

# Technical Debit is not Free

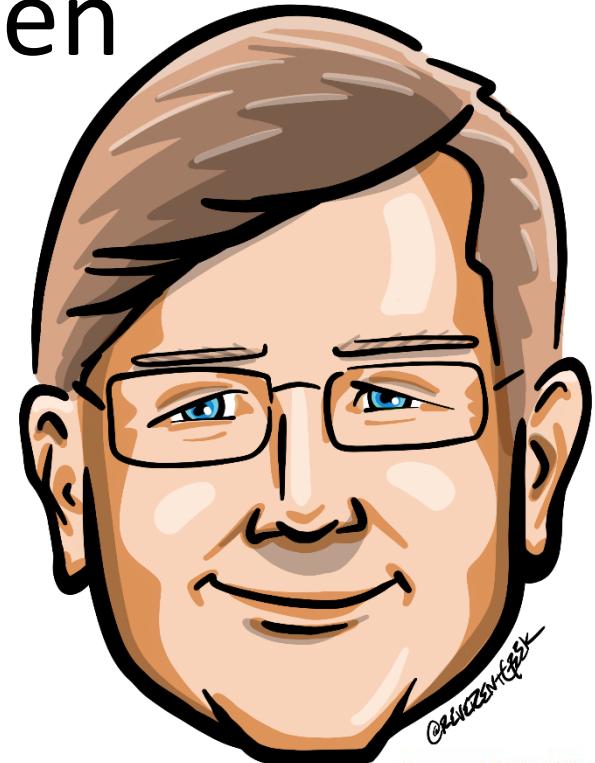
**Chad Green**  
Director of IT Architecture  
**Glennis Solutions**

Level: Introductory

Your Code Powers the World.  
Our Training Powers You.

# Who is Chad Green

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# 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



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# WHAT IS TECHNICAL DEBT?





## 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?

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 can be Bad

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# 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

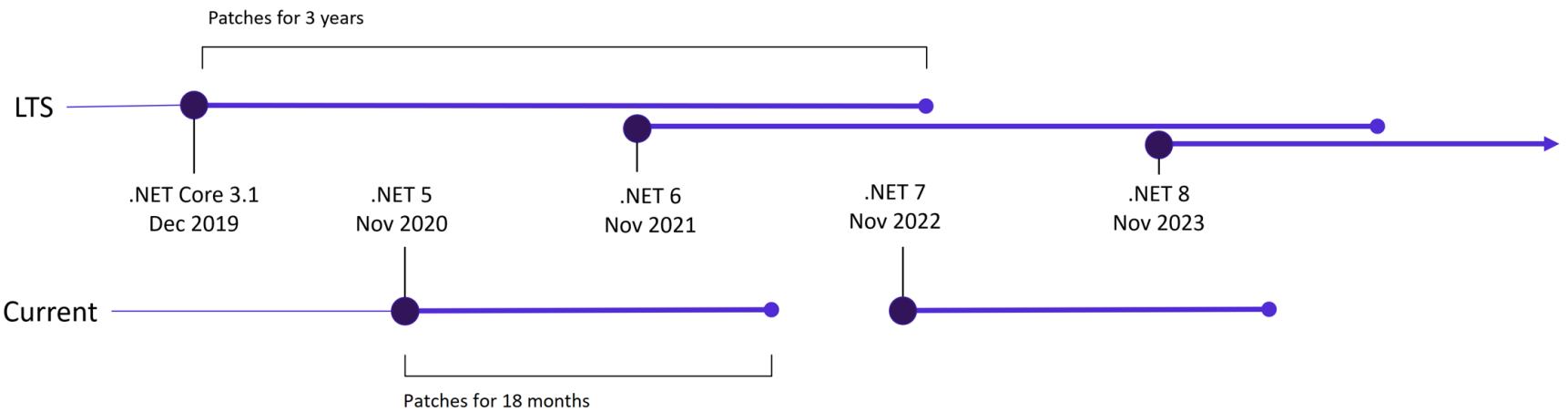
Current Release

.NET 6

LTS Release



# Another Technical Debt Example



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# PROS AND CONS OF TECHNICAL DEBT



# 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



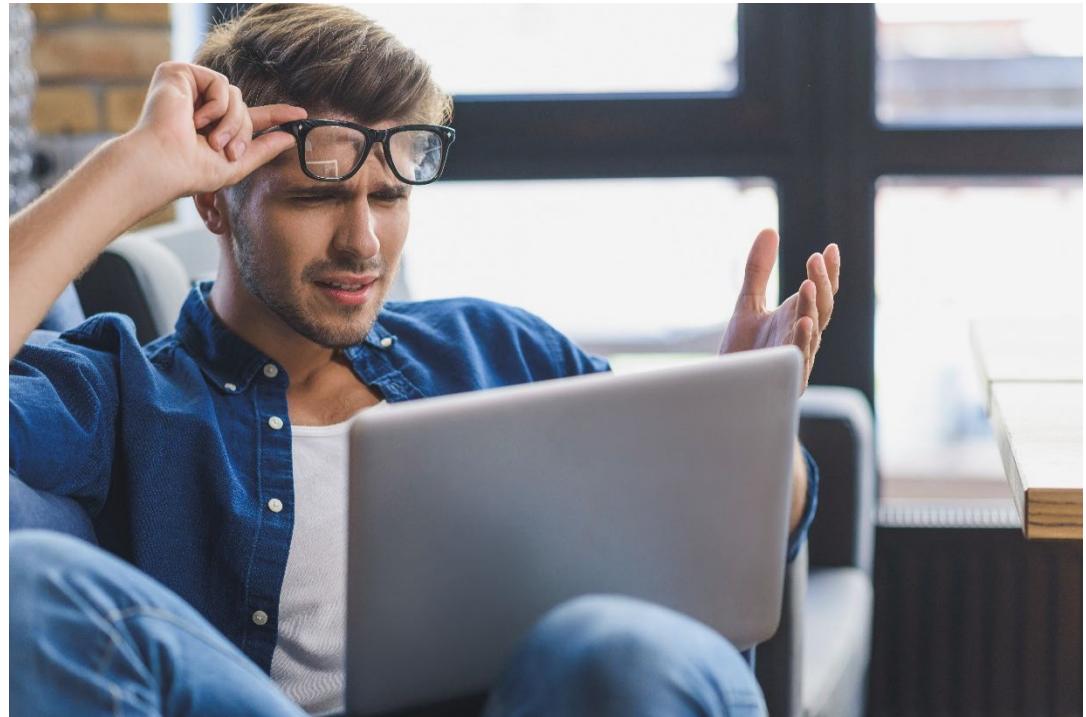
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# WHAT CAUSES TECHNICAL DEBT?



# Insufficient 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?



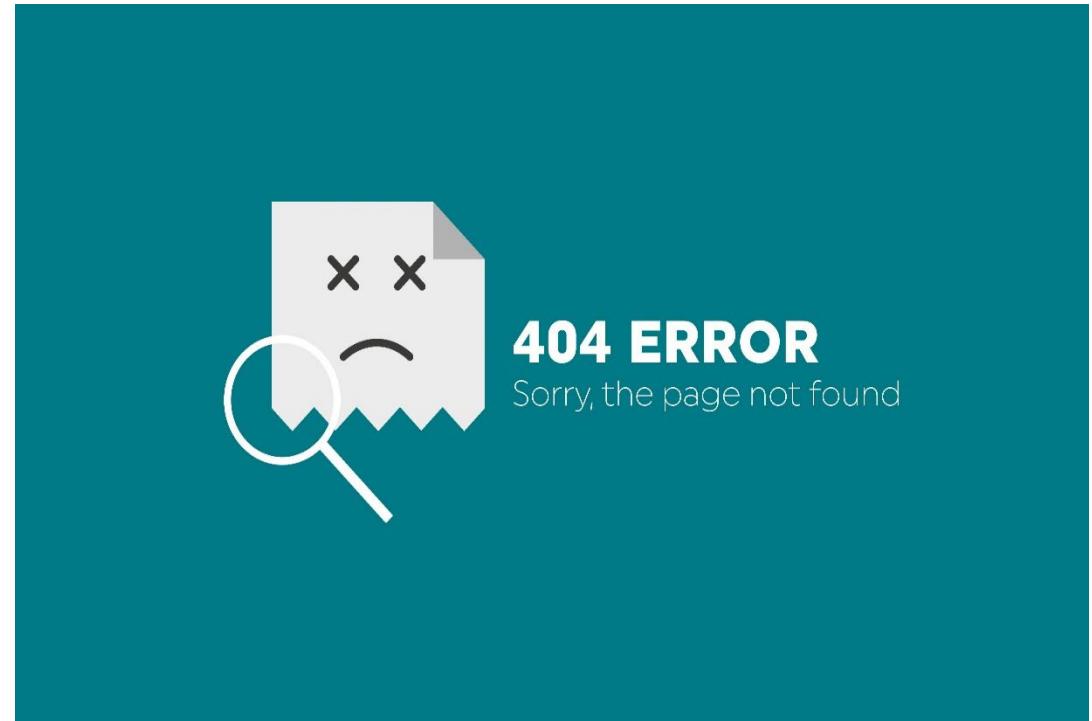
# Lack of a test suite

What causes technical debt?



## Lack of documentation

What causes technical debt?



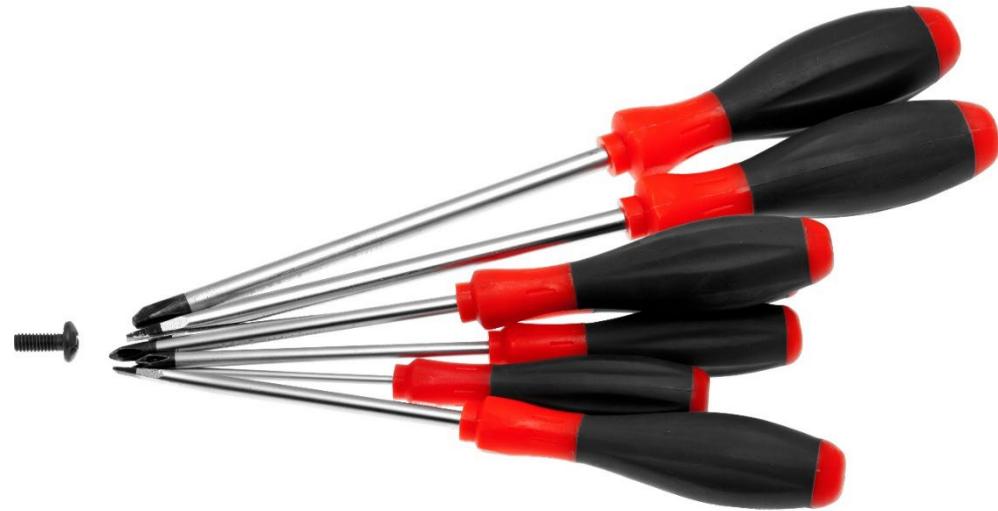
# Lack of collaboration

What causes technical debt?



# Parallel development

What causes technical debt?



# Delayed refactoring

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 changes



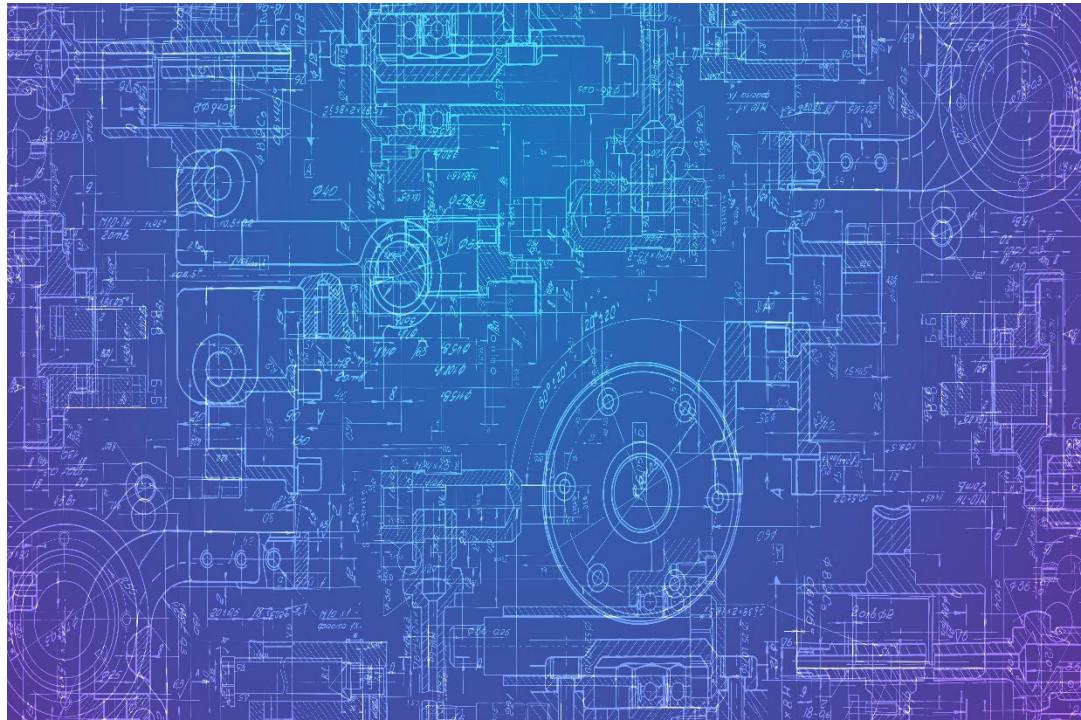
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# TYPES OF TECHNICAL DEBT



# Architecture

## Types of Technical Debt



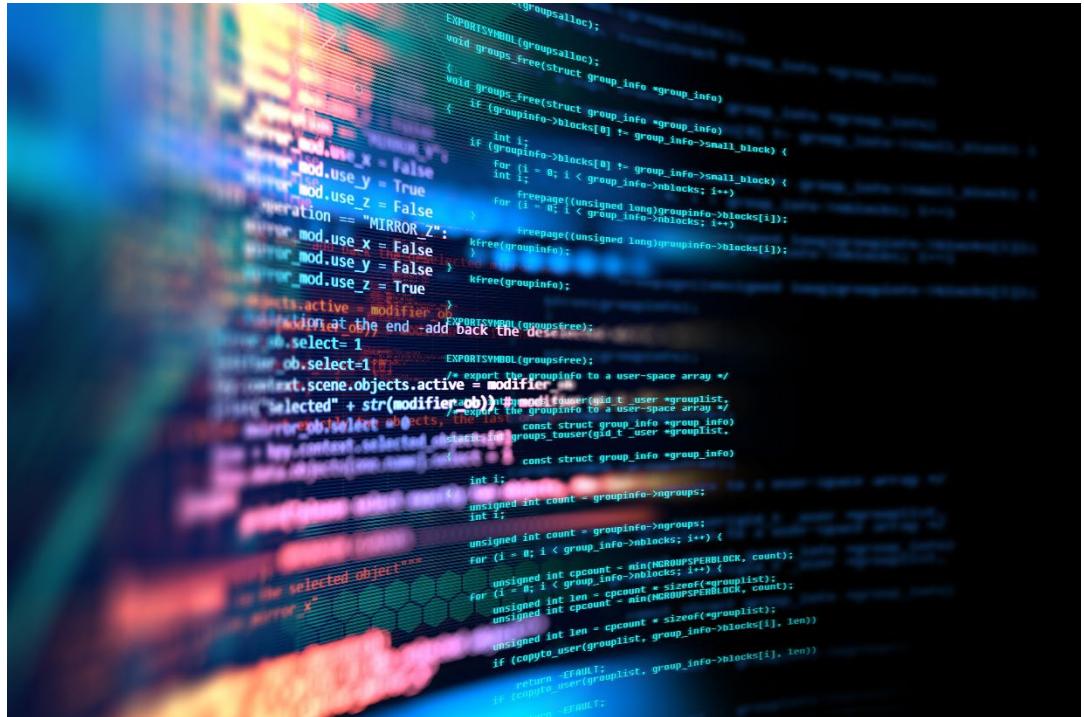
# Build

## Types of Technical Debt



# Code

## Types of Technical Debt



# Defect

Types of Technical Debt



# Design

## Types of Technical Debt



# Documentation

## Types of Technical Debt



# Infrastructure

## Types of Technical Debt



# People

## Types of Technical Debt



# 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



# Types of Technical Debt

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



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# TECHNICAL DEBT IDENTIFICATION



# 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



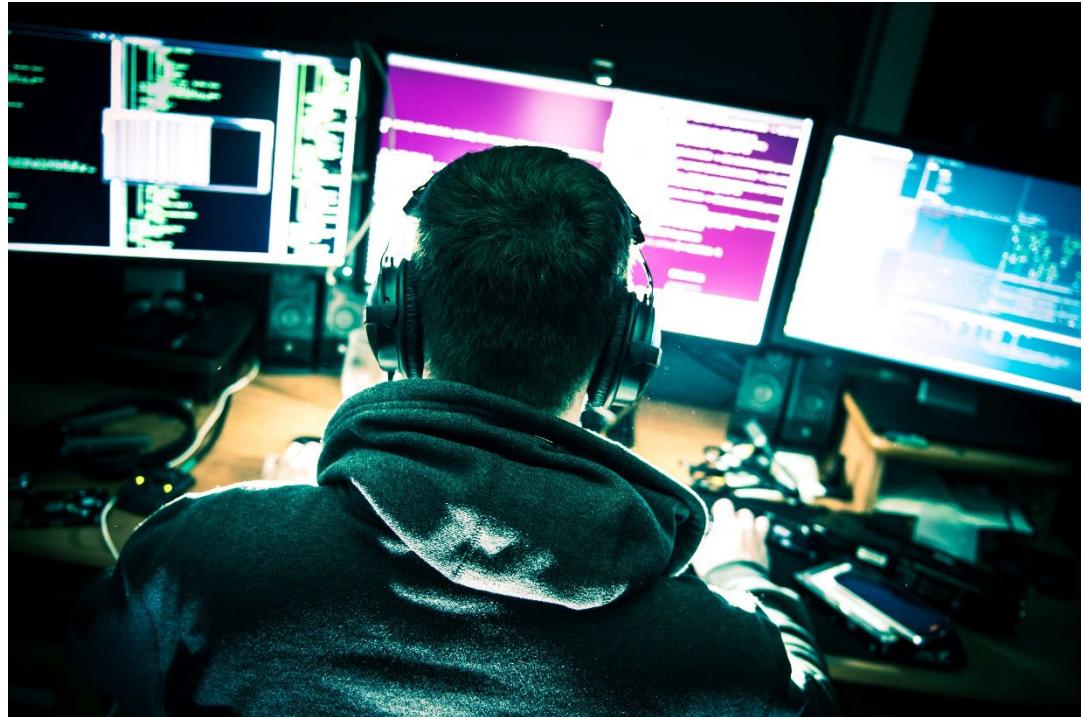
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# OPPORTUNITIES TO IDENTIFY TECHNICAL DEBT



# Coding

Opportunities to Identify Technical Debt



# *Manifesto for Software Craftsmanship*

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

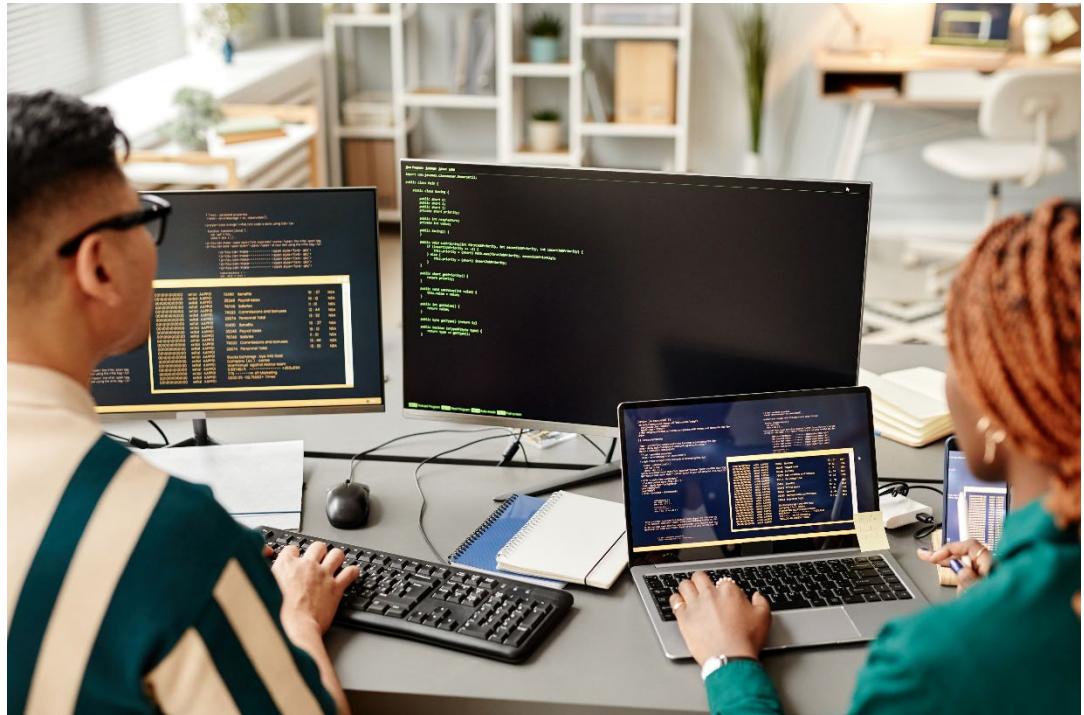
Not only responding to change,  
but also **steadily adding value**

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



# Stand Up

## Opportunities to Identify Technical Debt



# Sprint Review

Opportunities to Identify Technical  
Debt



# Often hidden in plain sight

Opportunities to Identify Technical  
Debt



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# RECODING TECHNICAL DEBT



# Recoding Technical Debt



- User Story
- Product Backlog Item
- Requirement
- Issue

# Recoding 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



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# TRACKING TECHNICAL DEBT



# Tracking Technical Debt



# 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

Co: Complexity

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

# 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

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

| <b>Id</b> | <b>Criticality (CR)</b> | <b>Complexity (CO)</b> | <b>Reward (R)</b> | <b>Score</b> |
|-----------|-------------------------|------------------------|-------------------|--------------|
| 1451      | 5                       | 1                      | 5                 | 1.6          |
| 1452      | 1                       | 5                      | 1                 | -0.4         |

# Technical Debt Score

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

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

# Technical Debt Score

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

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

# Technical Debt Score

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

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



30<sup>th</sup>  
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1993 - 2023

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# TECHNICAL DEBT RATIO



# Technical Debt Ratio

(Remediation Cost / Development Cost) x 100%

| Project   | Remediation Cost | Development Cost | Technical Debt Ratio |
|-----------|------------------|------------------|----------------------|
| Project 1 | 12.1             | 3,633.12         | 0.33%                |

# Technical Debt Ratio

(Remediation Cost / Development Cost) x 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

(Remediation Cost / Development Cost) x 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%               |



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# SUMMARY



# 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
- Recording 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      $(R \times .2) + (CR \times .15) - (CO \times .15)$
- Identifying technical debt
- Recording technical debt
- Technical Debt Score



# 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
- Recording technical debt
- Technical Debt Score
- Technical Debt Ratio

(Remediation Cost / Development Cost)  
x 100%



# Thank You!

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