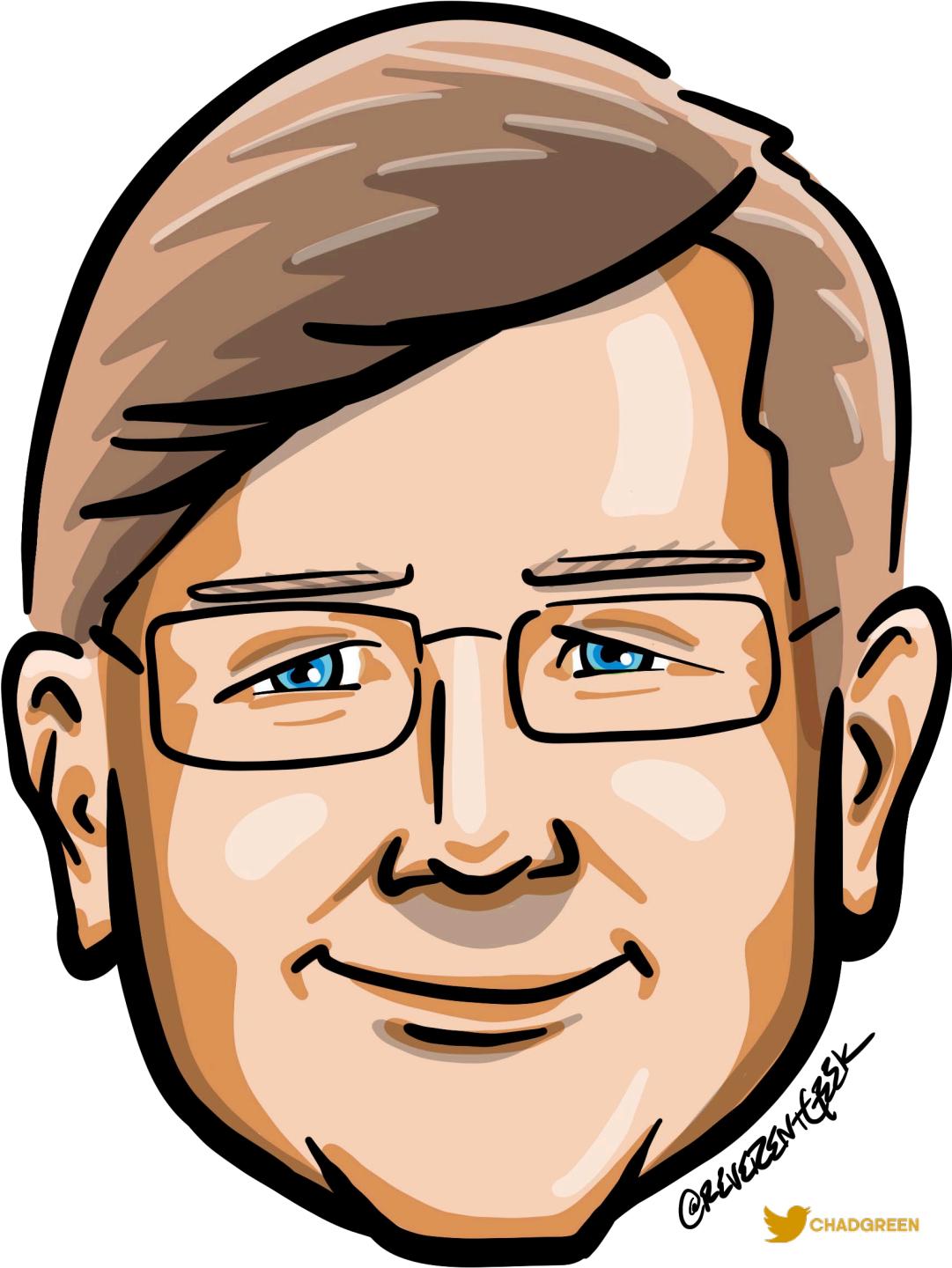




**TECHNICAL  
DEBT  
IS NOT FREE**

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# {Code PaLOUsa}

IT'S SOFTWARE DEVELOPMENT MADNESS

August 17 – 19, 2022



Keynote – Christina Aldan



.NET Rocks! 20<sup>th</sup> Anniversary Party

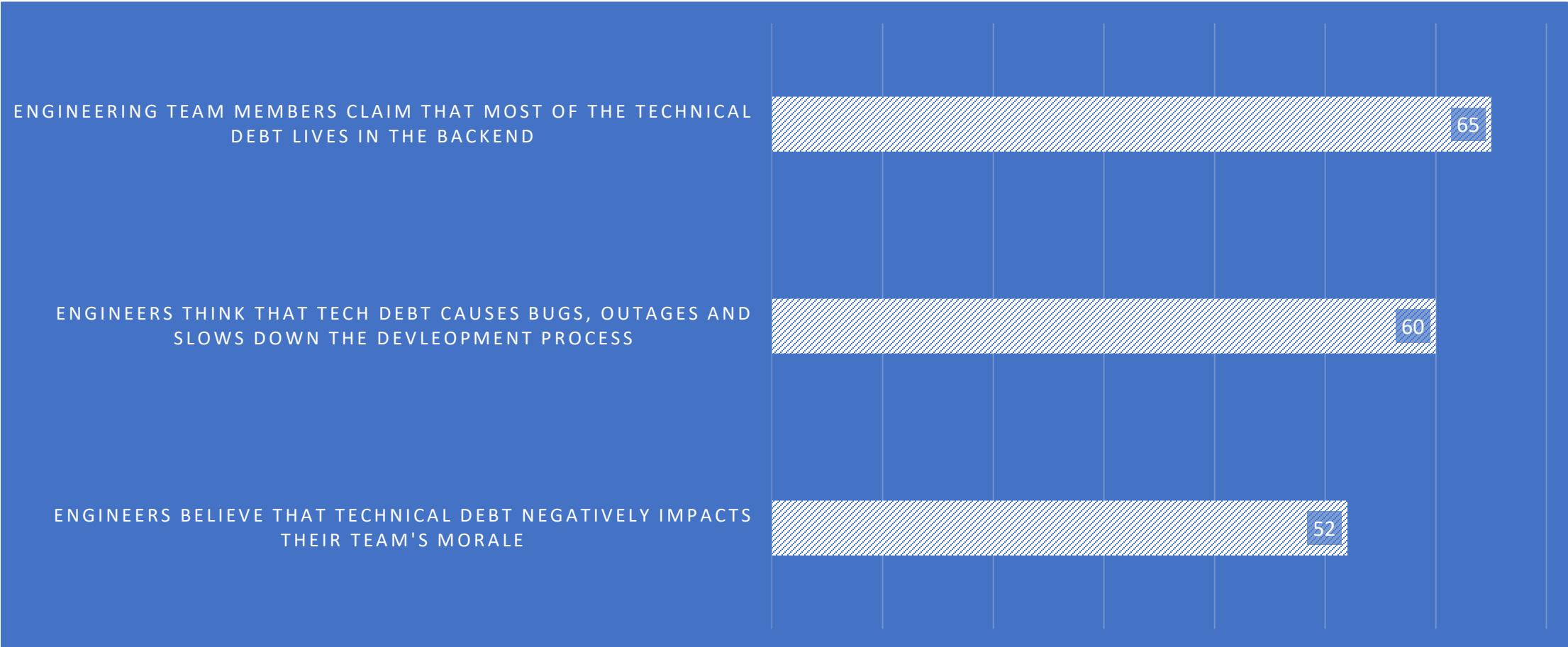


A Toast to Women in Technology

# 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



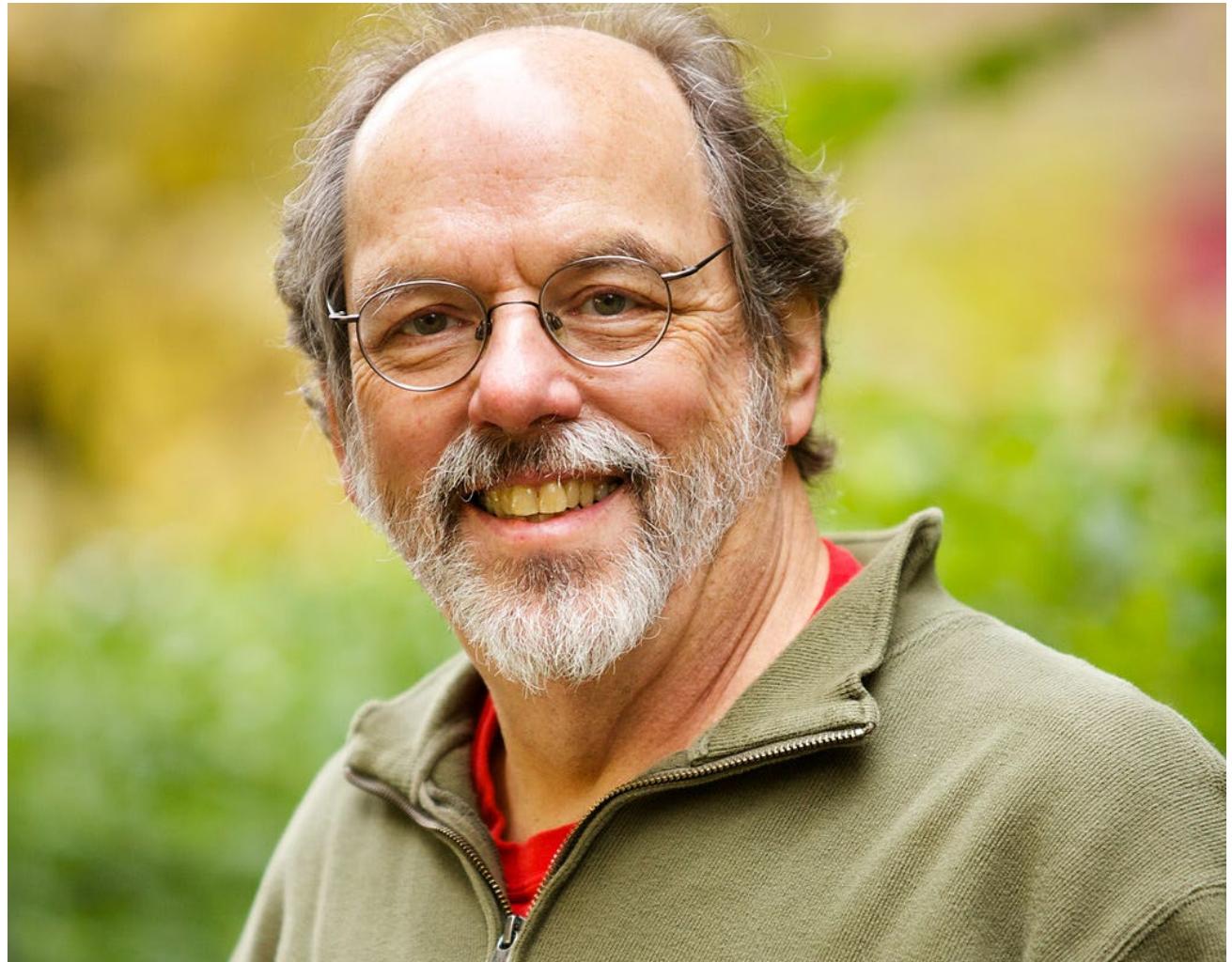
# What is Technical Debt

Technical Debt is not Free

# What is Technical Debt?

First described by Ward Cunningham in 1992

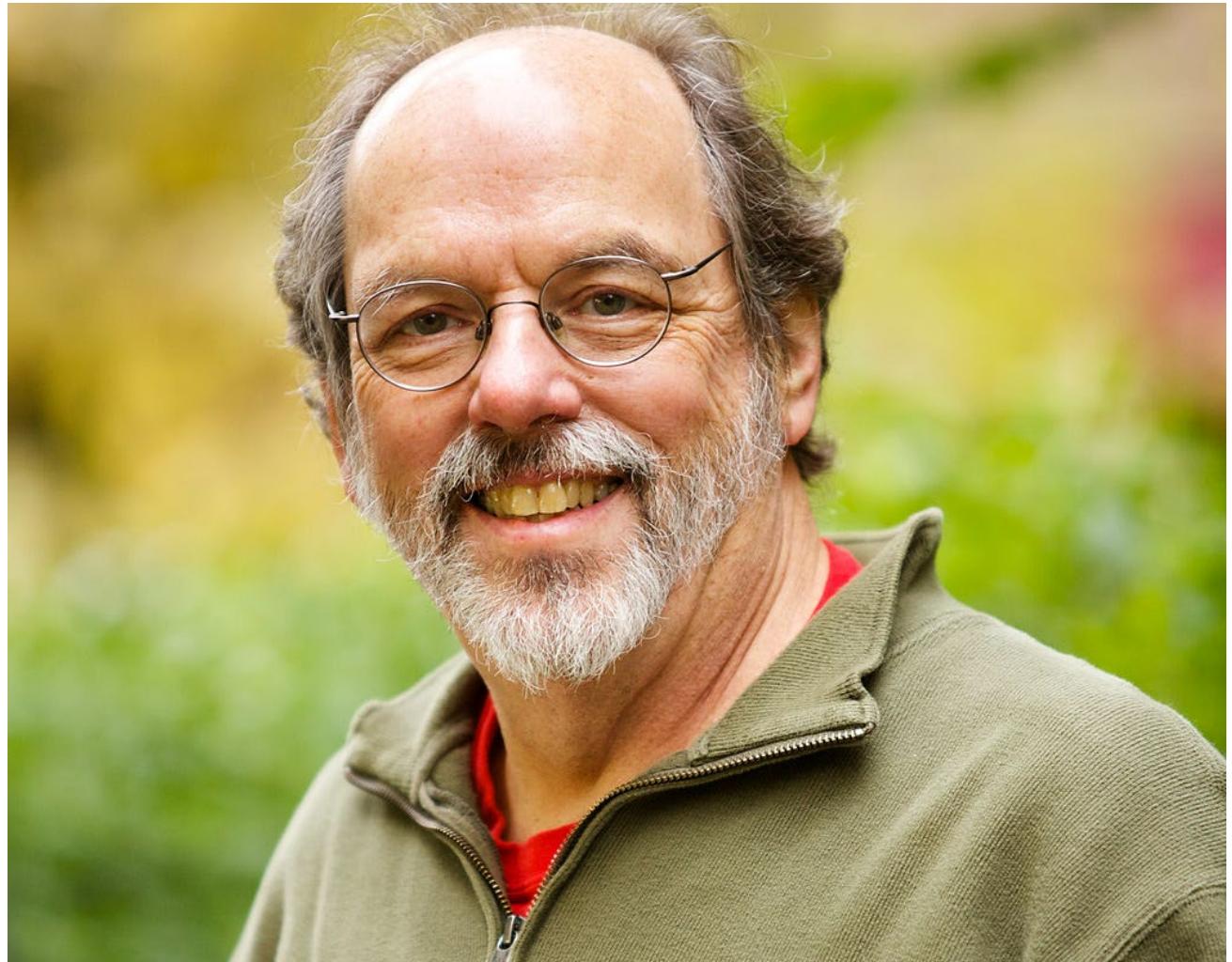
The danger occurs  
when the debt is not  
repaid.



# What is Technical Debt?

First described by Ward Cunningham in 1992

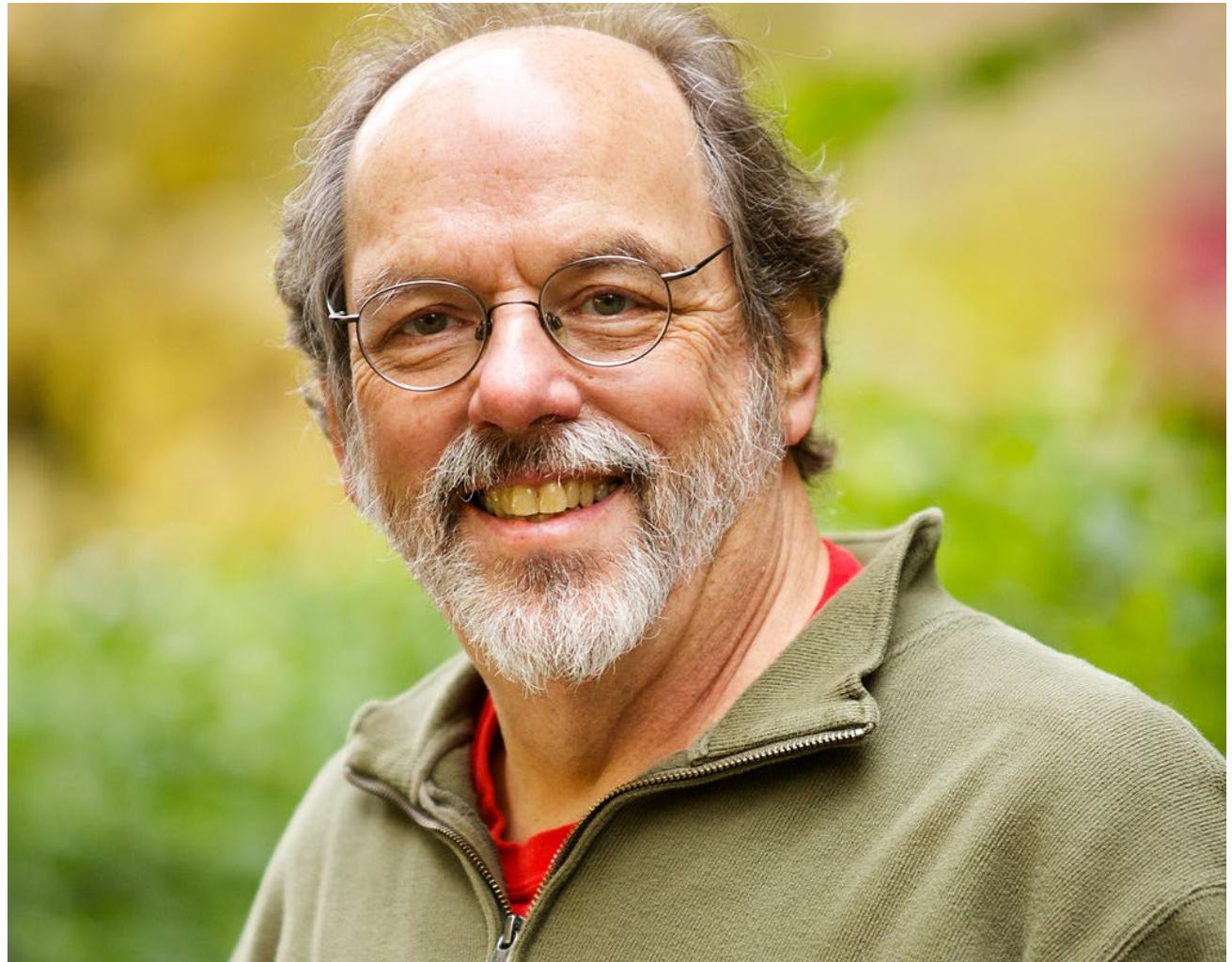
Every minute spent  
on not-quite-right  
code counts as  
interest on that  
debt.



# 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



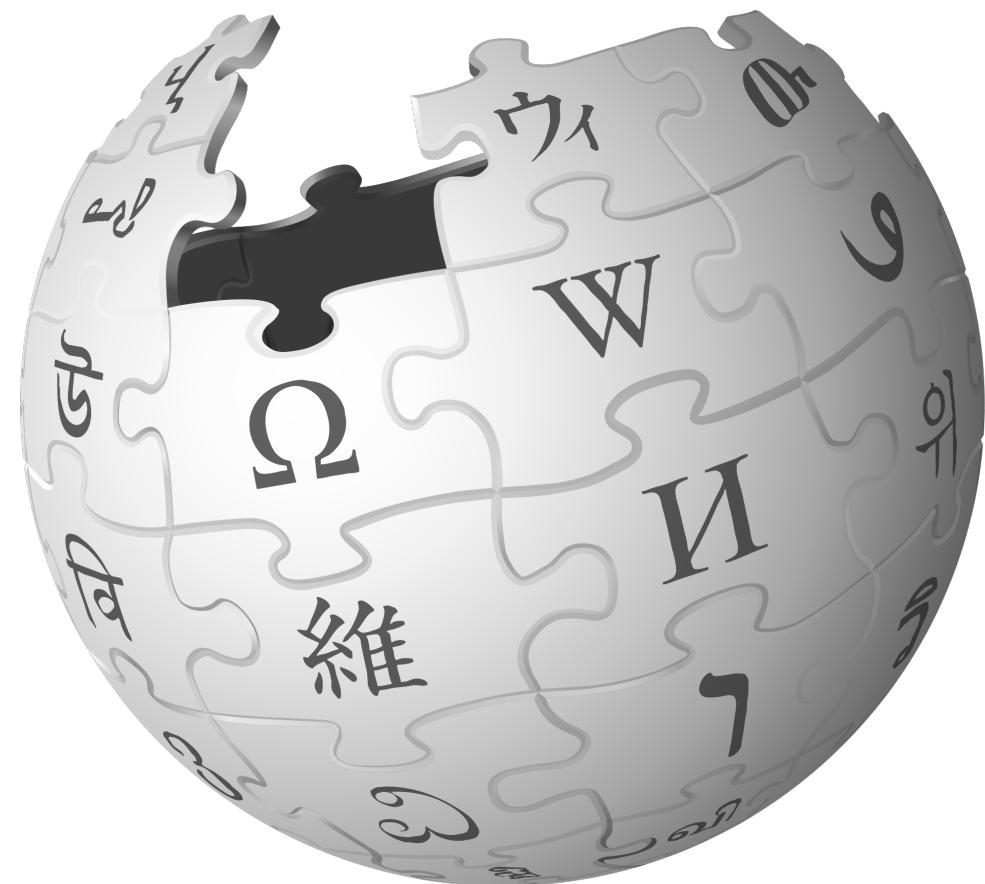
# What is Technical Debt?

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](http://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

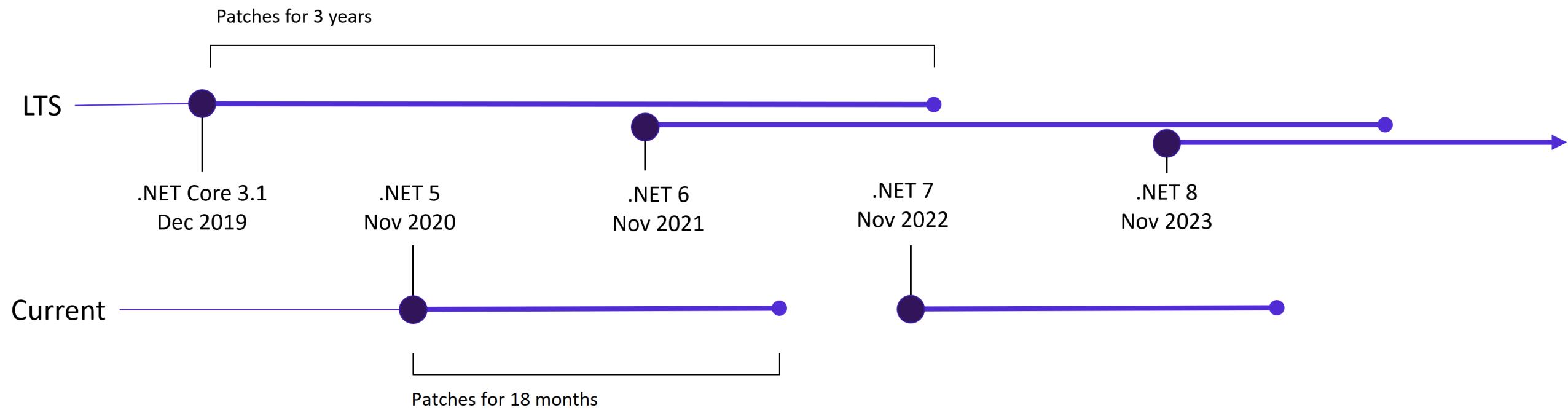
.NET 5

Current Release

.NET 6

LTS Release

# Another Technical Debt Example



# 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?



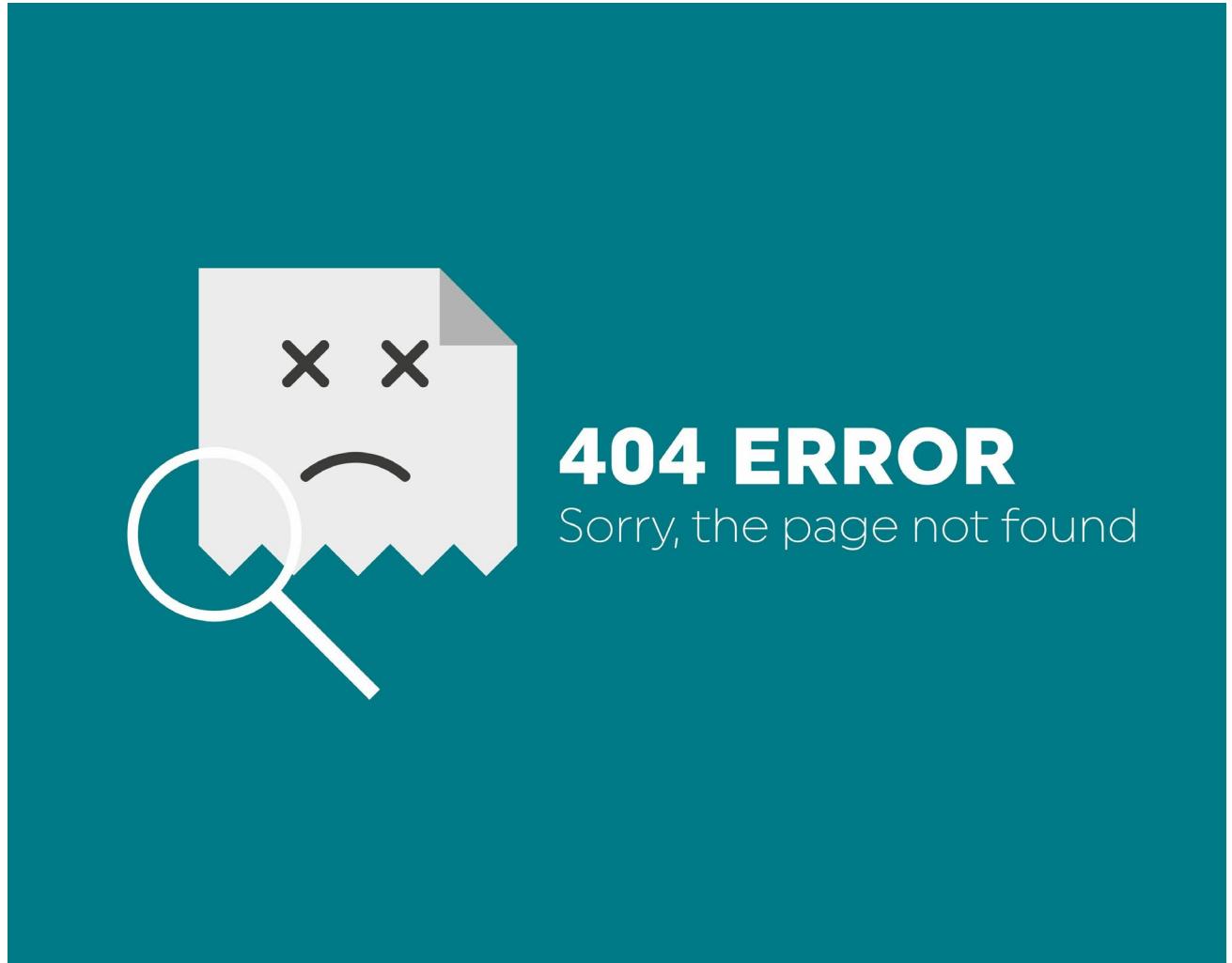
# Lack of a test suite

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?

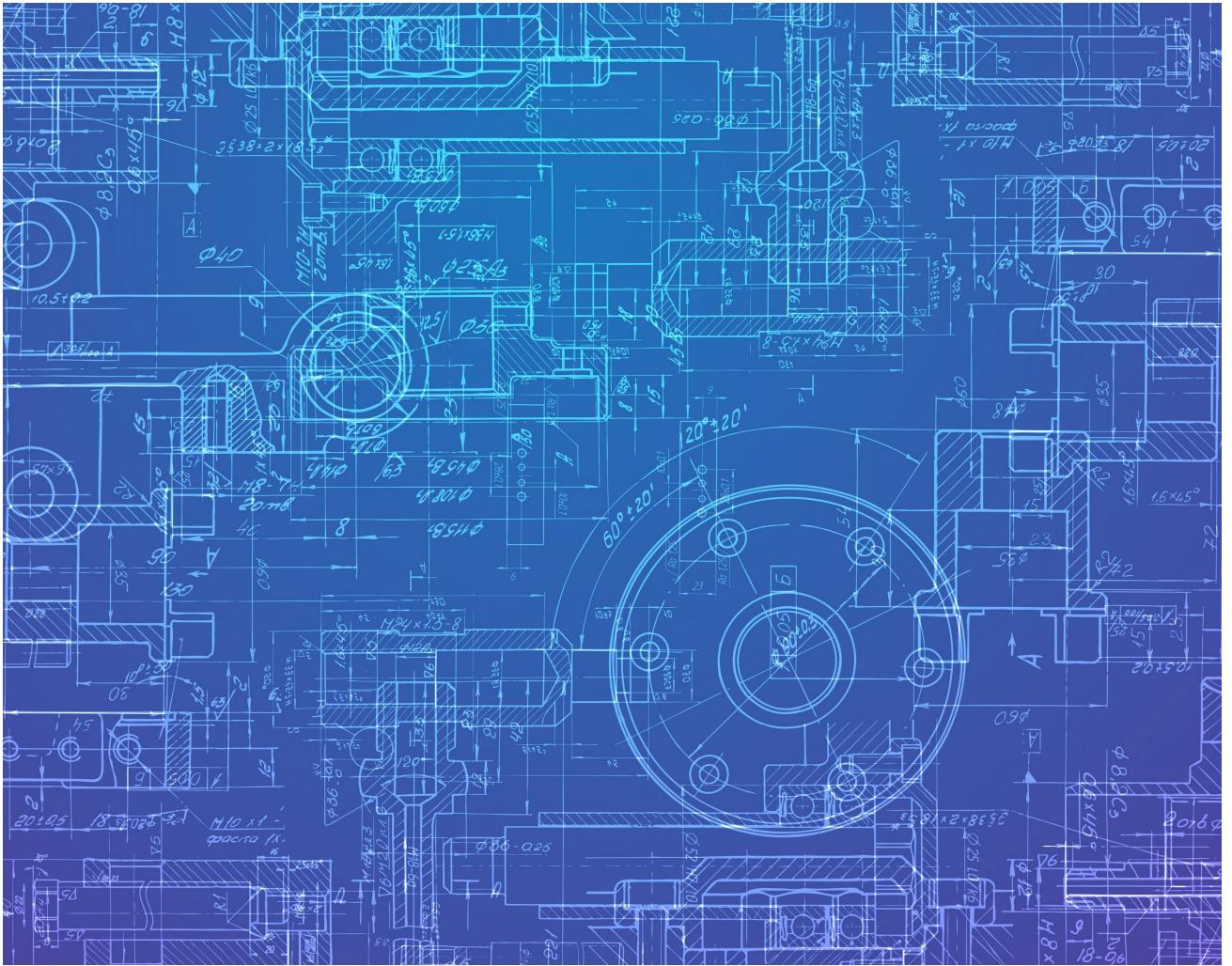
- Insufficient up-front definition
- Business pressures
- Lack of process or understanding
- Tightly-coupled components
- Lack of a test suite
- Lack of documentation
- Lack of collaboration
- Parallel development
- Delayed refactoring
- Lack of alignment to standards
- Lack of knowledge
- Lack of ownership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

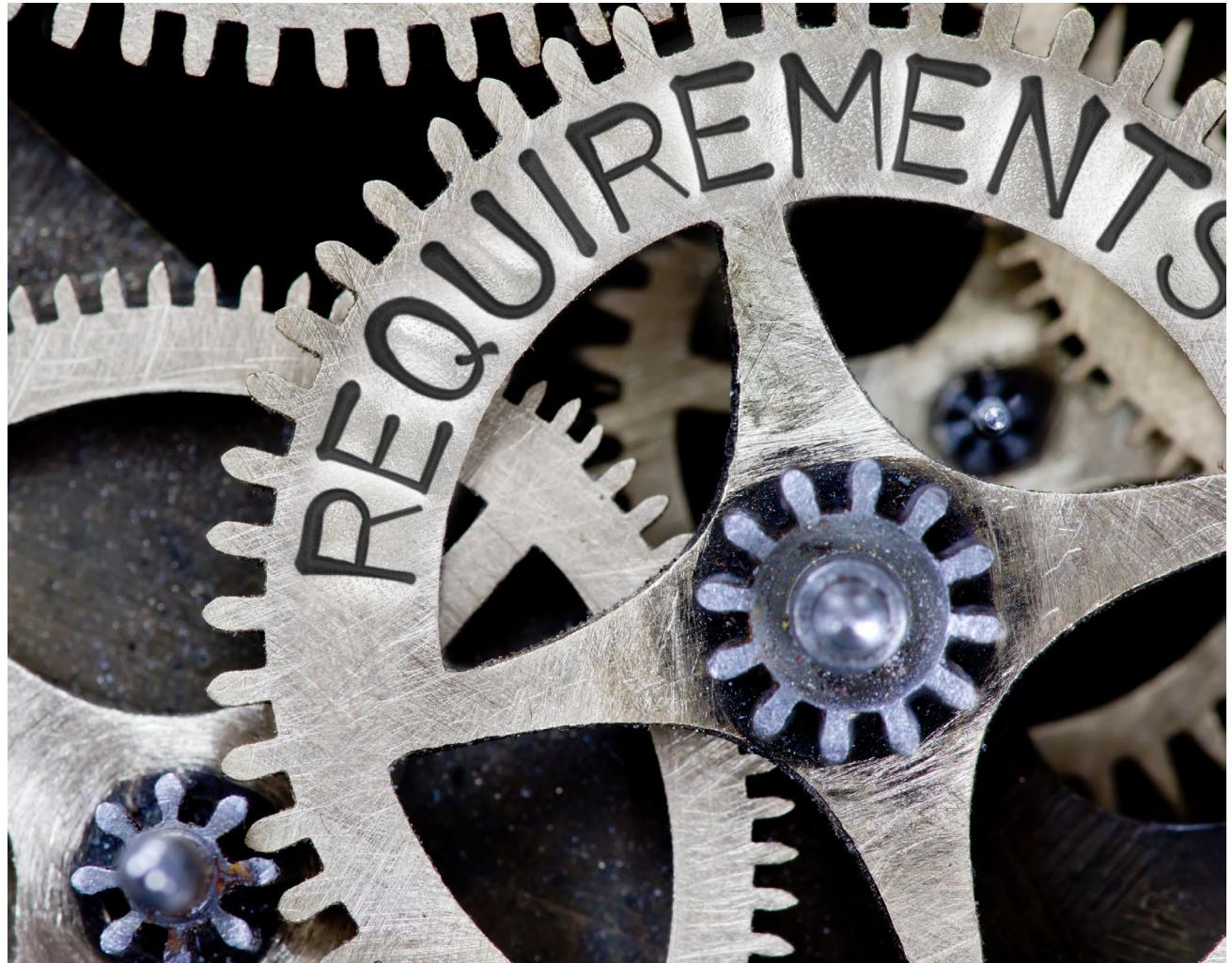
# Process

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

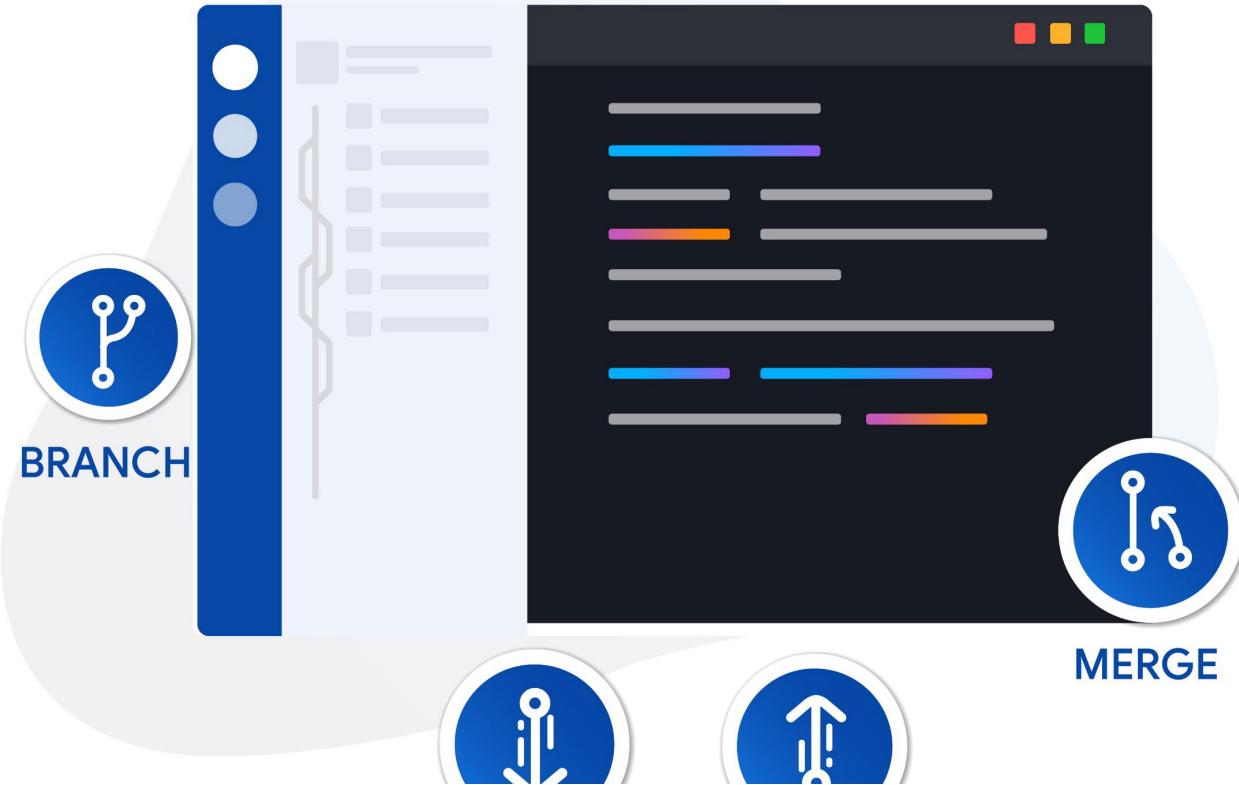
Opportunities to Identify Technical Debt

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

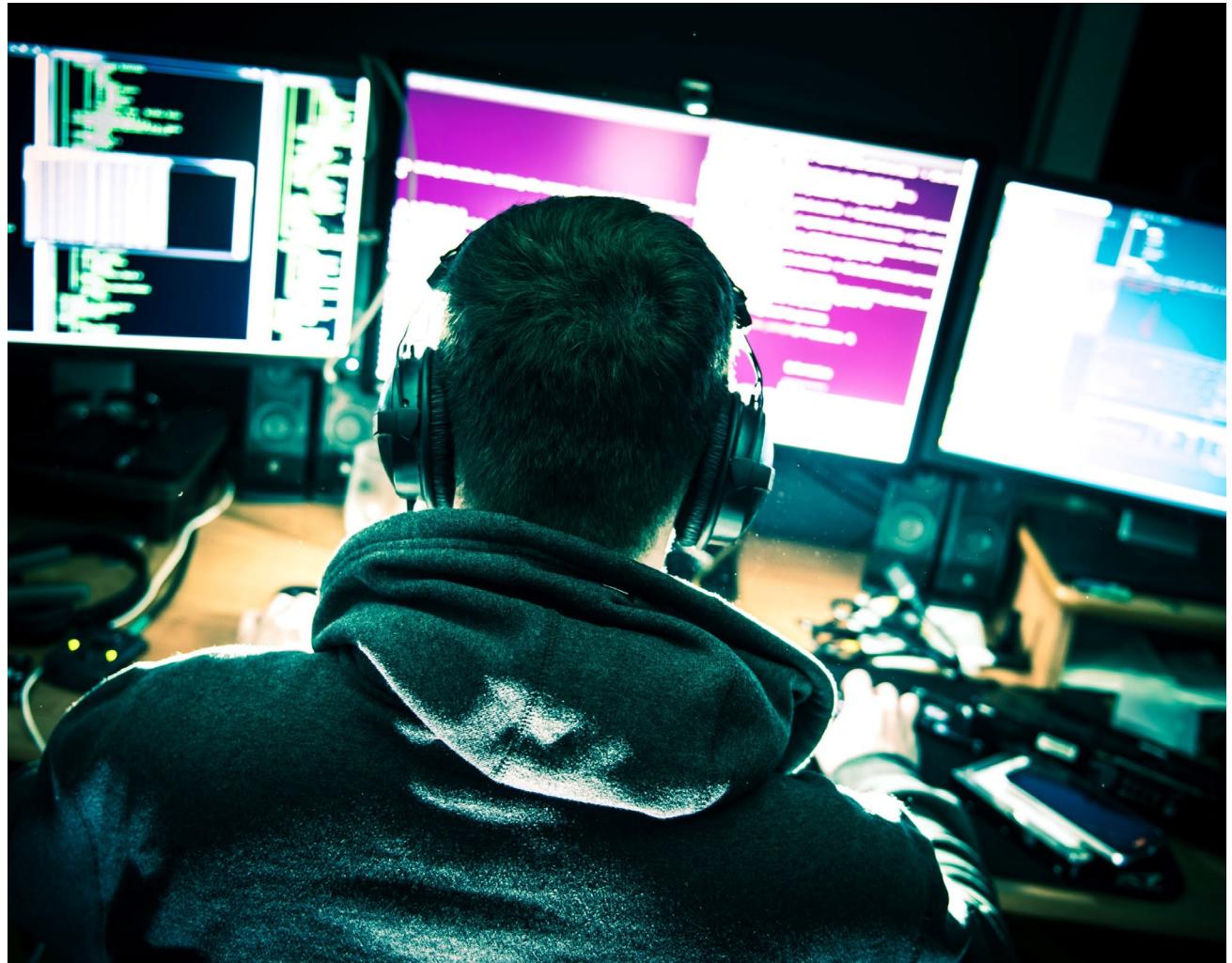
Opportunities to Identify Technical Debt



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**

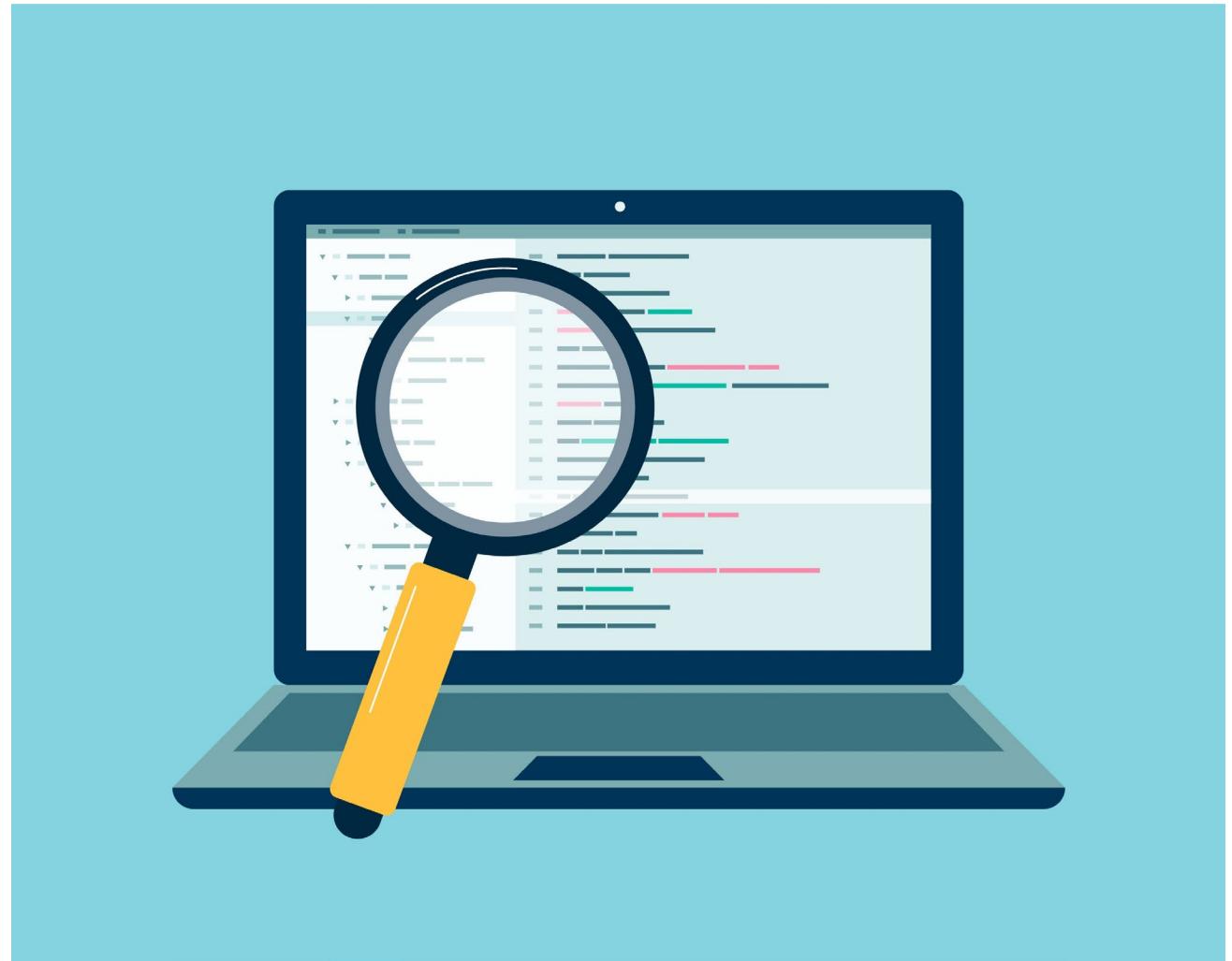
Not only responding to change  
but also **steadily adding value**

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	Medium	Medium	10	\$100	7.5
Product A	User Story 2	Task 2	Low	Low	5	\$50	6.0
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	Medium	Medium	10	\$100	7.5
Product B	User Story 2	Task 2	Low	Low	5	\$50	6.0
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	Medium	Medium	10	\$100	7.5
Product C	User Story 2	Task 2	Low	Low	5	\$50	6.0

# 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?
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# 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

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- What is technical debt?
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- 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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Technical Debt is not Free

