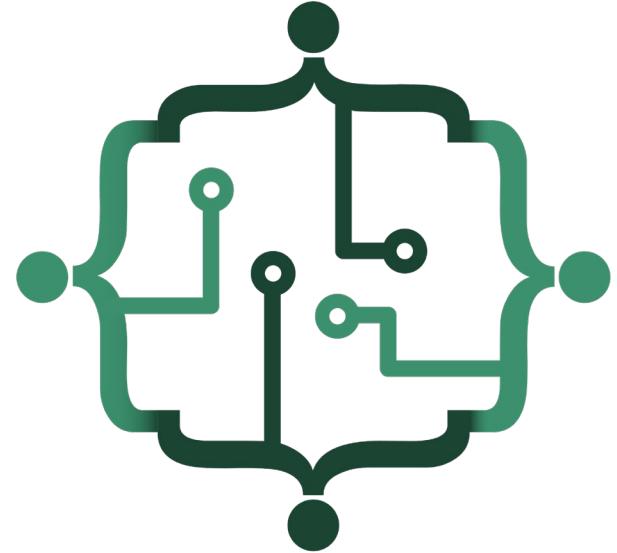


Technical Debt Is Not Free

LOUISVILLE
.NET MEETUP

modis



GREEN
EVENTS & TECHNOLOGY



Independent. Innovative. And always open source.

dotnetfoundation.org



.NET Foundation Virtual User Group

meetup

Find virtual .NET events happening around the globe!



Independent. Innovative.
And always open source.

Part of .NET Foundation – 380 groups

.NET Virtual User Group

📍 Seattle, WA

👤 2,710 members · Public group

👤 Organized by James Montemagno and 14 others



meetup.com/dotnet-virtual-user-group



{Code PaLOUsa}

IT'S SOFTWARE DEVELOPMENT MADNESS

August 17 – 19, 2022



Keynote – Christina Aldan



.NET Rocks! 20th Anniversary Party



A Toast to Women in Technology



RESTAURANT

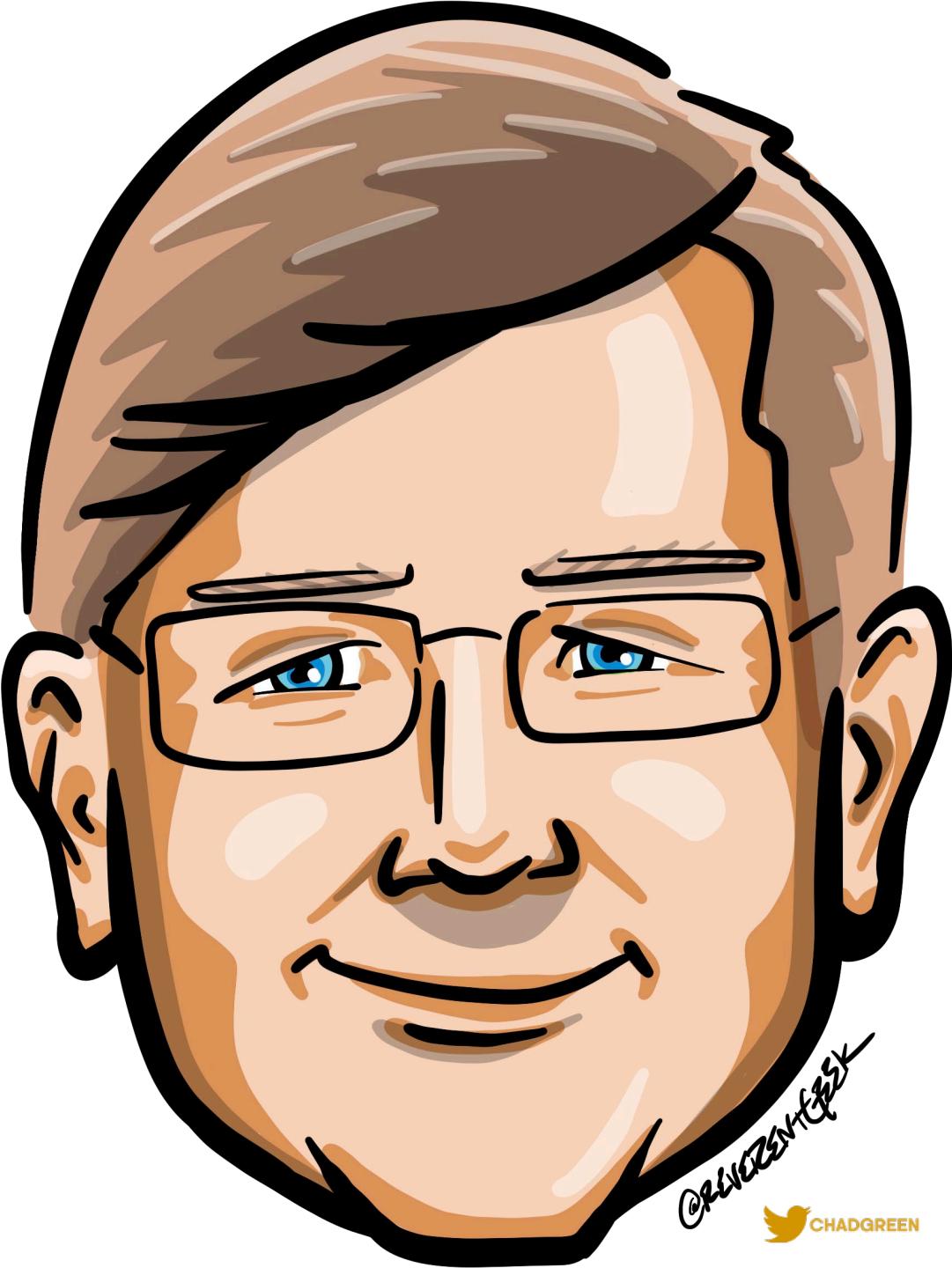
BREWHOUSE



**TECHNICAL
DEBT
IS NOT FREE**

Who is Chad Green

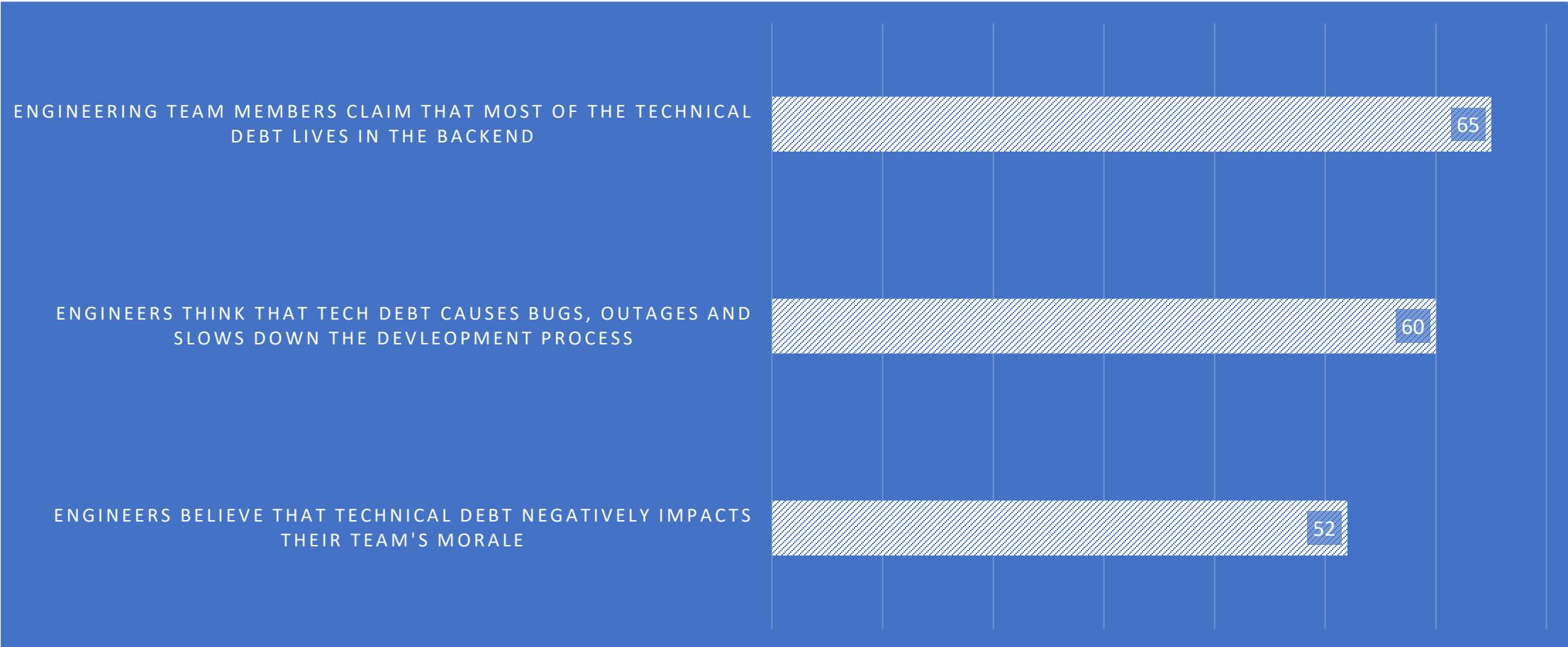
- ✉ chadgreen@chadgreen.com
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- 🌐 ChadGreen.com
- 🐦 ChadGreen & TaleLearnCode
- linkedin ChadwickEGreen



Agenda

- What is Technical Debt
- Pros and Cons of Technical Debt
- What Causes Technical Debt
- Types of Technical Debt
- Technical Debt Identification
- Tracking Technical Debt

Technical Debt Numbers



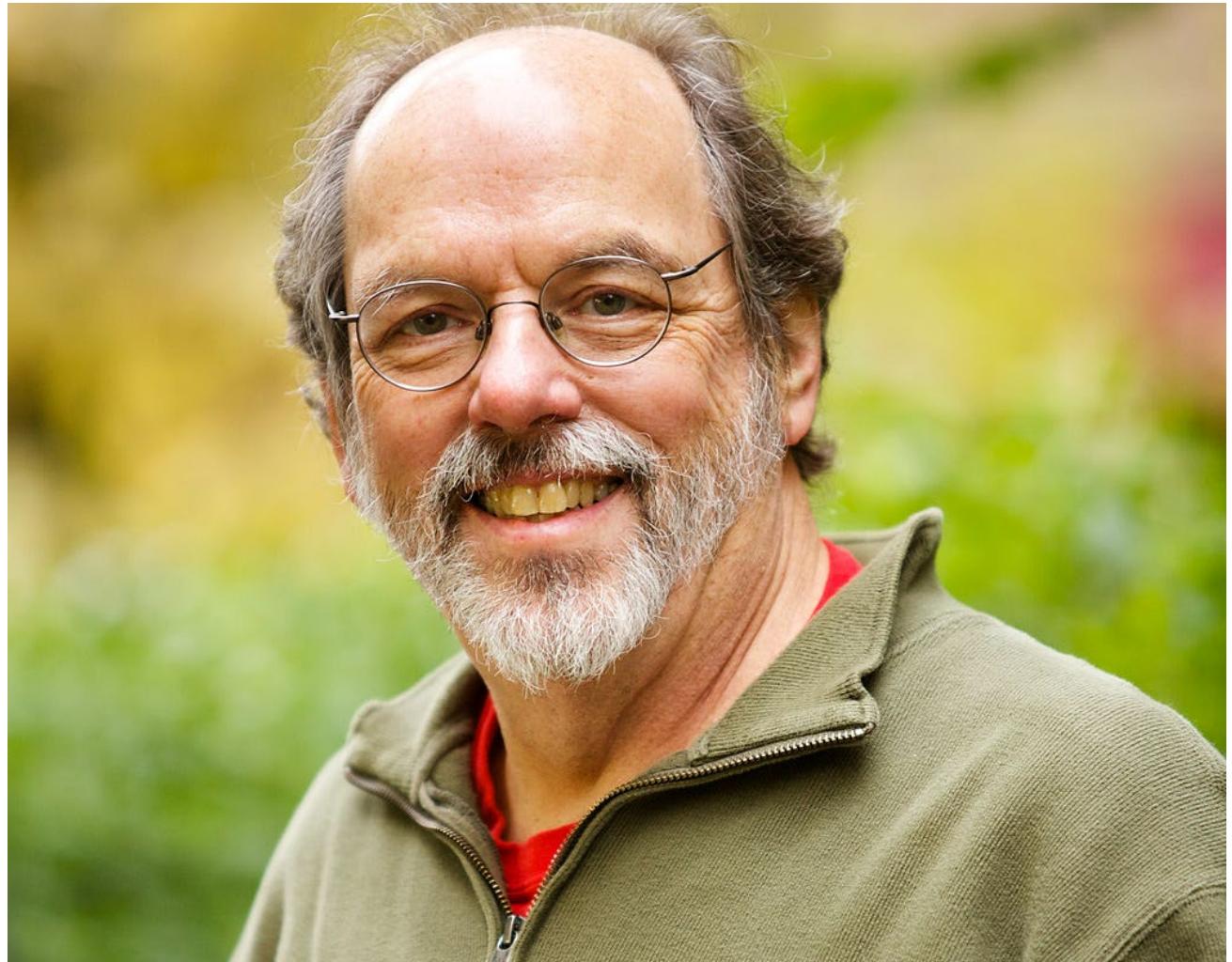
What is Technical Debt

Technical Debt is not Free

What is Technical Debt?

First described by Ward Cunningham in 1992

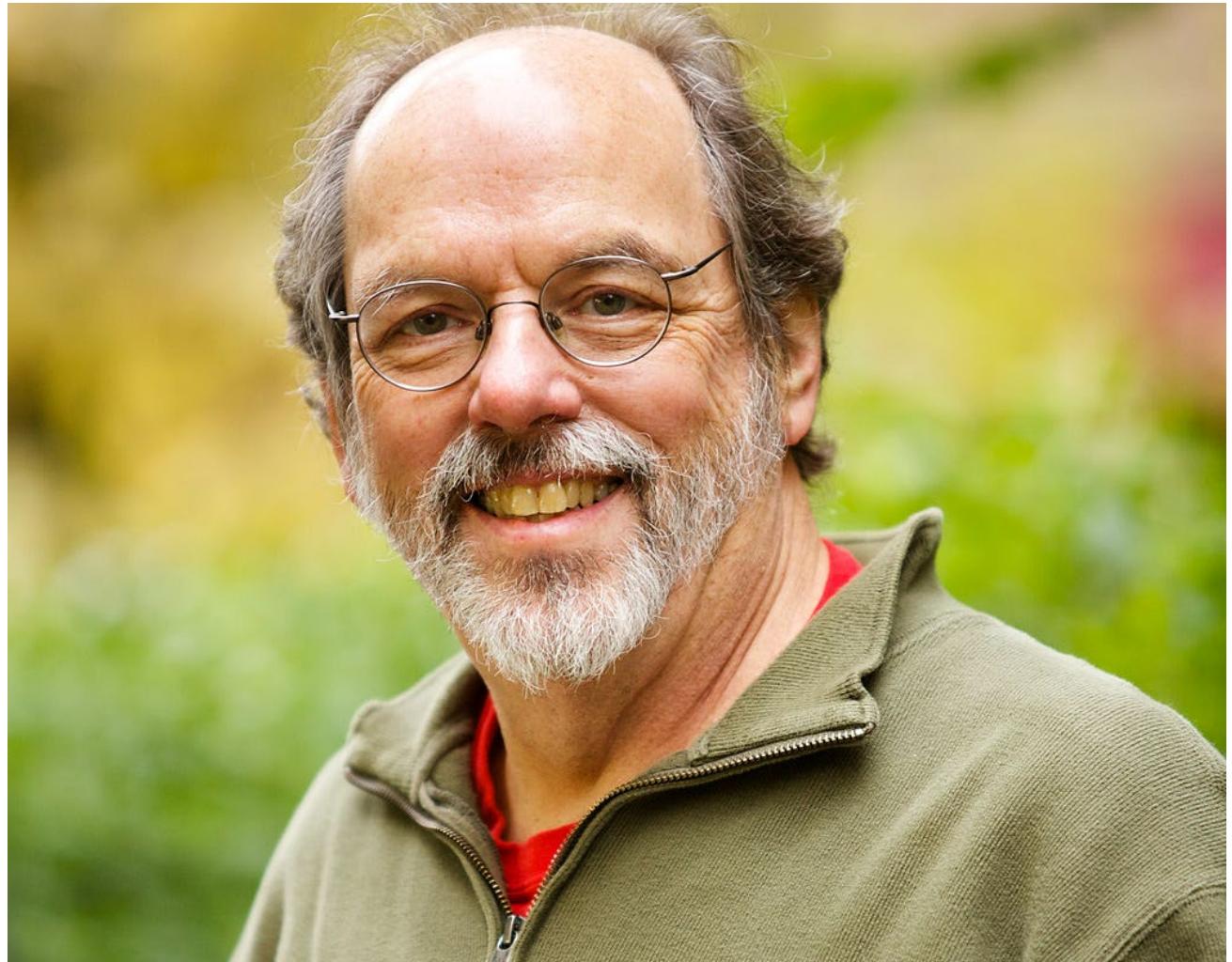
The danger occurs
when the debt is not
repaid.



What is Technical Debt?

First described by Ward Cunningham in 1992

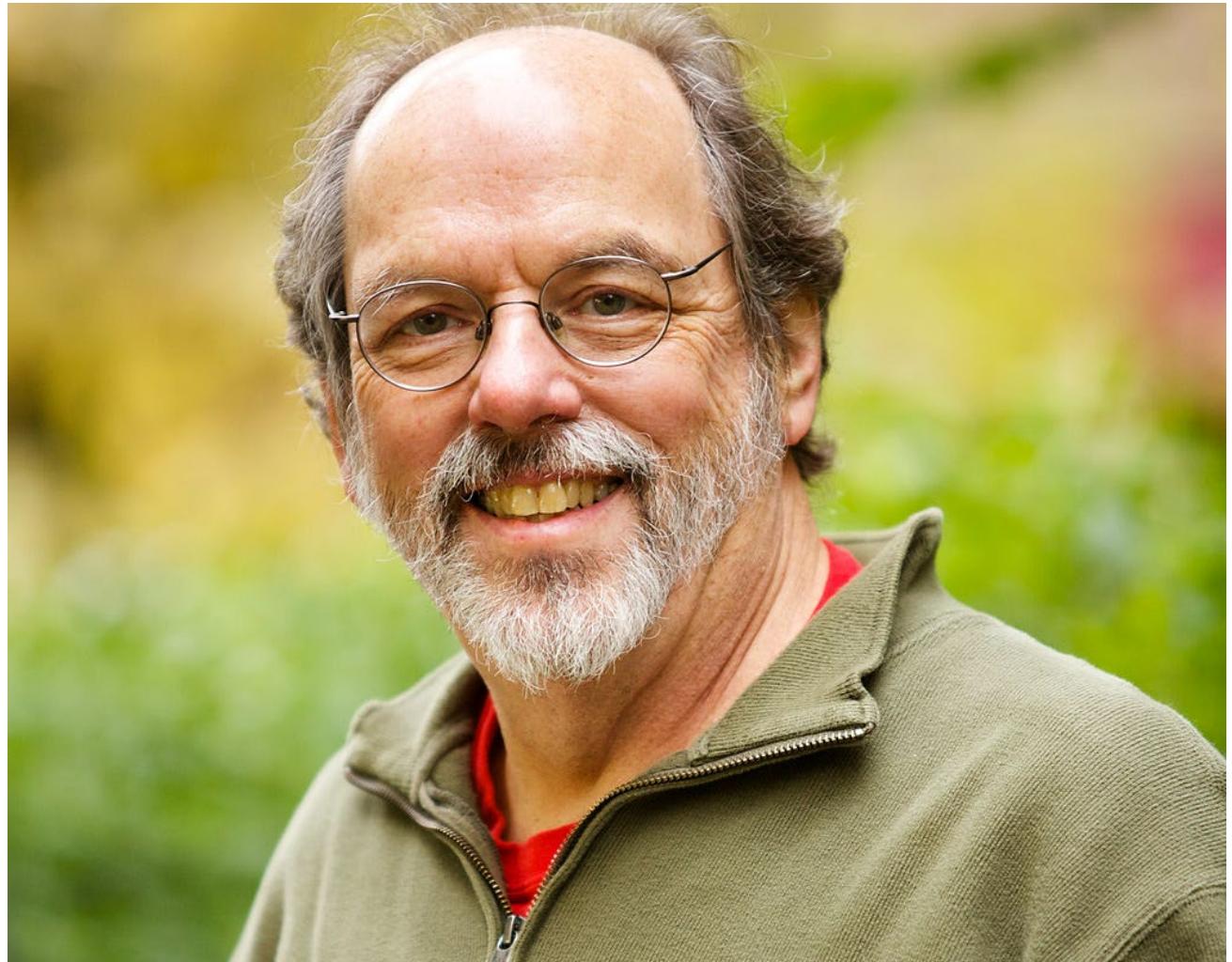
Every minute spent
on not-quite-right
code counts as
interest on that
debt.



What is Technical Debt?

First described by Ward Cunningham in 1992

...brought to a stand-still under the debt load of an unconsolidated implementation



What is Technical Debt?

Common definition from Martin Fowler

quick and dirty way



What is Technical Debt?

Common definition from Martin Fowler

incurs interest
payments



What is Technical Debt?

Common definition from Martin Fowler

extra effort that we have to do in future development



What is Technical Debt?

implied cost



What is Technical Debt?

rework



What is Technical Debt?

choosing easy



What is Technical Debt?

better approach



A more reasonable definition

A state of unnecessary complexity, duplication, subpar code, or otherwise deficient code that introduces risks in the form of time, quality, security, team morale, or other forms. Typically the results of past action or inaction.

Matt Eland

Killalldefects.com/2019/12/23/defining-technical-debt

Technical Debt is Bad

Technical Debt is Bad

Technical Debt can be Bad

Technical Debt can be Devastating

Technical Debt can be Useful

Technical Debt can be Beneficial

Technical Debt is not Free

Technical Debt Example

No User Roles

Technical Debt Example

No User Roles

Permission for
Specific Requirement

Technical Debt Example

No User Roles

Permission for
Specific Requirement

Differentiation of
Users

Technical Debt Example

No User Roles

Permission for
Specific Requirement

Differentiation of
Users

Yet Another
Permission Change

Technical Debt Example

No User Roles

Permission for
Specific Requirement

Differentiation of
Users

Yet Another
Permission Change

Another Technical Debt Example

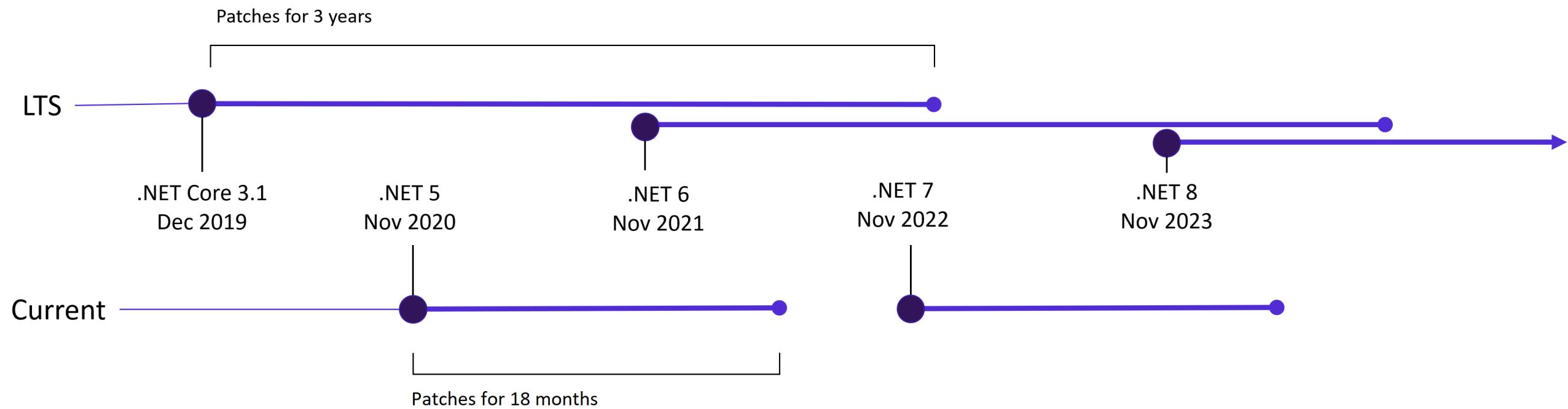
.NET 5

Current Release

.NET 6

LTS Release

Another Technical Debt Example



Technical Debt is not Free

Pros and Cons of Technical Debt

Technical Debt is not Free

Technical Debt Pros

Supplier

- Faster time to market
- Short term competitive advantage

Customer

- New features faster
- Short term capital preservation

Technical Debt Cons

Supplier

- Degradation of quality
- Limits ability to innovate
- Longer development cycles
- Less responsive to market changes
- Customer churn
- Developer churn

Customer

- Higher upgrade costs
- System compatibility issues
- Poor end user experience
- Less responsive to market changes
- Poor IT morale

What Causes Technical Debt?

Technical Debt is not Free

Insufficient up-front definition

What causes technical debt?



Business Pressures

What causes technical debt?



Technical Debt is not Free

Lack of process or understanding

What causes technical debt?



Tightly-coupled components

What causes technical debt?



Lack of a test suite

What causes technical debt?



Lack of documentation

What causes technical debt?



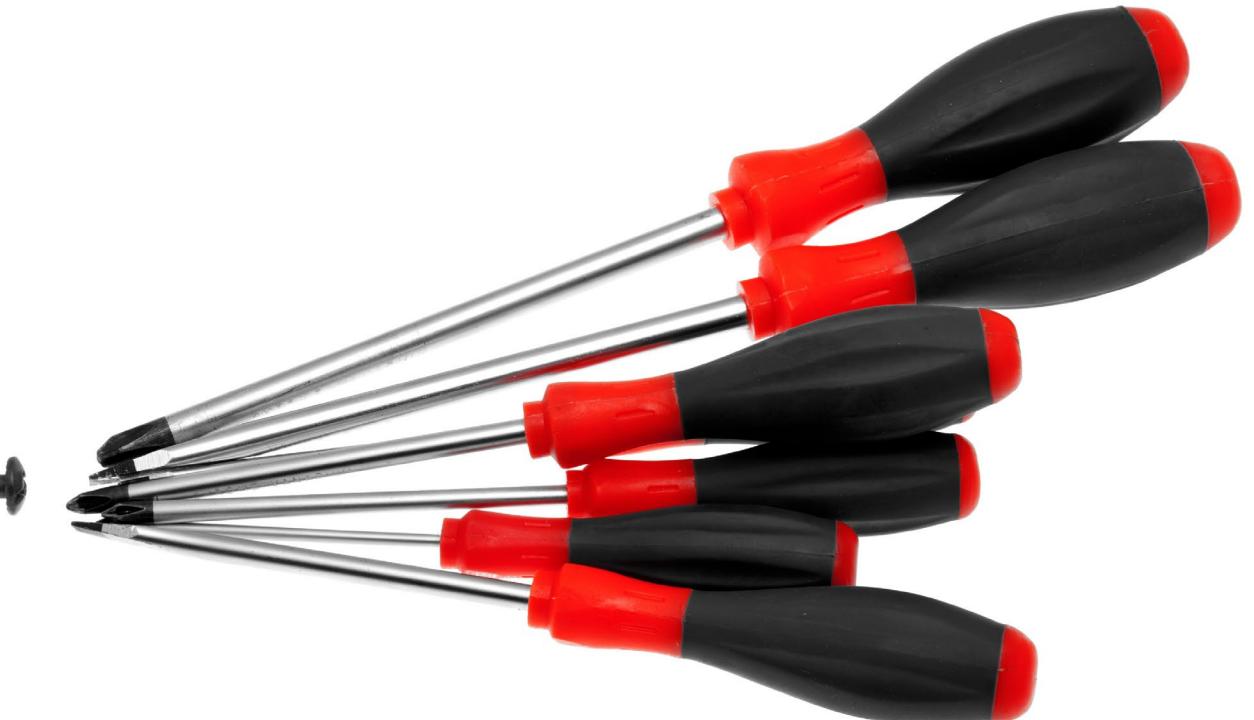
Lack of collaboration

What causes technical debt?



Parallel development

What causes technical debt?



Delayed refactoring

What causes technical debt?



Technical Debt is not Free

Lack of alignment to standards

What causes technical debt



Lack of knowledge

What causes technical debt?



Lack of ownership

What causes technical debt?



Poor technical leadership

What causes technical debt?



Last minute specification changes



What causes technical debt?

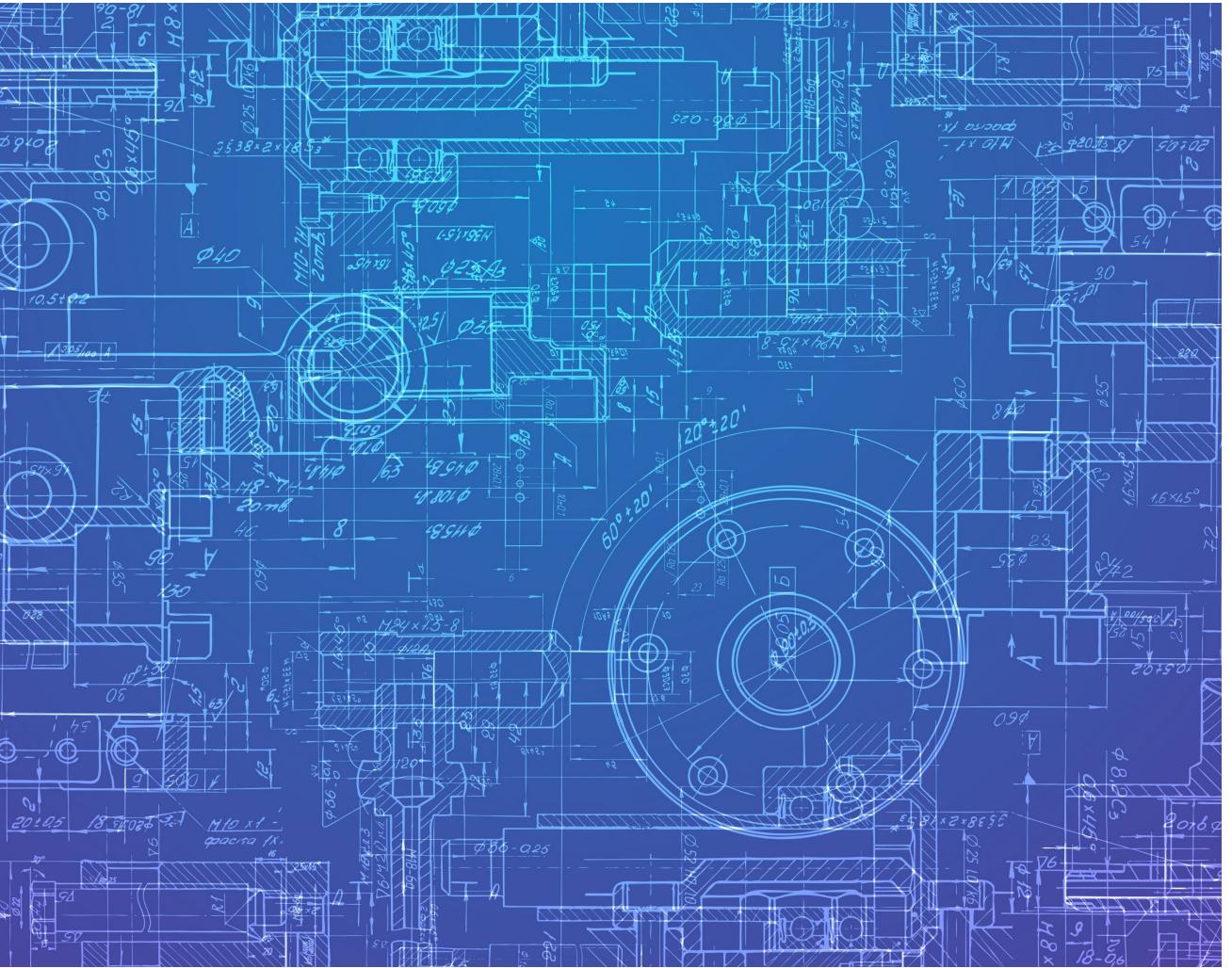
- Insufficient up-front definition
- Business pressures
- Lack of process or understanding
- Tightly-coupled components
- Lack of a test suite
- Lack of documentation
- Lack of collaboration
- Parallel development
- Delayed refactoring
- Lack of alignment to standards
- Lack of knowledge
- Lack of ownership
- Poor technical leadership
- Last minute specification changes

Types of Technical Debt

Technical Debt is not Free

Architecture

Types of Technical Debt



Technical Debt is not Free

Build

Types of Technical Debt



Technical Debt is not Free

Code

Types of Technical Debt



Defect

Types of Technical Debt



Technical Debt is not Free

Design

Types of Technical Debt



Technical Debt is not Free

Documentation

Types of Technical Debt



Technical Debt is not Free

Infrastructure

Types of Technical Debt



Technical Debt is not Free

People

Types of Technical Debt



Technical Debt is not Free

Process

Types of Technical Debt



Requirement

Types of Technical Debt



Technical Debt is not Free

Service

Types of Technical Debt



Technical Debt is not Free

Test Automation

Types of Technical Debt



Technical Debt is not Free

Test

Types of Technical Debt



Technical Debt is not Free

Technical Debt Identification

Technical Debt is not Free

Technical Debt Identification

Code Quality

Clarity

Technical Debt Identification

Code Quality

Maintainability

Technical Debt Identification

Code Quality

Documentation

Technical Debt Identification

Code Quality

Refactored

Technical Debt Identification

Code Quality

Well-Tested

Technical Debt Identification

Code Quality

Efficiency

Technical Debt Identification

Code Quality

Technical
Deficiencies

Have other teams built similar solutions?

Technical Debt Identification

Code Quality

Technical
Deficiencies

Are there inconsistent user experiences?

Technical Debt Identification

Code Quality

Technical
Deficiencies

Are solutions using the same
reusable frameworks?

Technical Debt Identification

Code Quality

Technical
Deficiencies

Are best practices being followed?

Technical Debt Identification

Code Quality

Technical
Deficiencies

Are deployments taking too long?

Technical Debt Identification

Code Quality

Technical
Deficiencies

Are limits being exceeded,
or are users seeing errors?

Technical Debt Identification

Code Quality

Technical
Deficiencies

Business
Misalignment

Technical Debt Identification

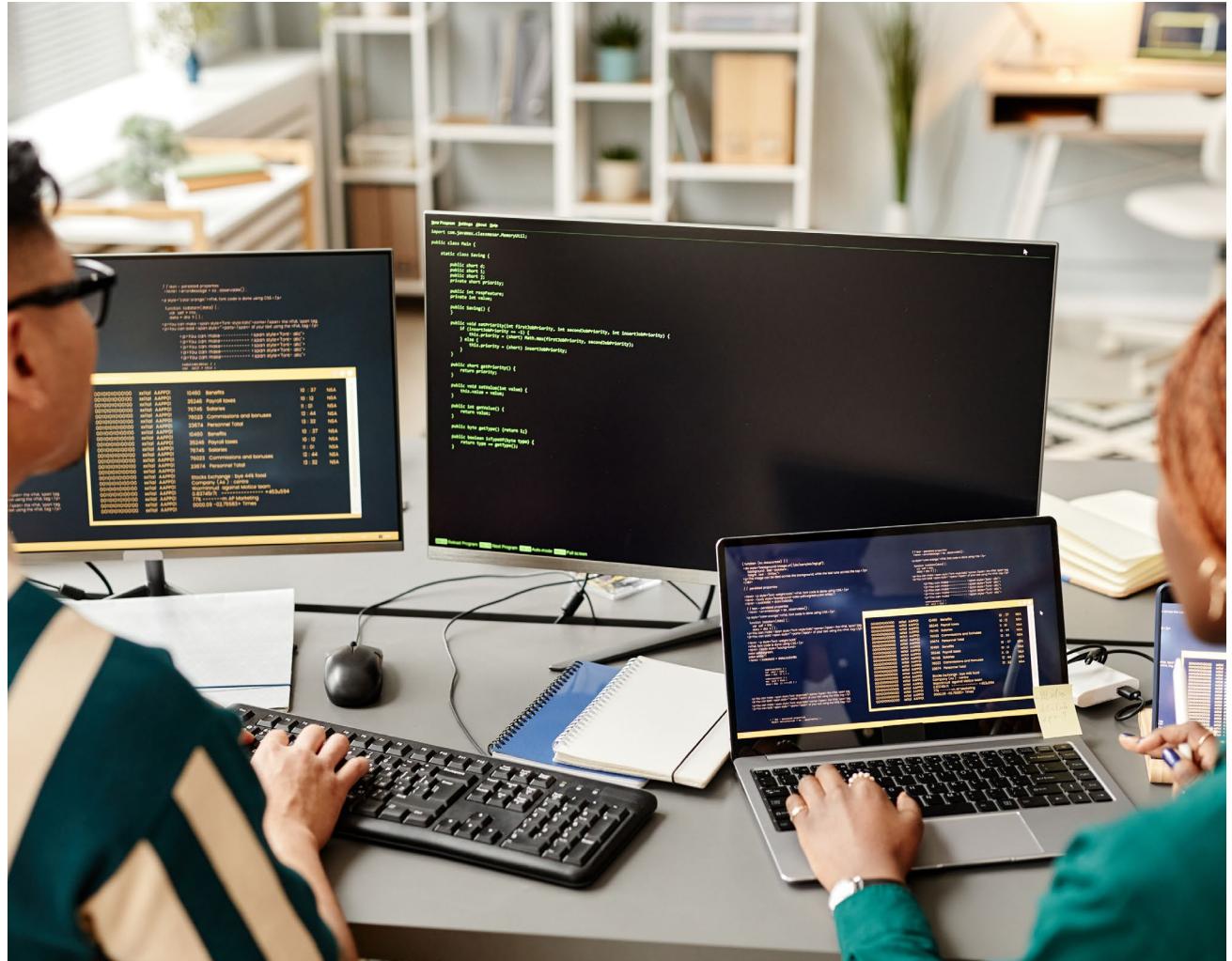
Code Quality

Technical
Deficiencies

Business
Misalignment

Code Reviews

Opportunities to Identify Technical Debt



Technical Debt is not Free

Pull Requests

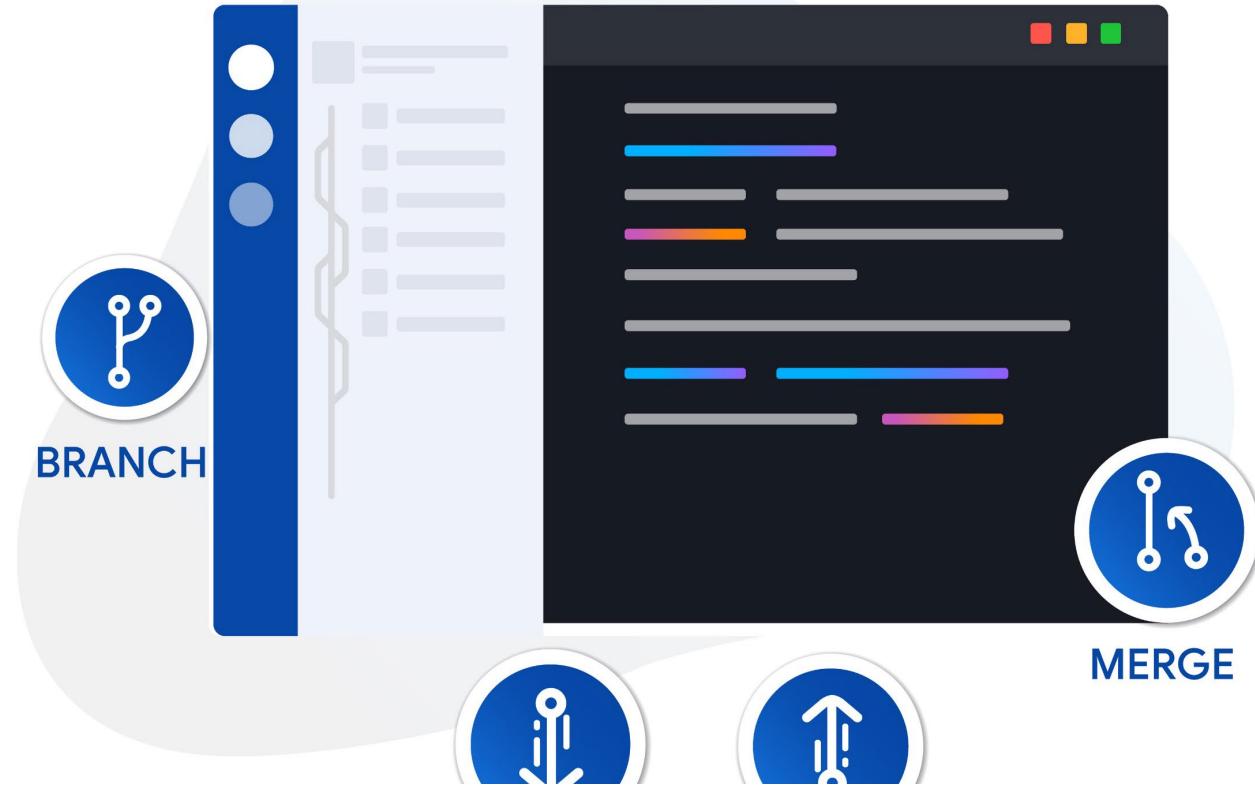
Opportunities to Identify Technical Debt

GIT REPOSITORIES

Software Development



GIT FLOW



Technical Debt is not Free

Sprint Review

Opportunities to Identify Technical Debt



Technical Debt is not Free

Stand Up

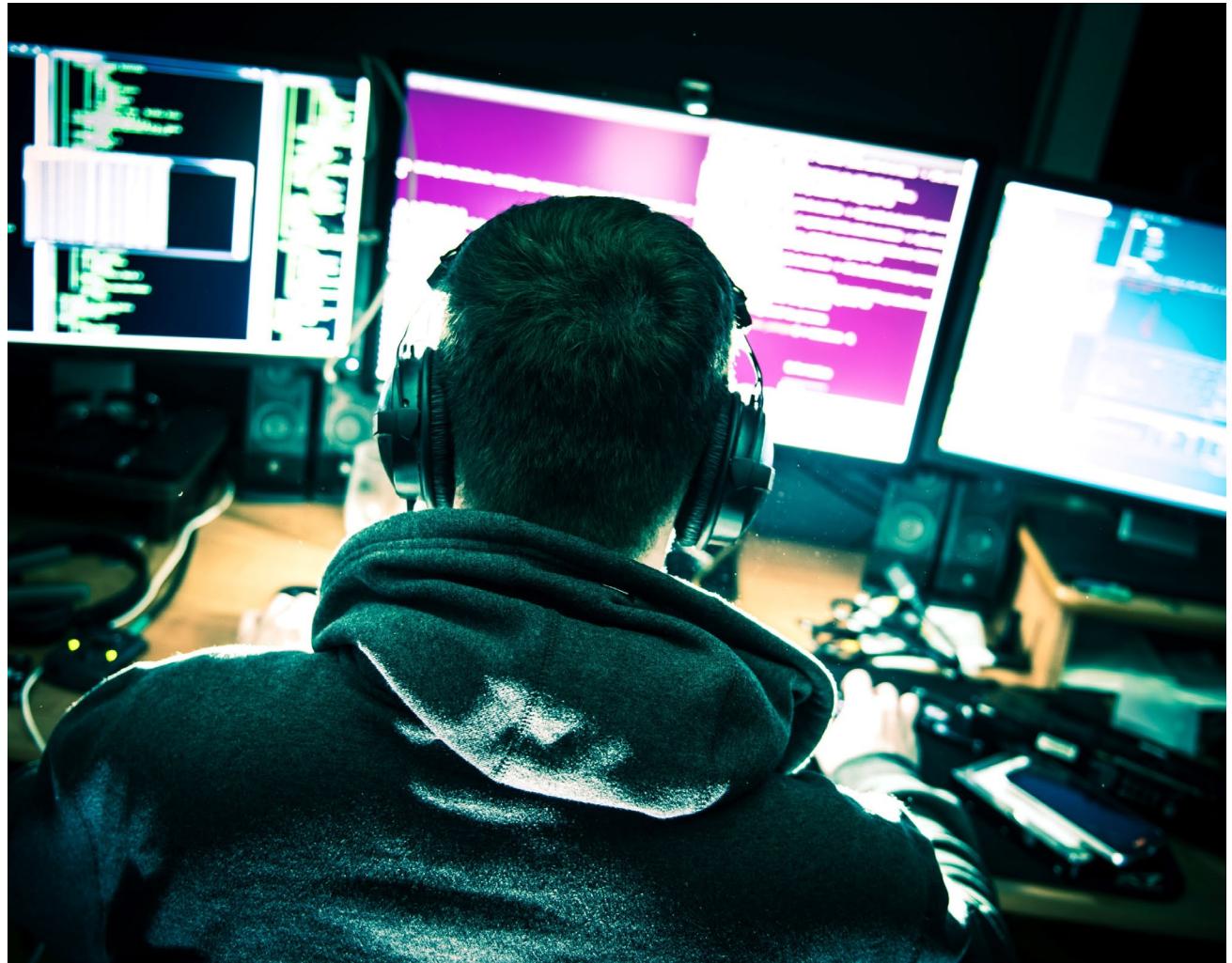
Opportunities to Identify Technical Debt



Technical Debt is not Free

Coding

Opportunities to Identify Technical Debt



Technical Debt is not Free

Manifesto for Software Craftsmanship

Not only working software,
but also **well-crafted software**

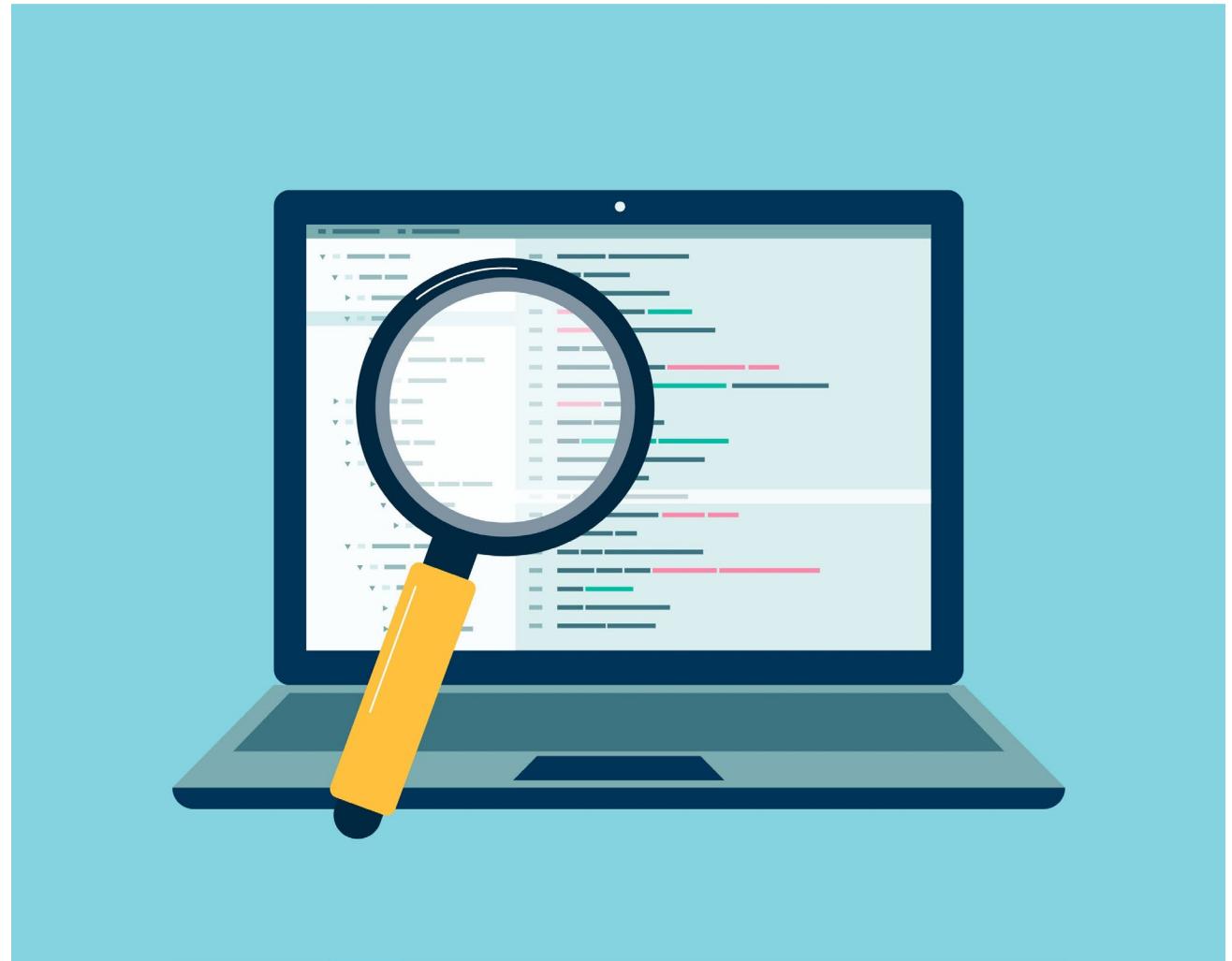
Not only responding to change
but also **steadily adding value**

Not only individuals and interactions
but also **a community of professionals**

Not only customer collaboration
but also **productive partnerships**

Code Analysis Tools

Opportunities to Identify Technical Debt



Often hidden in plain sight

Opportunities to Identify Technical Debt



Recording Technical Debt

- User Story
- Product Backlog Item
- Requirement
- Issue



Recording Technical Debt

- User Story
- Product Backlog Item
- Requirement
- Issue
- ~~Bug~~



Key Information to Record

- Problem Statement

We need to refactor our SSO.

Key Information to Record

- Problem Statement
 - In 22Q1, 20% of system outages were due to the SSO service straining under scale constraints. Given our focus on the enterprise segment, we are taking some time this quarter to ensure that part of the system is ready for us to continue to scale up this segment.

Key Information to Record

- Problem Statement
- Story Points
- Criticality
- Complexity
- Reward
- Remediation Cost

Tracking Technical Debt

Technical Debt is not Free

Tracking Technical Debt



Technical Debt is not Free

Tracking Technical Debt



Technical Debt is not Free

Technical Debt Register

- Product
- User Story #
- Title
- Criticality
- Complexity
- Reward
- Remediation Cost
- Technical Debt Score

| Product | User Story # | Title | Criticality | Complexity | Reward | Remediation Cost | Technical Debt Score |
|-----------|--------------|--------|-------------|------------|--------|------------------|----------------------|
| Product A | User Story 1 | Task 1 | High | Medium | 10 | \$100 | 8.5 |
| Product A | User Story 1 | Task 2 | Medium | Low | 5 | \$50 | 7.0 |
| Product A | User Story 2 | Task 1 | High | Medium | 10 | \$100 | 8.5 |
| Product A | User Story 2 | Task 2 | Medium | Low | 5 | \$50 | 7.0 |
| Product B | User Story 1 | Task 1 | High | Medium | 10 | \$100 | 8.5 |
| Product B | User Story 1 | Task 2 | Medium | Low | 5 | \$50 | 7.0 |
| Product B | User Story 2 | Task 1 | High | Medium | 10 | \$100 | 8.5 |
| Product B | User Story 2 | Task 2 | Medium | Low | 5 | \$50 | 7.0 |
| Product C | User Story 1 | Task 1 | High | Medium | 10 | \$100 | 8.5 |
| Product C | User Story 1 | Task 2 | Medium | Low | 5 | \$50 | 7.0 |
| Product C | User Story 2 | Task 1 | High | Medium | 10 | \$100 | 8.5 |
| Product C | User Story 2 | Task 2 | Medium | Low | 5 | \$50 | 7.0 |

Technical Debt Score

R : Reward

Cr : Criticality

Co: Complexity

$$(R \times .2) + (CR \times .15) - (CO \times .15)$$

Technical Debt Score

R : Reward

Cr : Criticality

Co: Complexity

$$(R \times .2) + (CR \times .15) - (CO \times .15)$$

Technical Debt Score

$$(R \times .2) + (CR \times .15) - (CO \times .15)$$

| Criticality (CR) | Complexity (CO) | Reward (R) | Score |
|------------------|-----------------|------------|-------|
| 5 | 1 | 5 | 1.6 |

Technical Debt Score

$$(R \times .2) + (CR \times .15) - (CO \times .15)$$

| Criticality (CR) | Complexity (CO) | Reward (R) | Score |
|------------------|-----------------|------------|-------|
| 5 | 1 | 5 | 1.6 |
| 1 | 5 | 1 | -0.4 |

Technical Debt Score

$$(R \times .2) + (CR \times .15) - (CO \times .15)$$

| Criticality (CR) | Complexity (CO) | Reward (R) | Score |
|------------------|-----------------|------------|-------|
| 5 | 1 | 5 | 1.6 |
| 1 | 5 | 1 | -0.4 |
| 3 | 2 | 3 | 0.75 |

Technical Debt Score

$$(R \times .2) + (CR \times .15) - (CO \times .15)$$

| Criticality (CR) | Complexity (CO) | Reward (R) | Score | Rank |
|------------------|-----------------|------------|-------|------|
| 5 | 1 | 5 | 1.6 | 1 |
| 1 | 5 | 1 | -0.4 | 3 |
| 3 | 2 | 3 | 0.75 | 2 |



Technical Debt is not Free

Technical Debt Ratio

Technical Debt is not Free

Technical Debt Ratio

$(\text{Remediation Cost} / \text{Development Cost}) \times 100\%$

| Project | Remediation Cost | Development Cost | Technical Debt Ratio |
|-----------|------------------|------------------|----------------------|
| Project 1 | 12.1 | 3633.12 | 0.33% |

Technical Debt Ratio

$(\text{Remediation Cost} / \text{Development Cost}) \times 100\%$

| Project | Remediation Cost | Development Cost | Technical Debt Ratio |
|-----------|------------------|------------------|----------------------|
| Project 1 | 12.1 | 3633.12 | 0.33% |
| Project 2 | 702 | 18,728.55 | 3.75% |

Technical Debt Ratio

$(\text{Remediation Cost} / \text{Development Cost}) \times 100\%$

| Project | Remediation Cost | Development Cost | Technical Debt Ratio |
|-----------|------------------|------------------|----------------------|
| Project 1 | 12.1 | 3633.12 | 0.33% |
| Project 2 | 702 | 18,728.55 | 3.75% |
| Project 3 | 1,058.25 | 9,593.37 | 11.03% |

Summary

Technical Debt is not Free

Technical Debt is not Free

- What is technical debt?

Technical Debt is not Free

- What is technical debt?
- Pros and cons of technical debt

Technical Debt is not Free

- What is technical debt?
- Pros and cons of technical debt
- Causes of technical debt

Technical Debt is not Free

- What is technical debt?
- Pros and cons of technical debt
- Causes of technical debt
- Types of technical debt

Technical Debt is not Free

- What is technical debt?
- Pros and cons of technical debt
- Causes of technical debt
- Types of technical debt
- Identifying technical debt

Technical Debt is not Free

- What is technical debt?
- Pros and cons of technical debt
- Causes of technical debt
- Types of technical debt
- Identifying technical debt
- Recoding technical debt

Technical Debt is not Free

- What is technical debt?
- Pros and cons of technical debt
- Causes of technical debt
- Types of technical debt
- Identifying technical debt
- Recoding technical debt
- Technical Debt Score

$$(R \times .2) + (CR \times .15) - (CO \times .15)$$

Technical Debt is not Free

- What is technical debt?
- Pros and cons of technical debt
- Causes of technical debt
- Types of technical debt
- Identifying technical debt
- Recoding technical debt
- Technical Debt Score
- Technical Debt Ratio

(Remediation Cost / Development Cost)
x 100%

Thank You!

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