

# Technical Debt Is Not Free

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**Senior Systems Architect**

**Jasper Engines & Transmissions**

Level: Introduction

Next Generation Skills  
for Developers



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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

Technical Debt Is Not Free

# WHAT IS TECHNICAL DEBT?



## What is Technical Debt?

A story as old as time



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A story as old as time

# What is Technical Debt?

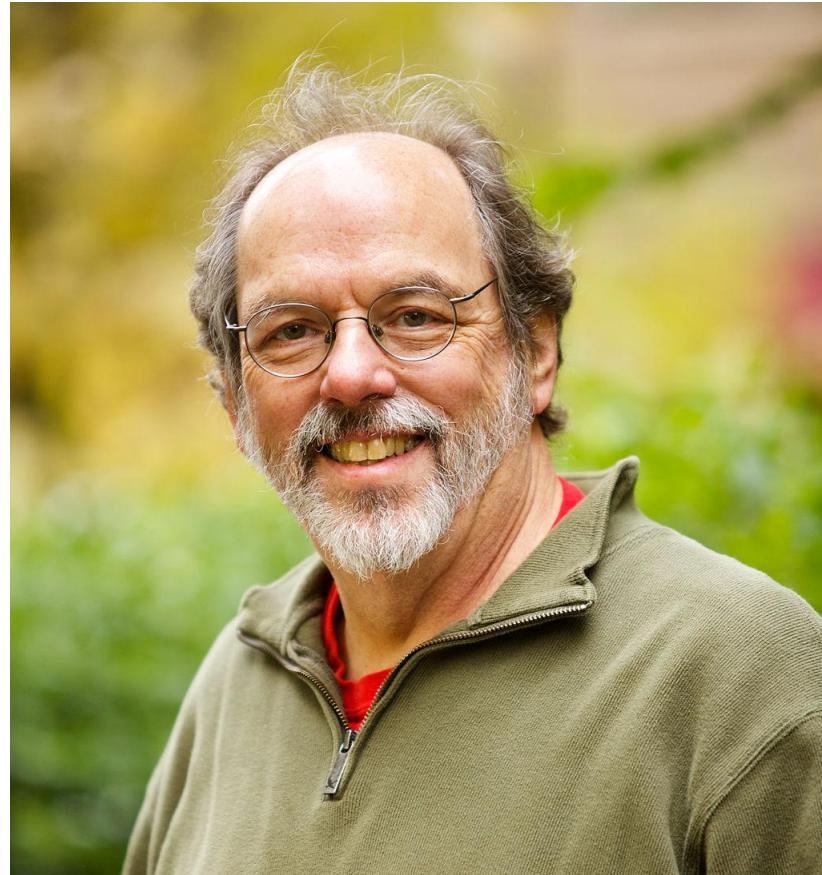
First described by Ward Cunningham in 1992



## What is Technical Debt?

First described by Ward Cunningham in 1992

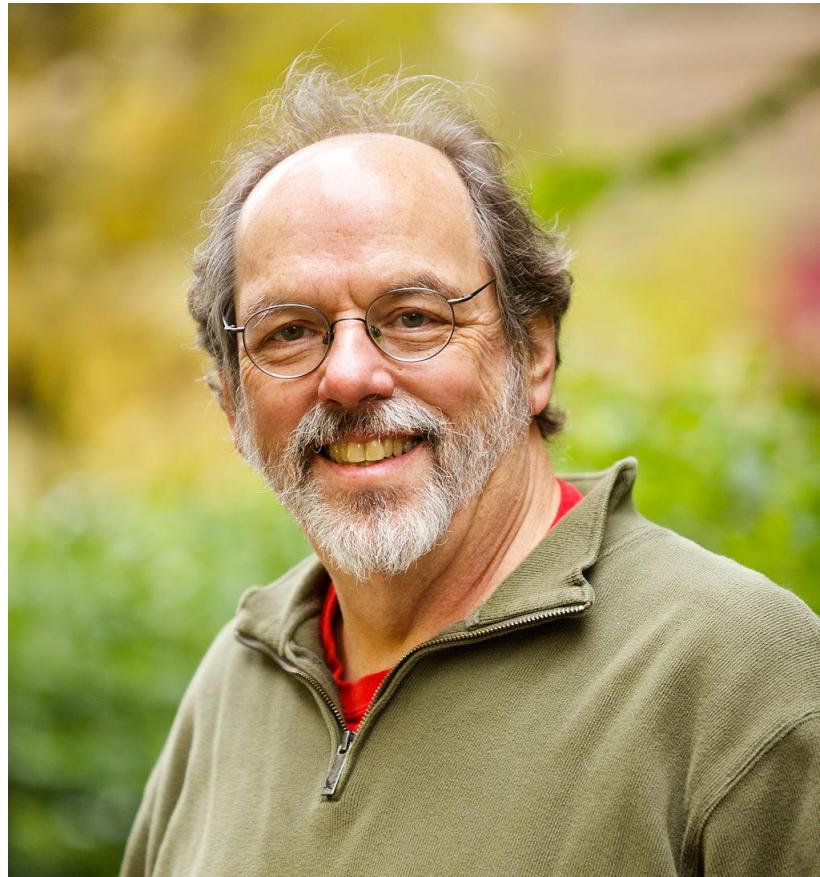
The danger occurs  
when the debt is not  
repaid



## What is Technical Debt?

First described by Ward Cunningham in 1992

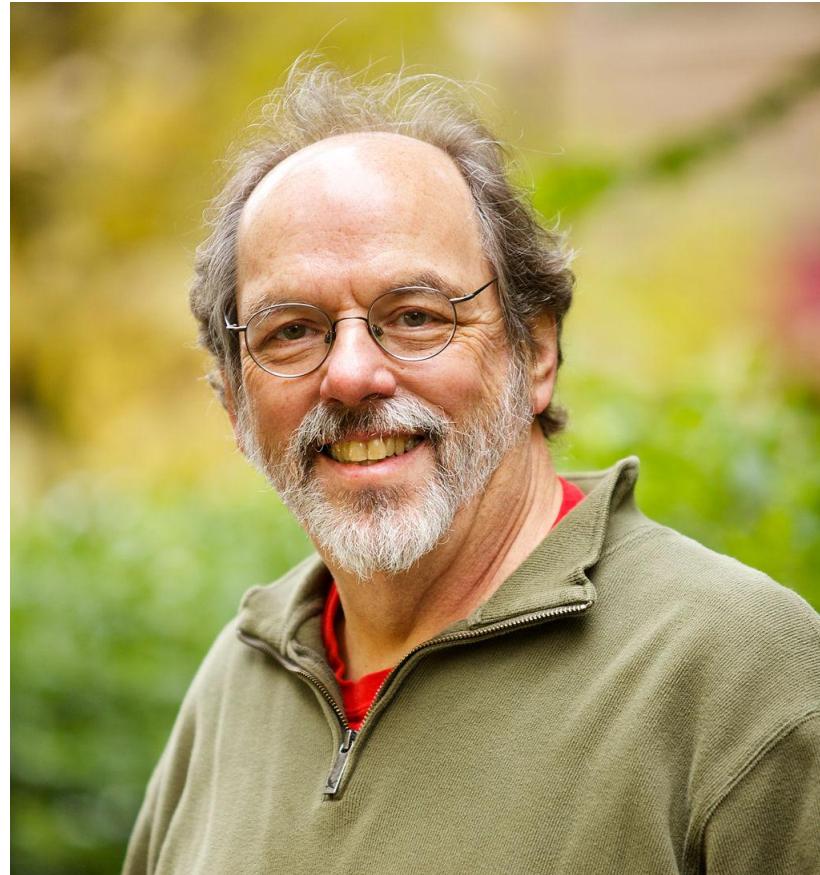
Every minute spent  
on not-quite-right  
code counts as  
interest on that debt.



## 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

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# Another Technical Debt Example

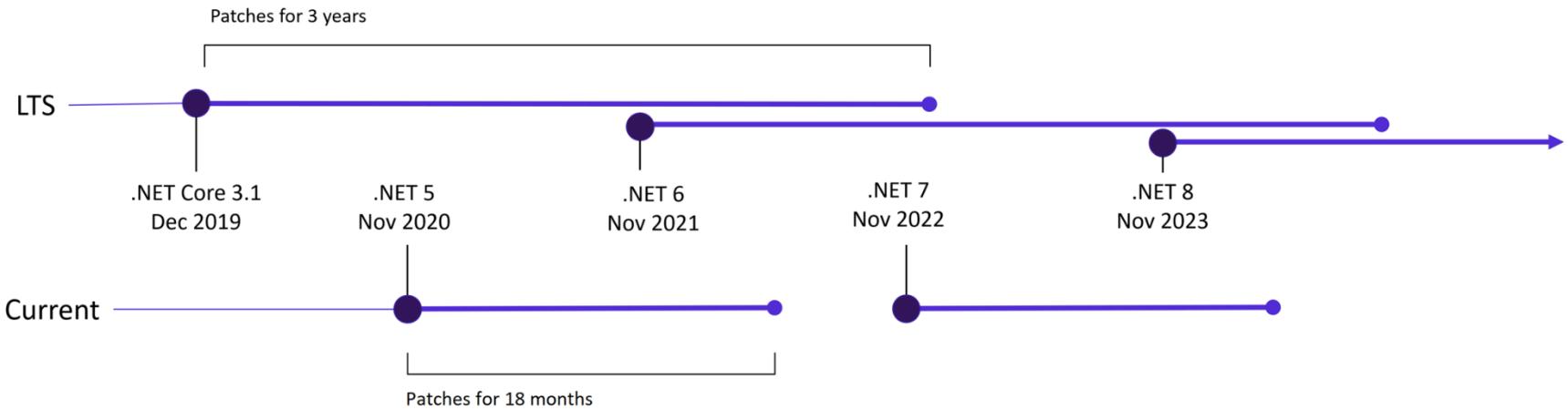
**.NET 5**

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?



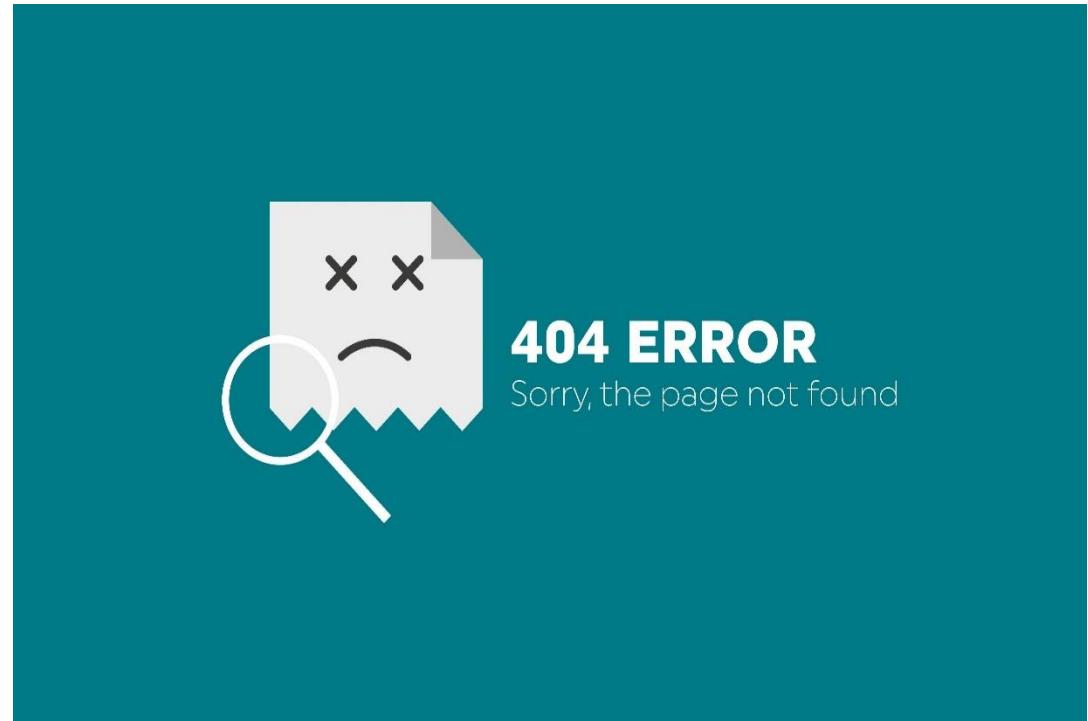
# Lack of a test suite

## What causes technical debt?



## Lack of documentation

What causes technical debt?



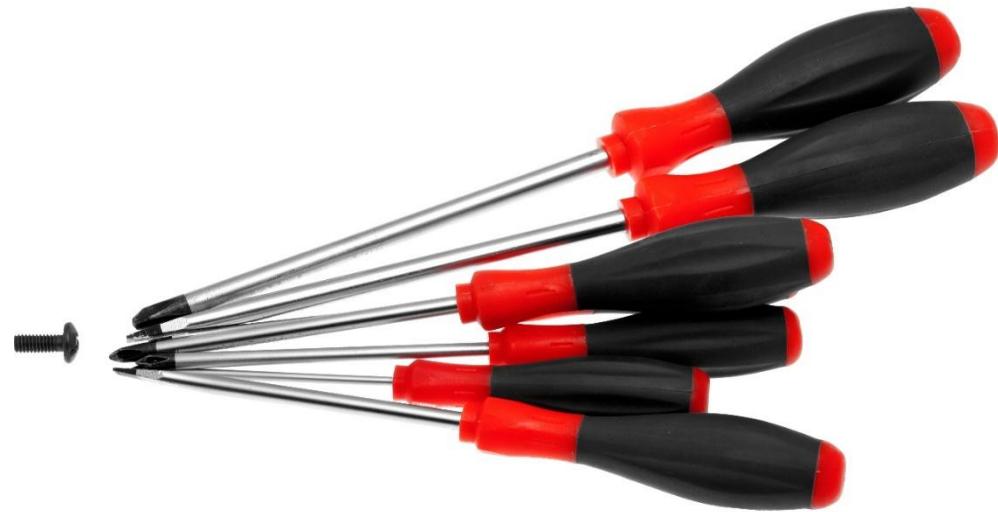
## Lack of collaboration

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?

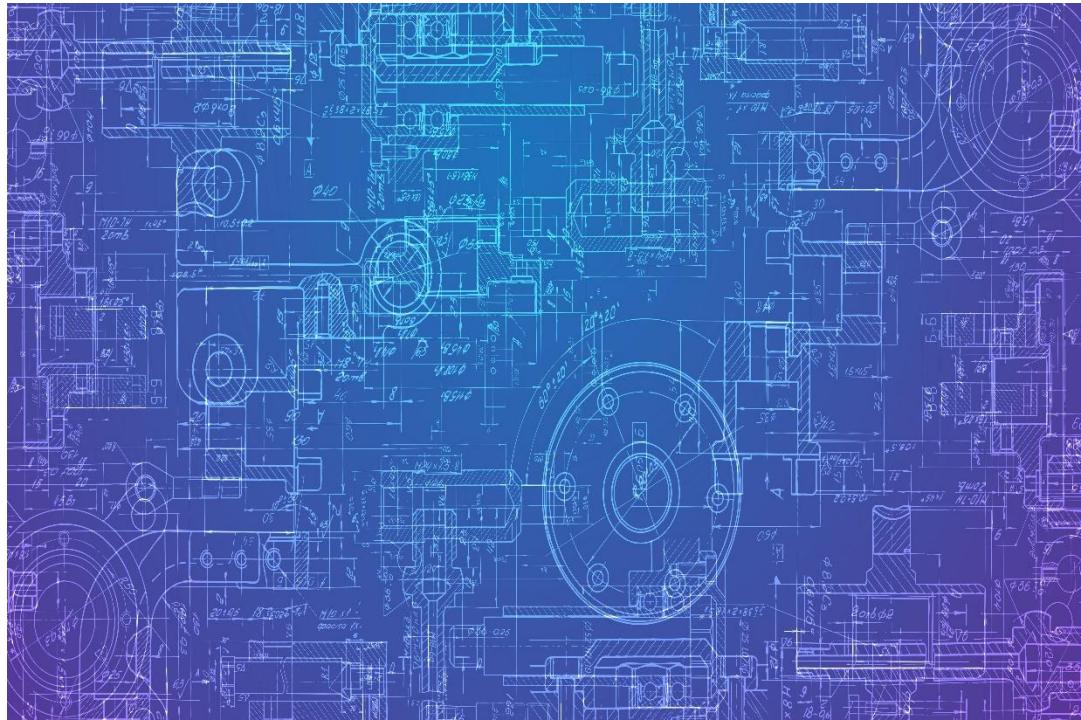
- Insufficient up-front definition
- Business pressures
- Lack of process of understanding
- Tightly-coupled components
- Lack of a test suite
- Lack of documentation
- Lack of collaboration
- Parallel development
- Delayed refactoring
- Lack of alignment to standards
- Lack of knowledge
- Lack of ownership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

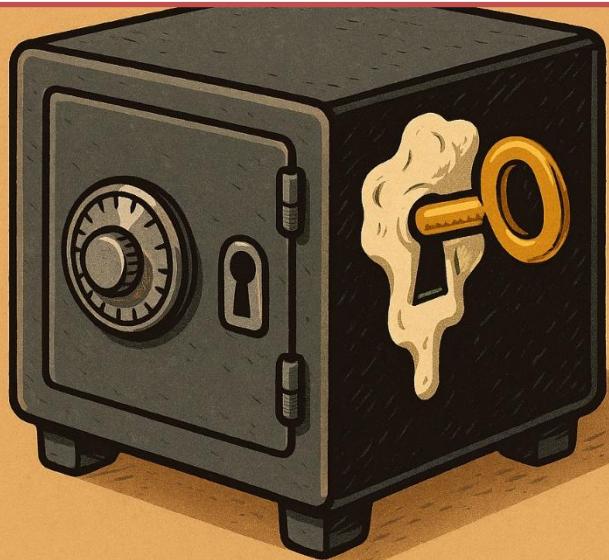
Business  
Misalignment

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# TEST YOUR KNOWLEDGE

# Test Your Knowledge

Locked in by Your Own Shortcut



A team hardcodes configuration values directly into the source code for faster delivery. Is this technical debt?

- Yes, its technical debt
- Only if the code fails in production
- Only if the values are incorrect
- No, it's a best practice

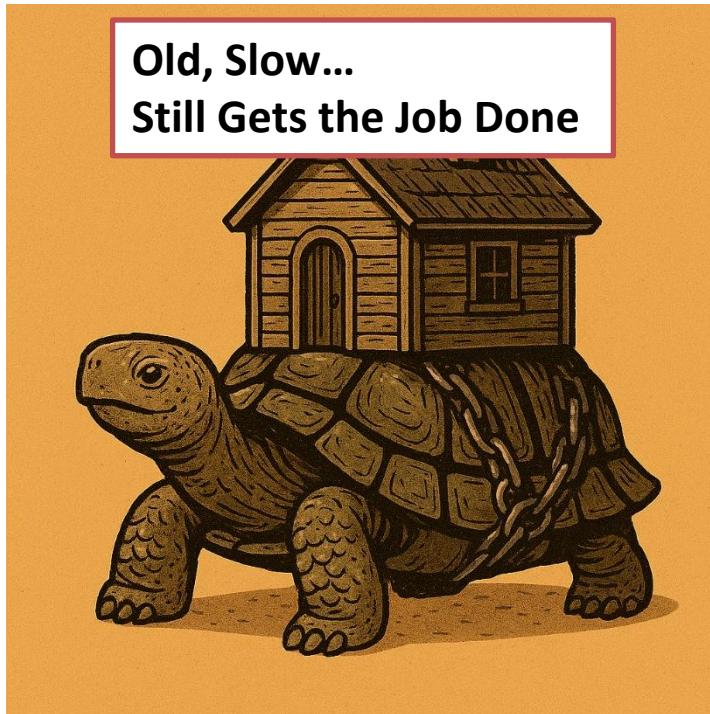
# Test Your Knowledge



A team delays writing unit tests for a new feature to meet a release deadline. Is this technical debt?

- Only if bugs are found later
- Only if the feature is critical
- Yes, it's technical debt
- No, testing is optional

# Test Your Knowledge



A legacy module has been stable and untouched for years. It uses outdated patterns but causes no issues. Is this technical debt?

- Yes, because it's outdated
- No, because it's stable
- Only if it blocks new features
- Only if it affects performance

# Test Your Knowledge

## Power Held Back by the Past

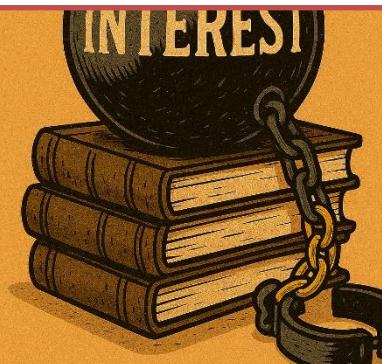


A team chooses to use an outdated third-party library because upgrading would delay a release by two weeks. They plan to “fix it later.” Is this technical debt?

- Yes, It's technical debt
- Only if the library has known security issues
- No, because it's a conscious decision
- Only if the library is no longer supported

# Test Your Knowledge

**The Longer You Wait, the  
Heaver It Gets**



Which of the following best describes “interest payments” on technical debt?

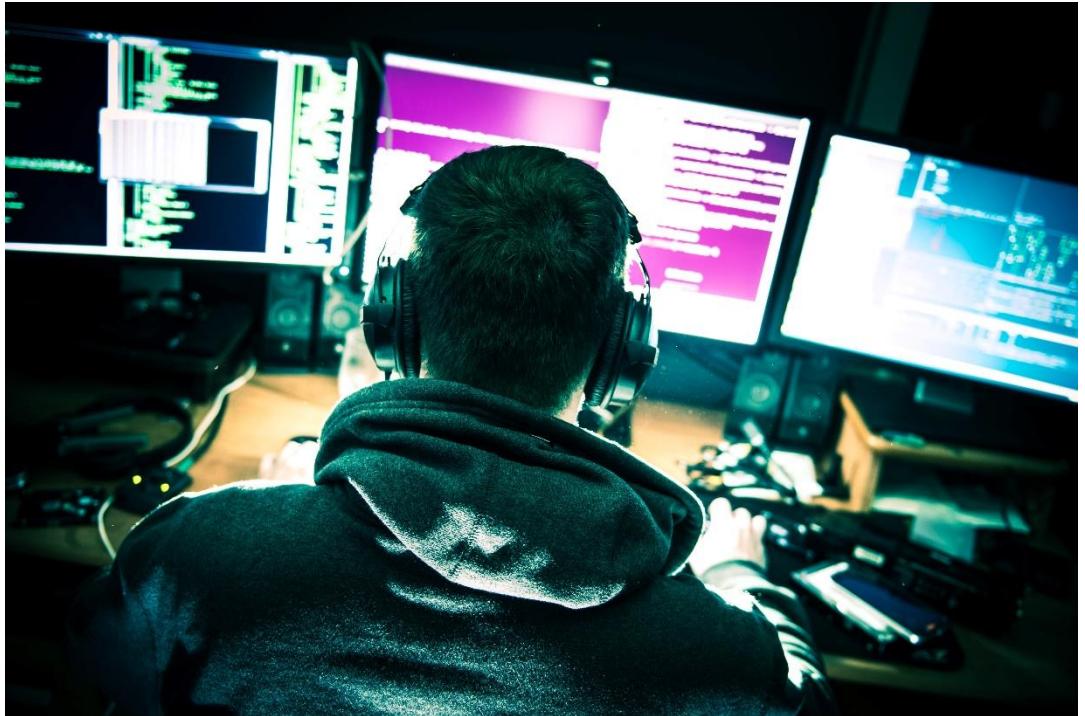
- The financial cost of hiring more developers
- The effort required to maintain or work around debt over time
- The time spent fixing bugs caused by poor design
- The cost of refactoring code

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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**

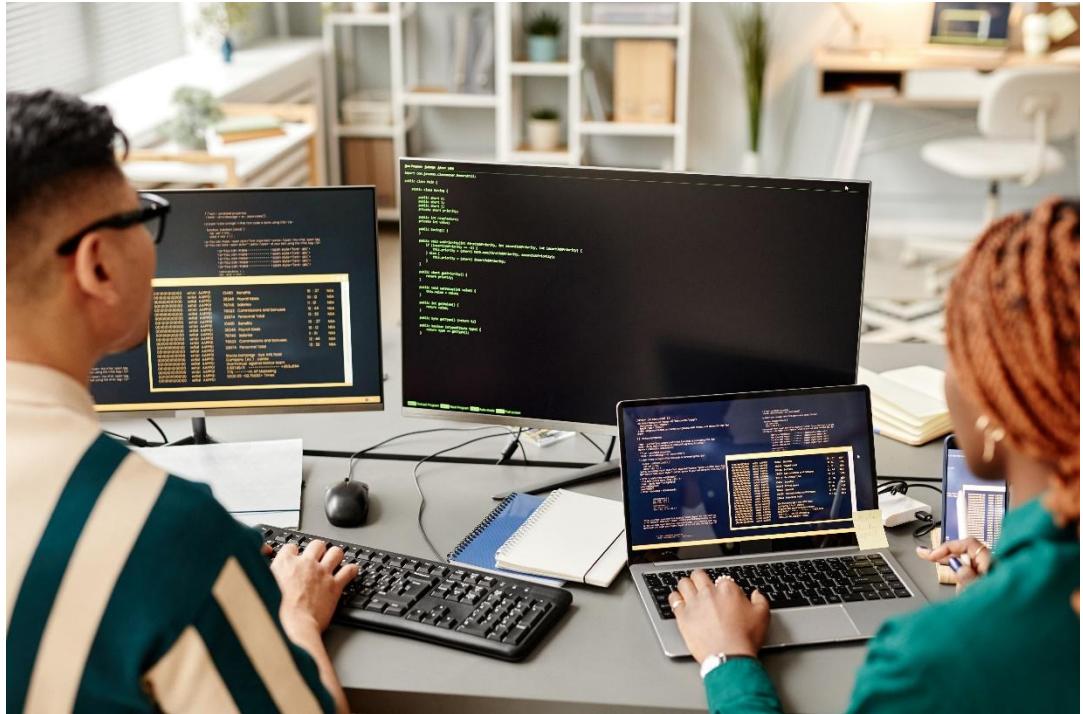
Not only responding to change,  
but also **steadily adding value**

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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# RECORDING 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 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

Product	User Story #	Title	Criticality	Complexity	Reward	Remediation Cost	Technical Debt Score
1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2
3	3	3	3	3	3	3	3
4	4	4	4	4	4	4	4
5	5	5	5	5	5	5	5
6	6	6	6	6	6	6	6
7	7	7	7	7	7	7	7
8	8	8	8	8	8	8	8
9	9	9	9	9	9	9	9
10	10	10	10	10	10	10	10
11	11	11	11	11	11	11	11
12	12	12	12	12	12	12	12
13	13	13	13	13	13	13	13
14	14	14	14	14	14	14	14
15	15	15	15	15	15	15	15
16	16	16	16	16	16	16	16
17	17	17	17	17	17	17	17
18	18	18	18	18	18	18	18
19	19	19	19	19	19	19	19
20	20	20	20	20	20	20	20
21	21	21	21	21	21	21	21
22	22	22	22	22	22	22	22
23	23	23	23	23	23	23	23
24	24	24	24	24	24	24	24
25	25	25	25	25	25	25	25
26	26	26	26	26	26	26	26
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28	28	28	28	28	28	28	28
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31	31	31	31	31	31	31	31
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33	33	33	33	33	33	33	33
34	34	34	34	34	34	34	34
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36	36	36	36	36	36	36	36
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41	41	41	41	41	41	41	41
42	42	42	42	42	42	42	42
43	43	43	43	43	43	43	43
44	44	44	44	44	44	44	44
45	45	45	45	45	45	45	45
46	46	46	46	46	46	46	46
47	47	47	47	47	47	47	47
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52	52	52	52	52	52	52	52
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62	62	62	62	62	62	62	62
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74	74	74	74	74	74	74	74
75	75	75	75	75	75	75	75
76	76	76	76	76	76	76	76
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79	79	79	79	79	79	79	79
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82	82	82	82	82	82	82	82
83	83	83	83	83	83	83	83
84	84	84	84	84	84	84	84
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86	86	86	86	86	86	86	86
87	87	87	87	87	87	87	87
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95	95	95	95	95	95	95	95
96	96	96	96	96	96	96	96
97	97	97	97	97	97	97	97
98	98	98	98	98	98	98	98
99	99	99	99	99	99	99	99
100	100	100	100	100	100	100	100

# 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



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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

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- What is technical debt?
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- 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

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- 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?
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- Technical Debt Score
- Technical Debt Ratio

(Remediation Cost / Development Cost)  
x 100%

# Thank You!

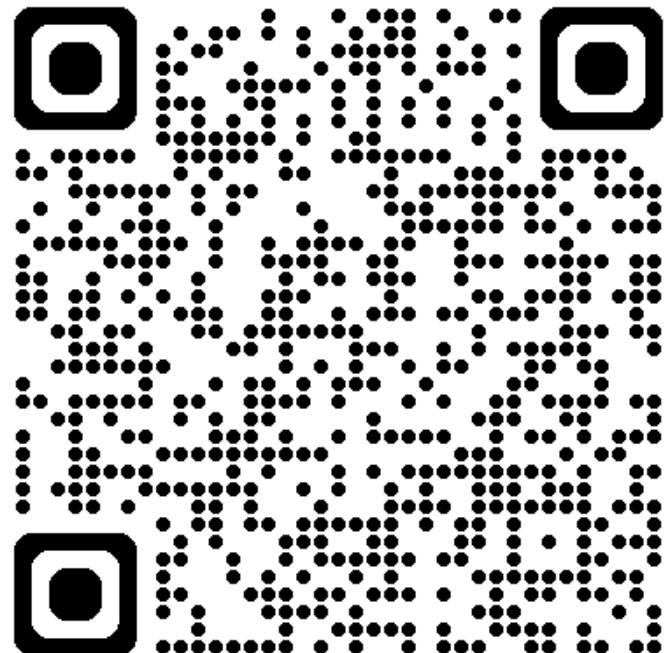
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