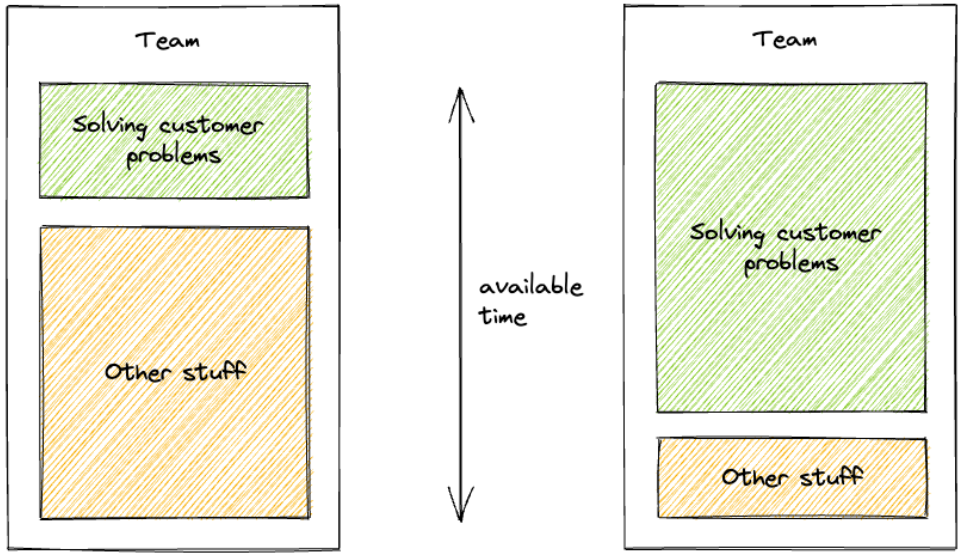
How do we make it easier to **fight software entropy**?



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^colab

1. A mindset shift from **local** to **company-wide** tech thinking.

2. Approaching **tech platforms** as long-lived products.

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Design

Visualisation

Data

Finance

Identity

Security

Deploy

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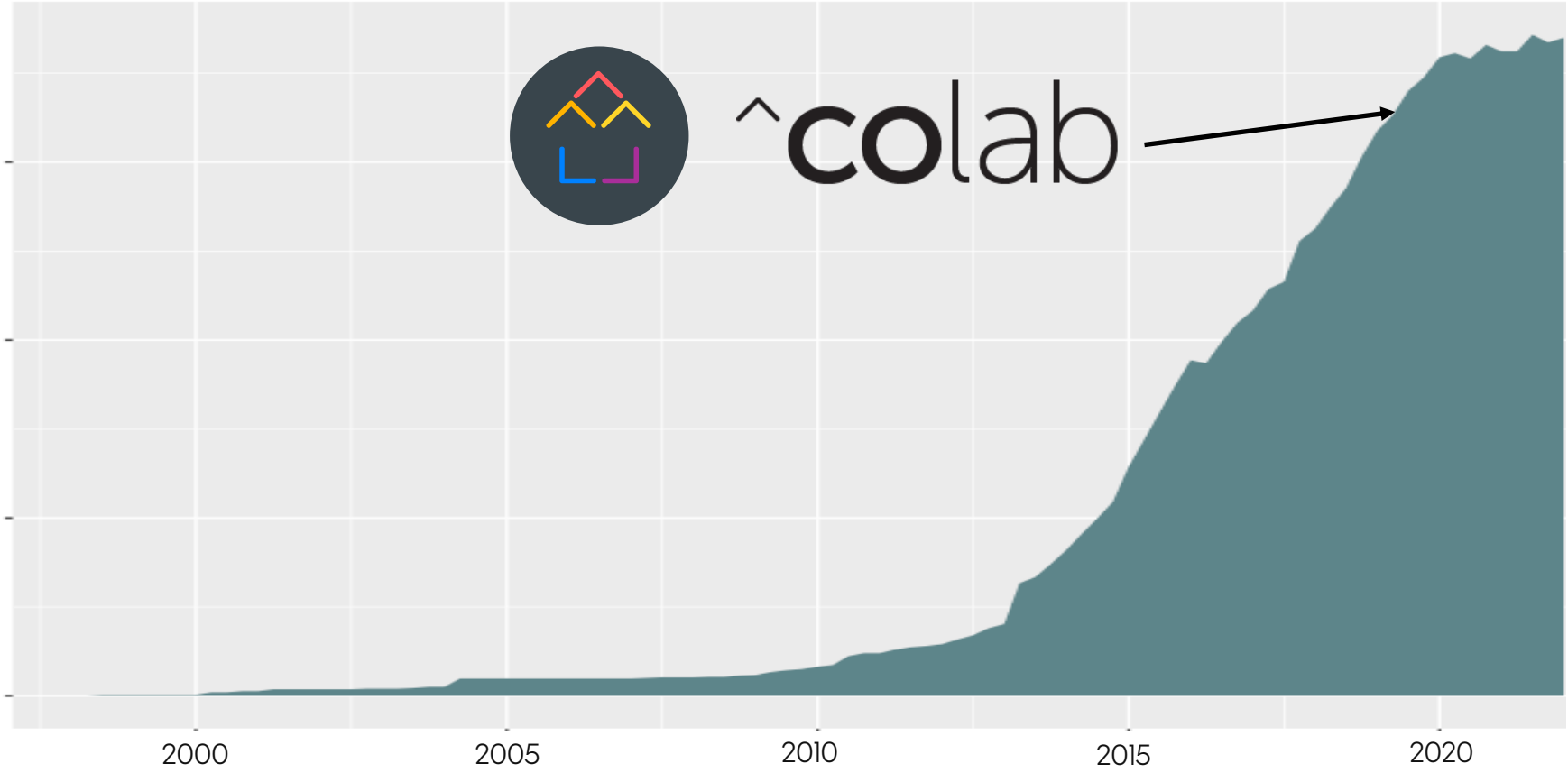
Our **platform strategy** at work



The **less software** you have to maintain, the **lower the entropy**.

Photo by Mourizal Zativa on Unsplash

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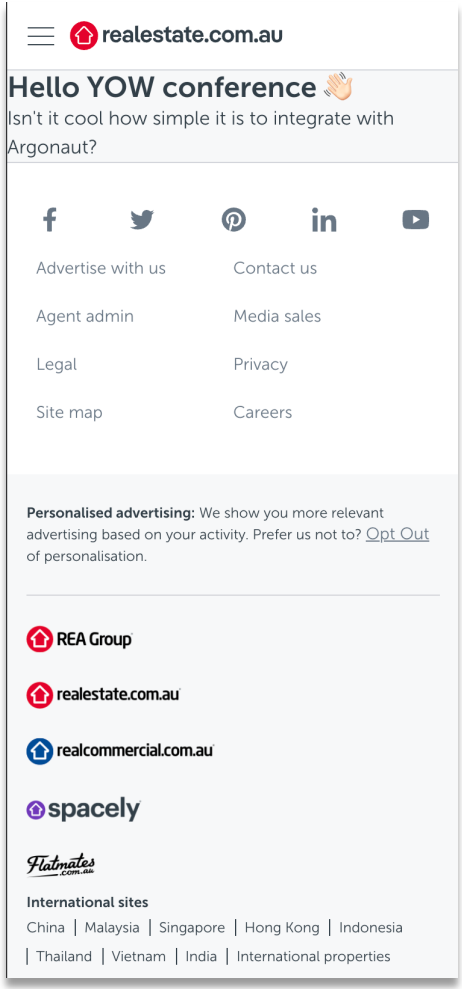
Our web platform, Argonaut

http://realestate.com.au/?mfeTag=dev:yow-demo

```
36  export const getAction: GetAction = async (): Promise<Action> =>
37    renderAction(async () => ({
38      getElements: async () => {
39        return {
40          Screen: (
41            <div>
42              <H1>Hello YOW conference 👋</H1>
43              <P>Isn't it cool how simple it is to integrate with Argonaut?</P>
44            </div>
45          ),
46        };
47      },
48      getHead: async () => join(title("YOW Conference")),
49    }));
50
```



Do our platforms help us to **reduce** the **total entropy** in our systems?

35% less code

75% less developer effort

50% time to market

90% lower custodianship

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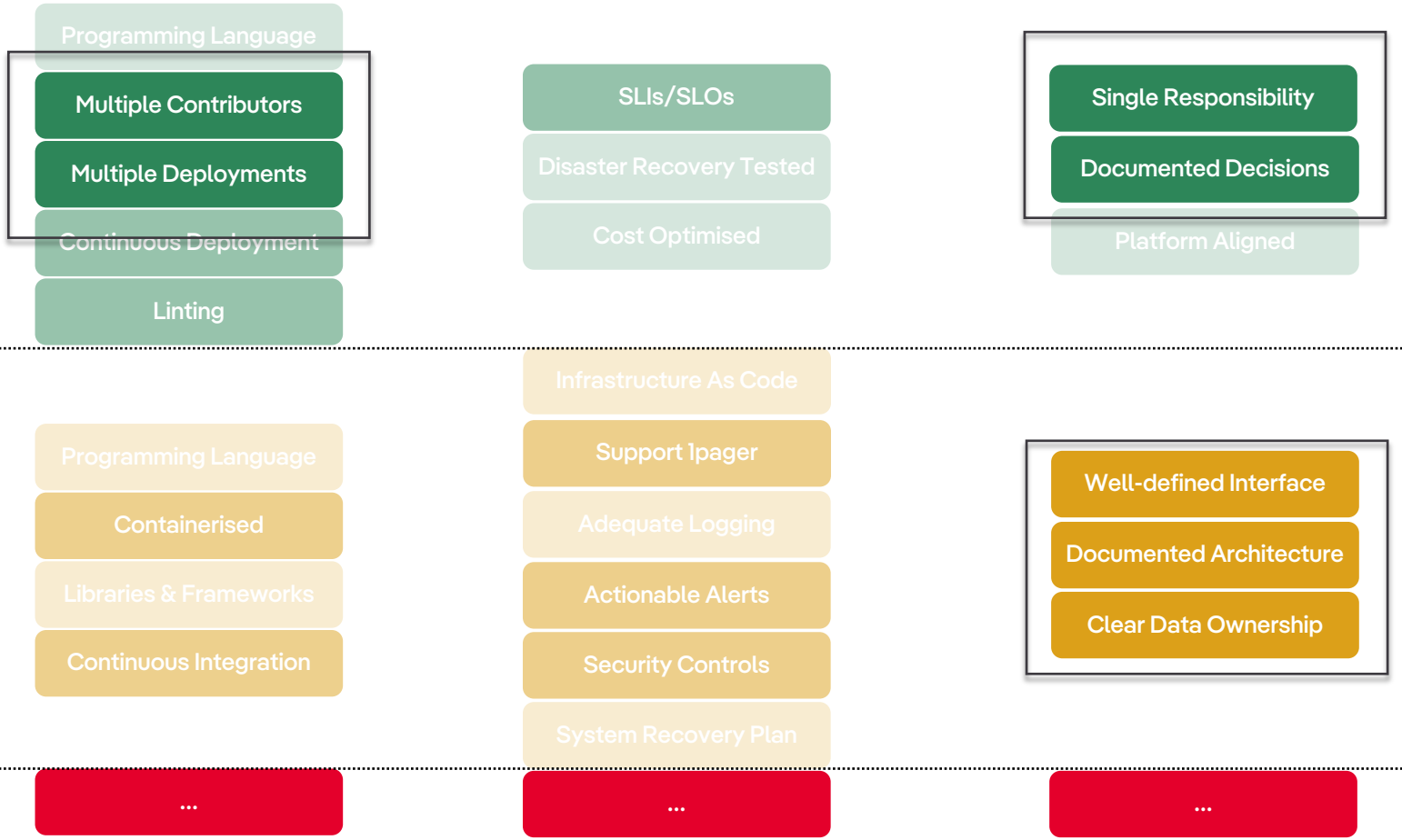
Platforms make **maintaining healthy software** easier



Key takeaways

A platform strategy helps the long-term fight against software entropy

Platforms reduce the amount of software you write

Platforms reduce the amount of software you maintain

Platforms increase overall consistency and structure

Photo by Rudolf-Peter Bakker on Unsplash

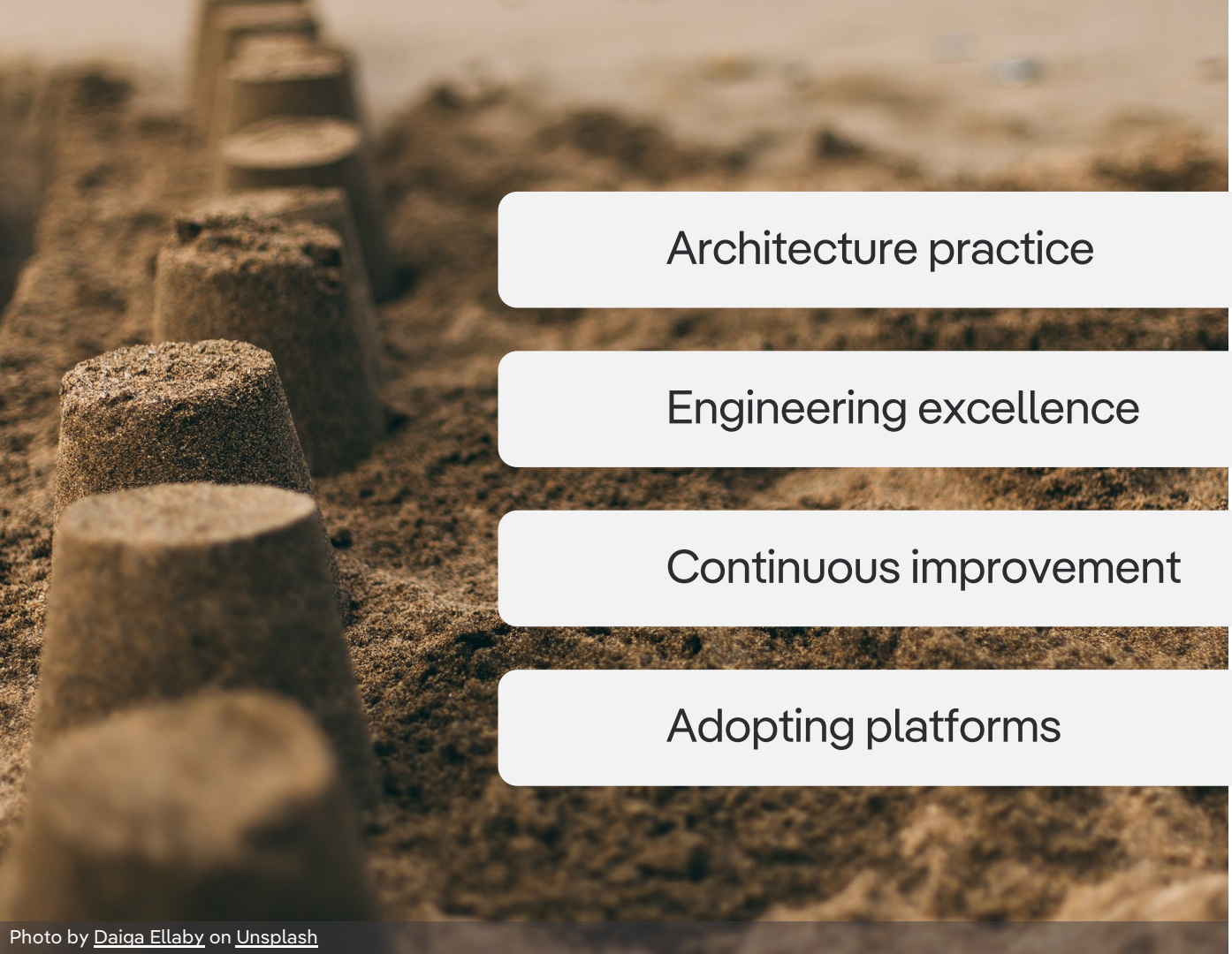


Photo by Daiga Ellaby on Unsplash

- Architecture practice
- Engineering excellence
- Continuous improvement
- Adopting platforms

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Key takeaways

Software entropy is a very real and present issue in our industry. Ignore it at your peril.

REA fights software entropy with:

- Architectural alignment
- A culture of engineering excellence
- Dedicated capacity for teams and architects
- A platform strategy reducing bespoke software

By getting the structures in place and the right energy investment, you too can fight software entropy.

Photo by Rudolf-Peter Bakker on Unsplash

Fighting Software Entropy

December 2022

YOW!

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(Exec Mgr, Architecture)

Image credit: http://www.thenegativepsychologist.com/