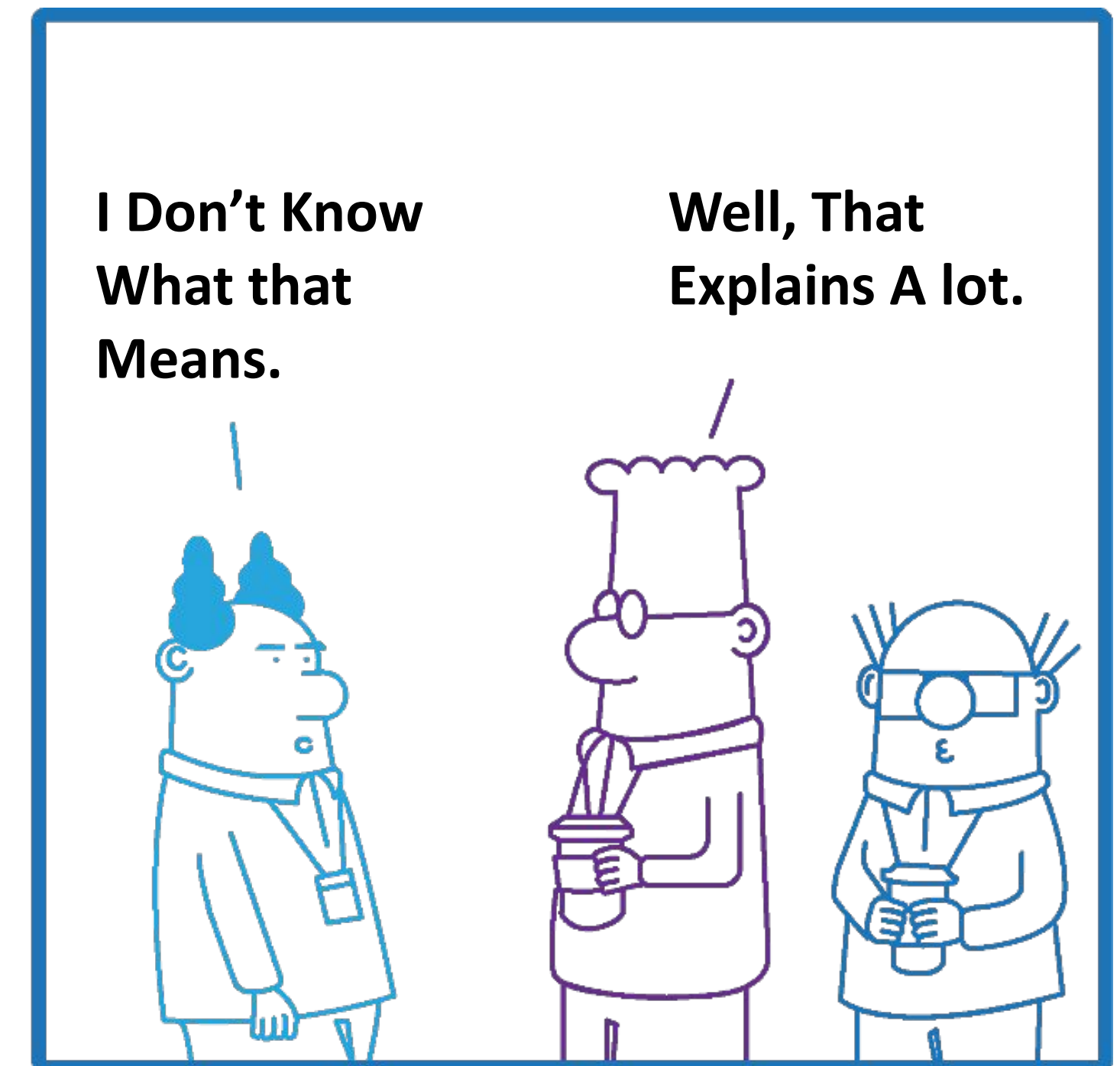
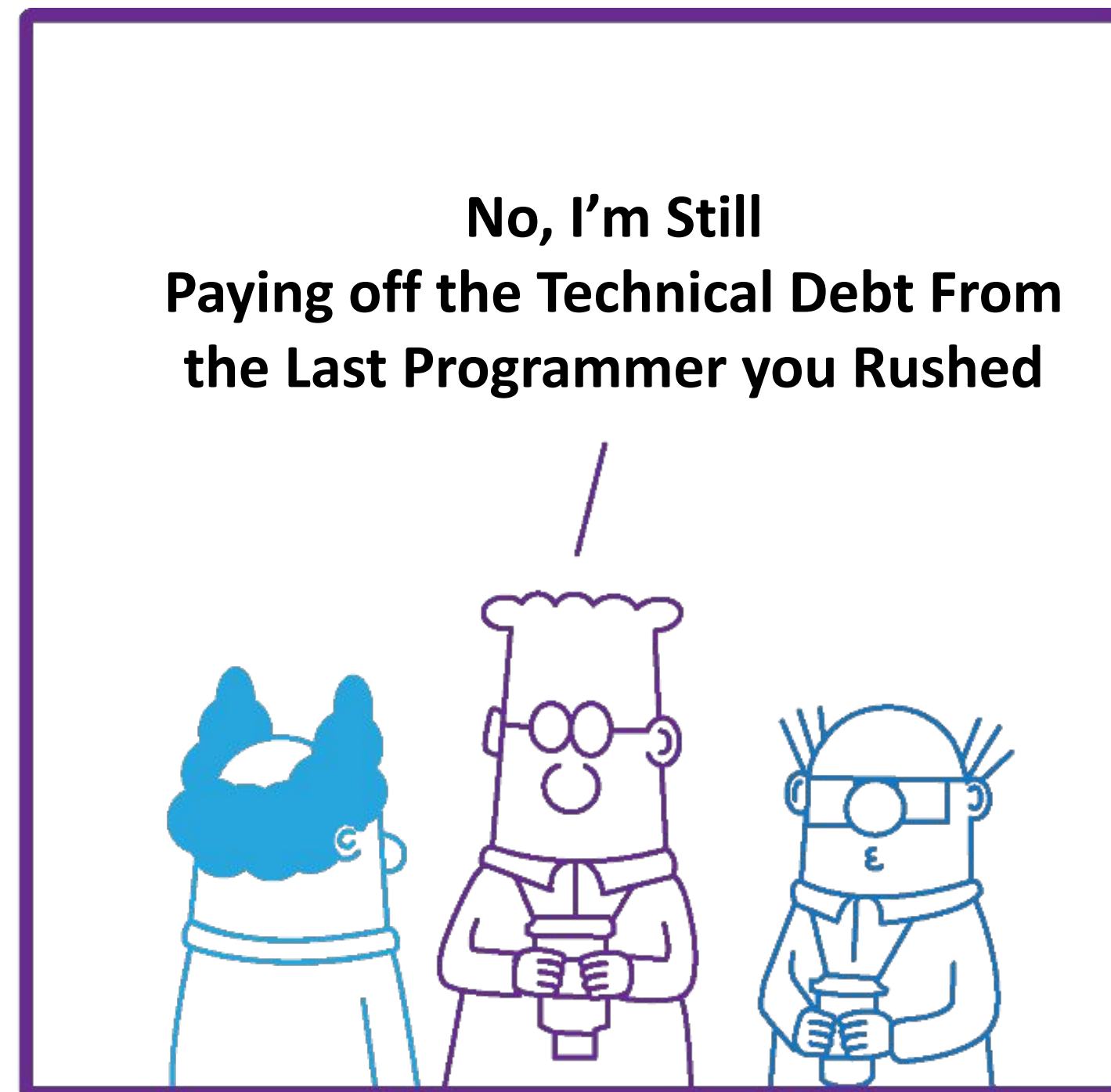
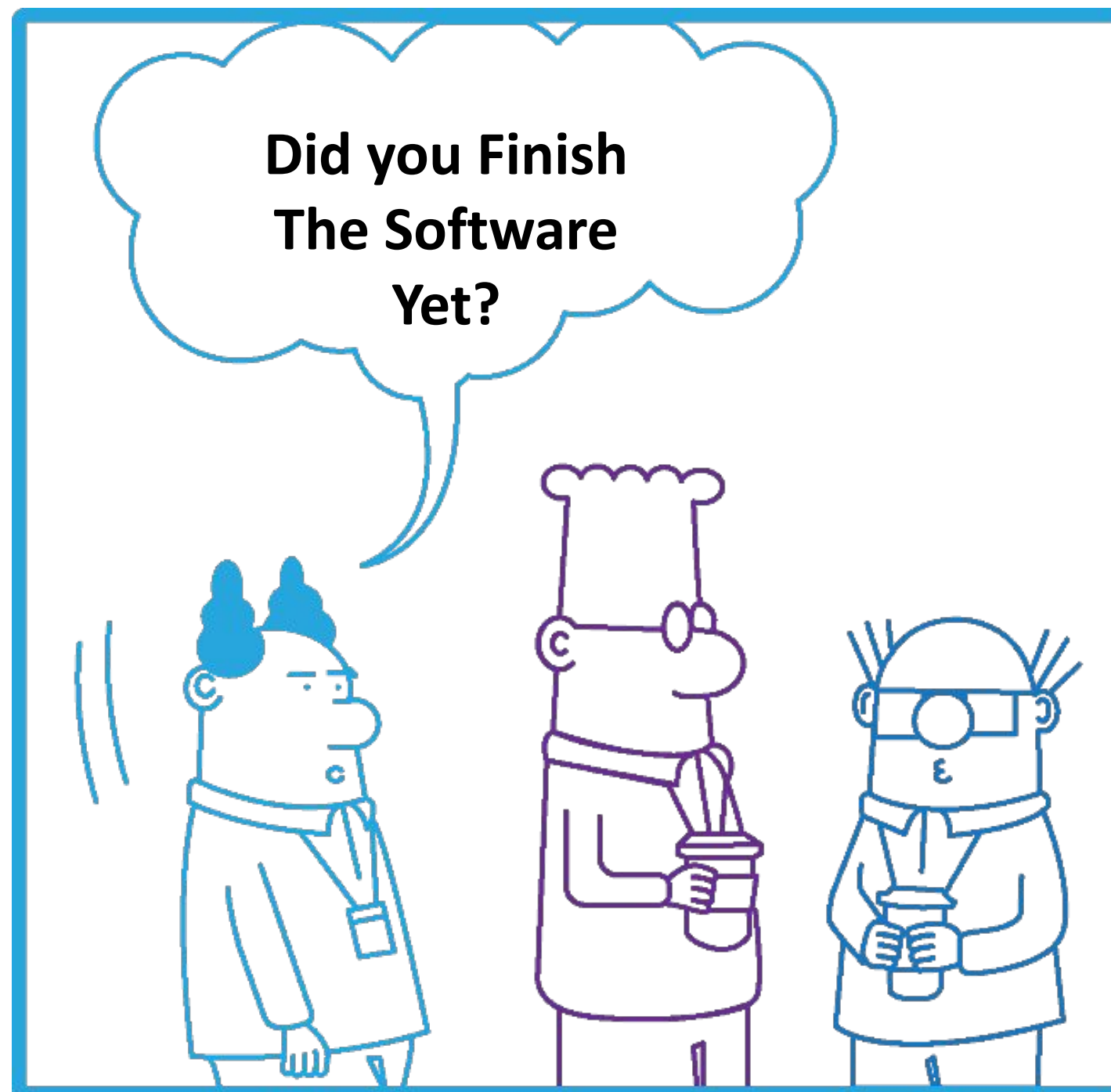


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Measuring Technical Debt to Avoid Tech Bankruptcy

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Nischal Doshi

Head of Solutions and Presales

A Techno Functional Solutions Leader in Product Engineering, Enterprise Solutions engineering.

Summary

- What is Tech Debt and Why measure it
- Identifying What to measure and How to measure
- How to Manage the Tech Debt and When to do Modernization
- Tech Debt Takeaways

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Redefining Tech Debt and Why Measure it

Common Customer Challenges of Product Engineering in Accion World

We do not have single truth of Customer Identity resulting in disjointed customer experience

We have 5 different versions of "Address Verification" service

Customers can't figure out our UI and Mobile App does not work with the same platform

We need "Data Infrastructure expert consultant" to analyze frequent system down issue

Our in-house teams are spending more time in maintenance vs new feature development

We are facing multiple security breaches

We are still running outdated version of this software and finding difficult to rollout updates / patches

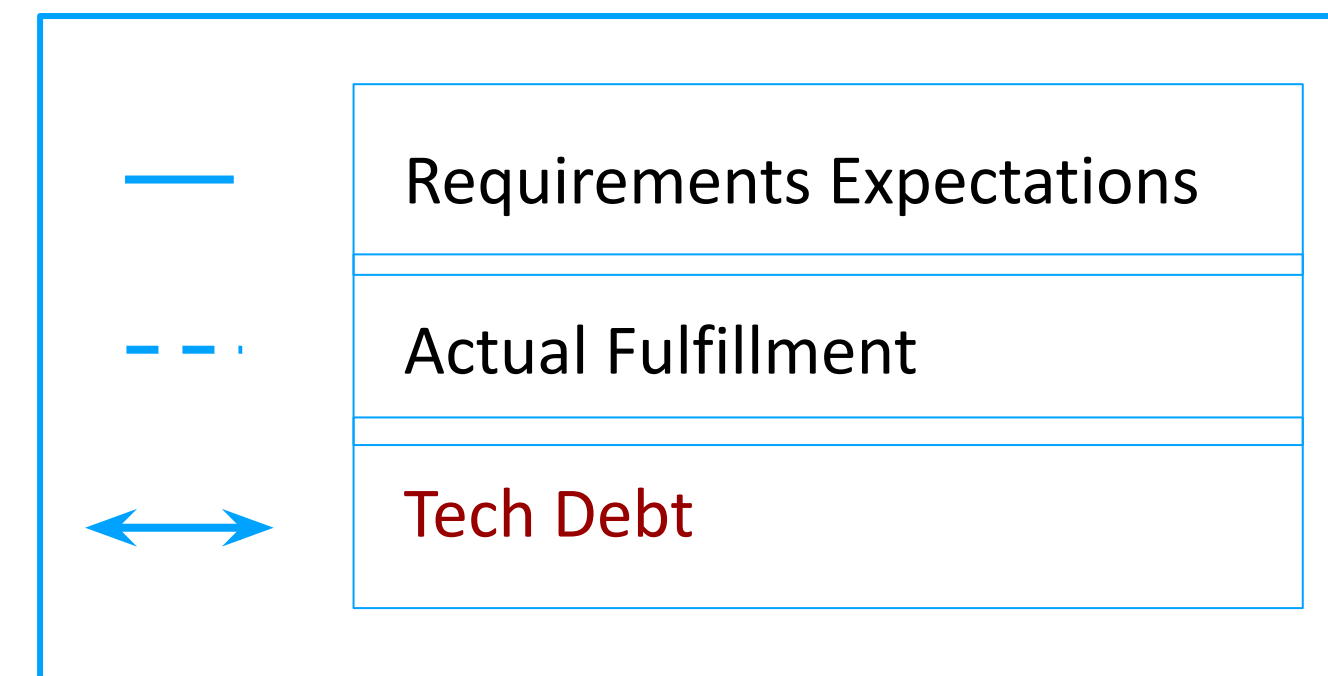
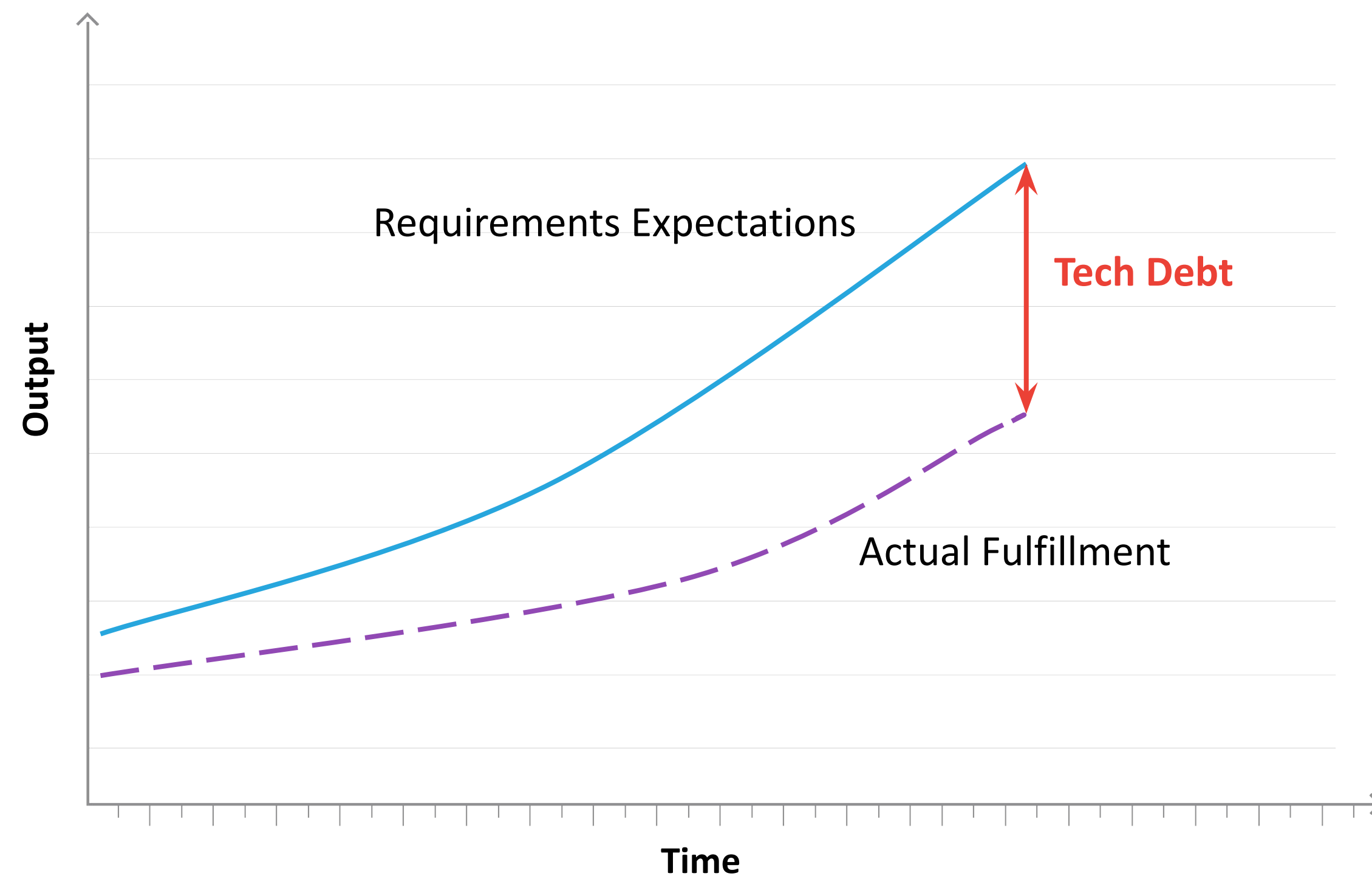
Our platform is unable to scale for new demands and services

We need to fix performance issues first before we can add new features

That piece of code is too old, nobody knows how it works, I would not touch it

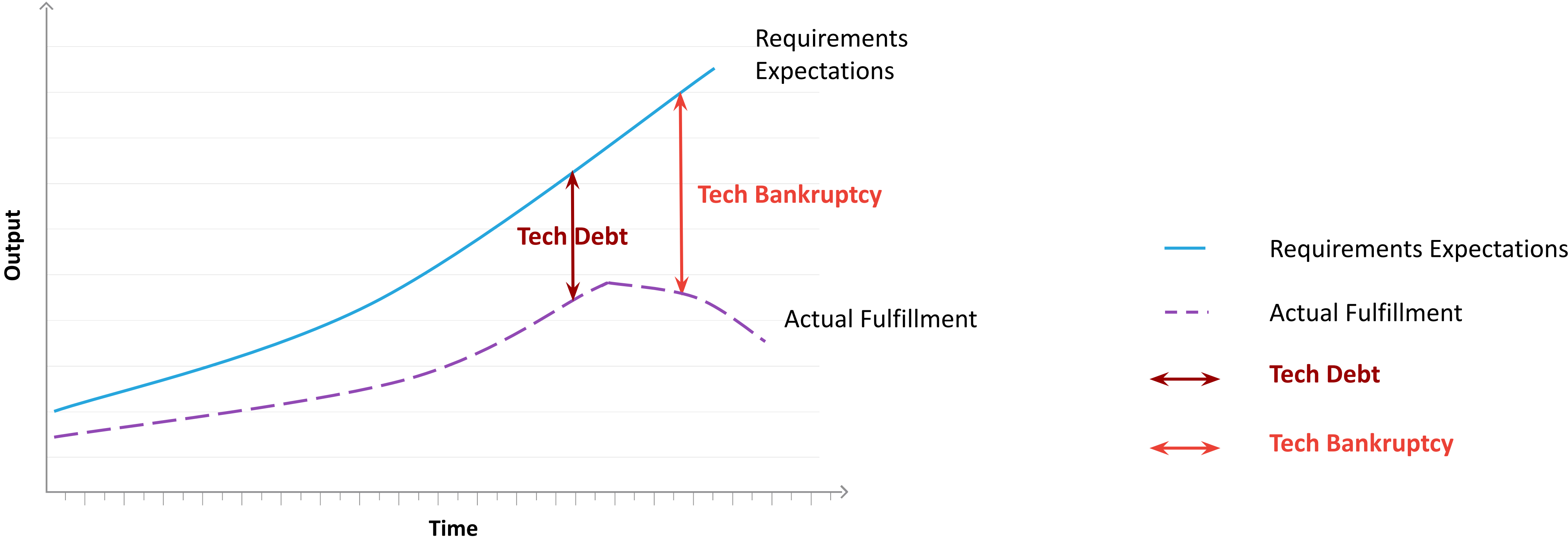
Our code-base became too complex as we kept adding customizations for each new client

Too much inconsistent data to develop and test against

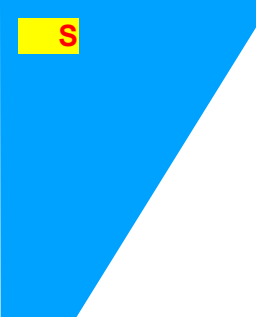


Tech Debt is: Additional time and cost required to close the gap between the requirements expectations vs the actual fulfillment.

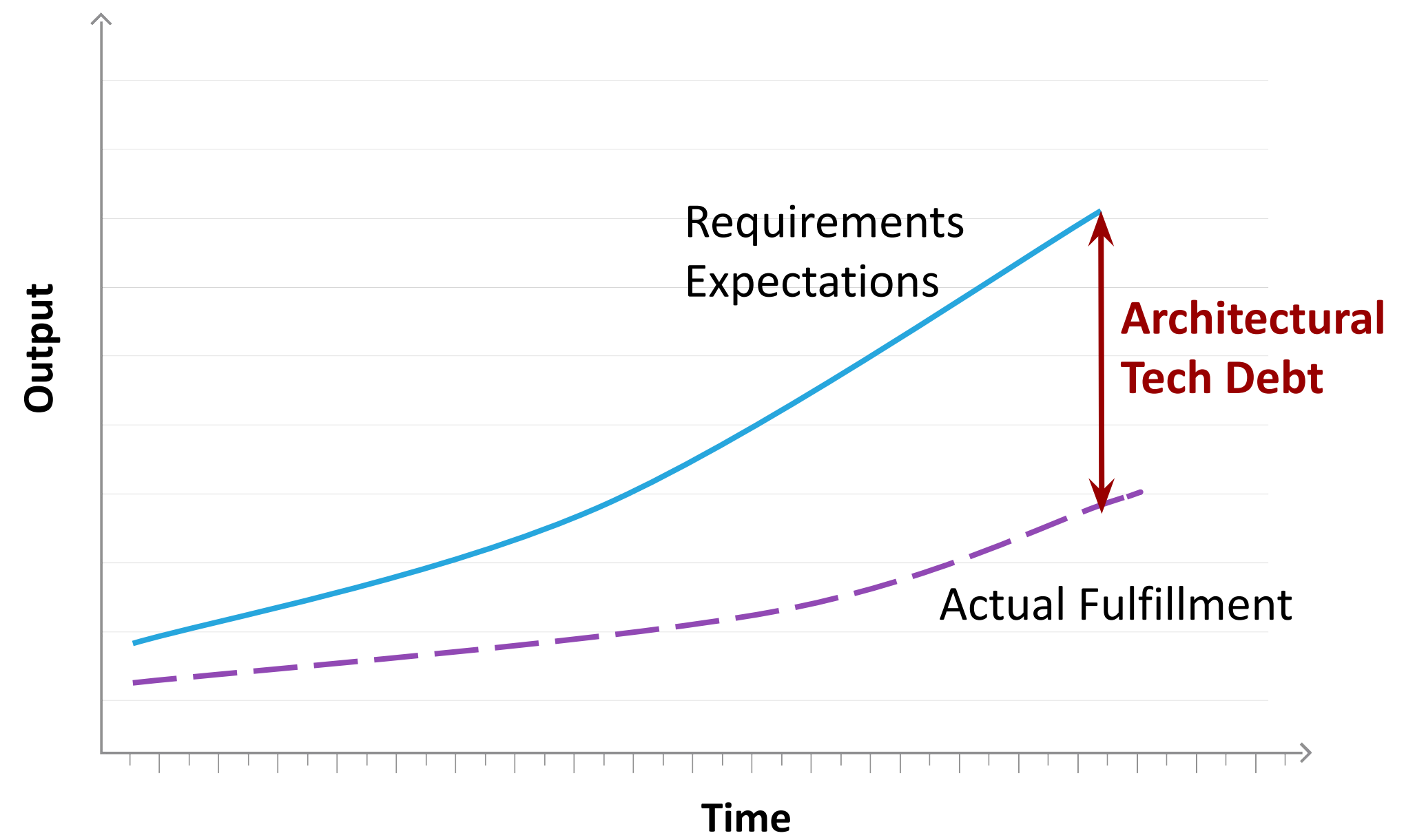
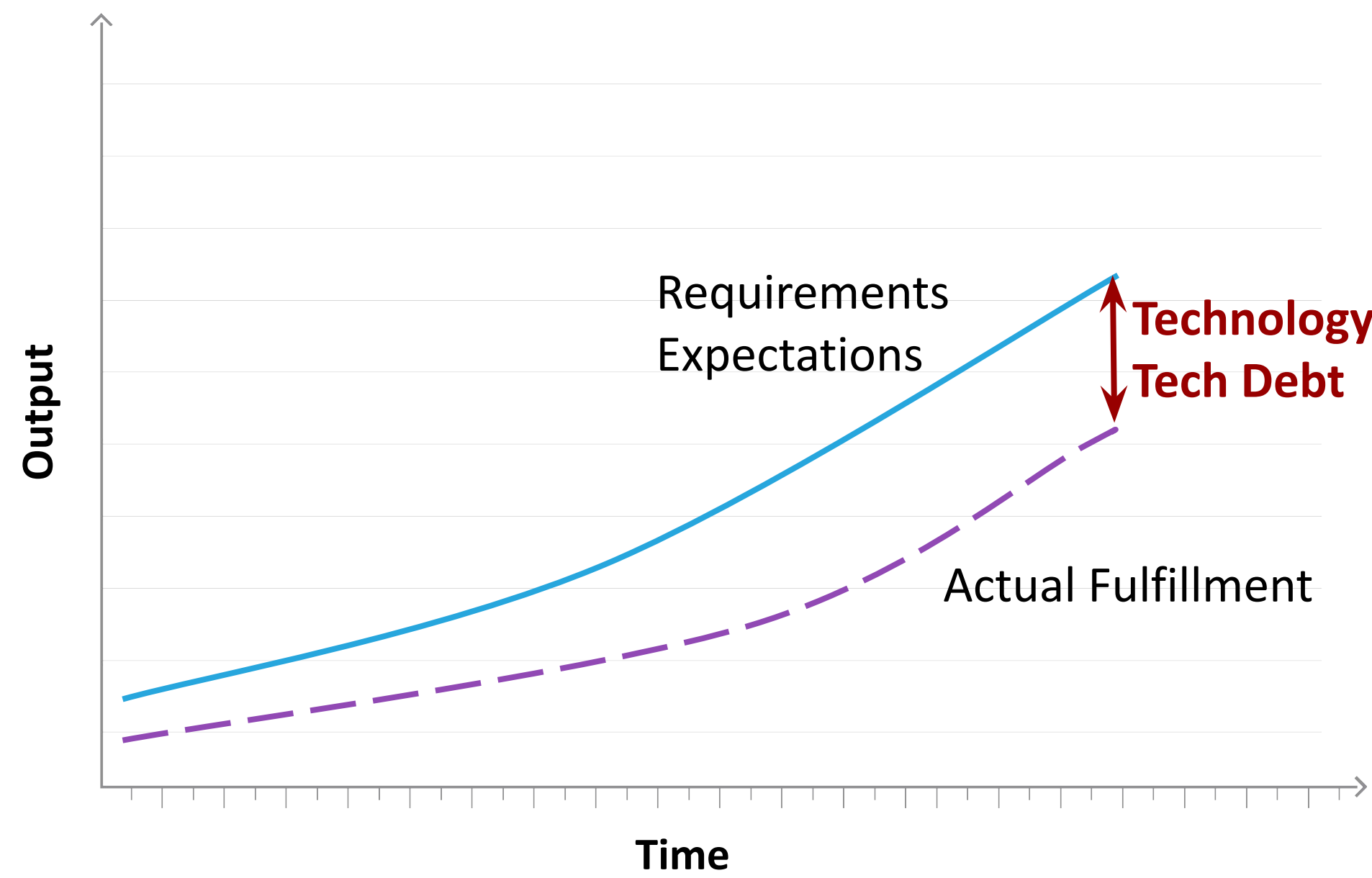
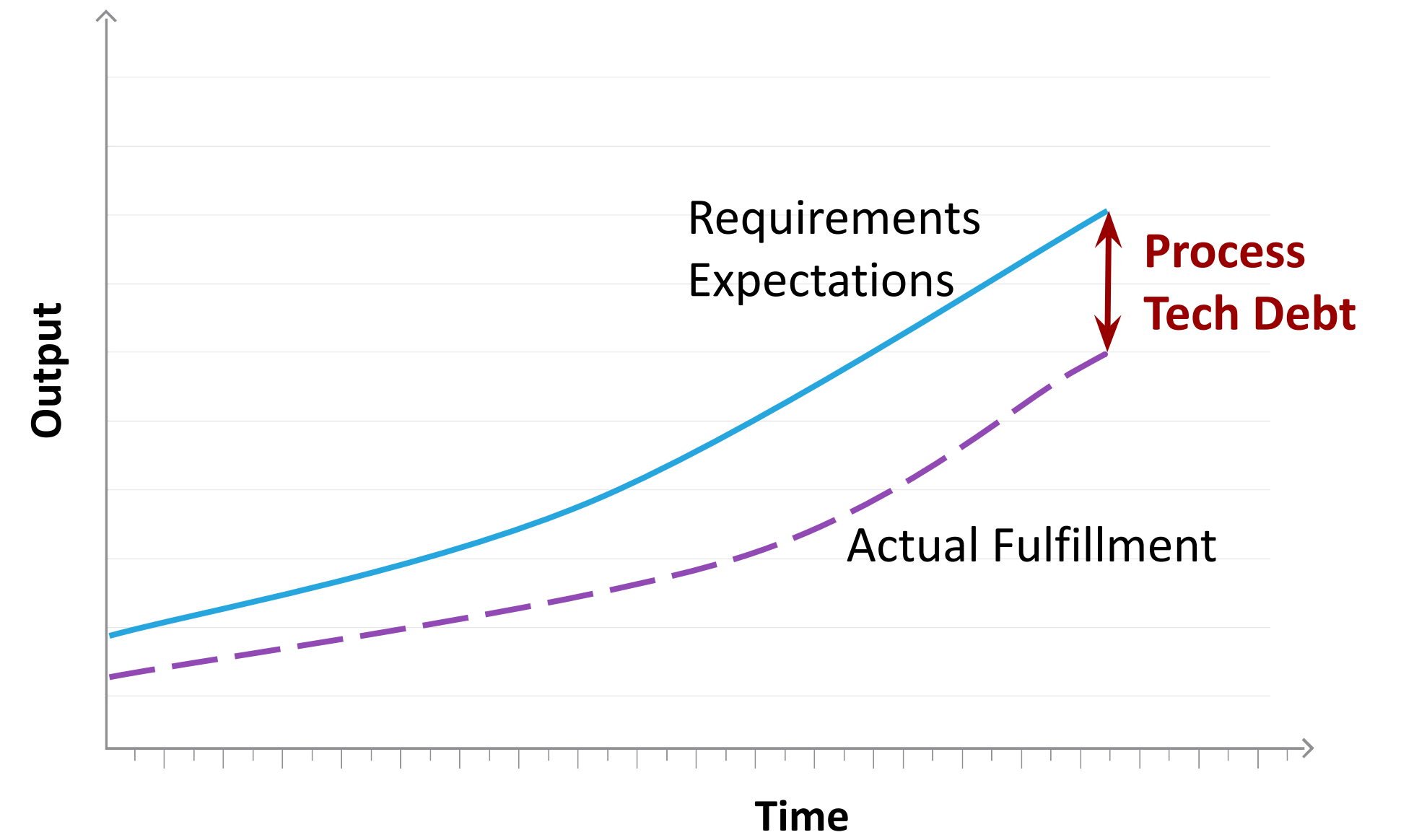
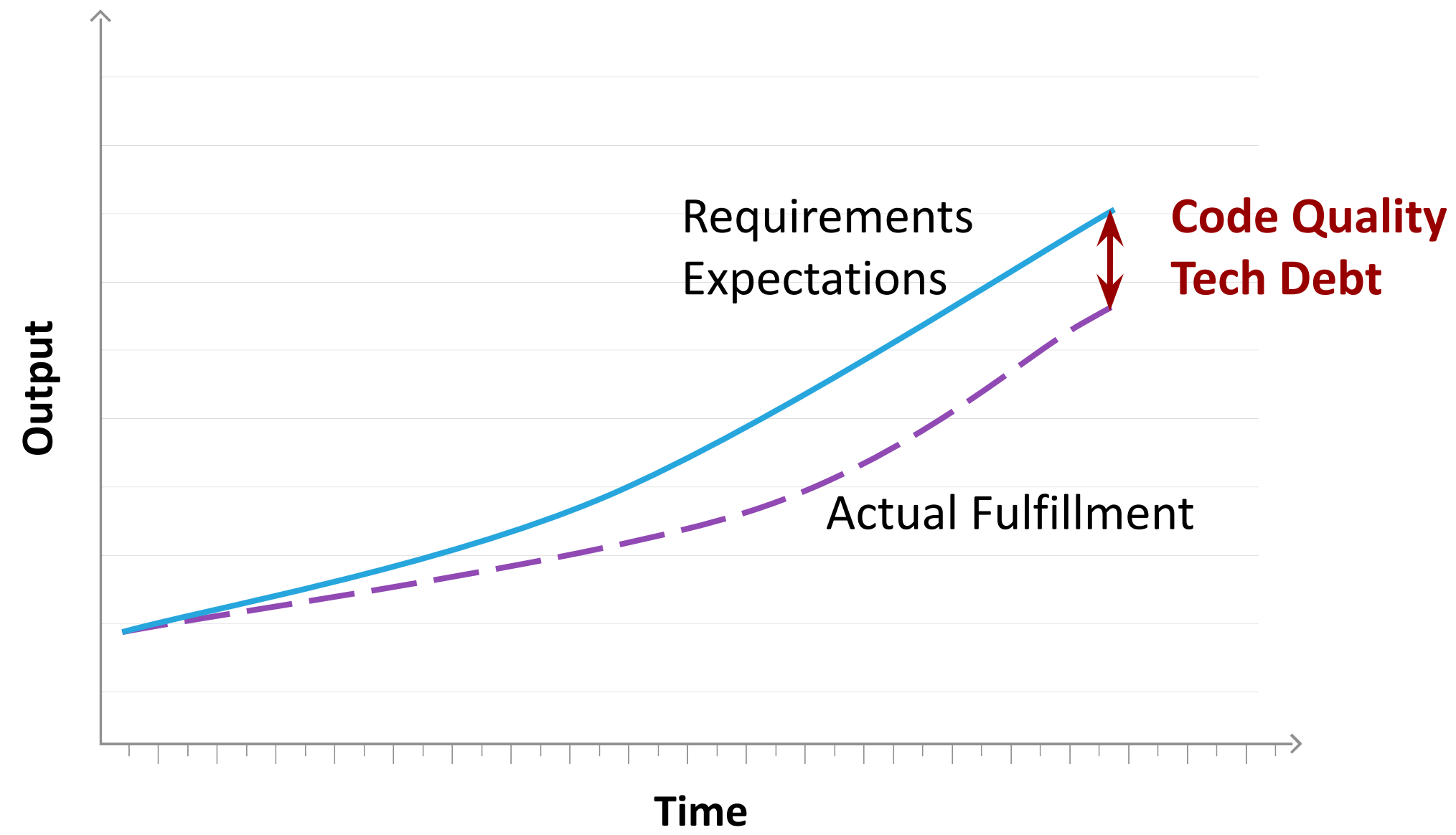
Cost of not addressing Tech Debt: Road To Technical Bankruptcy?

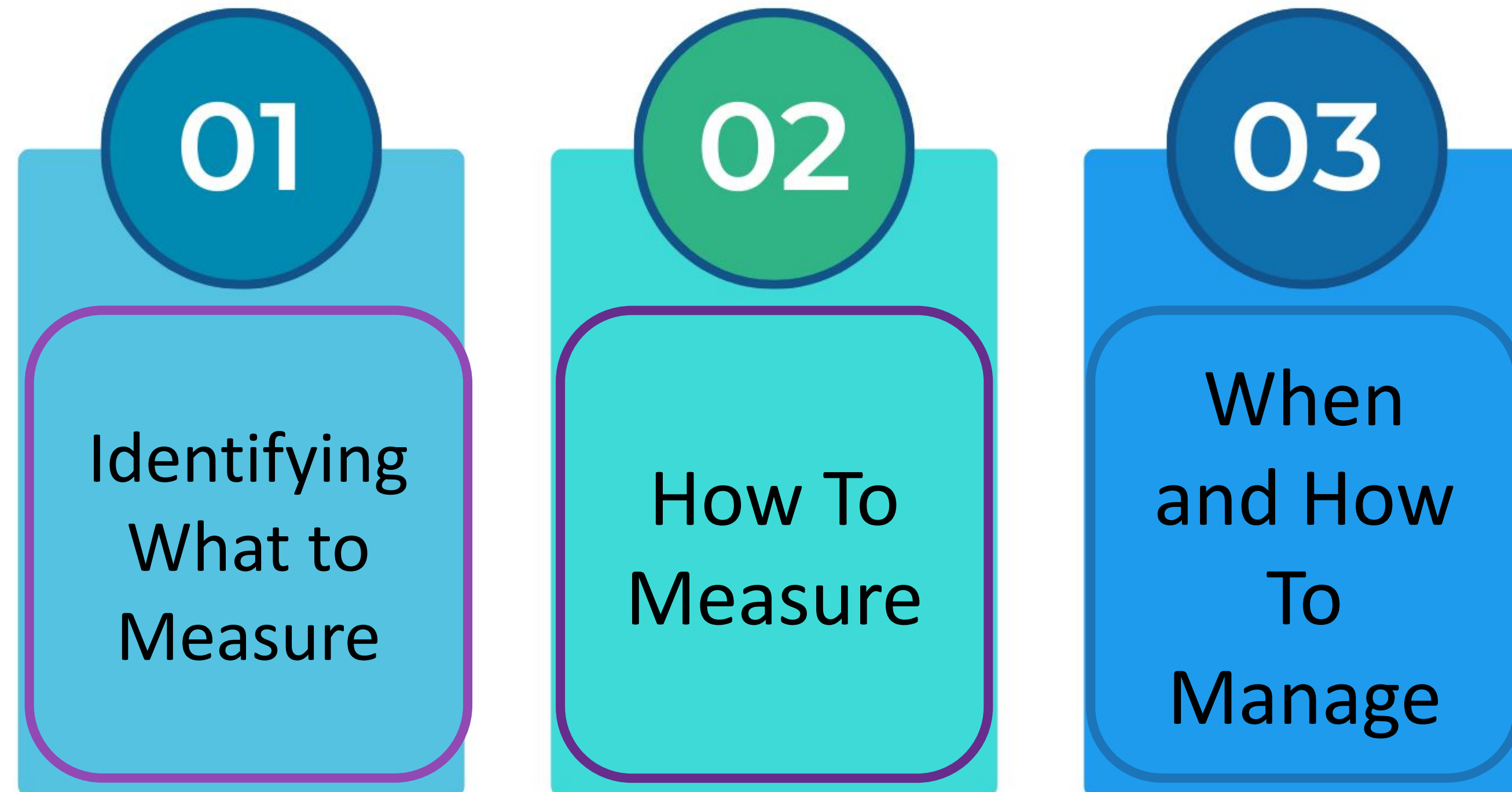


Technical Bankruptcy occurs when system starts delivering negative Output as the time and efforts are consumed in fixing the system complexity (entropy / tech debt).



Different Causes, Different Level of Tech Debts





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Identifying What to Measure and How to Measure

Accion's Experience



- A Global Auction Management company with 5 different Tech Stack and different level of Tech Debt
- How to Measure and Compare Tech Debt, identify Best In Class components, and prepare a prioritization and modernization approach

A	B	C	D	E	F	G	H	I	J	K	L	M	
GAP													
Domain		GAP Component	Low Data Dependency	Independently deployable	API Separation	UI Tech Maturity	Low Tech debt.	Technology Maturity	Skill Availability	Tech Scoring	LA Component	Low Data Dependency	Indep
			Code for one business domain can be changed and deployed into production environment without changing any other business domains.	Code for one business domain can be changed and deployed into production environment without changing any other business domains.	No interdependency between APIs to perform a operation.	Technologies which provide package ecosystem, robust programming, fast performance, stability, compatibility, and simplicity.	The difference between the ideal state of application and current state.	Technologies which supports software development in microservices. Technologies which are stable and well supported.	Skilled resource availability to manage and maintain the technology used for developing application	Weighted average		Code for one business domain can be changed and deployed into production environment without changing any other business domains.	Code busi can depl proc envi char busi
Bidder Management	Bidder Registration	GAP WL: AuctionRegistration Controller GAP Toolbox: BidderController,	3	2	3	2	1	3	3	2.65	Bidder Management System	2	
	Bidder Login										Bidder Management System		
	Bidder Profile and Preferences										User Management System		
	Bidder Vetting												
Auctioneer Management	Auctioneer Registration	GAP Toolbox	2	2	2	2	1	3	3	2.3			
	Auctioneer Login												
	Auctioneer Profile and Preferences												
Taxonomy Management	Taxonomy Definition										Content Management		

This formed the basis for how to track Tech Debt using Pathological or non-intrusive analysis

Classifying the KPIs for the Impact

KPI Impact	Business	Structural	Process	Data	People
KPIs	Time to Market Usability NPS / CSAT Adoption Rate	System Complexity analysis Defects Analysis Test Coverage Change Frequency Performance Analysis	Velocity Right First Time Cycle Time MTTR	Data Quality Data Integration Data Governance Data Processing Data Volume	Technical Debt Ratio Resource Utilization
Tech Debt to Address	Customer experience, Time to Market, Agility, Technology Adoption	Architectural Complexity, System Framework, Integrations, Performance, Security, Documentation	Process Complexity, Manual hand-offs, Measurement, Compliance	Data Completeness, data Consistency, Data Availability	Skills / Knowledge, Workarounds, Dependencies

By classifying the KPIs for the Impact, it allows the Prioritization and resource alignment towards addressing appropriate Tech Debt items.

Not every Tech Debt is caused by Code quality and not all Tech Debt is developer responsibility.

What KPIs can be Measured

KPI	Metric	Impact Category
System Complexity analysis	Cyclomatic complexity, Software Demography, Aging etc	Structural
Defects Analysis	Analysis of type of defects, severity levels, impact areas	Structural
Backlog Analysis	Trend Analysis of User Stories backlog fulfillment, Build Time	Structural
Test Coverage	Percentage of code covered by tests	Structural
Change Frequency	Number of code commits, Number of code deployments	Structural
Performance Analysis	Scalability, responsiveness	Structural
Time to Market	Time to release with new features and functionalities	Business
Usability	Number of customer complaints related to system performance or usability	Business
NPS / CSAT	Net Promoter Score (NPS) or Customer Satisfaction (CSAT) scores related to system performance or usability	Business
Adoption Rate	Rate of Customer Adoption to new releases / features	Business

What KPIs can be Measured

KPI	Metric	Impact
Cost of Human resources	Costs of additional resources, specialists time & effort	People
Technical Debt Ratio	Debt-to-service ratio	People
Resource Utilization	Productivity	People
Velocity	Amount of work a Team can tackle during a single Sprint	Process
Cycle Time	Lead time to deliver changes from ideation to innovation	Process
MTTR	Mean Time to Repair / Recovery from system failure	Process
Data Quality	Completeness, Accuracy Consistency, Duplicate records, Duplicate data	Data
Data Integration	Integration points, Mapping complexity, Time to integrate	Data
Data Governance	Data breaches, Compliance, Data lineage	Data
Data Processing	Data Processing Speed, Real-time Processing, Latency	Data
Data Volume	Data size, Number of records, Data growth rate	Data

Many of these KPIs may already be measured for different operational and business use cases. It is possible to leverage and repurpose these towards measuring Tech Debt use case as well.

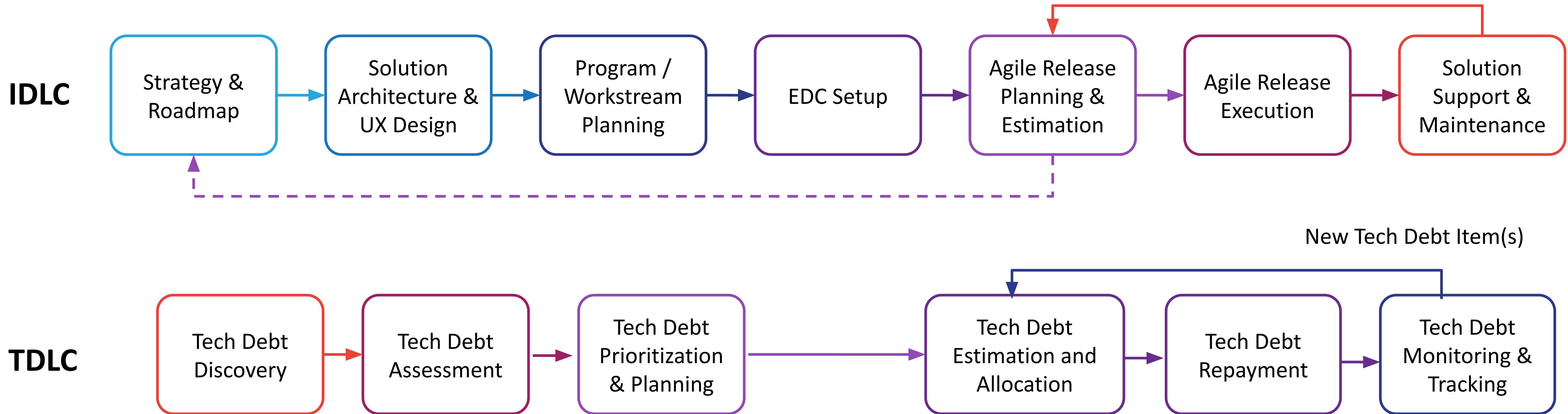
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Managing Tech Debt



Tech Debt Lifecycle (TDLC) implements Pathological Tech Debt Analysis and will run implicitly in alignment to Software Development Life Cycle (IDLC)

Pathological Tech Debt Analysis

Tech Debt Discovery

- Discovery sessions
- Personnel Interactions
- Artefacts analysis
- Architectures
- Surveys etc

Tech Debt Assessment

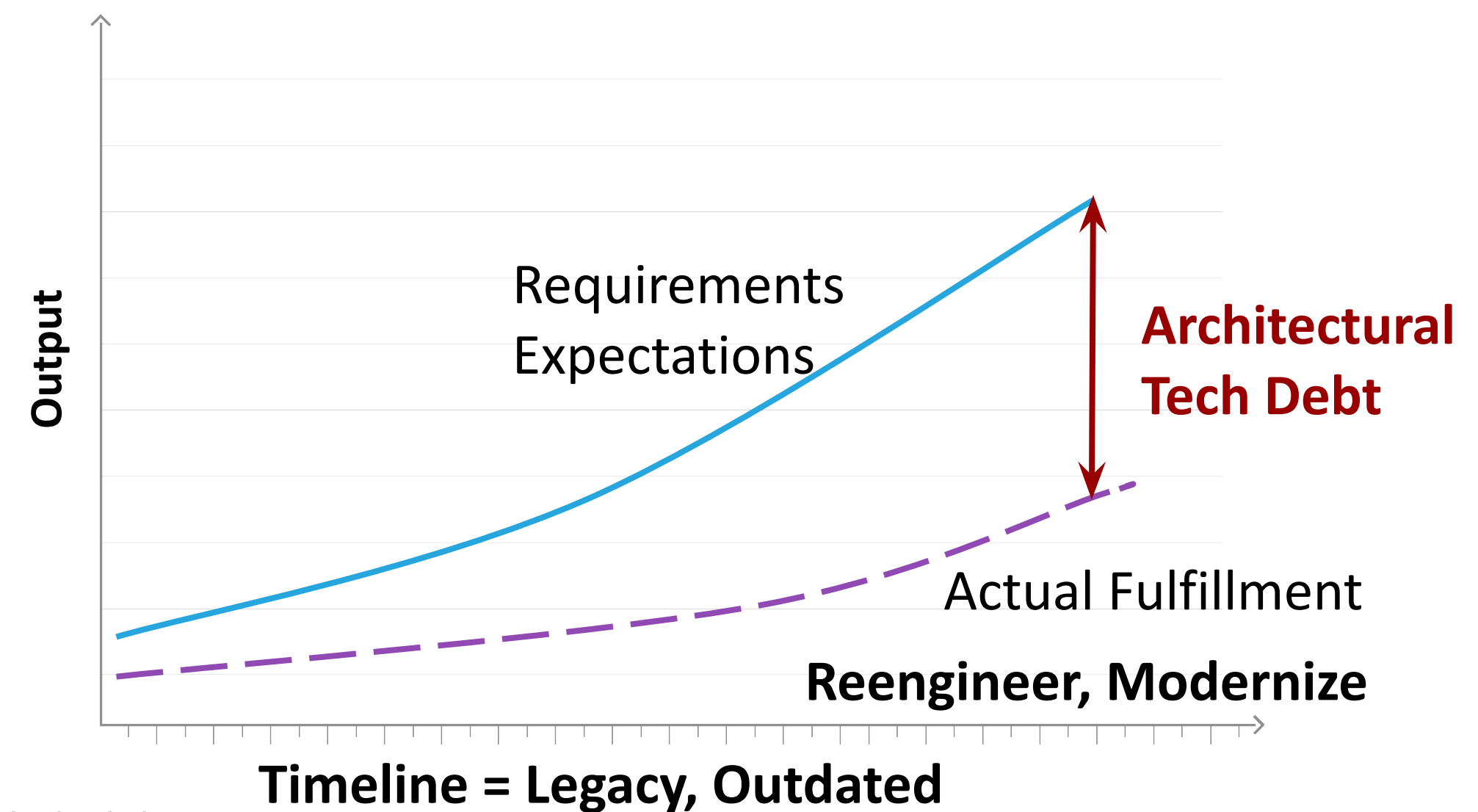
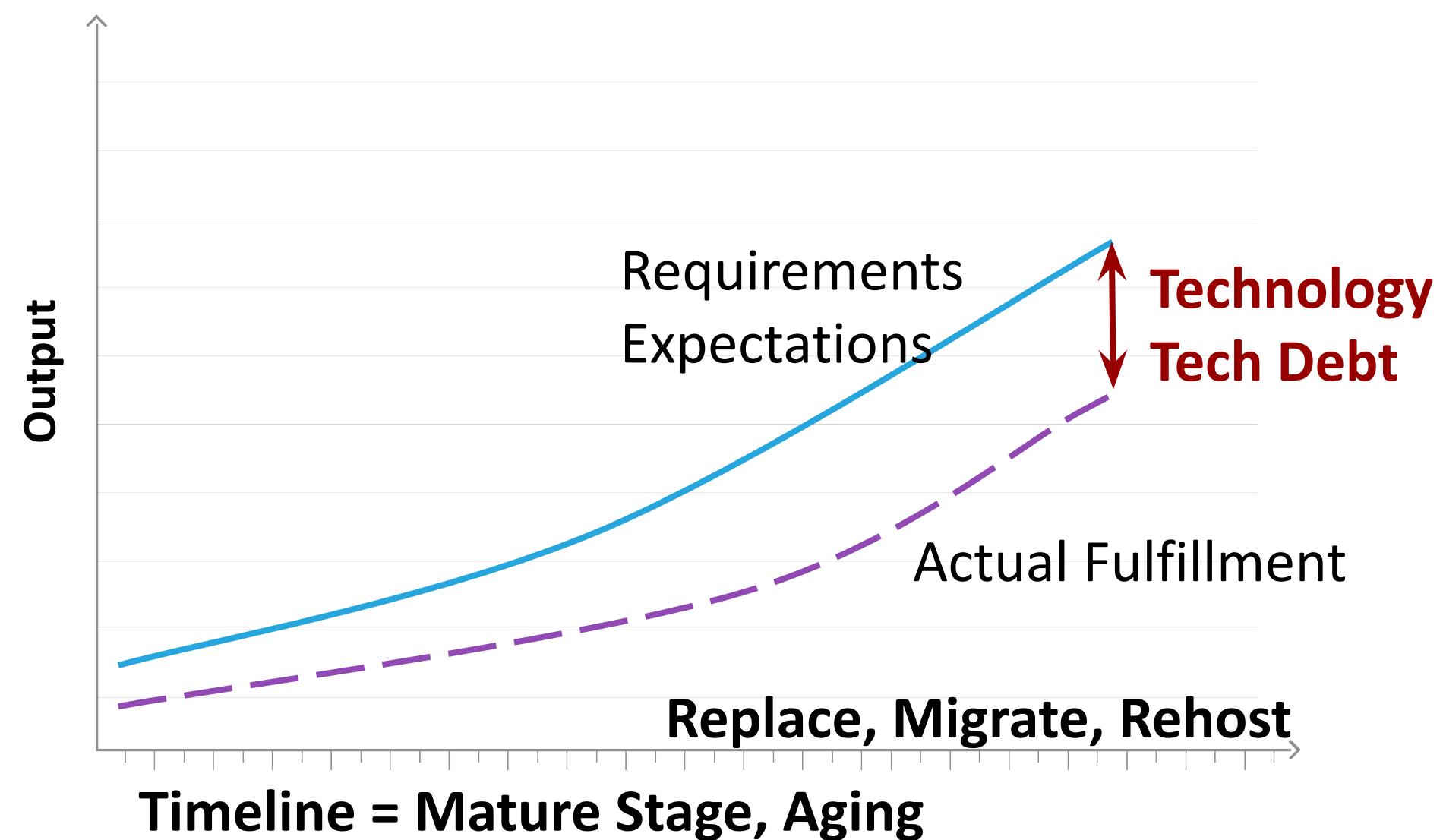
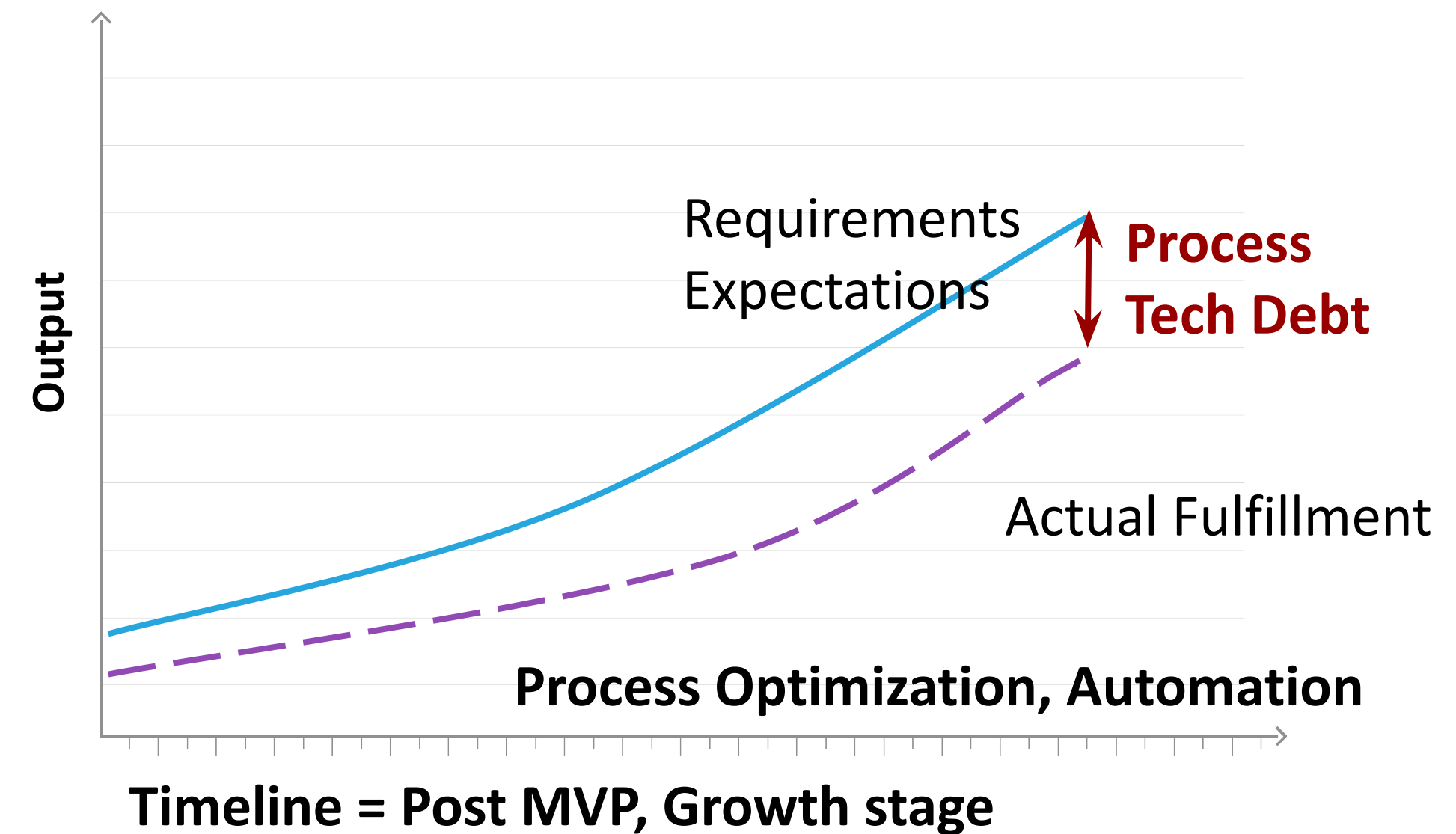
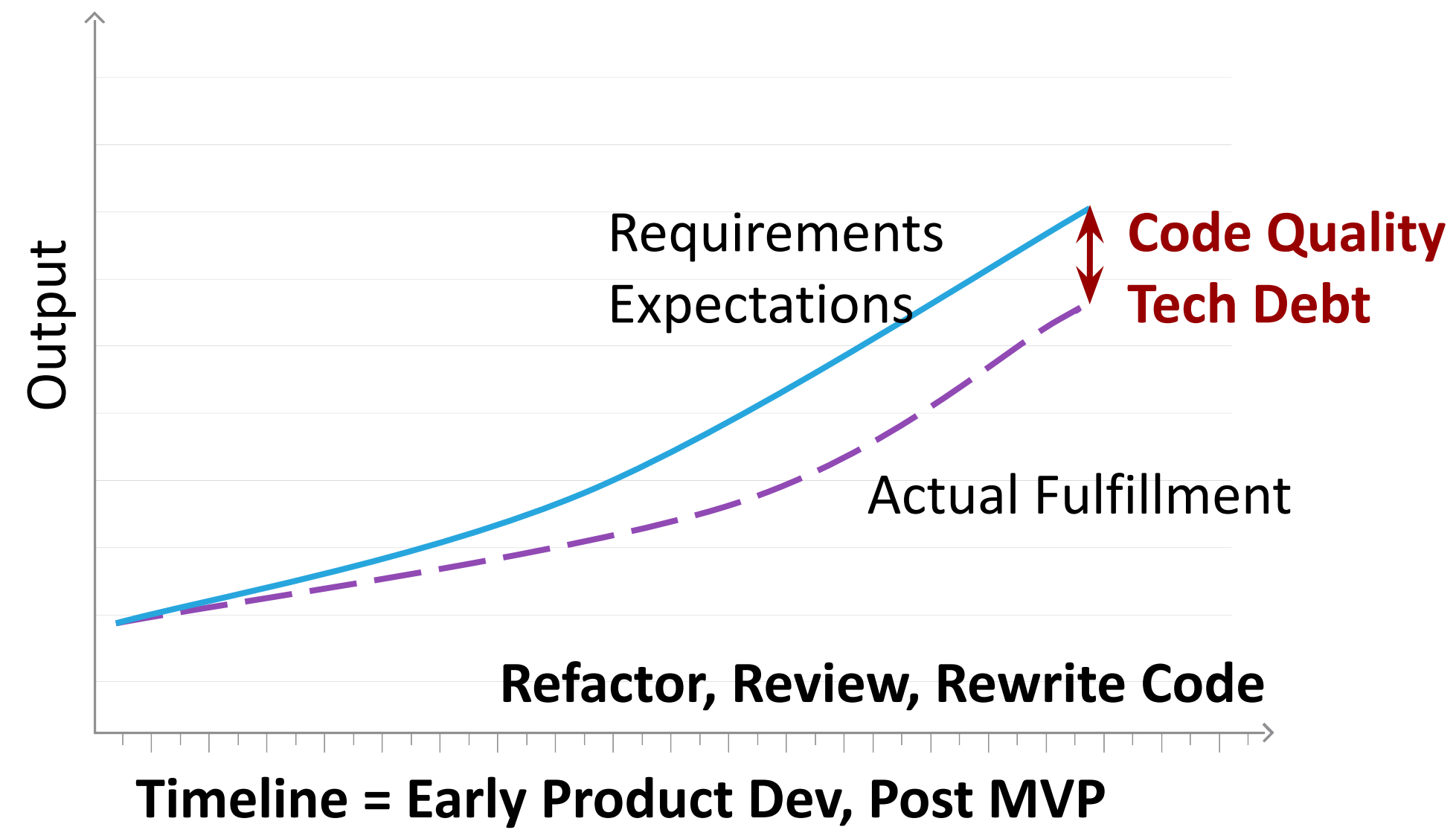
- Top-down / Bottom up Analysis
- Business, Structural, Data, Process and People Analysis
- Functional and Technical Impact Scorecards

Tech Debt Prioritization & Planning

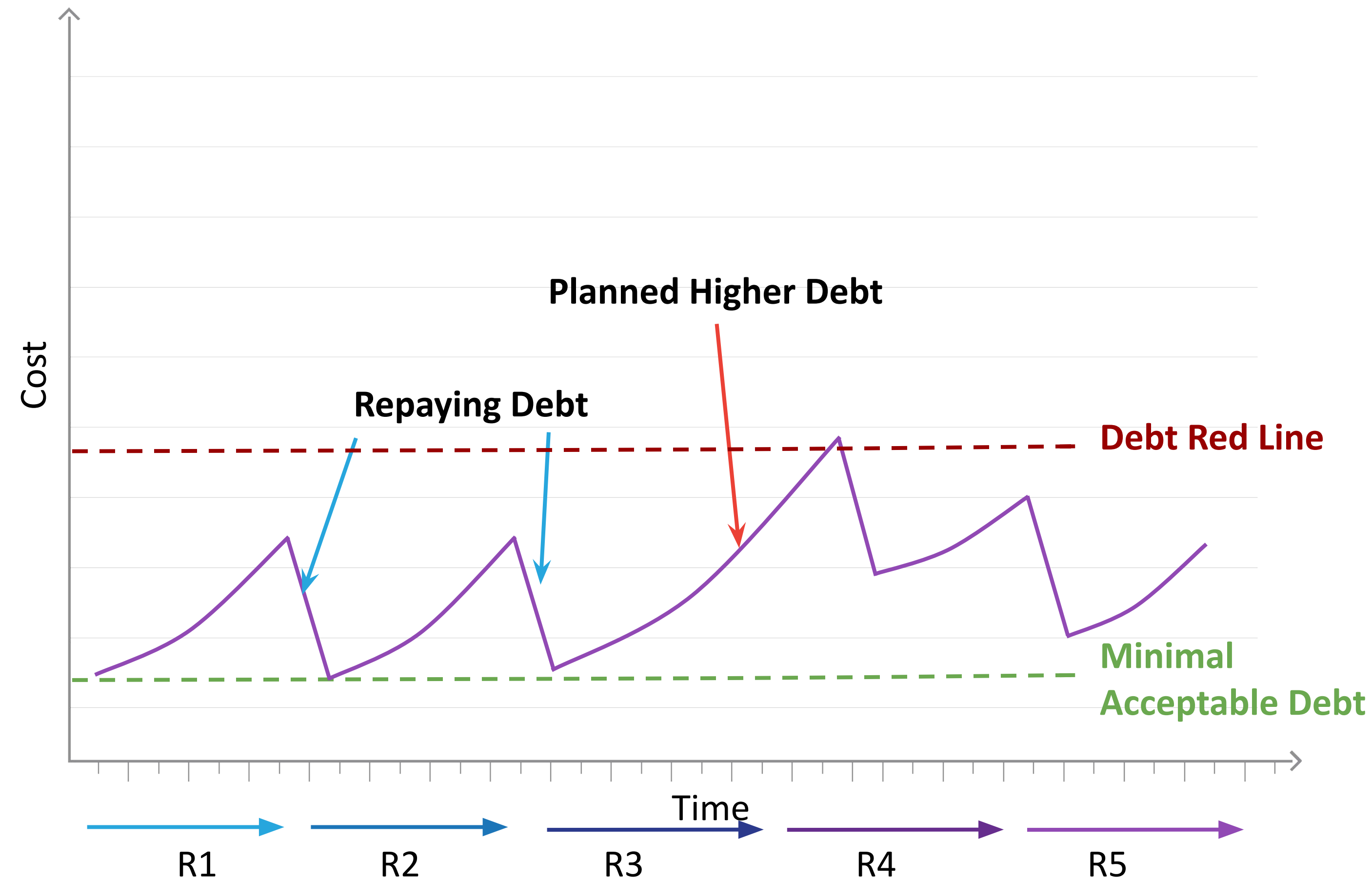
- New Service and Data Bridge
- Front-end separation
- Customer Identity service
- Address Validation
- Other Items...

KPI Impact	Business	Structural	Process	Data	People
Assessment Approach	<ul style="list-style-type: none"> ● Based on Market Research Data ● UX Maturity Assessment ● Empirical evidences, Survey, Interviews etc 	<ul style="list-style-type: none"> ● Using data from tools like SonarQube, JIRA, Confluence (tracking tools) ● Architecture Maturity Assessment ● Empirical evidences ● Validate, Co-relate and produce Technical Scoring matrix 	<ul style="list-style-type: none"> ● Understand Business Process and Workflows from interactions and documentation for Process Maturity Assessment ● DevOps and Automation Maturity Assessment 	<ul style="list-style-type: none"> ● Data Maturity Assessment ● Assessment and Correlation of gathered Data points from Data Quality and Governance tools ● Empirical evidences 	<ul style="list-style-type: none"> ● Data based on IDLC Project Governance reports ● Empirical evidences

Different Tech Debt Causes, Timelines, Different Repayment Solutions



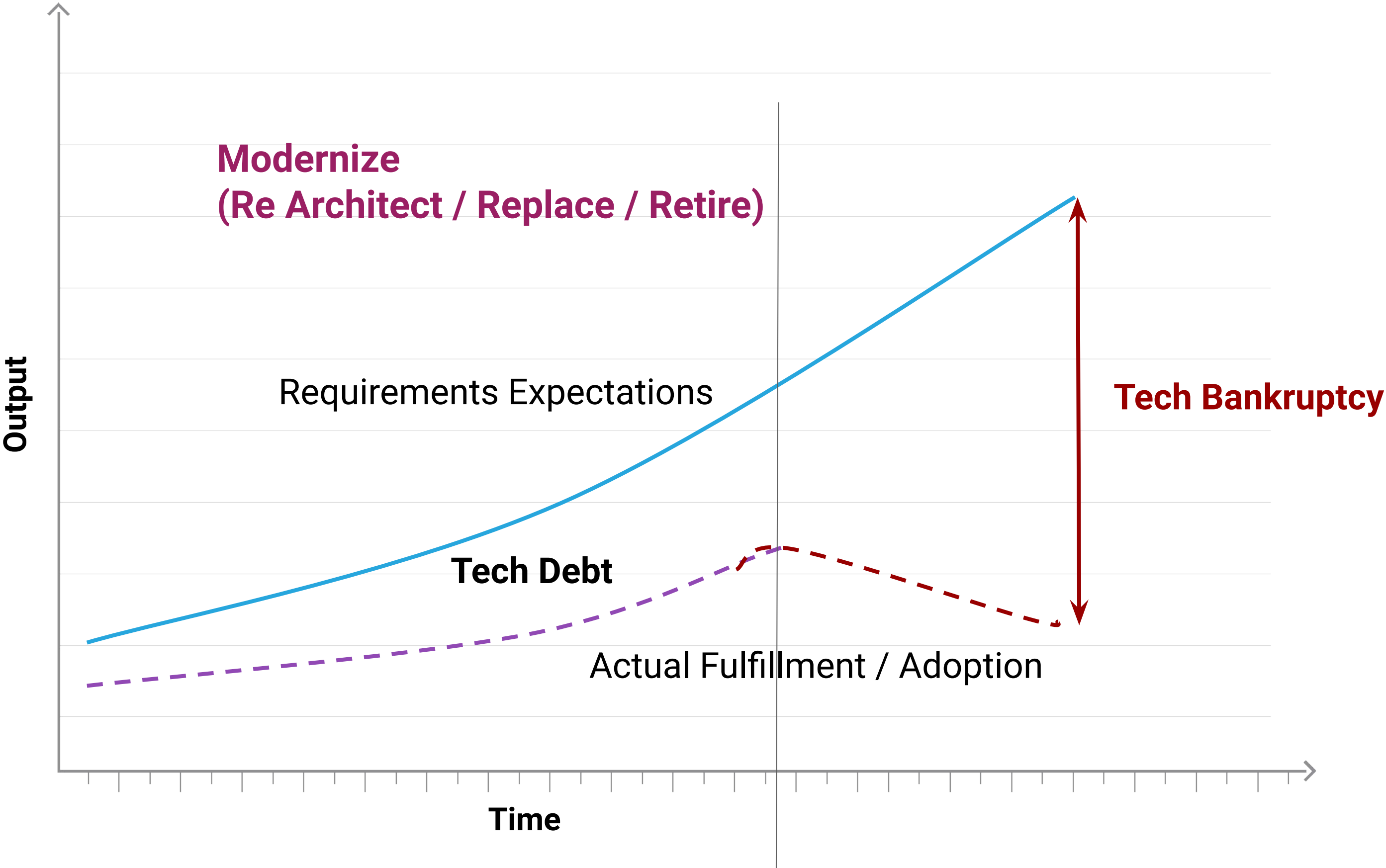
Managing Tech Debt by Re-paying Tech Debt as Cost



- Run discovery to identify Tech Debt items
- Define Tech debt Red Line threshold
- Plan Tech debt repayment as part of the roadmap
- Measure it as soon as symptoms are visible and Budget for it
- Prioritize higher impact items.
- Plan regular Repayment (e.g. every release)
- Keep within Red Line to avoid Tech Bankruptcy
- Treat Tech Debt as a Tool for lessons learned leading to innovation and growth

When measured, prioritized and repaid in cost terms, it keeps the Tech Debt within acceptable range and avoids the road to Technical Bankruptcy

When is it right time to consider Modernization



Continuously Measure the Tech Debt, and consider Modernization before too much Tech Debt is accrued leading to Technical Bankruptcy.



Tech Debt can be considered as Gap between requirements expectations vs actual output delivered

Tech Debt, if left unchecked and unmanaged, can lead to Tech Bankruptcy

Tech Debt can be measured using pathological tests aligning to different stages of delivery life cycle

Use appropriate Discovery and Tech Debt assessment methodology

Prioritize, Plan, Repay, and Monitor the Tech Debt items in an ongoing basis to avoid Technical Bankruptcy

Tech Debt cannot be avoided. Instead use it as a tool for Innovation and Growth.

AS A SOFTWARE ARCHITECT

I SEE DEBT, PEOPLE

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Thank You!

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