



MISSISSIPPI STATE
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Managing Technical Debt: An Industrial Case Study

Managing Technical Debt Workshop
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Presenter:

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Motivation

- Lack of empirical research for practitioners
- Identify best practices regarding Technical Debt (TD)
 - Characterization
 - Consequences
 - Addressing
 - Prioritization

Taxonomy

McConnell



Fowler



Intentional

Unintentional

Reckless

*"We don't have time
for design"*

Prudent

*"We must ship now
and deal with
consequences"*

Deliberate

Inadvertent

"What's Layering?"

*"Now we know how we
should have done it"*

Rothman



Design
Debt

Code
Debt

Testing
Debt

Defect
debt

Documentation
debt

Cost Estimation



You know it is not my interest to pay the principal, or my principal to pay the interest.

(Richard Brinsley Sheridan)

Nugroho et al

Principal → Repair Effort
Interest → Maintenance Effort

Chin et al

Principal
Recurring interest
Compounding Interest

Curtis et al

Principal
Number of should-fix violations
Hours to fix each violation
Cost of labor.

Decision Making

Prioritization techniques [Seaman et al]

**Cost Benefit
Analysis approach**

**Analytic
Hierarchy
Process (AHP)**

**Portfolio
approach**

**Options
approach**

Prioritization factor [Snipes et al]

Severity

Existence of a workaround

Urgency of the fix

required by a customer

Effort to implement the fix

Risk of the proposed fix

Scope of testing required

Decreasing
order of
importance

Research Questions

- RQ1: How can technical debt be **characterized** to distinguish the impacts of certain types of debt?
- RQ2: What are the **consequences** of technical debt on the development process?
- RQ3: How is technical debt **addressed**?
- RQ4: How can technical debt be **prioritized** so that the most critical ones are addressed first?

Study Context

Mid-size
industrial partner

2000
employees

Specializes in
communication
devices

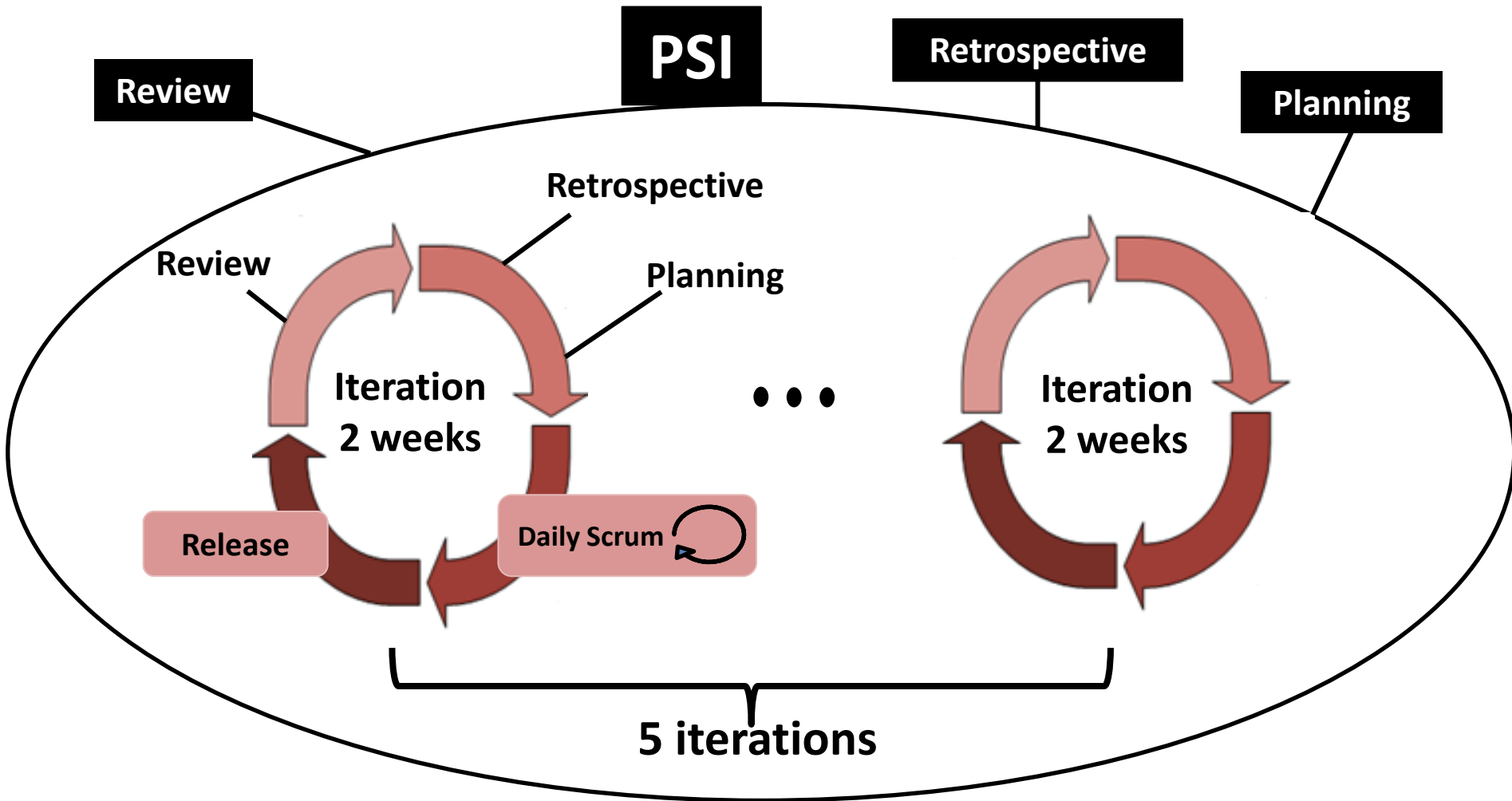
Division adopted
Scrum in 2012

28 Scrum
teams

250 engineers

In-house
training

Potentially Shippable Increment



User Story Color Codes

Feature

Planned
Defect

Infrastructure
Debt

Design
Spike

Automation
Debt

Data Collection

Phase 1
Duration: 3 days



Observation

Phase 2
Duration: 3 days



Interviews
(Focus: agile
adoption)

Phase 3
Duration: 2 days



**Online
Questionnaire**



Interviews
(Focus:
technical debt)

Coding Scheme

Codes	Description
Definition	Words/phrases used to define/describe technical debt
Categories	Different types of technical debt
Causes and Impact	Causes - Motivations behind incurring technical debt Impact - Consequences of technical debt
Prioritization	Techniques/process to prioritize technical debt
Management	Tracking/managing/handling technical debt

Definition & Categories

Definition

Get things out quickly

Create bad software

Conscious decision



Something that will hurt you later

Categories

Code design debt

Unit testing

Automation debt, fix defects and bugs

Test debt, bug debt

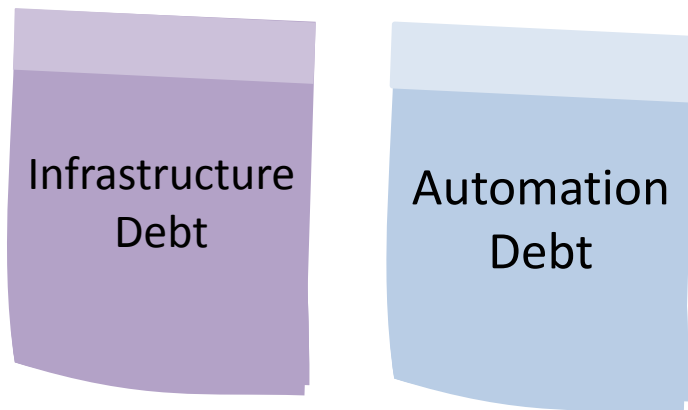


Research Question 1

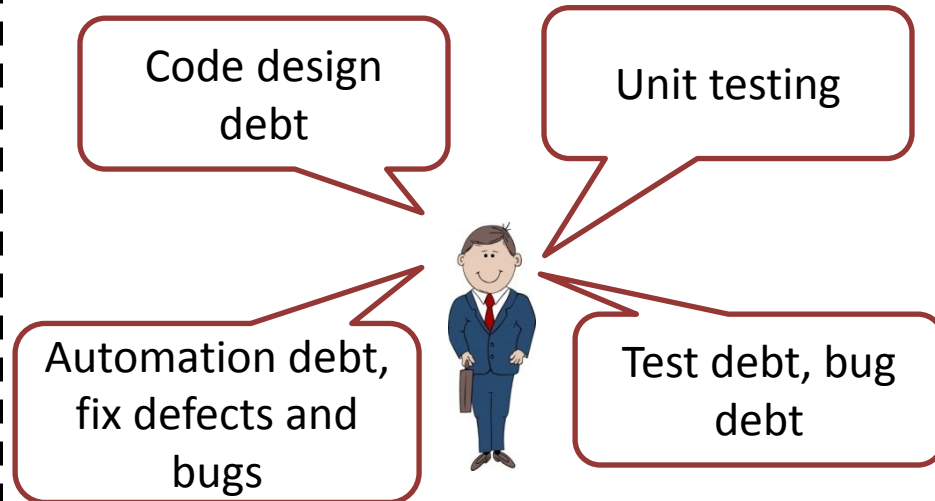
How can technical debt be characterized to distinguish the impacts of certain types of debt?

Definition & Categories

Management Categories



Engineers Categories



Research Question 1

How can technical debt be characterized to distinguish the impacts of certain types of debt?

Consequences

- Lack of insights



if [the debt is] not solved for two years, it kills a project

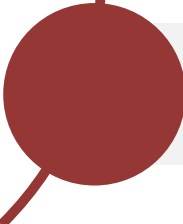
Research Question 2

What are the consequences of technical debt on the development process?

Management



Dedicated teams for TD reduction



Teams assign about 20% of PSI time for debt reduction

Research Question 3
How is technical debt addressed?

Prioritization

Customer
Requests

Severity of
the debt







Research Question 4
**How can technical debt be prioritized so that
the most critical ones are addressed first?**

Limitations

- Study carried out with one partner
 - Development of software for communication devices
 - New to agile
- Researcher bias in the interpretation of results

Conclusion

- Goal: understand how technical debt is characterized, addressed, prioritized and assess its impact
- Results

Taxonomy	Management	Consequences	Prioritization
			

What's Next

- Focus on **consequences** of technical debt
 - Investigate appropriate models to assess impact of debt
 - Evaluate risk associated with taking on debt
- Replicate study with industrial partner (as process matures) and other partners

Thank You



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