# Managing Technical Debt

## Credit Check

**TECHNICAL DEBT OCCURS** when a design or construction approach is taken that is expedient in the short term but increases complexity and cost in the long term. Whether it results from inexperience, accident, or strategy, all software-reliant systems carry some technical debt. If managed well, some technical debt can accelerate design exploration and system delivery. Left unrecognized and unmanaged, accumulated technical debt drives up development and sustainment costs. Understanding the causes of debt is essential for selecting the appropriate management practices and successfully controlling the debt.

### All Systems Have Technical Debt

All organizations with long-lived software-intensive



Transportation

Banking and Finance

Gas and Oil Storage and Delivery

Electrical Energy
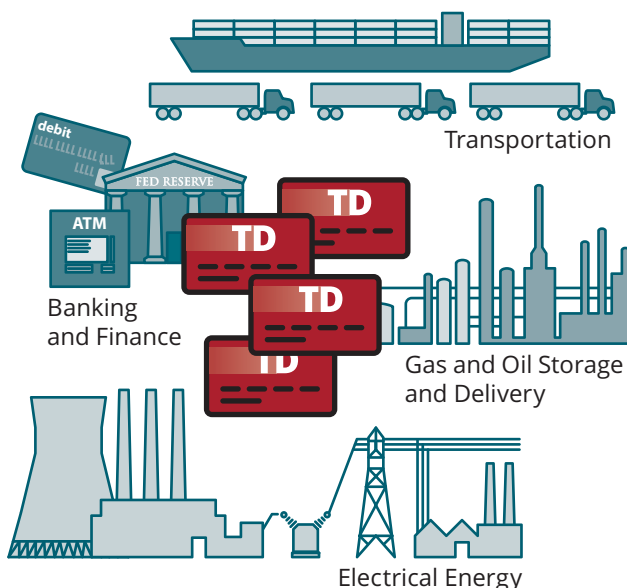
systems have to deal with technical debt. The Software Engineering Institute (SEI) recommends conducting a Technical Debt Credit Check to reveal the causes of technical debt and determine whether the debt will continue to grow. The Technical Debt Credit Check is a systematic approach to understand the context and state of a software development project using four focus areas: business vision, architecture, development, and organization. Technical debt can be introduced in many different ways, at different points in the lifecycle, and by different stakeholders. The credit check examines the history of a project to identify trends in how technical debt has been or might be introduced.

An organization or team may sense that technical debt is building up but find it hard to begin addressing it systematically. If this is happening in your organization, the Technical Debt Credit Check can bring awareness of technical debt to development teams and decision makers. It begins with a check of the business goals against the system architecture, development practices, and organizational context. The findings provide guidance for successfully executing a deeper analysis of a system, formulating a strategy for managing technical debt, and determining actionable outcomes.

You can also use the Technical Debt Credit Check as an ongoing activity that is part of a project's objectives for continuous improvement. To do this, your organization establishes a baseline in areas that are most likely to contribute to technical debt and allocates analysis and management resources accordingly. Once you have established the baseline, the project can use the criteria to investigate causes of technical debt periodically to keep it under control.

## Benefits of a Credit Check

The Technical Debt Credit Check will help an organization

- understand how it introduces debt into the system
- prioritize development practices to improve
- make organizational changes that reduce injection of unnecessary debt

The four focus areas—business vision, architecture, development, and organization—inform analysis techniques that uncover causes of technical debt and help you prioritize what to do next. Here are some common examples:

- With a clear vision of the business goals of the system, a project team will understand the desired system qualities, the desired development state, and the consequences of choices that developers make when diverging from that state. Without this clear vision, a system can accrue technical debt and suffer consequences that affect cost and schedule. The Technical Debt Credit Check reveals where business goals and the system are misaligned so that you can take steps to close the gap.

- Architecting activities that balance the short-term and long-term technical goals of a project must be integrated into the software development lifecycle to strategically manage technical debt. The Technical Debt Credit Check reveals where a system's architecturally significant requirements are unclear so that you can take steps to derive the important quality attributes from business goals.

- If development practices don't align with the business vision and architecture, the development infrastructure and implementation efforts can inject technical debt that lowers the overall value or quality of the system or raises its cost. The Technical Debt Credit Check reveals potential risks related to development and its processes and tools so that you can take steps to realign practices and put the necessary quality control procedures in place.

- When an organization's structure does not support its development processes, technical debt creeps in. The Technical Debt Credit Checks reveals where iteration cycles across the organization in large projects are misaligned (e.g., between hardware, software, and safety-critical testing) so that you can take steps to better align the cycles and revisit the testing strategy.

## How We Can Help

The SEI helps project teams conduct a Technical Debt Credit Check to identify the root causes of a system's existing technical debt and determine whether the debt will continue to grow.

The Technical Debt Credit Check enables teams to review their business vision, the organization's capacity to support that vision, and the software development artifacts and practices.

When you understand the causes of debt, you can select appropriate management practices to reduce further debt.

During the assessment:

- The SEI guides project teams through a self-analysis based on criteria and questions provided by the SEI.

- The project teams and the SEI review the results of the self-analysis.

- The SEI team conducts follow-on interviews.

- The SEI team analyzes the results and presents a scorecard that includes causes of technical debt identified in each focus area, ranked according to impact based on the data collected.

- The SEI recommends software engineering improvements that address the high-impact causes and that will institutionalize an integrated practice for managing technical debt.

- The SEI recommends techniques to identify technical debt items that may result from the observed causes.

The project team and key stakeholders—such as the architect, product owner, and project manager—will need to be available for interviews and work with the SEI team, vet the results, and review the findings to ensure that the analysis is accurate.

The outcome is a scorecard that lists the causes of technical debt and recommendations for improvement.

## About the SEI

Always focused on the future, the Software Engineering Institute (SEI) advances software as a strategic advantage for national security. We lead research and direct transition of software engineering, cybersecurity, and artificial intelligence technologies at the intersection of academia, industry, and government. We serve the nation as a federally funded research and development center (FFRDC) sponsored by the U.S. Department of Defense (DoD) and are based at Carnegie Mellon University, a global research university annually rated among the best for its programs in computer science and engineering.

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