



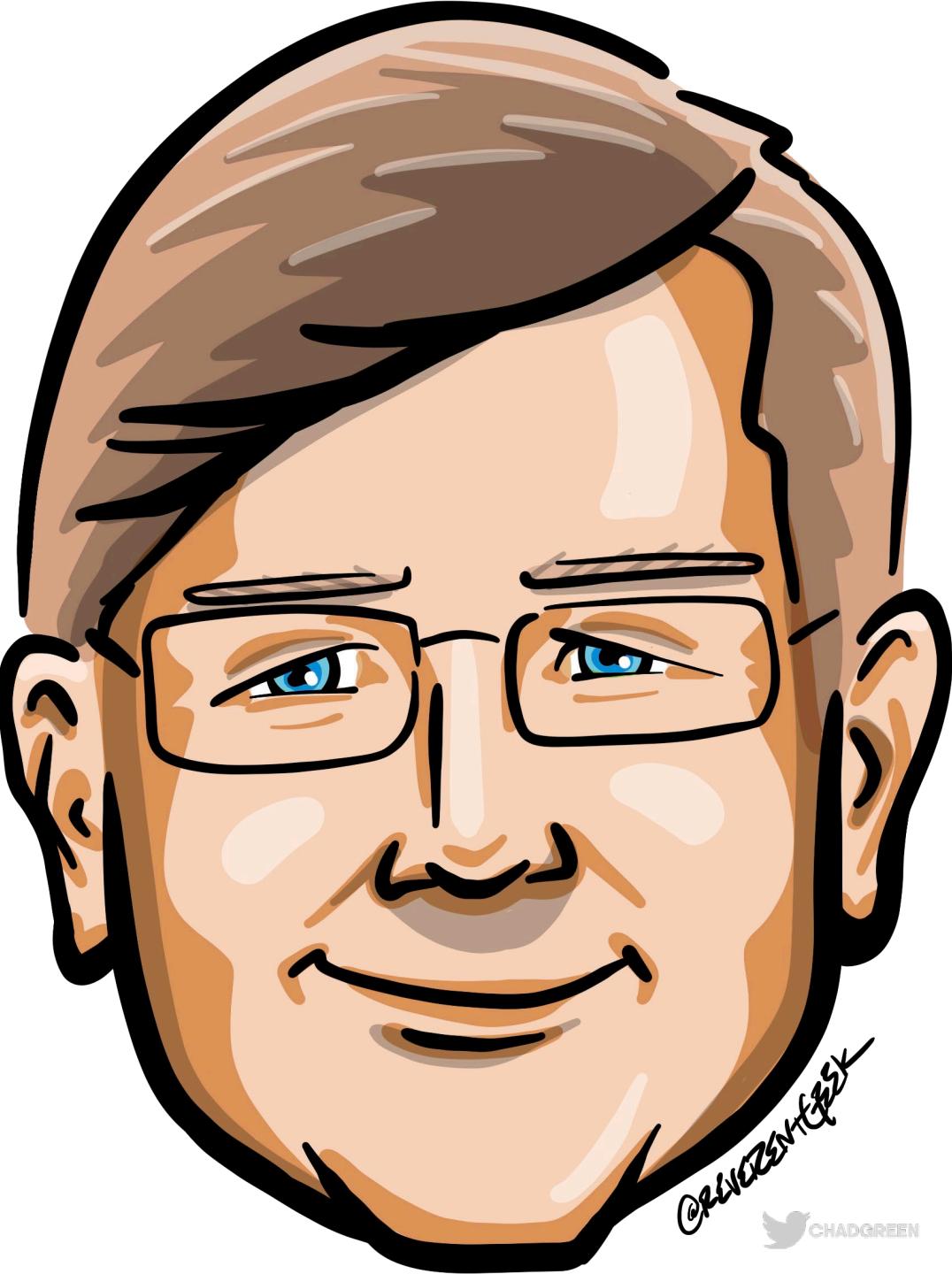
**TECHNICAL**

**DEBT**

**IS NOT FREE**

# Who is Chad Green

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# Age n d a

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

# What is Technical Debt?

Technical Debt Is Not Free

# What is Technical Debt?

A story as old as time



# What is Technical Debt?

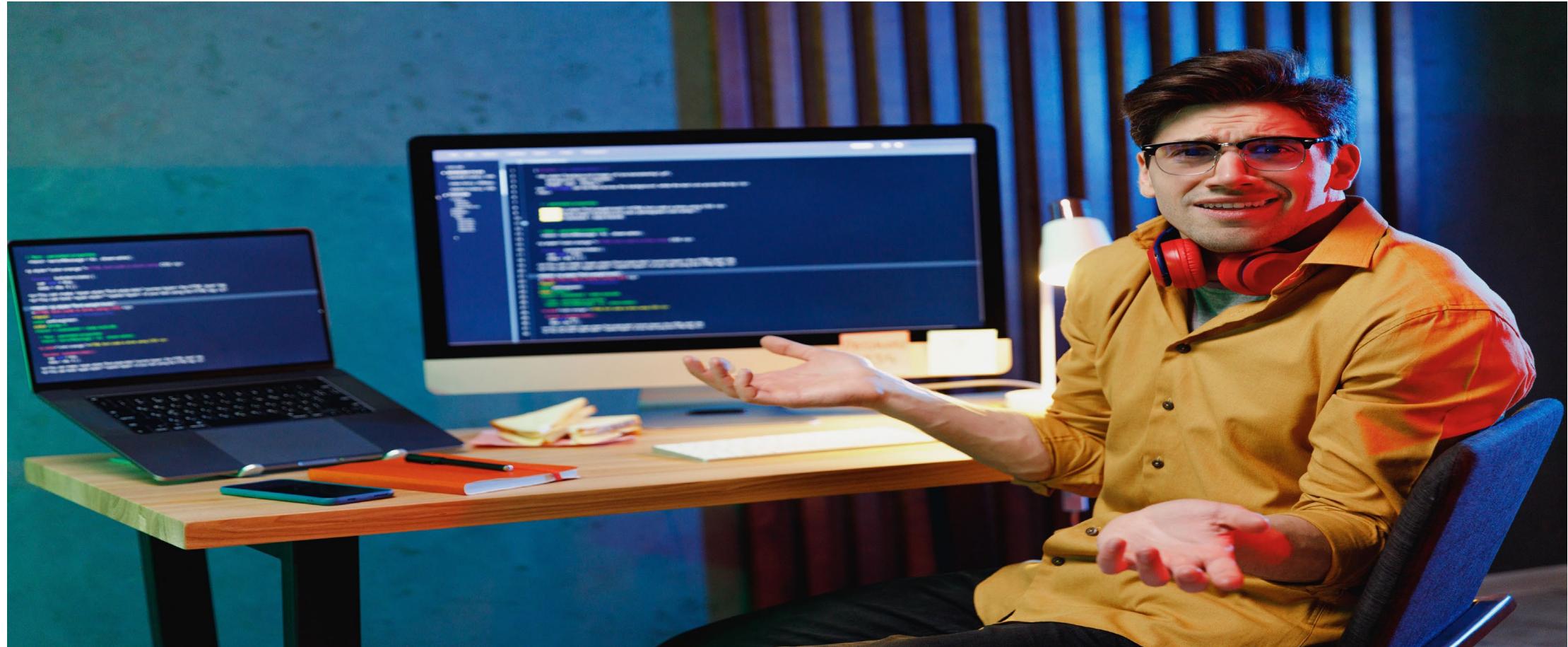
A story as old as time





# What is Technical Debt?

A story as old as time



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# What is Technical Debt?

A story as old as time





# What is Technical Debt?

A story as old as time





# What is Technical Debt?

A story as old as time



# What is Technical Debt?

A story as old as time



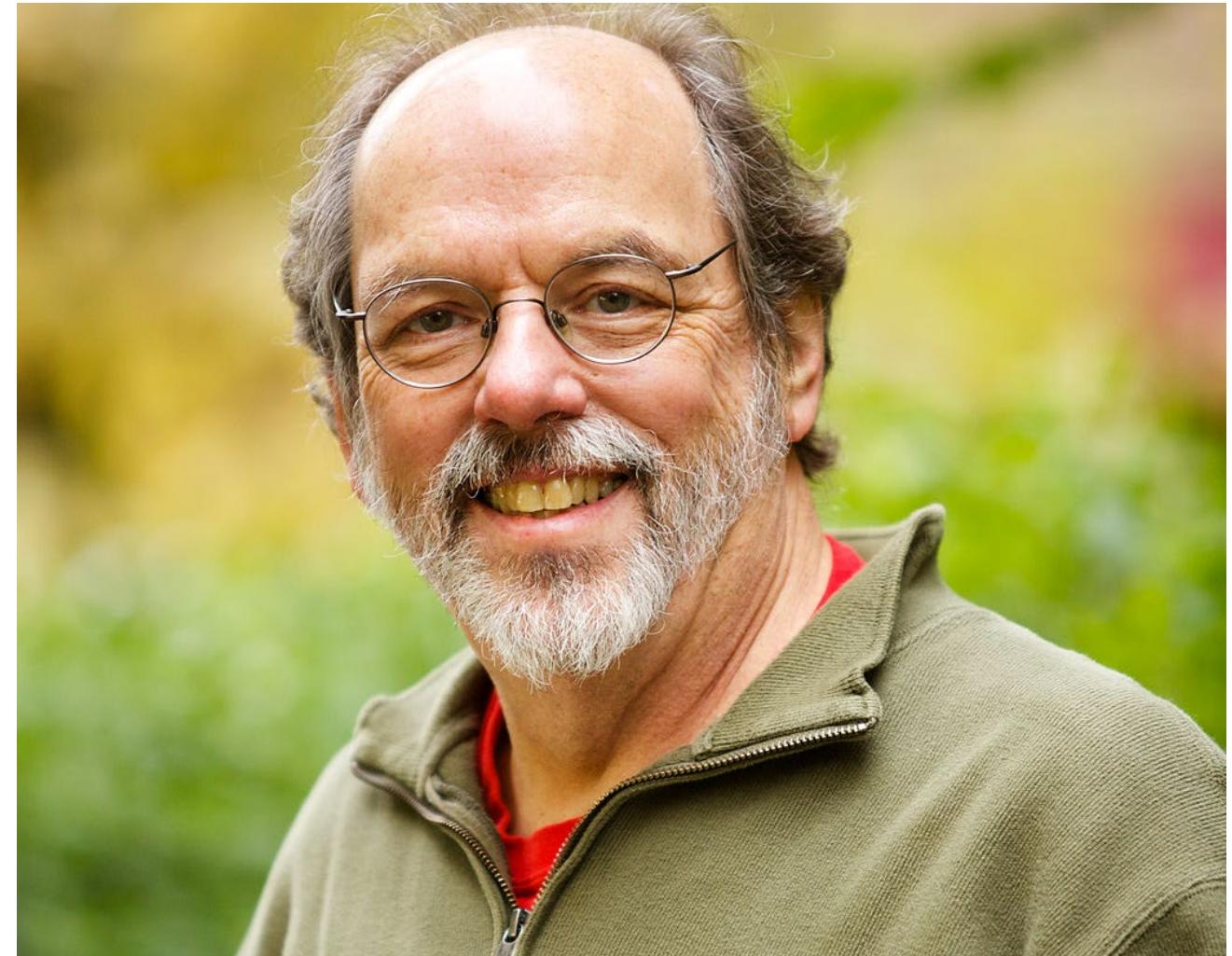
# What is Technical Debt?

A story as old as time



# What is Technical Debt?

First described by Ward Cunningham in 1992

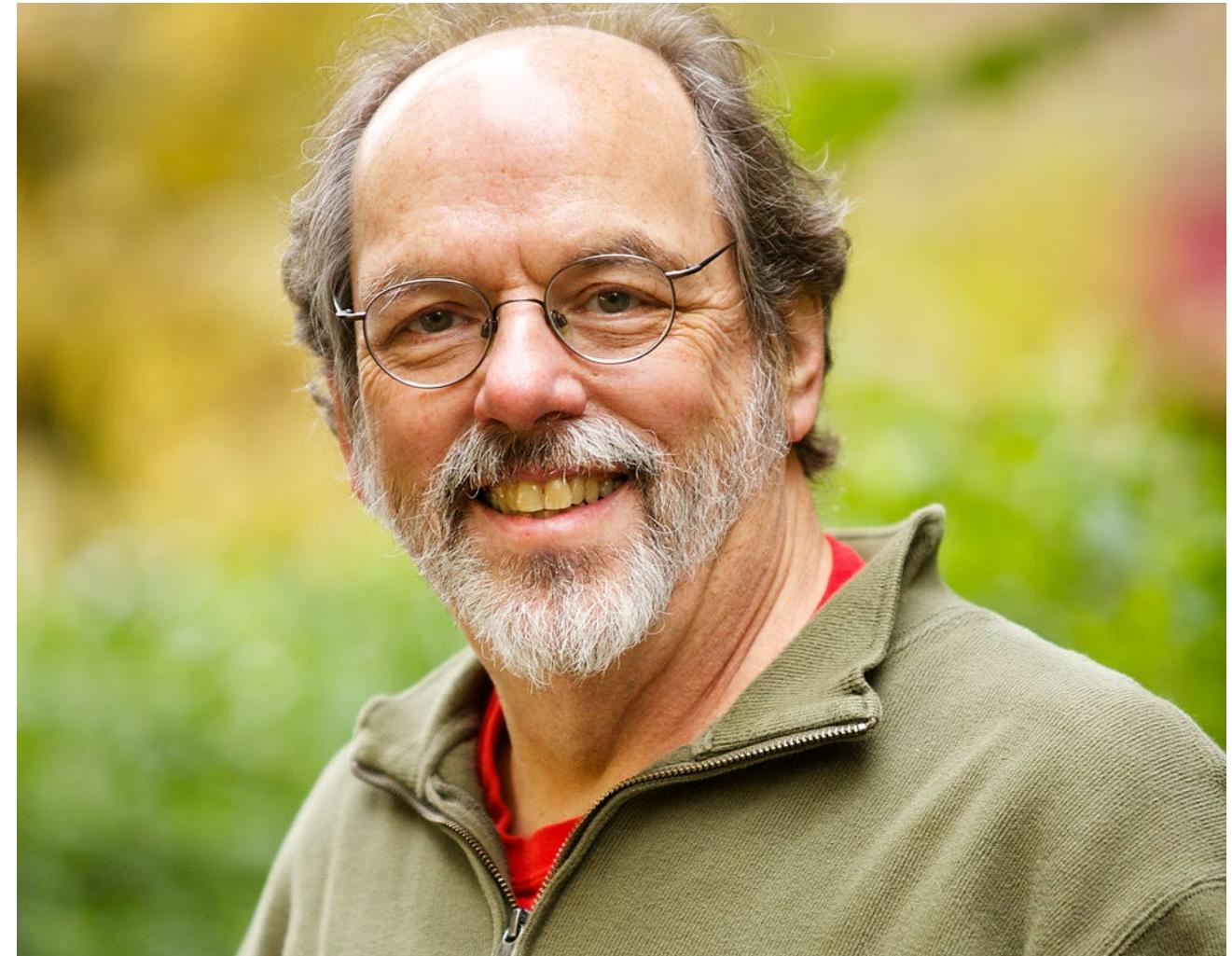




# What is Technical Debt?

First described by Ward Cunningham in 1992

The danger occurs  
when the debt is not  
repaid

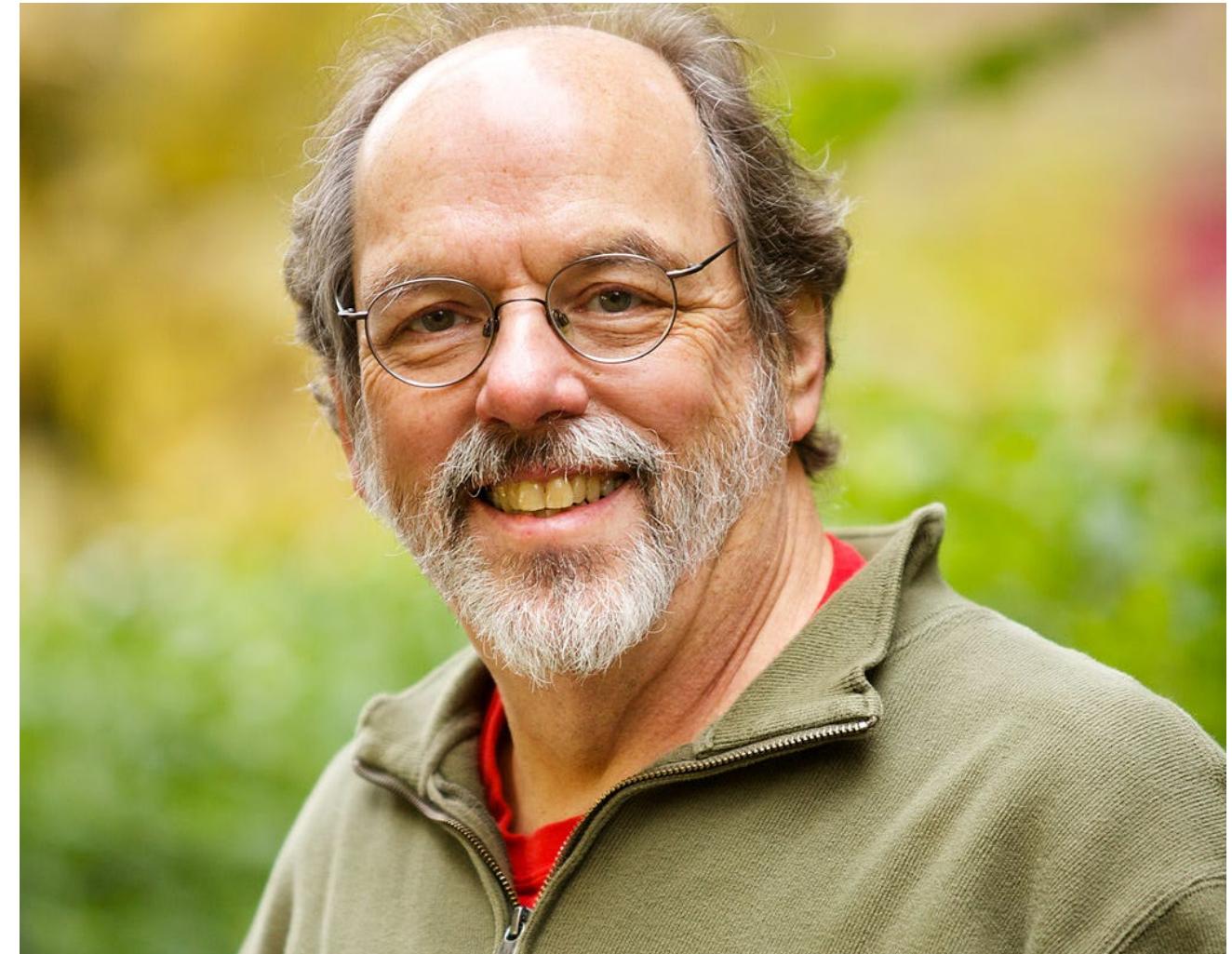




# What is Technical Debt?

First described by Ward Cunningham in 1992

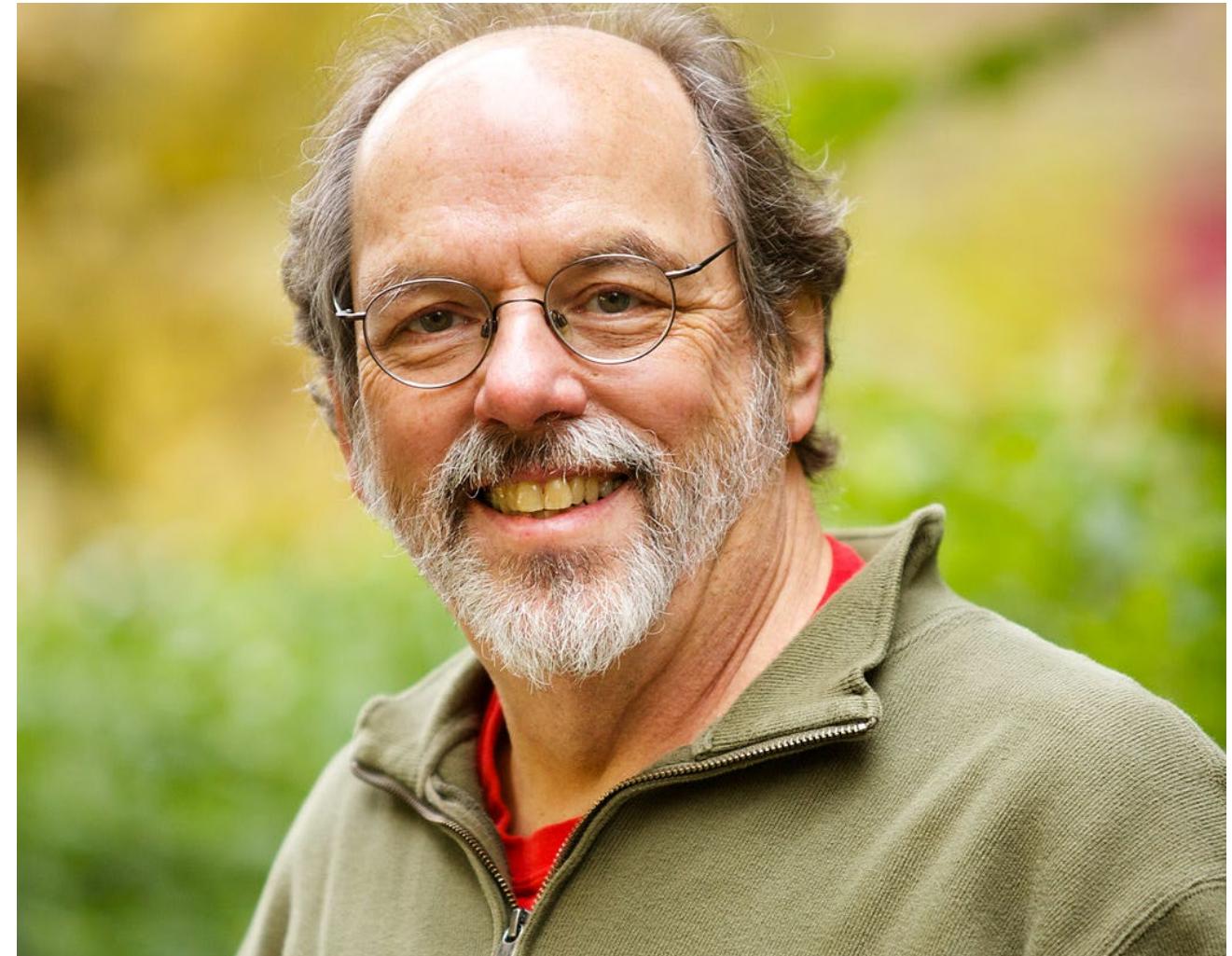
Every minute spent  
on not-quite-right  
code counts as  
interest on that debt.



# 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 comes from Martin Fowler



# What is Technical Debt?

Common definition comes from Martin Fowler

quick and dirty way



# What is Technical Debt?

Common definition comes from Martin Fowler

incurs interest  
payments





# What is Technical Debt?

Common definition comes from Martin Fowler

extra effort that we have to do in future development



# What is Technical Debt?

More academic definition

implied cost



# What is Technical Debt?

More academic definition

rework



# What is Technical Debt?

More academic definition

choosing easy



# What is Technical Debt?

More academic definition

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

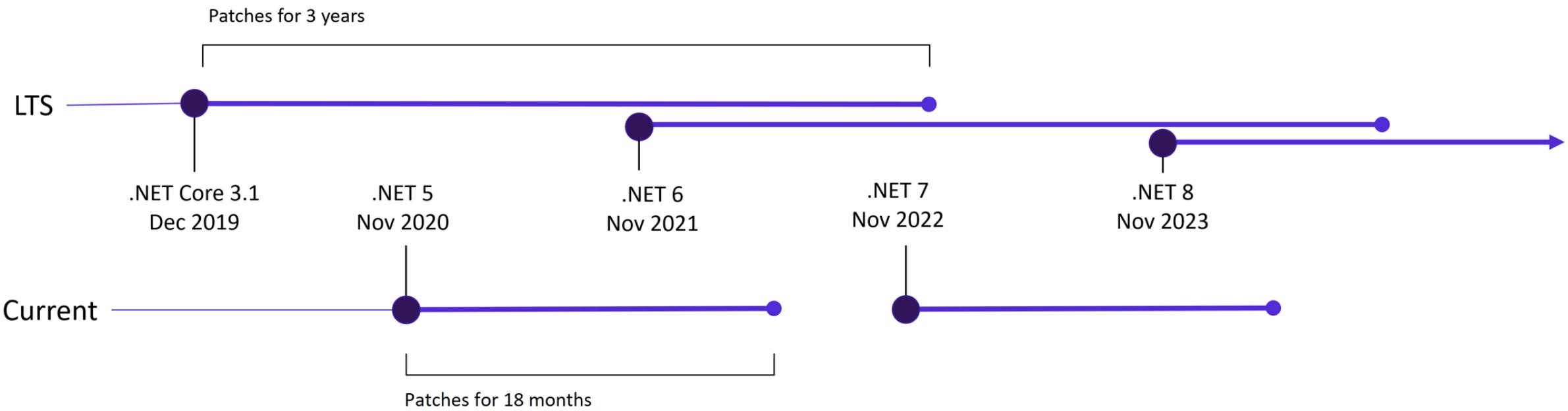
Current Release

.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

# In sufficient up-front definition

What causes technical debt?



# Business Pressures

What causes technical debt?



# Lack of process or understanding

What causes technical debt?



# Tightly-coupled components

What causes technical debt?





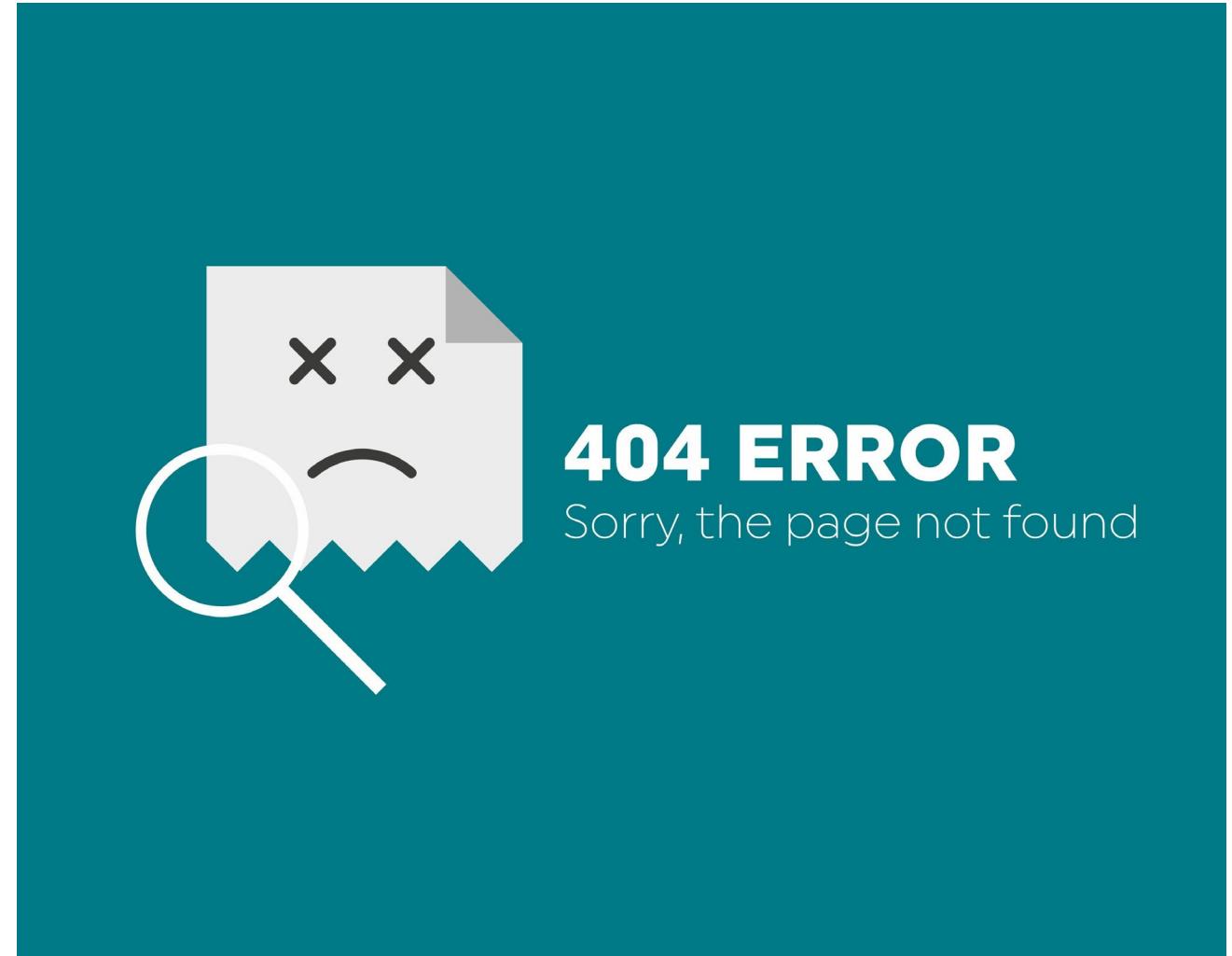
# Lack of a test suite

## What causes technical debt?



# Lack of documentation

What causes technical debt?



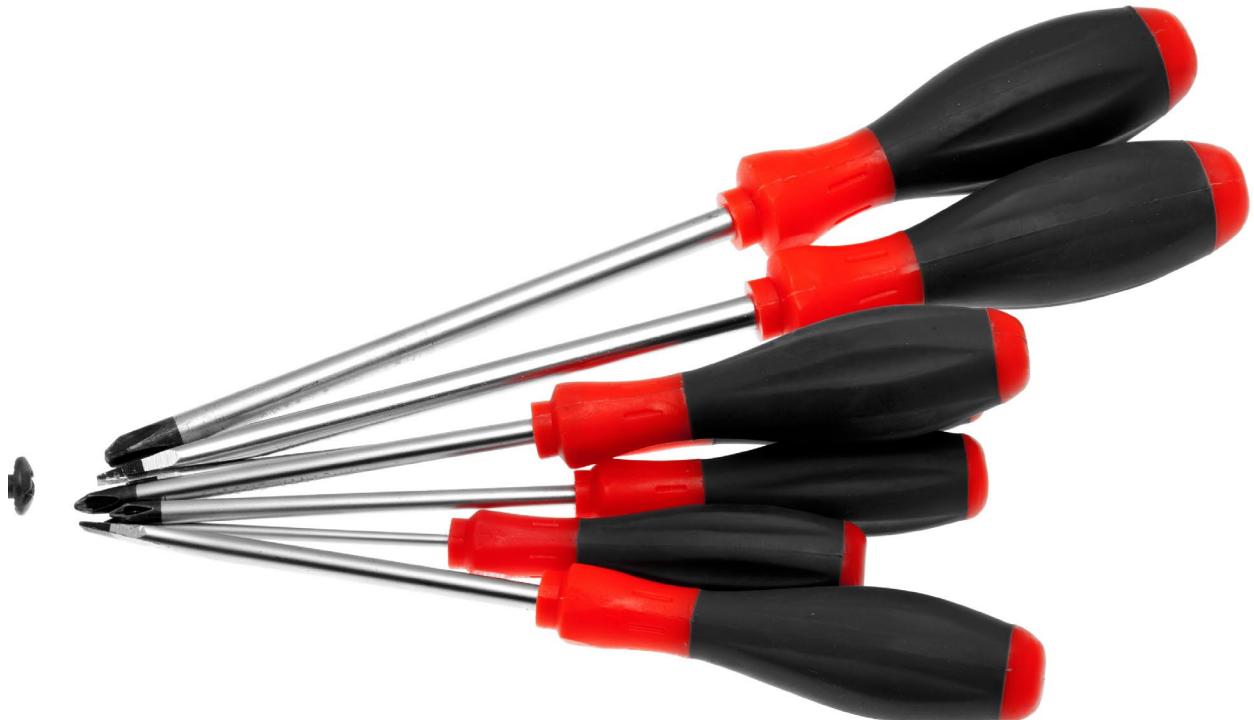
# Lack of collaboration

What causes technical debt?



# Parallel development

What causes technical debt?



# De layed re factoring

What causes technical debt?



# 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?



# What causes technical debt?

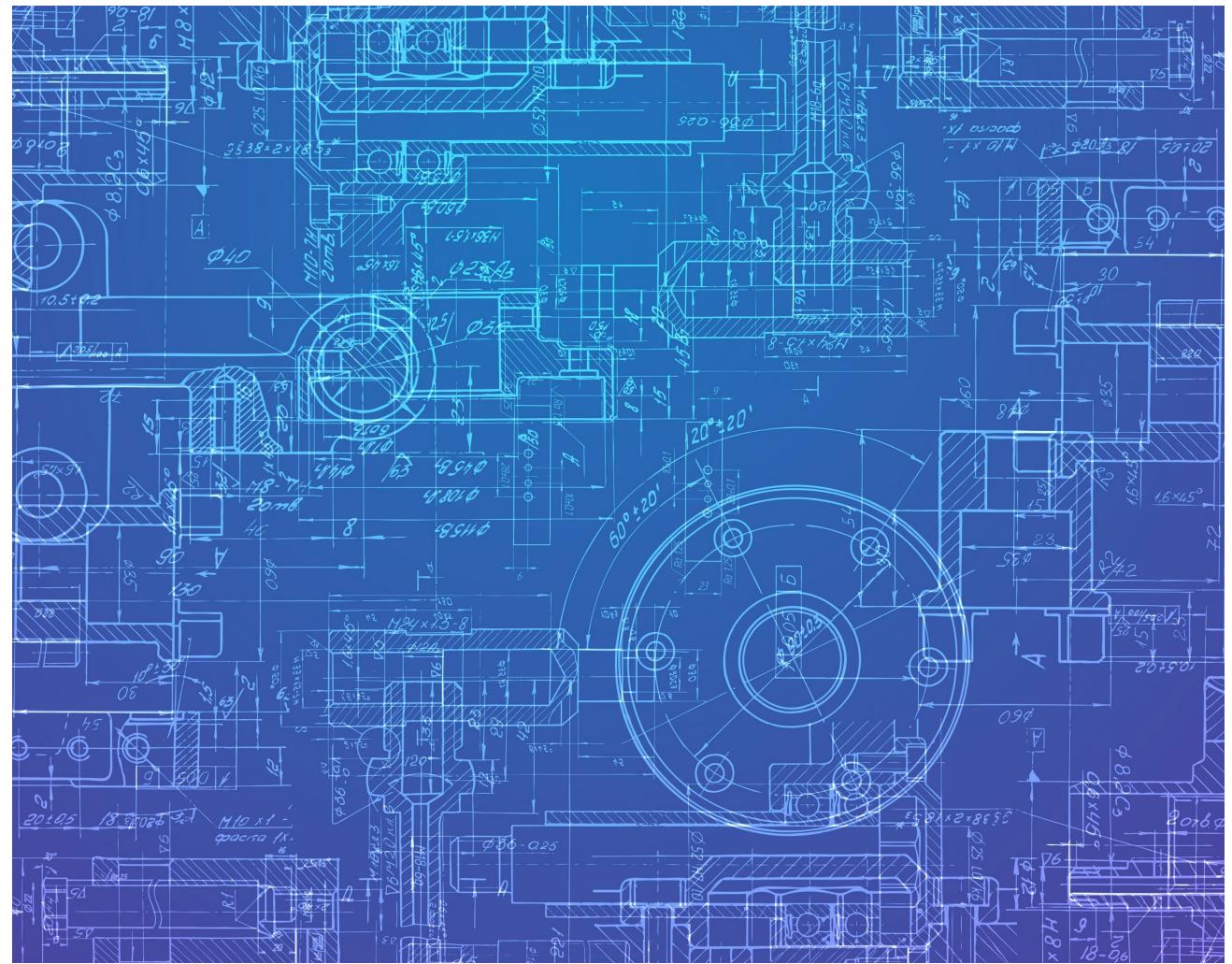
- Insufficient up-front definition
- Business pressures
- Lack of process of understanding
- Tightly-coupled components
- Lack of a test suite
- Lack of documentation
- Lack of collaboration
- Parallel development
- Delayed refactoring
- Lack of alignment to standards
- Lack of knowledge
- Lack of ownership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

# Types of Technical Debt

Technical Debt Is Not Free

# Architecture

## Types of Technical Debt



Technical Debt is not Free



# Build

Types of Technical Debt



# Code

## Types of Technical Debt



# De fe c t

Types of Technical Debt



# Design

Types of Technical Debt



# Documentation

Types of Technical Debt



# Infrastructure

Types of Technical Debt



Technical Debt is not Free



# Pe o ple

Types of Technical Debt



Technical Debt is not Free



# Process

Types of Technical Debt



# Requirement

Types of Technical Debt





# Service

Types of Technical Debt





# Test Automation

Types of Technical Debt



# Test

Types of Technical Debt



Technical Debt is not Free



# Types of Technical Debt

- Architecture
- Build
- Code
- Defect
- Design
- Documentation
- Infrastructure
- Process
- Requirement
- Service
- Test Automation
- Test

# 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

Refactoring



# 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

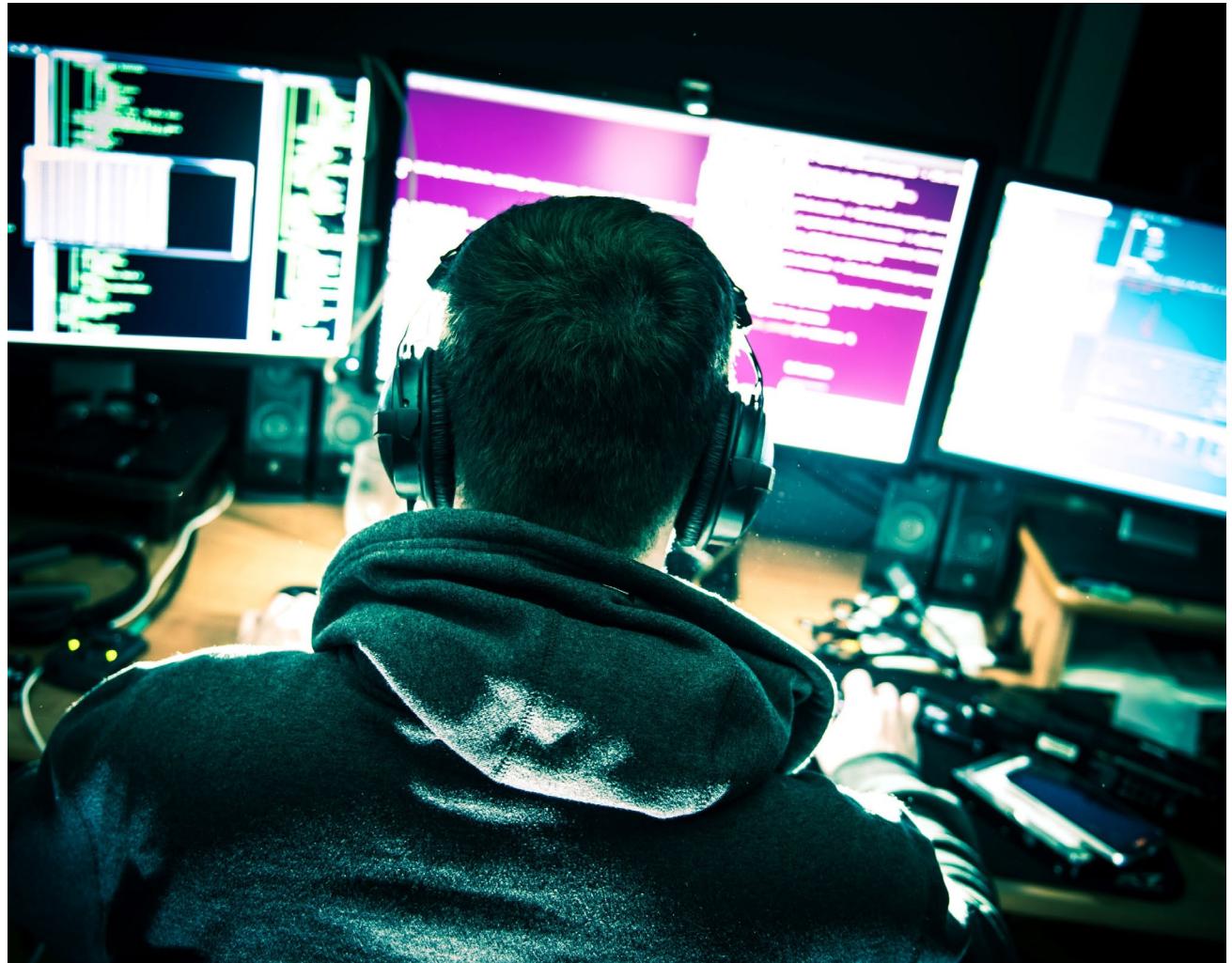
Business  
Misalignment

# Opportunities to Identify Technical Debt

Technical Debt Is Not Free

# Coding

Opportunities to Identify Technical Debt





# *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**

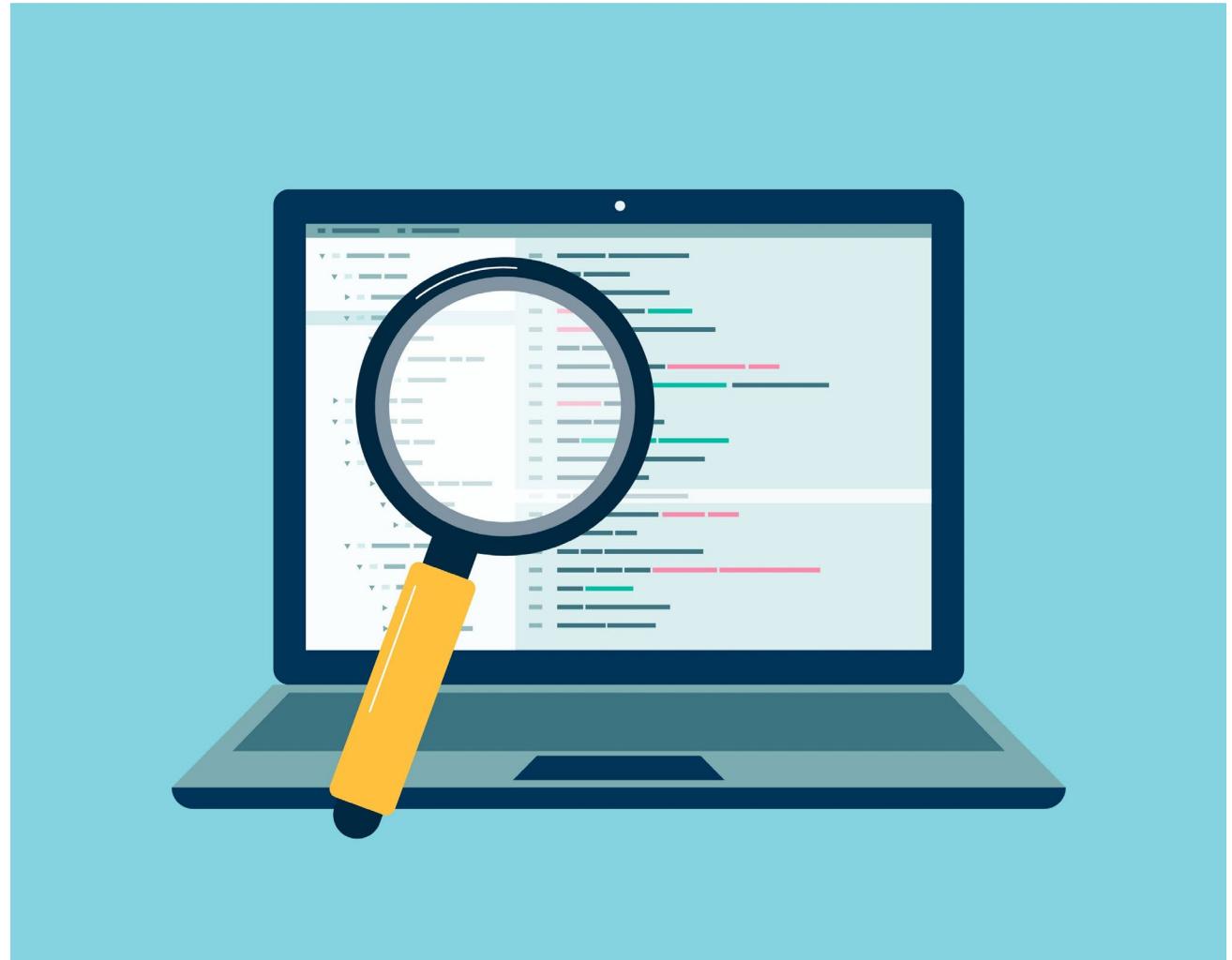
# Code Reviews

Opportunities to Identify Technical Debt



# Code Analysis Tools

Opportunities to Identify Technical Debt



# Pull Requests

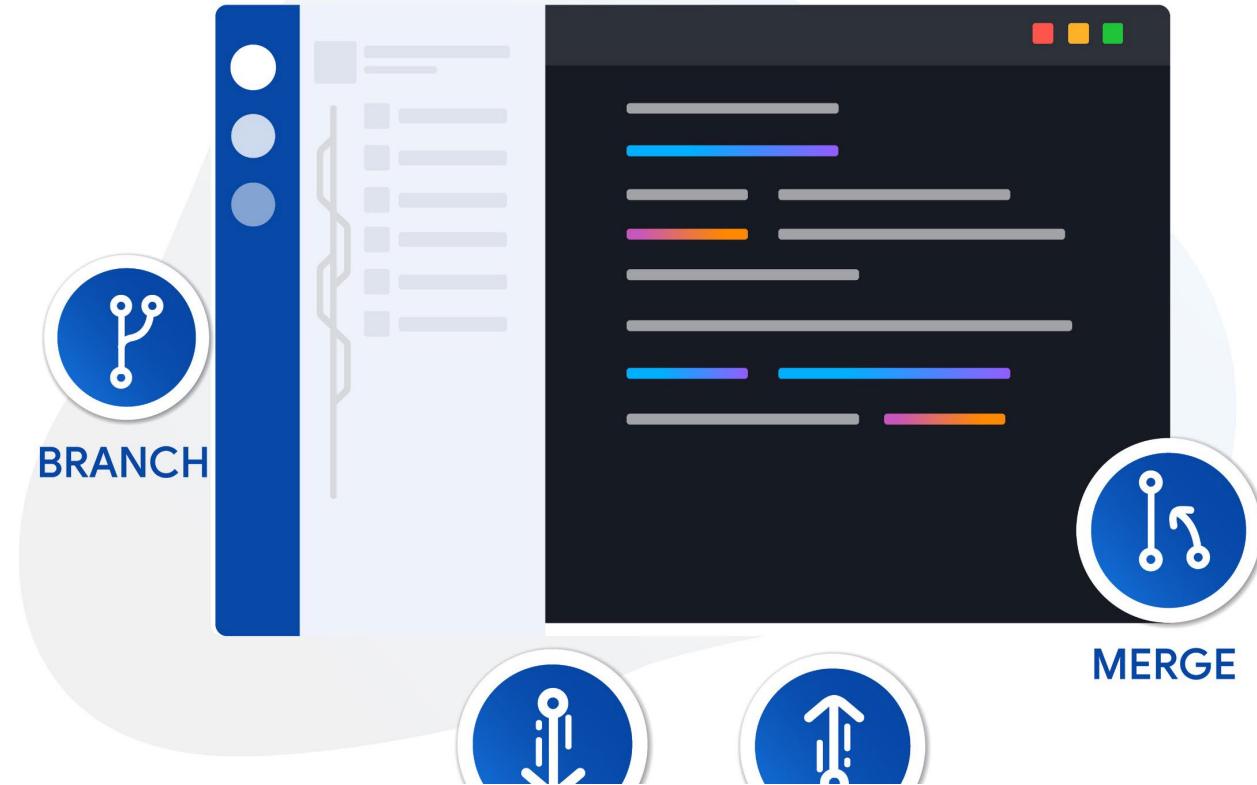
Opportunities to Identify Technical Debt

GIT REPOSITORIES

Software Development



GIT FLOW



# Stand Up

Opportunities to Identify Technical Debt



# Sprint Review

Opportunities to Identify Technical Debt



# Often hidden in plain sight

Opportunities to Identify Technical Debt



# Recording Technical Debt

Technical Debt Is Not Free

# 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 22Q4, 20% of system outages were due to the single-sign-on 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 use 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 Register

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



# Technical Debt Score

R : Reward

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

Co: Complexity

# Technical Debt Score

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

Id	Criticality (CR)	Complexity (CO)	Reward (R)	Score
1451	5	1	5	1.6

# Technical Debt Score

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

Id	Criticality (CR)	Complexity (CO)	Reward (R)	Score
1451	5	1	5	1.6
1452	1	5	1	-0.4

# Technical Debt Score

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

Id	Criticality (CR)	Complexity (CO)	Reward (R)	Score
1451	5	1	5	1.6
1452	1	5	1	-0.4
1453	3	2	3	0.75

# Technical Debt Score

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

Id	Criticality (CR)	Complexity (CO)	Reward (R)	Score	Rank
1451	5	1	5	1.6	1
1453	3	2	3	0.75	2
1452	1	5	1	-0.4	3

# ONE MORE THING





# 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	3,633.12	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	3,633.12	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	3,633.12	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

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

# Thank You!

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