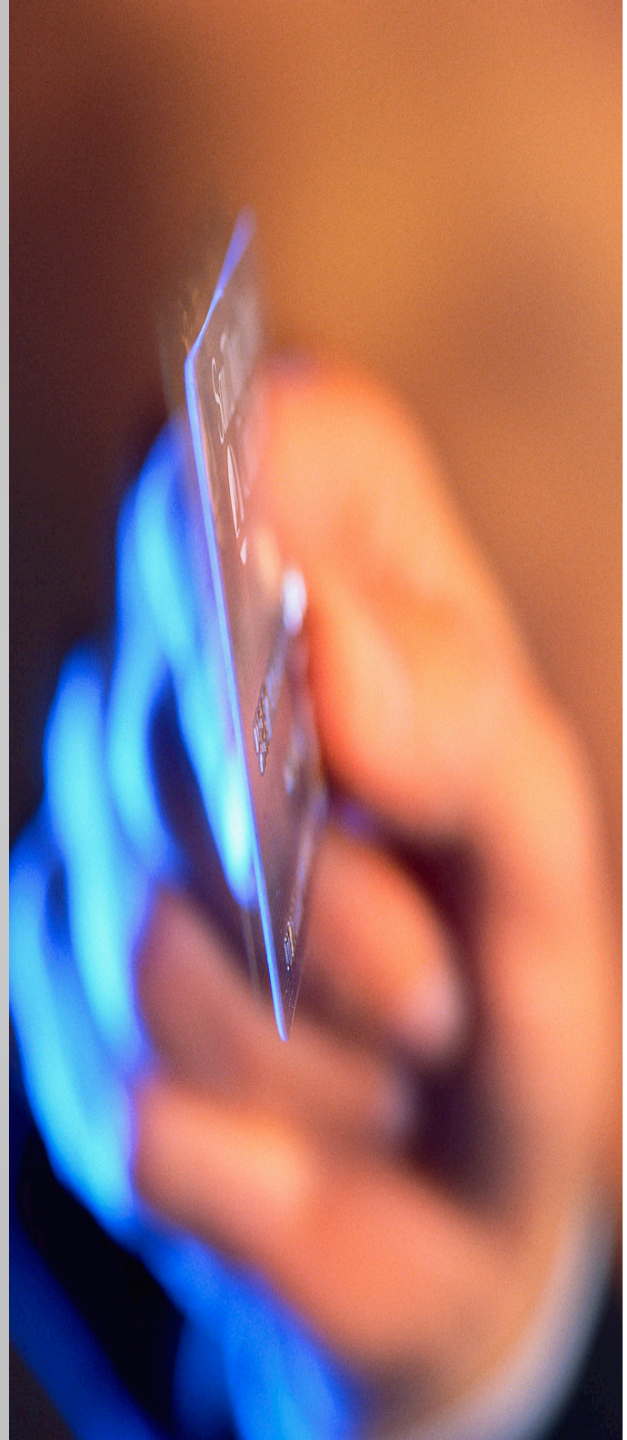

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Technical Debt
Identification, Payment, and Restructuring

Todd W Fritsche

Principal Key Expert / Chief Architect

Siemens Healthcare Health Services

09-October-2013

Siemens:
A Globally Integrated Technology Company

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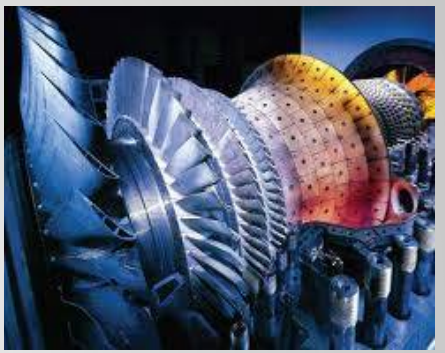
Medical Imaging

High-Speed and
Light Rail



Gas Turbines

Industrial Automation

HVDC

Building Automation

Siemens Healthcare Sector

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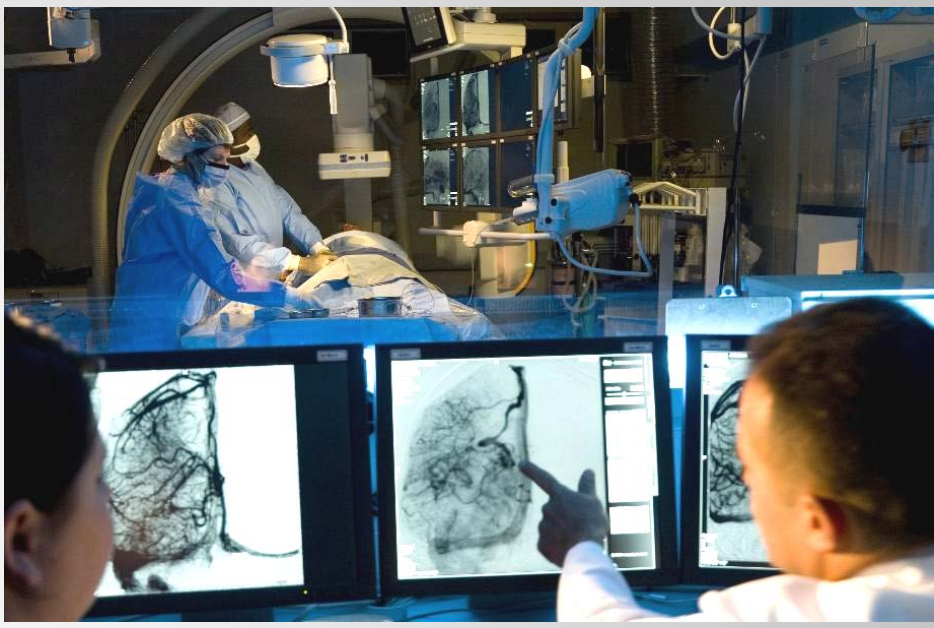
One of the world's largest providers to the healthcare industry

A leader in imaging systems, laboratory diagnostics, healthcare IT, and hearing aids.

We offer customers products and solutions for comprehensive patient care from a single source – from prevention and early diagnosis to therapy and aftercare.

By optimizing the clinical procedures associated with the most important medical conditions, we help make healthcare faster, better, and more cost-efficient.

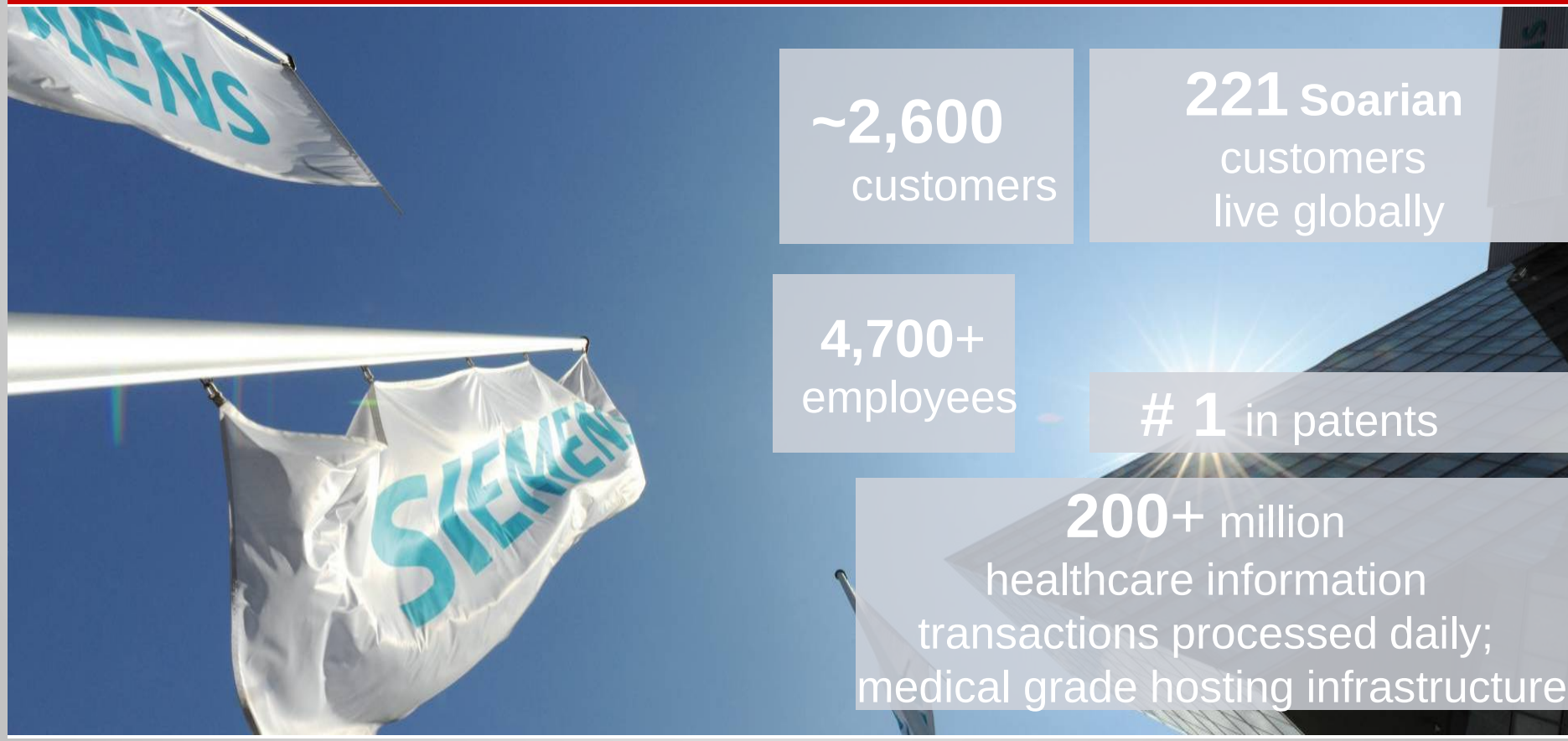


Key figures (FY 2012)

In millions of €	
New orders	13,806
Total revenue	13,642
Profit	1,815
Employees	51,000

Health Services – An HIT Industry Leader

A Global Industry Leader



*US HIT Related Patents

Health Services Global Presence

SIEMENS

Geographical spread

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Key products:
- Soarian
- Analytics
- Health Information Exchange
- i.s.h.med

Siemens Health Services
Our Goal and Mission

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To provide information technology solutions and services that enable care delivery organizations to thrive in an era of greater accountability for the access, costs, quality and safety of the healthcare they deliver

Applications for the Enterprise

Clinical and Business Intelligence	Continuity of Care Document	Legal Health Record

Revenue Cycle	Clinical

Patient Access	Revenue Management	Results	Orders	Clinical Documentation	CPOE	Ancillary /Specialty	Point of Care
▪ Worklists & Census Mgmt ▪ Registration/ Admissions	▪ Acute & Amb. Billing ▪ Contract Engine & Reimbursement	▪ Results Repository	▪ Orders ▪ Charges	▪ Interdisciplinary ▪ Physician ▪ Plan of Care	▪ MD/Provider Order Mgmt ▪ Medications ▪ ePrescribing ▪ Med Rec	▪ Critical Care ▪ Cardiology ▪ ED ▪ Pharmacy ▪ Lab ▪ HIM ▪ Rad/PACS	▪ Med Admin ▪ Vital Signs ▪ Patient Specimens

▪ Analytics/Reporting ▪ Single Sign On ▪ Adaptability Tools	▪ Device Connectivity ▪ Output Management ▪ Rules Engine	▪ Security ▪ Interoperability ▪ Wireless Mobility

Service-Oriented Architecture, Workflow Management Technology, Knowledge Management Framework, Medical Grade Infrastructure, Services

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A Typical Application

- 200 people (developers, testers, analysts)
- 3,000,000 lines of code
- Deployed onto 20 Servers
- Utilizing a high speed private WAN (1.544 Mbps)
- Stringent government regulations (FDA, HIPAA)
- 2+ years per release (concept to delivery)

Todd's Technical Debt Postulate

The Yin and Yang of Technical Debt

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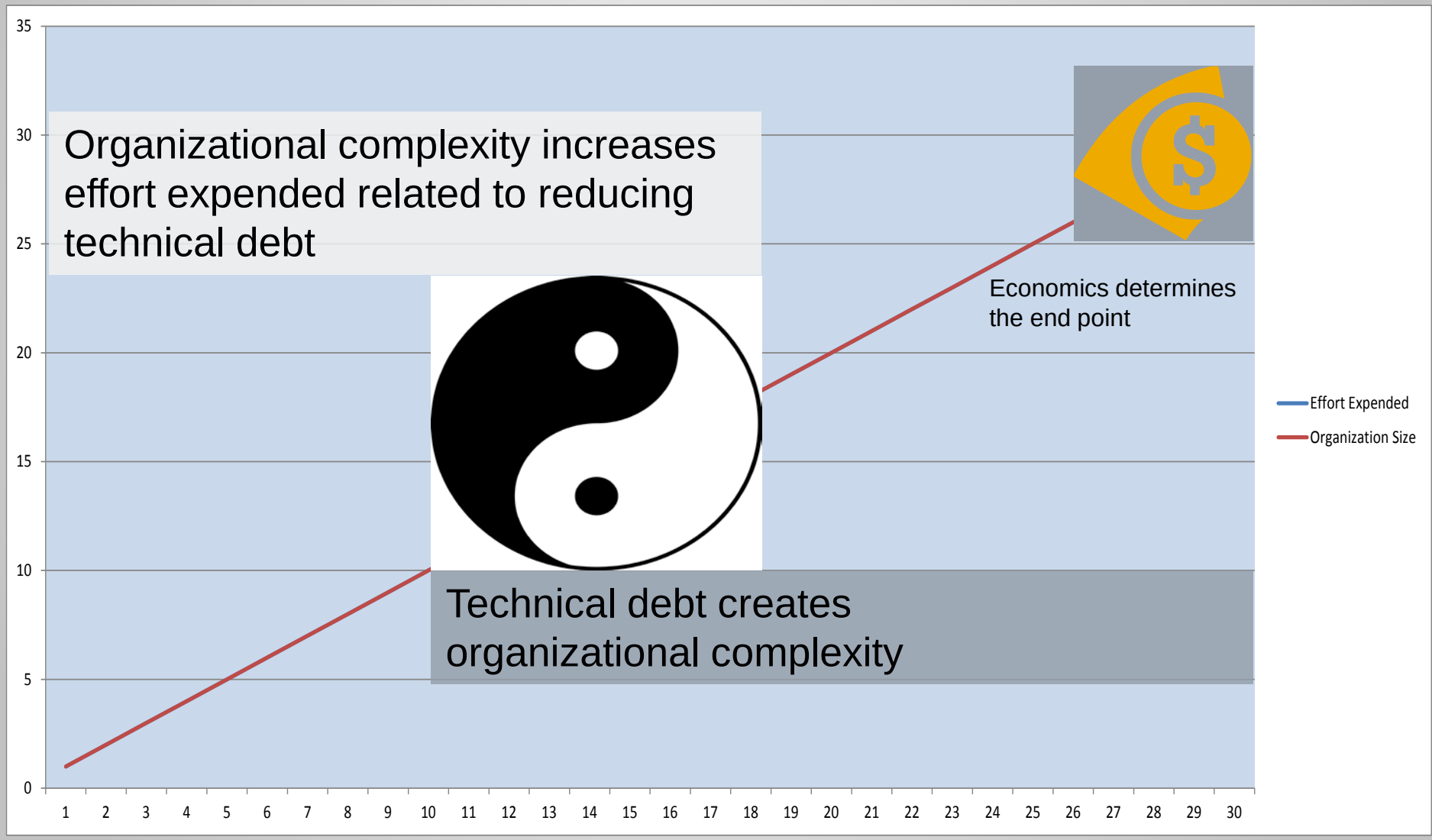

Where is Effort Expended?

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Defining
What is technical debt?

Finding
Identifying and showing technical debt

Quantifying
Quantify the cost of technical debt

Selling
Secure buy-in to pay down selected technical debt

Controlling
Manage and avoid the accumulation of technical debt

Proving
Did the pay down work and meet expectations?

Defining
(some relevant thoughts?)

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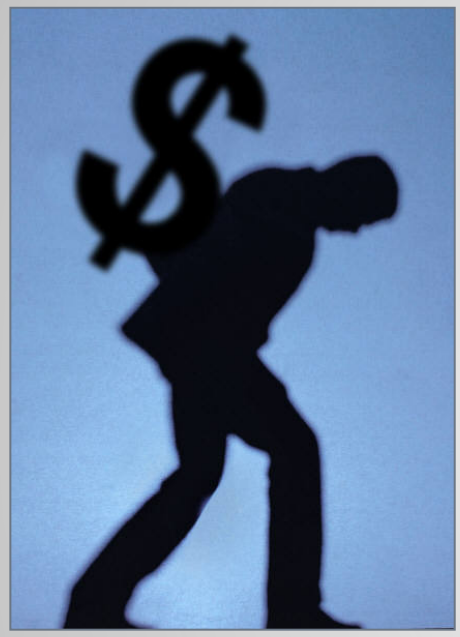

In the Financial World

Debt is:
- A contract
- Contracts are restructured all the time

Debt Restructuring is:
- A euphemism for debt forgiveness

Defining

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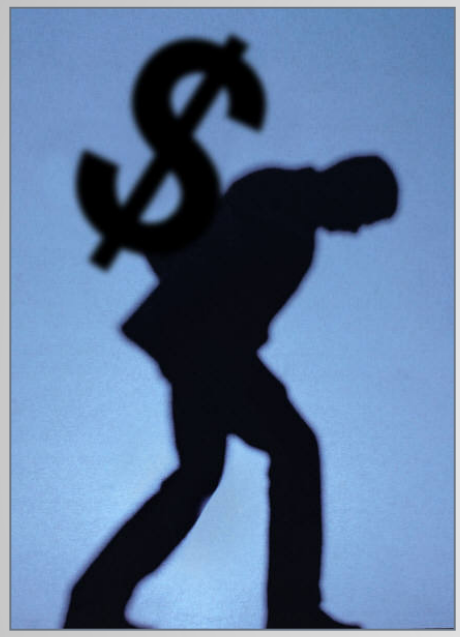

Lehman's Laws of Software Evolution

- In software engineering, **the Laws of Software Evolution** refer to a series of laws that Lehman and Belady formulated starting in 1974 with respect to Software evolution.[1][2] The laws describe a balance between forces driving new developments on one hand, and forces that slow down progress on the other hand.

Todd's Technical Debt Formula

- Technical Debt is code, design, and architecture erosion where the **total cost** of meeting new requirements exceeds the cost of redesign and re-architecting plus the cost of the work for the new requirements.
  - Total cost is hard to compute
    - Time horizon?
    - Does optimizing people time count as cost if staffing remains the same?

1. Lehman, Meir M. (1980). "Programs, Life Cycles, and Laws of Software Evolution". *Proc. IEEE* **68** (9): 1060–1076.

2. Lehman, M. M.; J. F. Ramil, P. D. Wernick, D. E. Perry, and W. M. Turski (1997). "Metrics and laws of software evolution—the nineties view". *Proc. 4th International Software Metrics Symposium (METRICS '97)*. pp. 20–32.doi:10.1109/METRIC.1997.637156.

Finding

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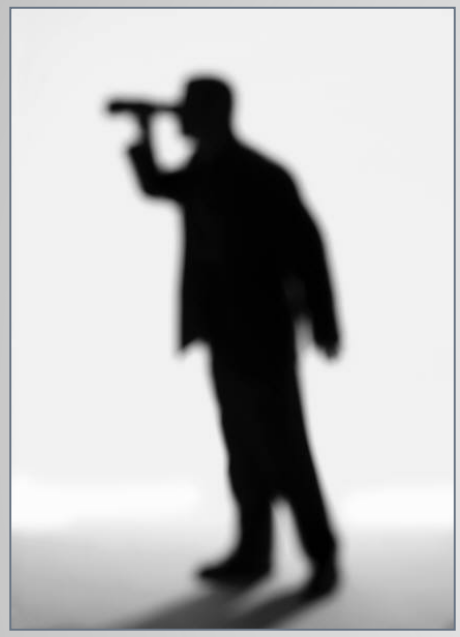

- Architecture (e.g. non-functional requirement) assessments
  - Measure and assess
- Tracking flux in requirements, code, design, and defects
  - Sometimes change is bad
- Static code analysis
  - More on this next
- Support ticket evaluation
- Business Process Reengineering
  - Business processes will reflect technical debt

Finding Technical Debt

Will you know it when you see it?

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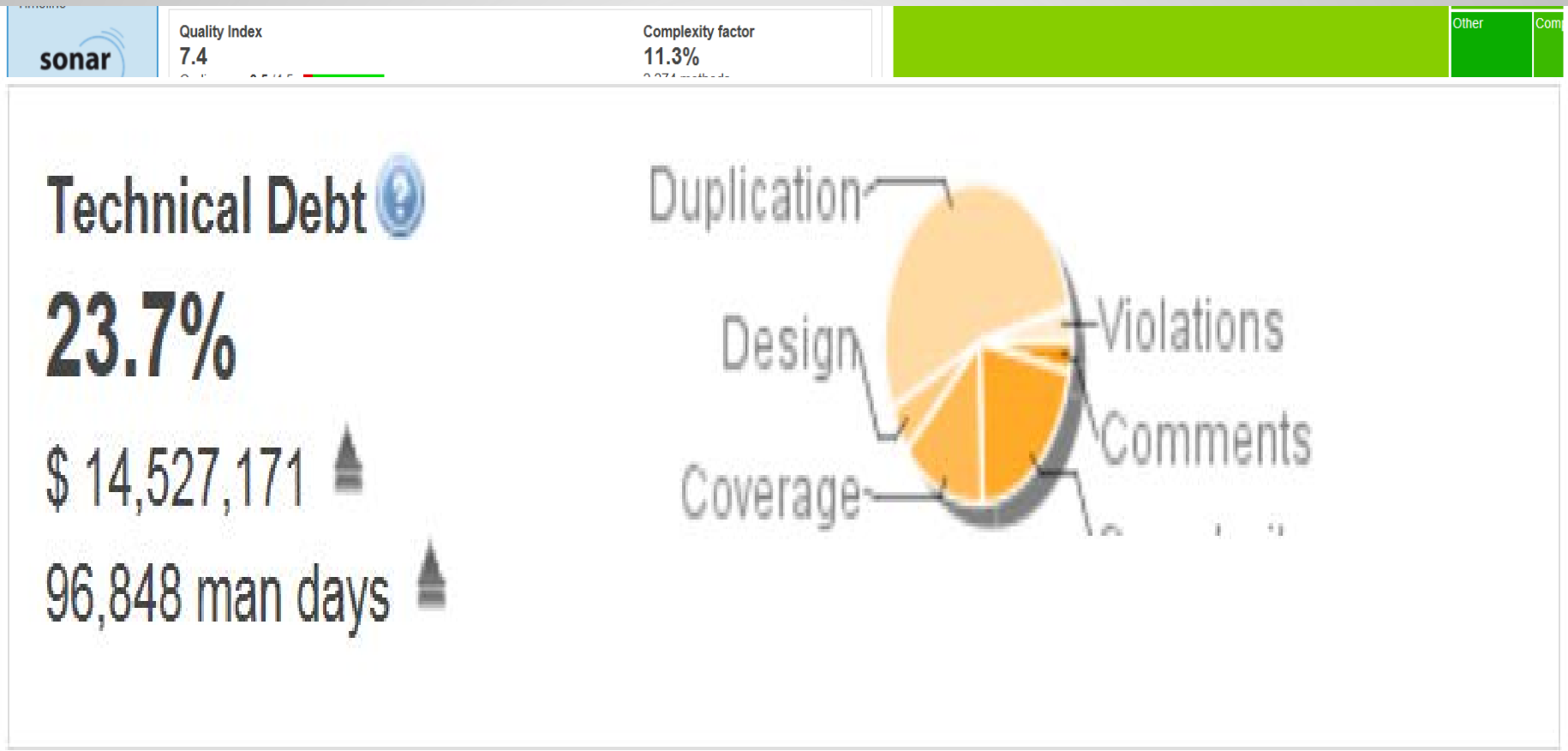

Quantifying

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How Bad Is It?

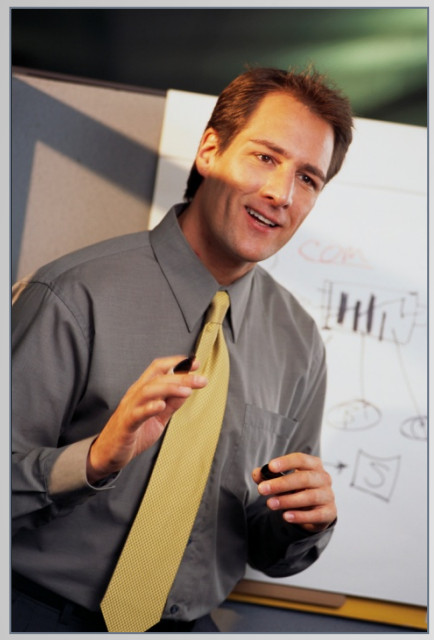
Measure the impact of technical debt by:

- Non-functional characteristics degrade over time or are not met in the first place
  - both operational and developmental NFRs
- Increase in product support costs
- Slow feature development with high costs
- Inability to find and retain good development talent

Show technical debt by:

- Document and track open issues on multiple levels – code, test, documentation, design, architecture, requirements
- Trending bugs over time, track release roll out issues
- Measure cost and time of fixing defects
- Customer concerns regarding technology obsolescence or ability to provide for future requirements

Selling



Secure the support of management!

Prove the cost to the business:

- Prioritize by cost over a 2 release time horizon

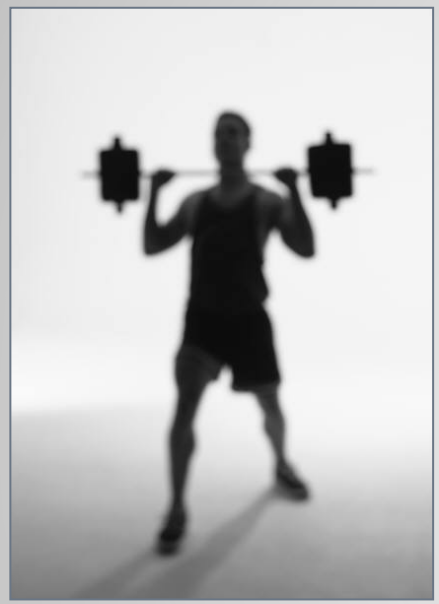
Provide a plan to pay down the selected technical debt:

- % of development bandwidth
- Fix as you go
- Sunset features

Highlight customer feedback such as:

- Security concerns
- Currency issues that could impact their business
- Concerns that the product may not be positioned to evolve
- Users don’t love to use the product; support issues

Controlling



Zero technical debt is not affordable, however, avoid accumulation of debt to a level where control is lost

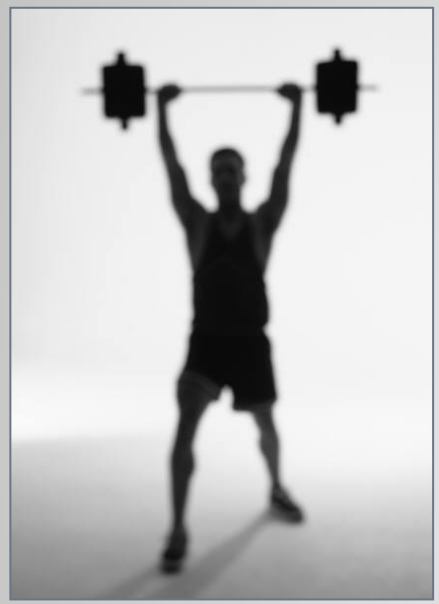
Methods to Manage to Technical Debt

- Evaluate technical debt as part of project risk management
- When possible tie pay down of technical debt to features
- Negotiate a budget for paying down technical debt selected solely by development in product releases, institutionalize this practice
- Create mechanisms that minimize accumulation and metrics that track the current state
- Have evangelists that develop a culture where developers are always paying off instead of producing more technical debt

Challenges

- Features are perceived as having more value than reducing technical debt
  - features provide more immediate value
  - the ROI on paying down technical debt is usually rather long
- Product management and executive turnover cycles are quick – their incentive packages are short term and not year over year

Proving



Measure, measure, measure:

- Support tickets
- Developer efficiency
- Developer satisfaction
- Customer satisfaction
- Release timelines met

Summary
What's Critical when Dealing with Technical Debt

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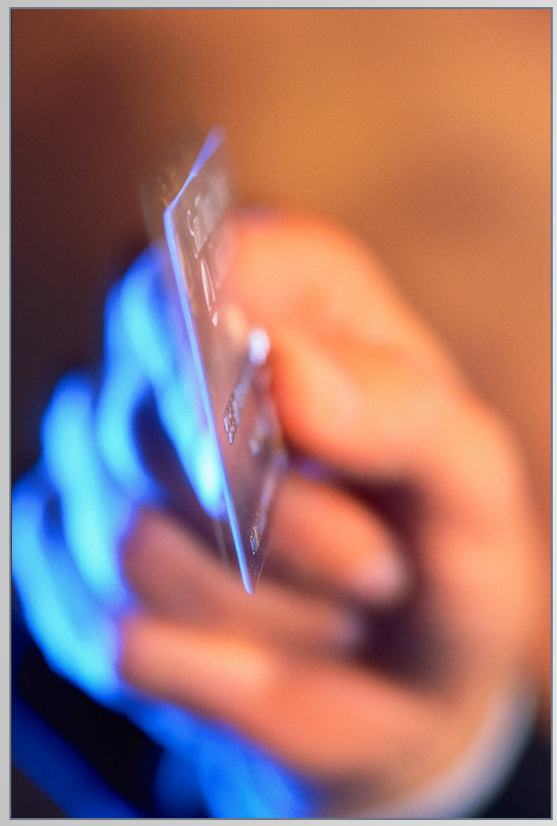

Technical debt can be managed but cannot be ignored

Show the business impact of technical debt through quantified measures in order to securing money to pay down the debt

Change the business culture so that paying off technical debt is standard operating procedure

➔ Not paying down or restructuring technical debt is not an option