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**TOCICO 2005 Conference**

**Improved and Updated  
- Now with 12 months of data**

# ***From Worst to Best in 9 Months Implementing Drum-Buffer-Rope in Microsoft's IT Department***

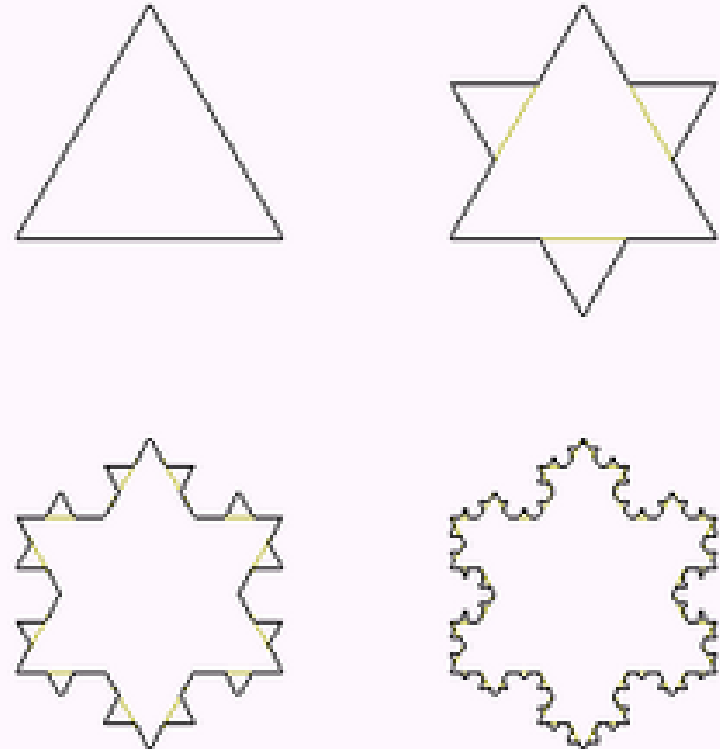
**Presented By: *David J. Anderson and Dragos G. Dumitriu*  
*Microsoft Corporation***

**Date: November 2005**

# Introduction

## This case study shows...

- Focus on simplicity
- 5 Focusing Steps
- Drum-Buffer-Rope
- No need to resort to Critical Chain
- Or seek an exotic solution using the Thinking Processes



*The first four iterations of the Koch snowflake*

# Background

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- XIT one of Microsoft's 8 IT departments

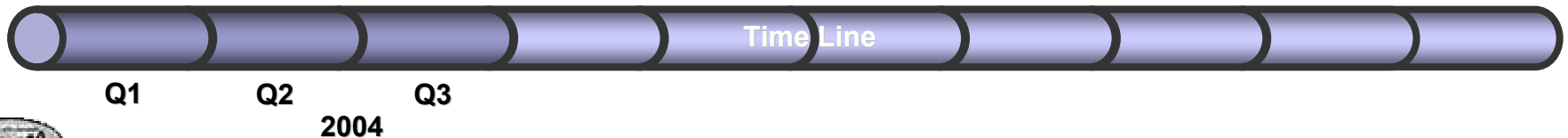
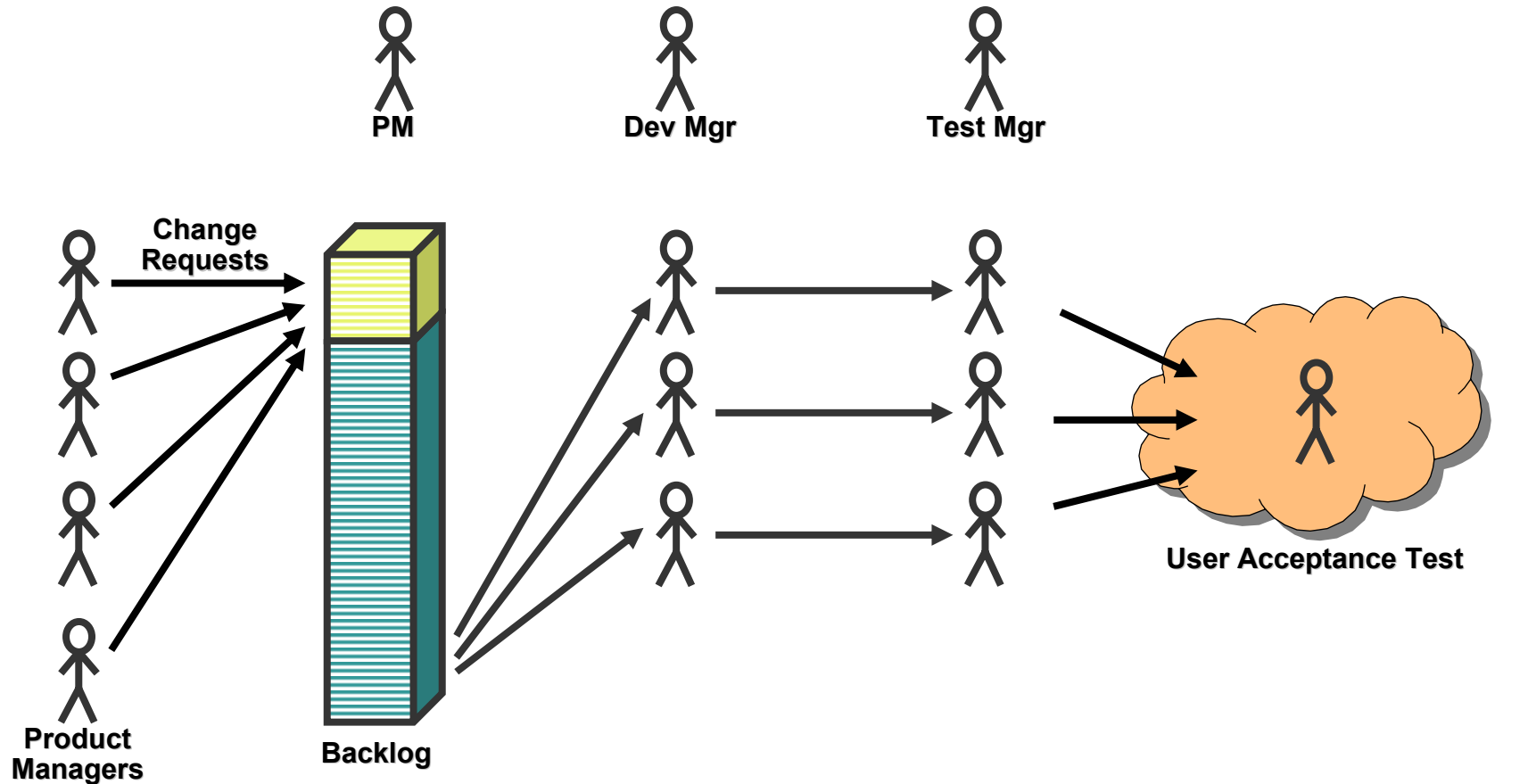
- **XIT Sustained Engineering**

- Small team
- Change requests
- Supports over 80 applications (and growing)
- Engineering responsibilities moved from Redmond (Washington, USA) to Hyderabad (India) in 2004
- Hyderabad vendor is CMMI Level 5 and uses TSP/PSP
- Initial quality is very high



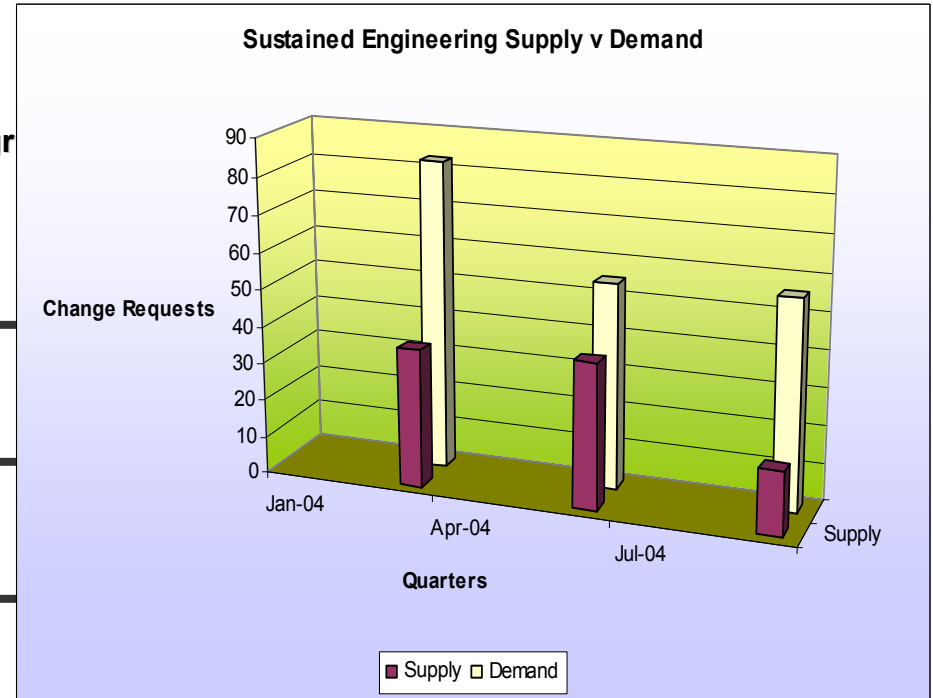
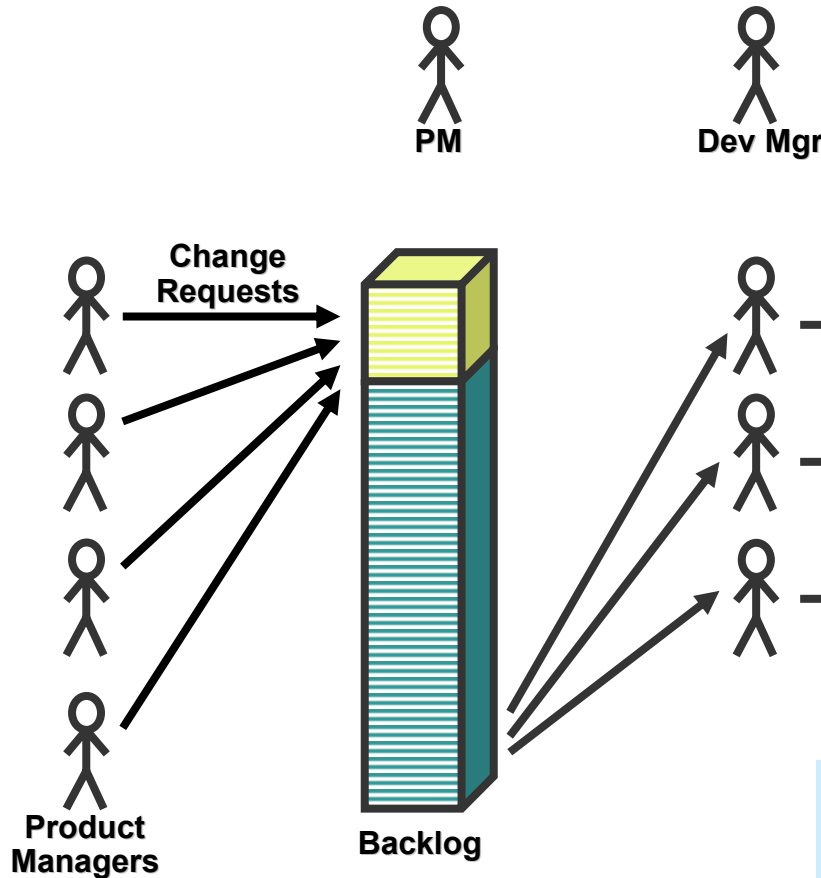
# Current Reality (July 2004)

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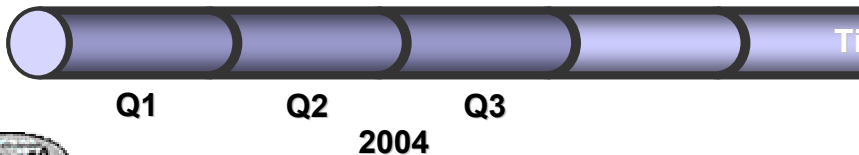


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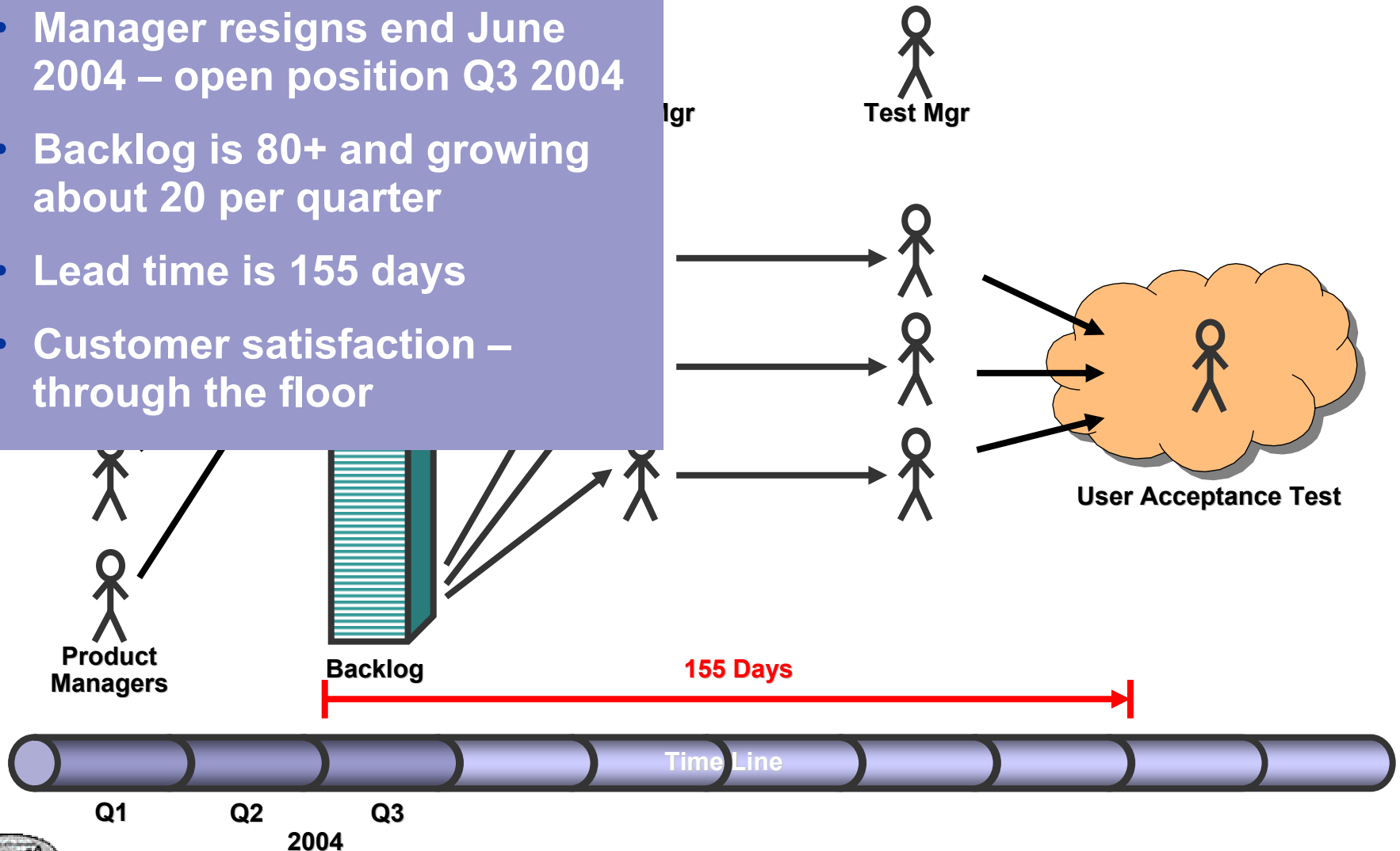


**Demand is outstripping supply and the queue is growing**



# Current Reality (July 2004)

- Manager resigns end June 2004 – open position Q3 2004
- Backlog is 80+ and growing about 20 per quarter
- Lead time is 155 days
- Customer satisfaction – through the floor



# Management Wanted More Data

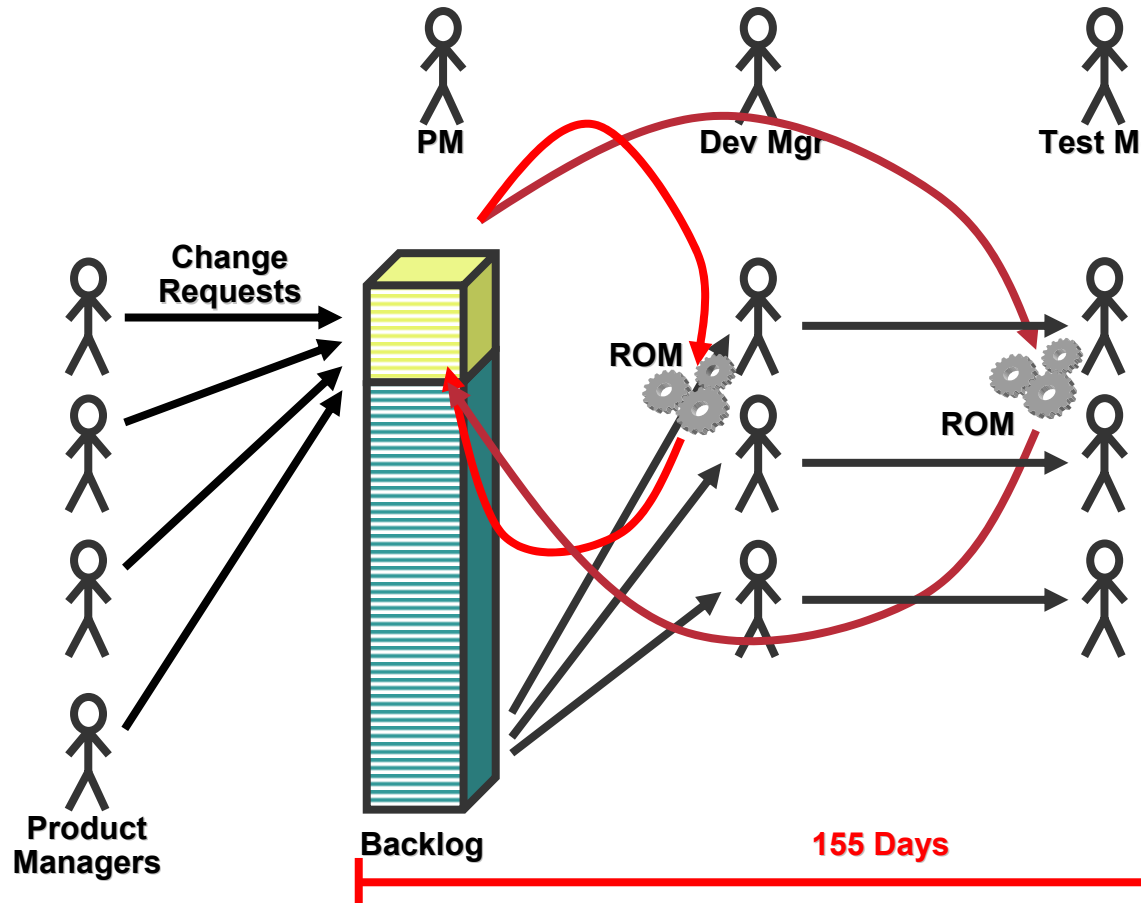
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- **Job Description asked for skills in MS Project, SQL Server and ASP.Net**
- **Someone who could write Queries and Reports and build a website to give better insight into the data**
- **The belief was that if only they had more data to build more accurate schedules they could fix the problem**
- **When it is not working try harder**
  - **Wrong leverage point**
  - **More pressure when less was needed**



# Estimation (ROM) was Top Priority

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- SLA – 48 hours to return a rough order of magnitude estimate (ROM)
- All change requests are ROM estimated
- ROMs are expedited as top priority due to SLA

Time Line

Q1

Q2

Q3

2004

# Estimation (ROM) was Top Priority

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**3 Developers,  
3 Testers  
But...  
80 Applications  
What happens?...**

- SLA – 48 hours to return a rough order of magnitude estimate (ROM)
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Product Managers

Backlog

155 Days

Time Line

Q1

Q2

Q3

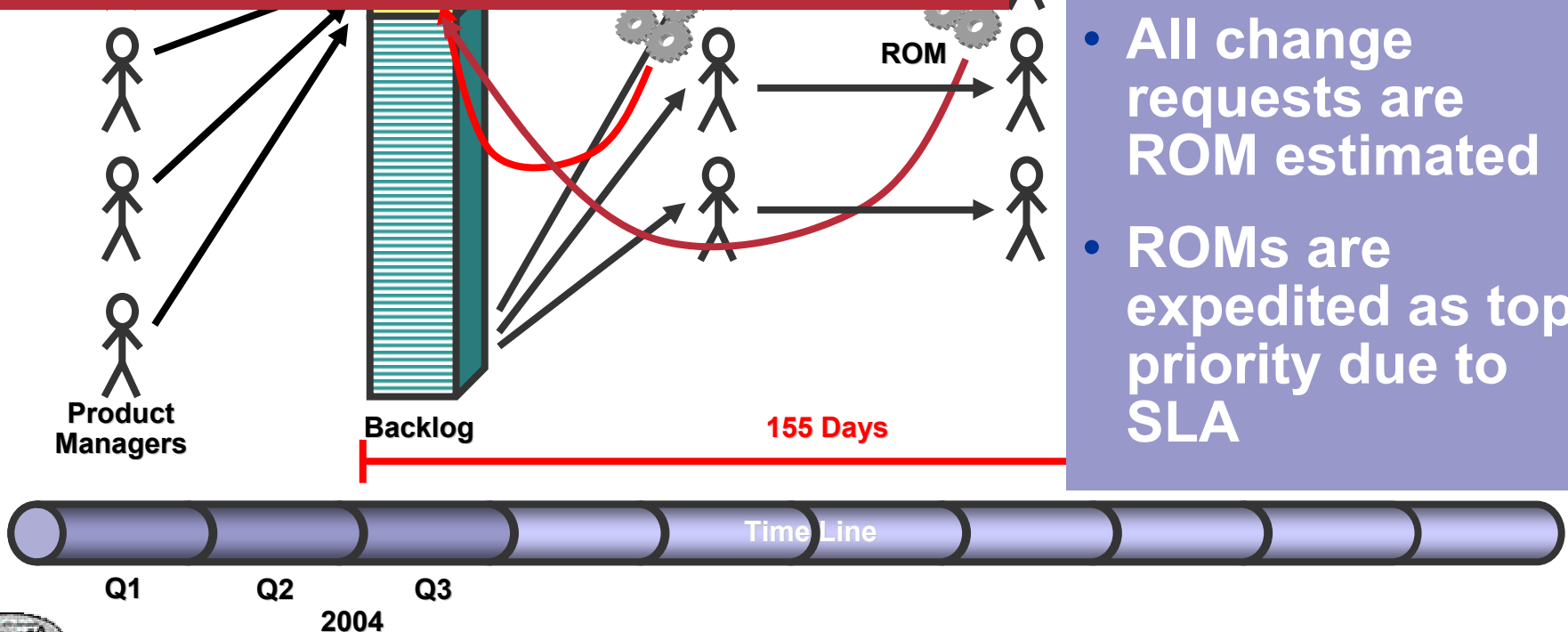
2004

# Estimation (ROM) was Top Priority

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- Open and Read Source Code
- Read Application Guide
- Whole process about 1 day per developer and tester

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**Estimation was using  
33%-40%  
of available capacity!!!**

Managers

Time Line

Q1

Q2

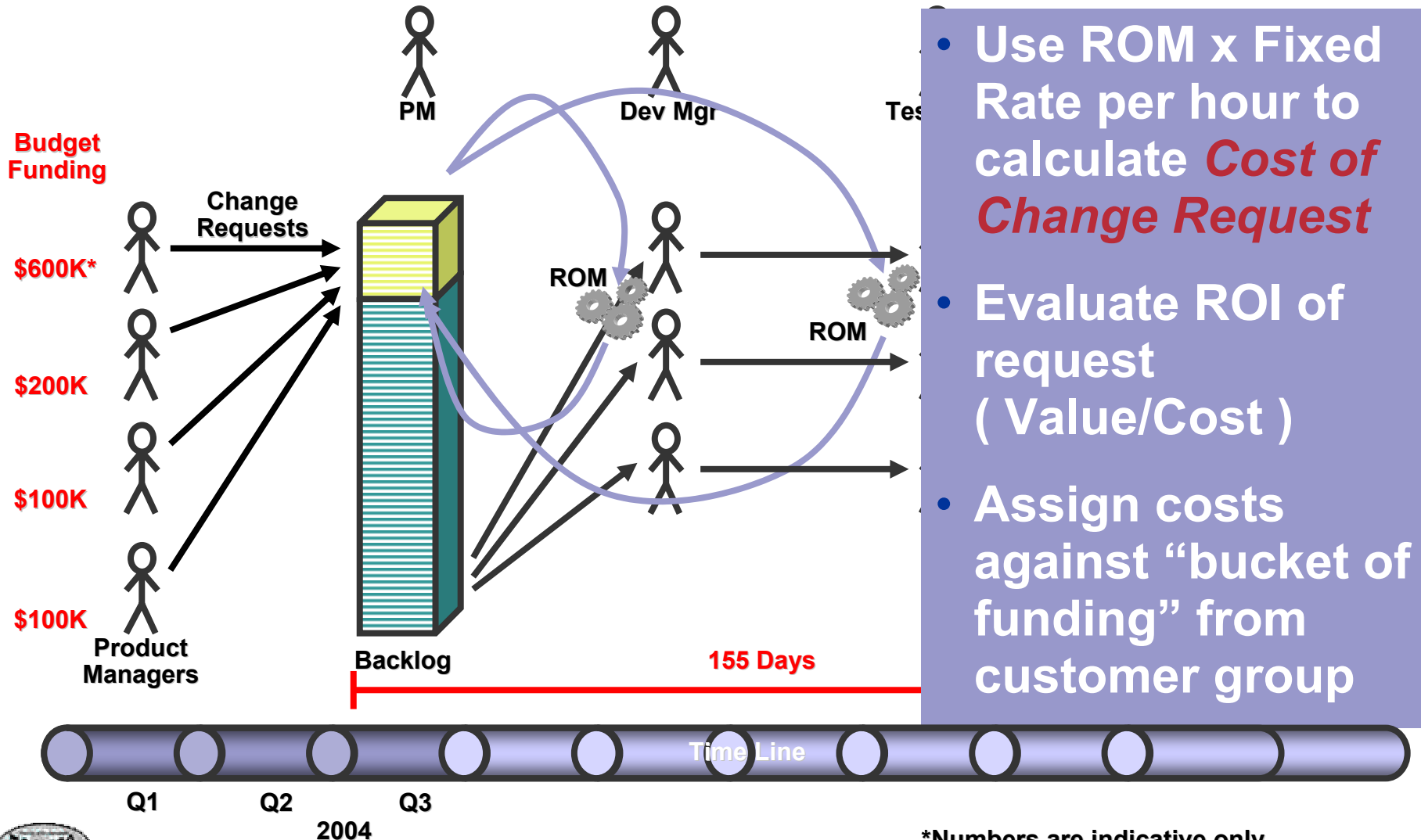
Q3

2004



# Estimates were used to facilitate cost accounting

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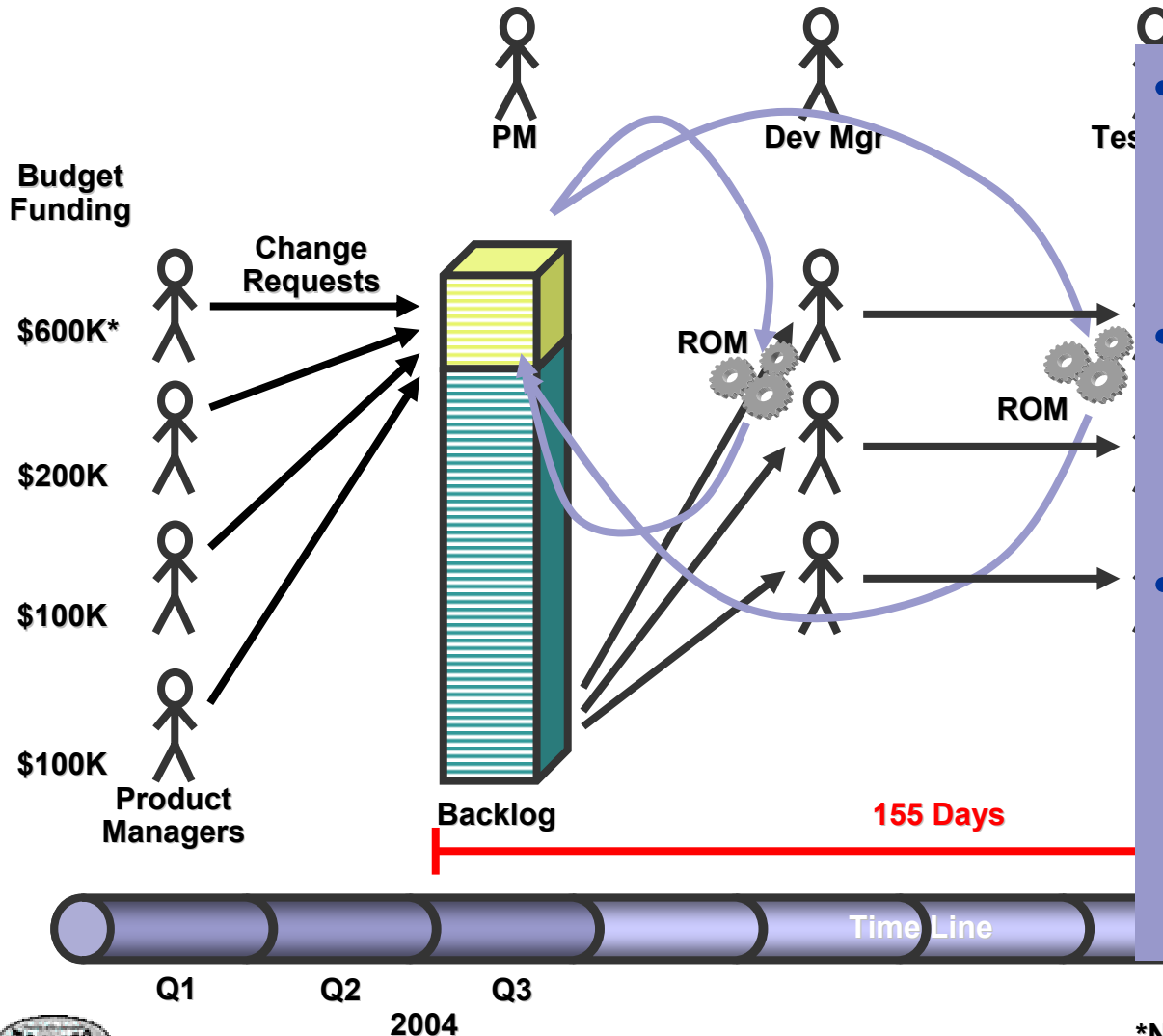


\*Numbers are indicative only



# Estimates were used to facilitate monthly rescheduling

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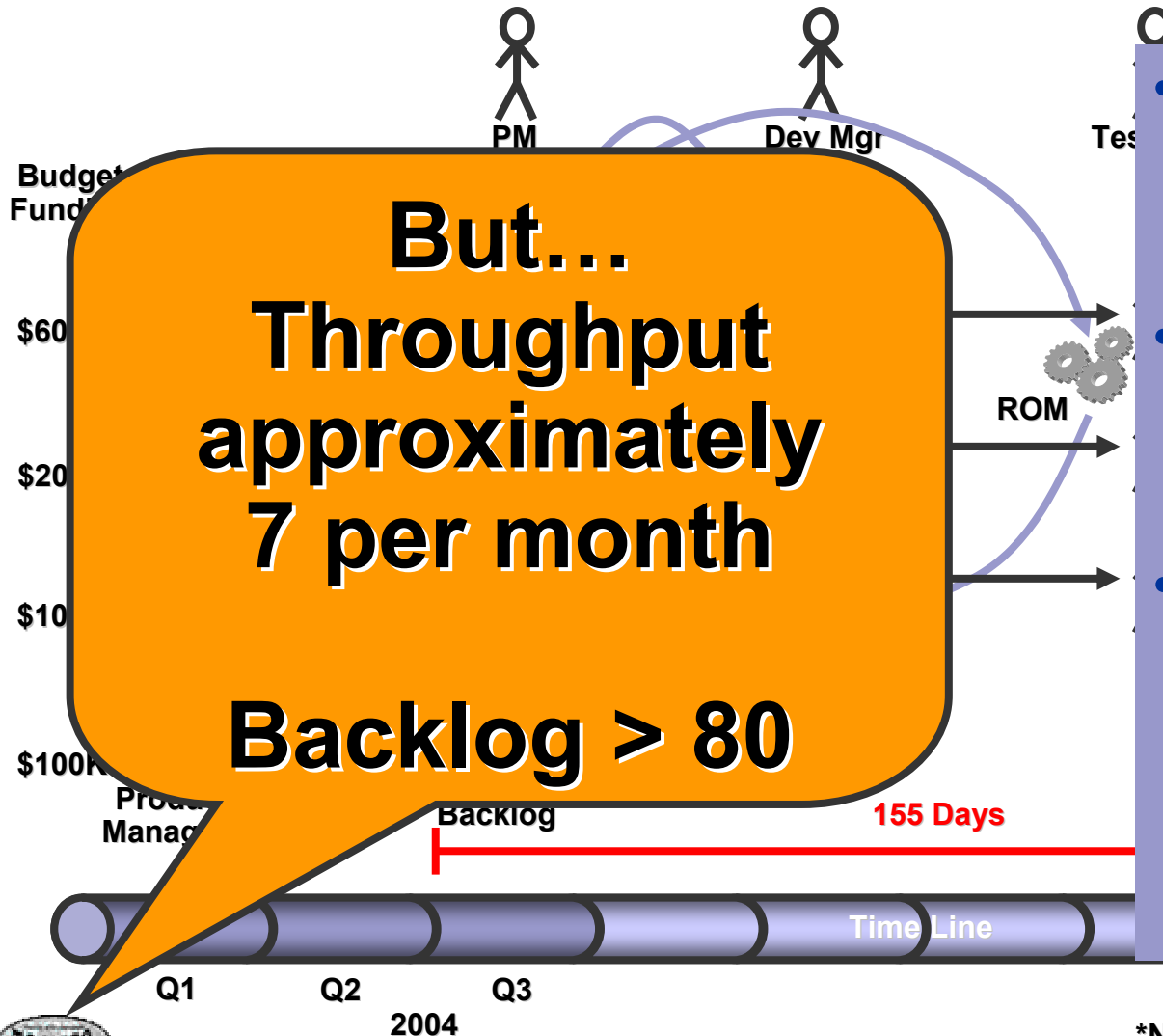


- Monthly rescheduling meeting
- Assign “urgency” to each request on backlog
- Reschedule entire backlog based on urgency and ROM estimate  
**(every month!)**

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# Estimates were used to facilitate monthly rescheduling

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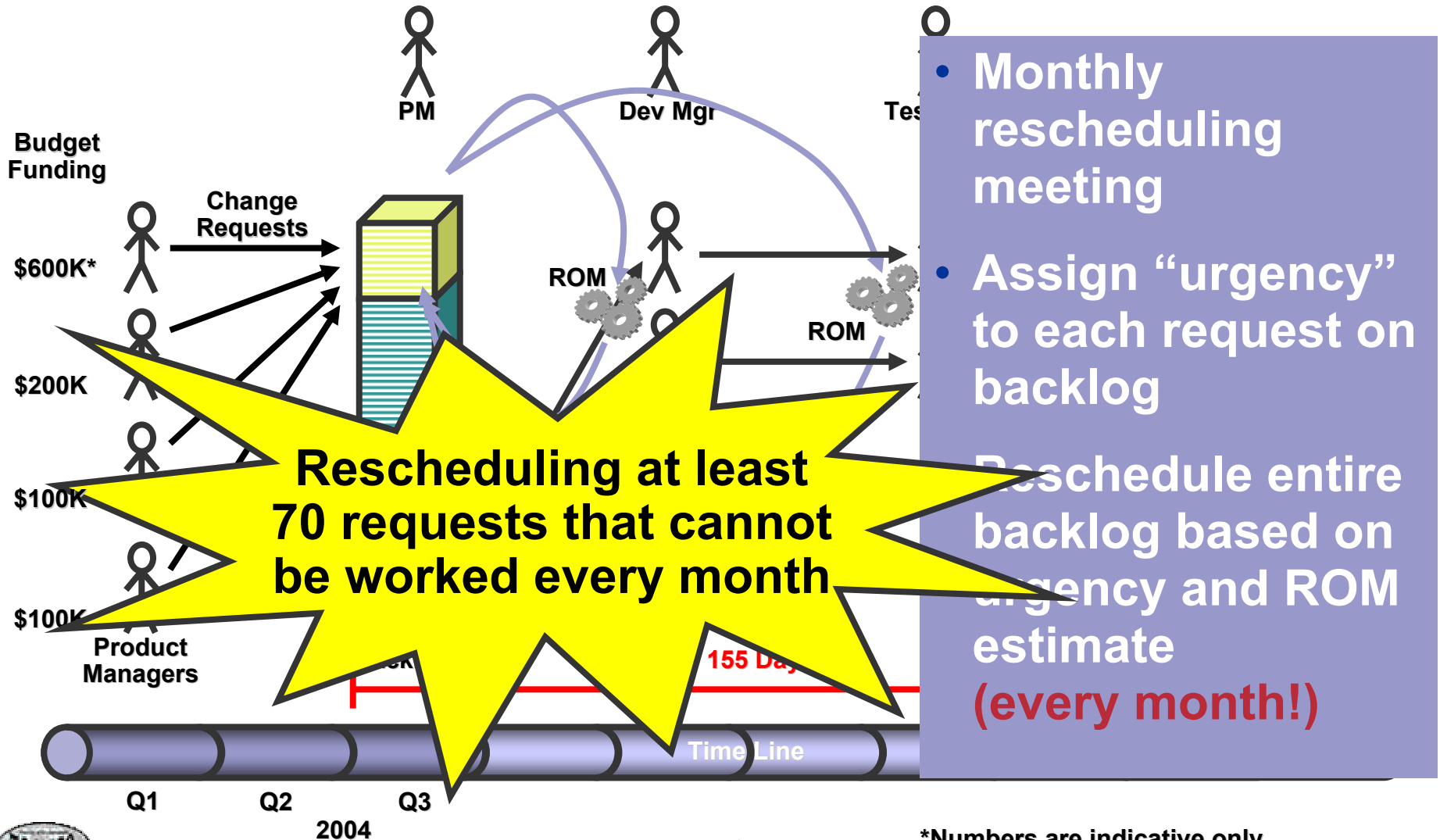


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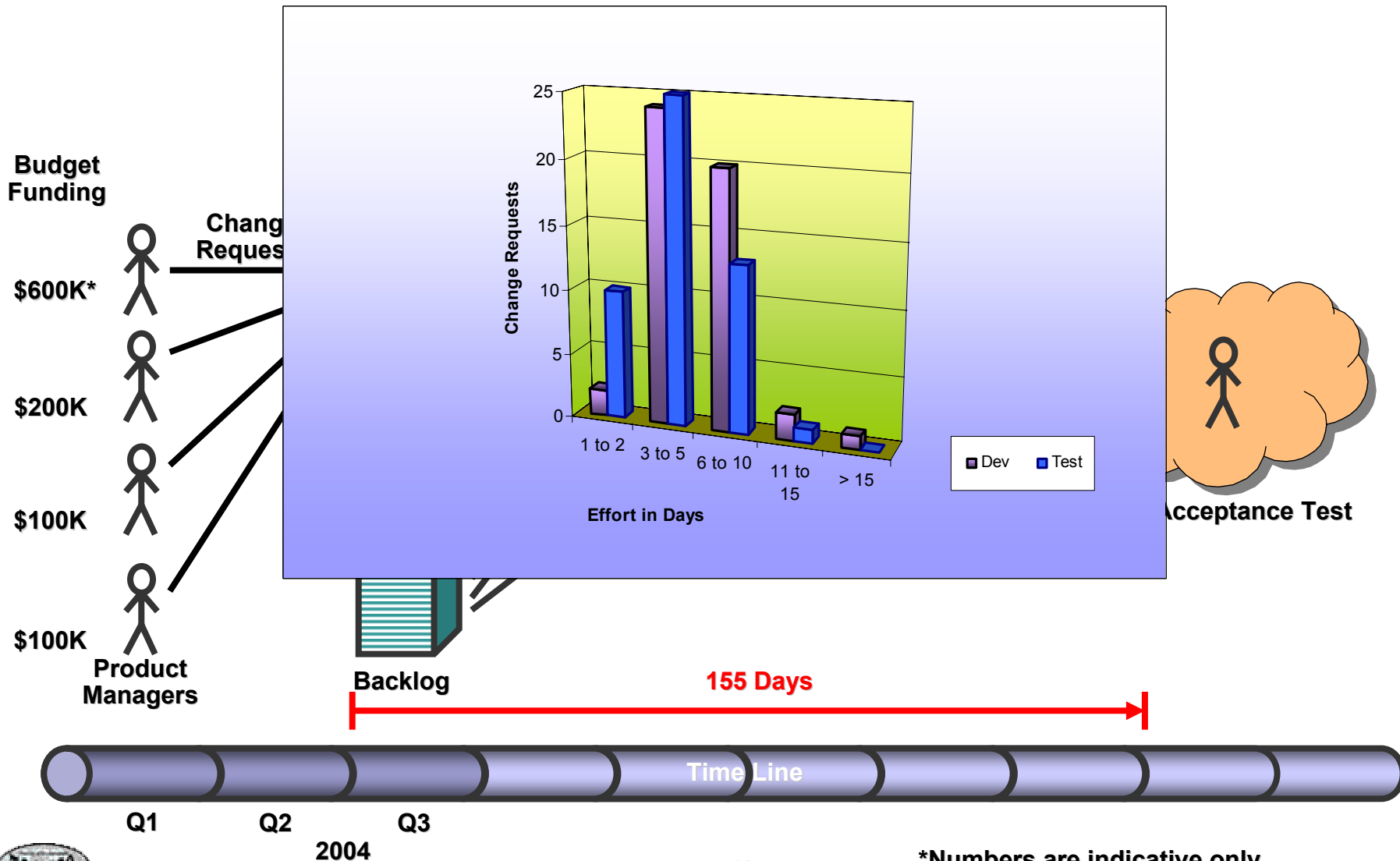
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# Estimates were used to facilitate monthly rescheduling

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# Actual effort was miniscule compared to lead time of 155 days

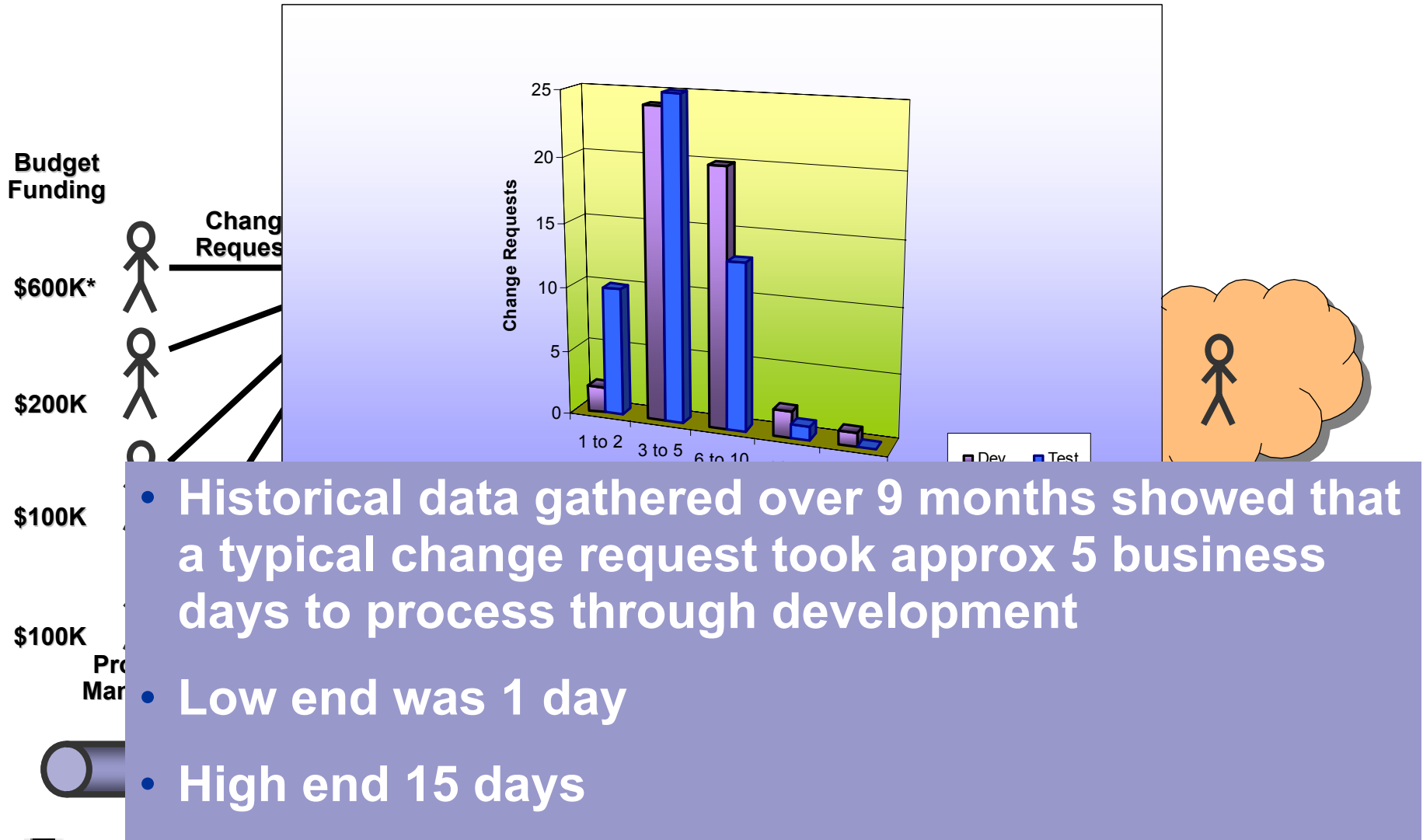


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2004

17

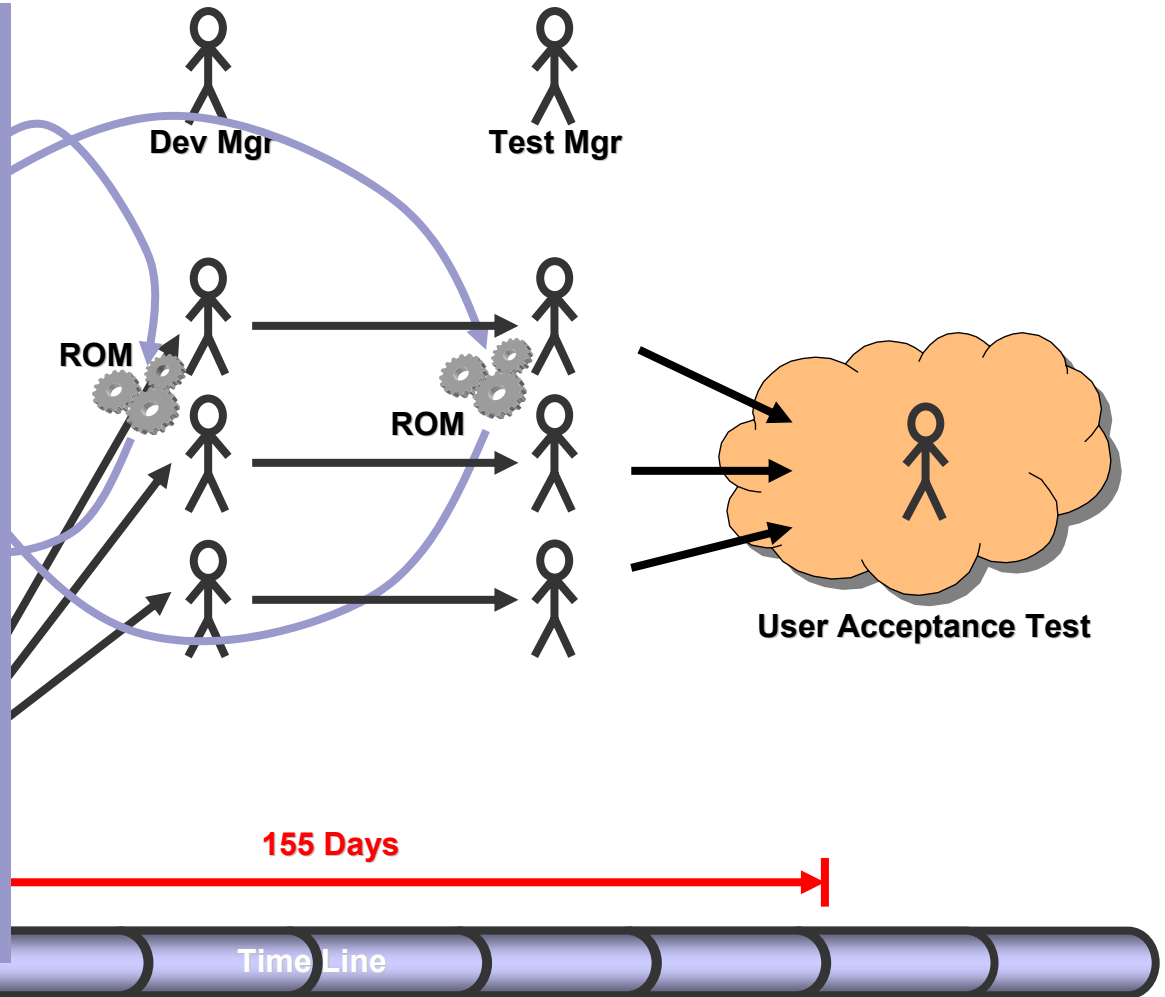
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# Are Estimates are *muda*?

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- Only 52% of requests were actually ever completed
- Other 48%
  - Too big (bigger than 15 days)
  - Too expensive (low value versus cost)
  - Overtaken by events, application decommissioned before request is processed



Q1

Q2

Q3

2004

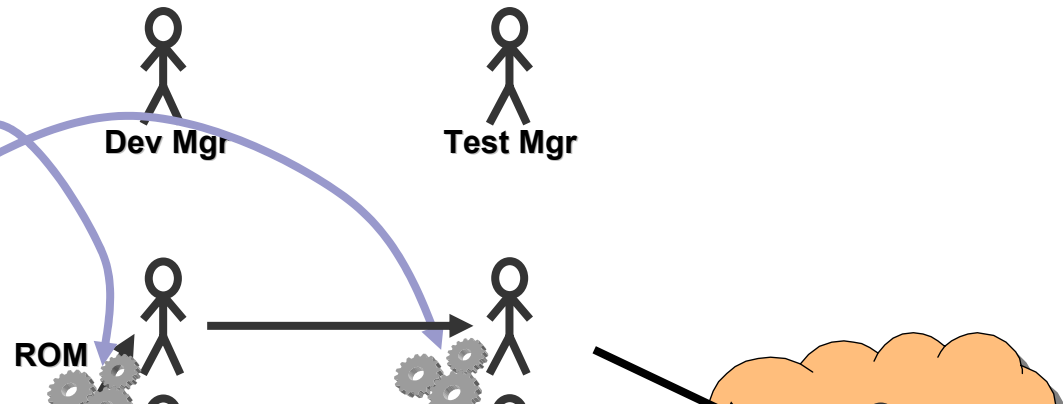
Time Line



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- ROMs are taking 40% of capacity but 48% of ROMs represent analysis that is never used beyond estimate, schedule and go/no go decision!
- Knowledge work is perishable. ROM analysis is done months before work is conducted and there is no guarantee that ROM is conducted by same engineer who will code or test.
- Conclusion – all ROMs are *muda*

Q1

Q2

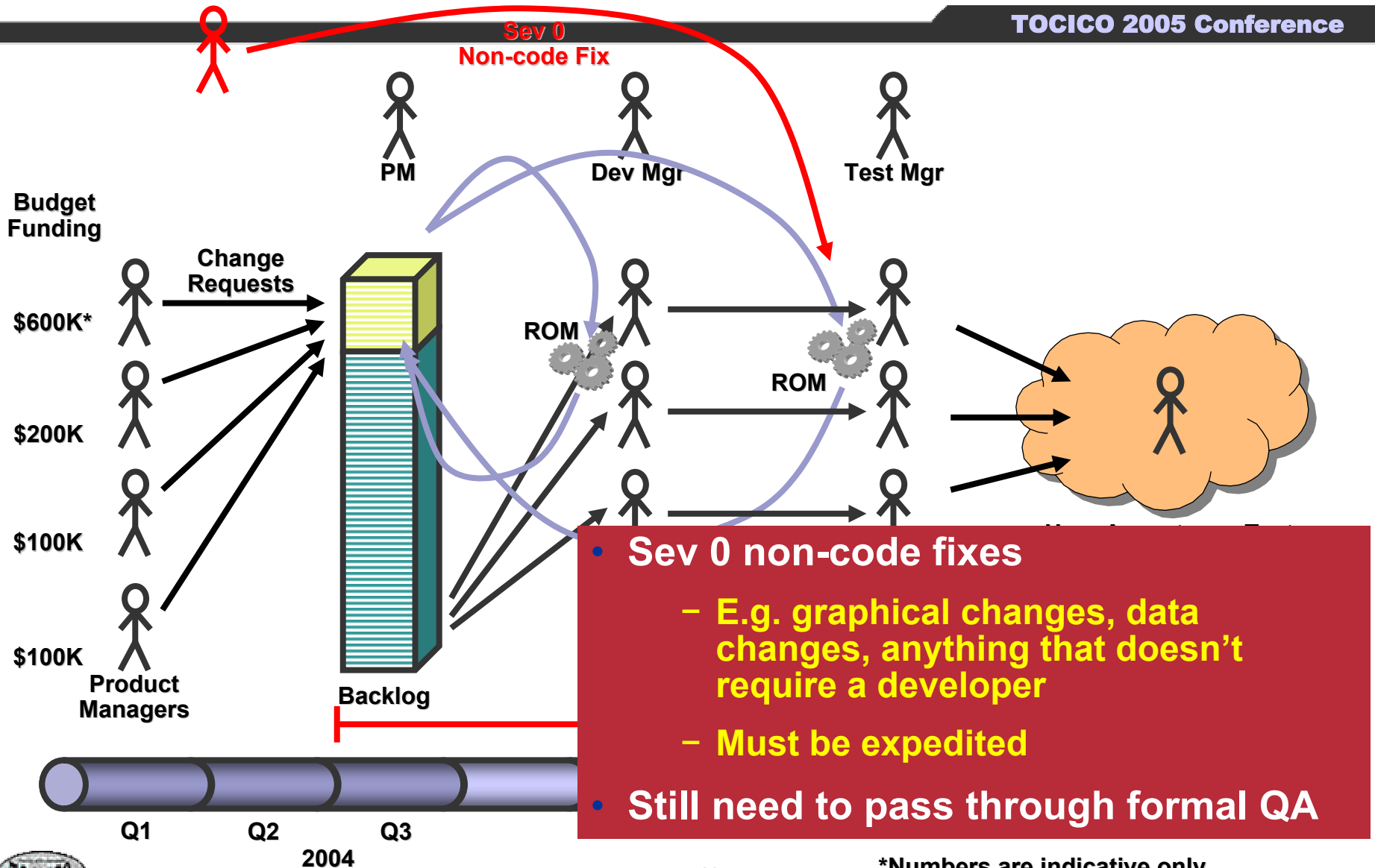
Q3

2004

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# Could it get worse? Severity 0

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# Productivity

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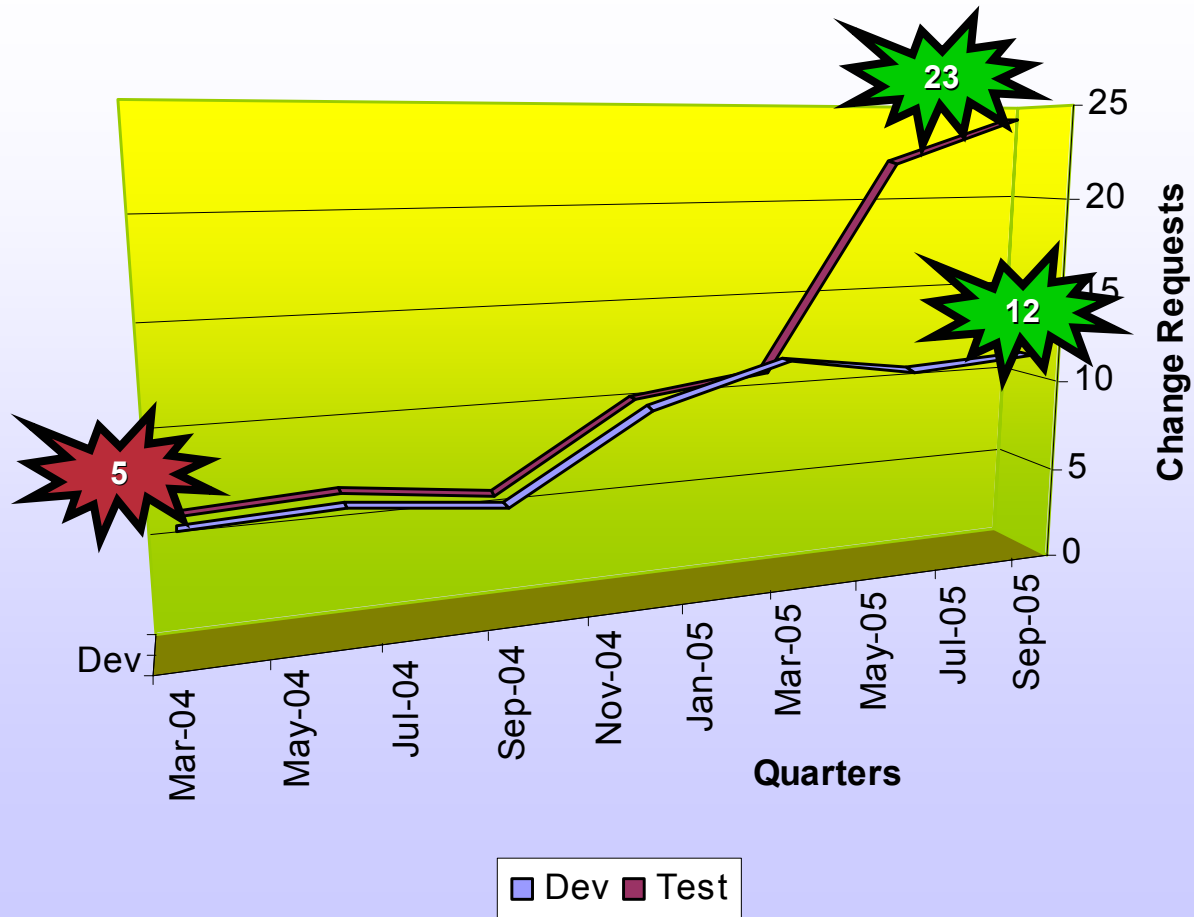
A man in a blue suit is shown in a dark room, appearing to be in a state of motion or juggling. He is holding a stack of papers. The room is filled with numerous thin, vertical poles, each topped with a glowing, circular disc. The overall scene suggests a complex, busy environment where productivity is being questioned.

It's possible to look busy without being productive!

# Productivity

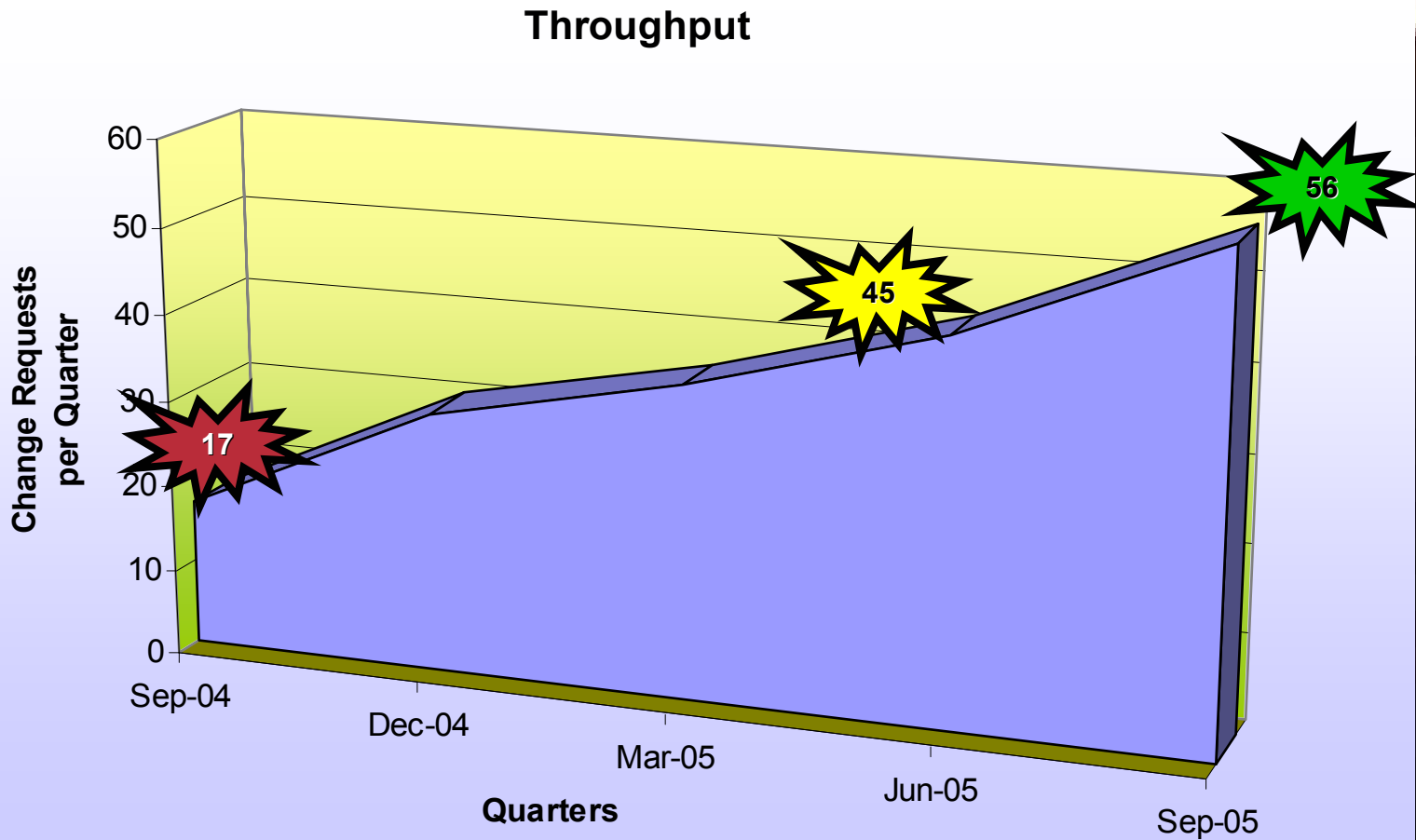
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## Productivity per Resource



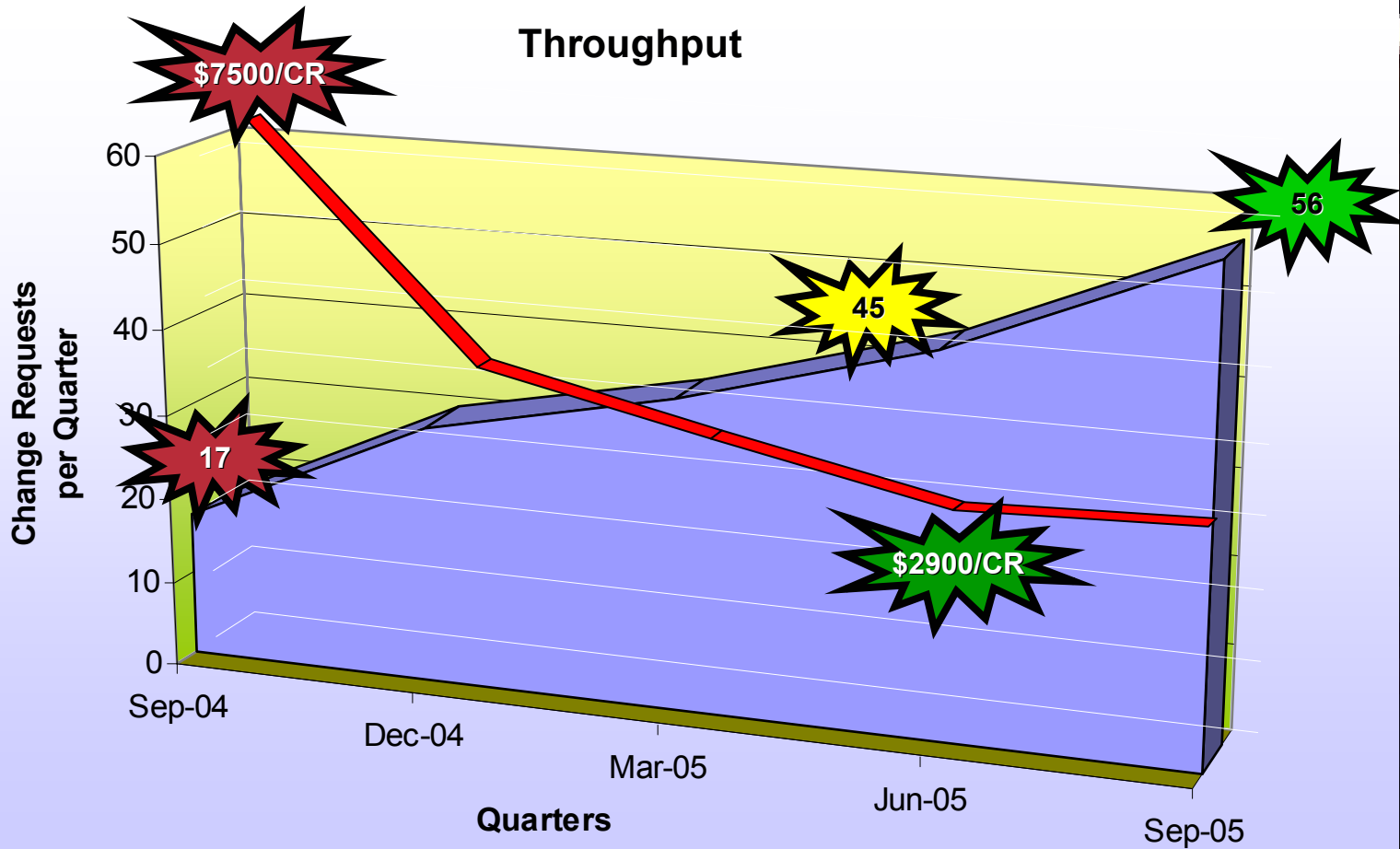
# Throughput

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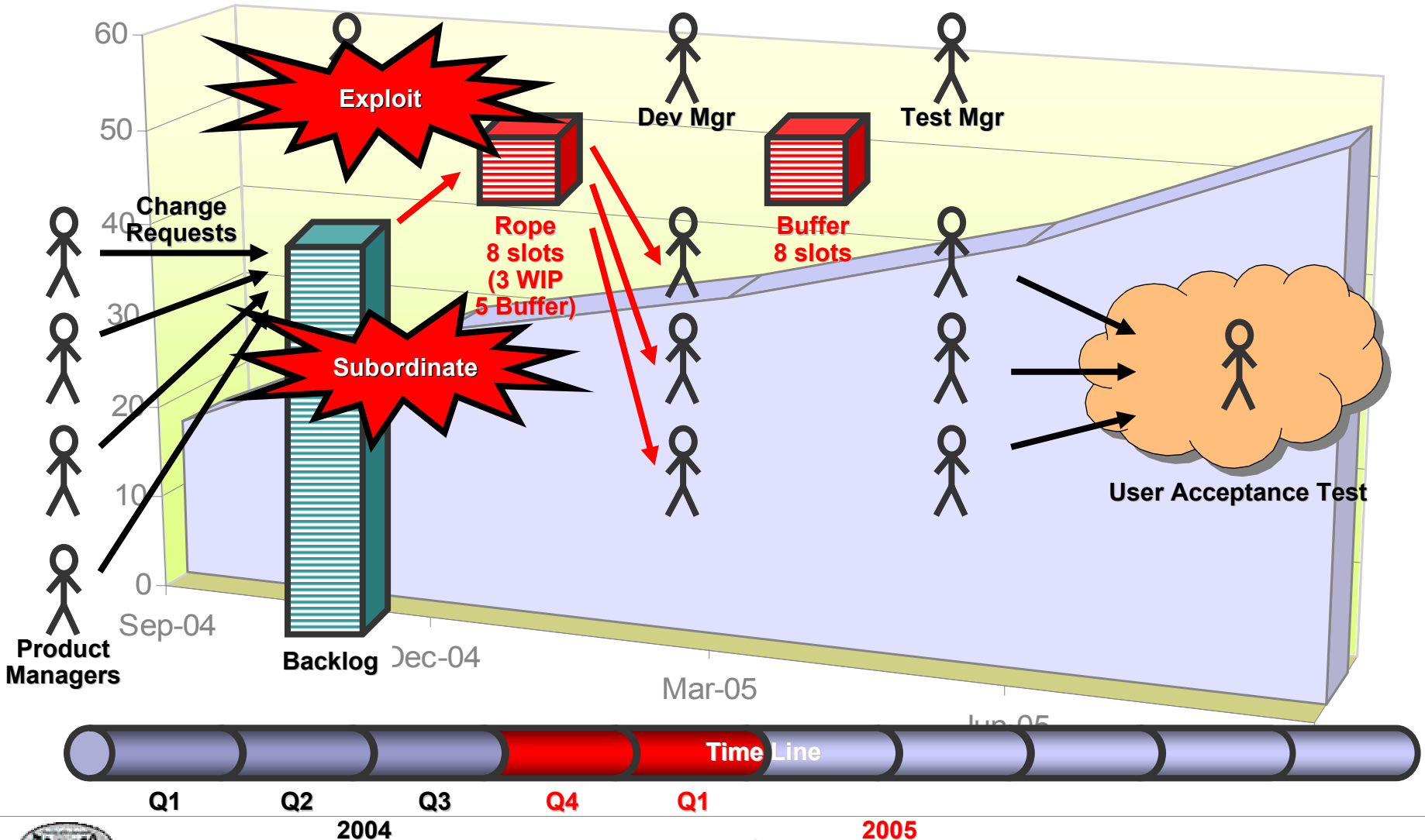
# Throughput and Cost

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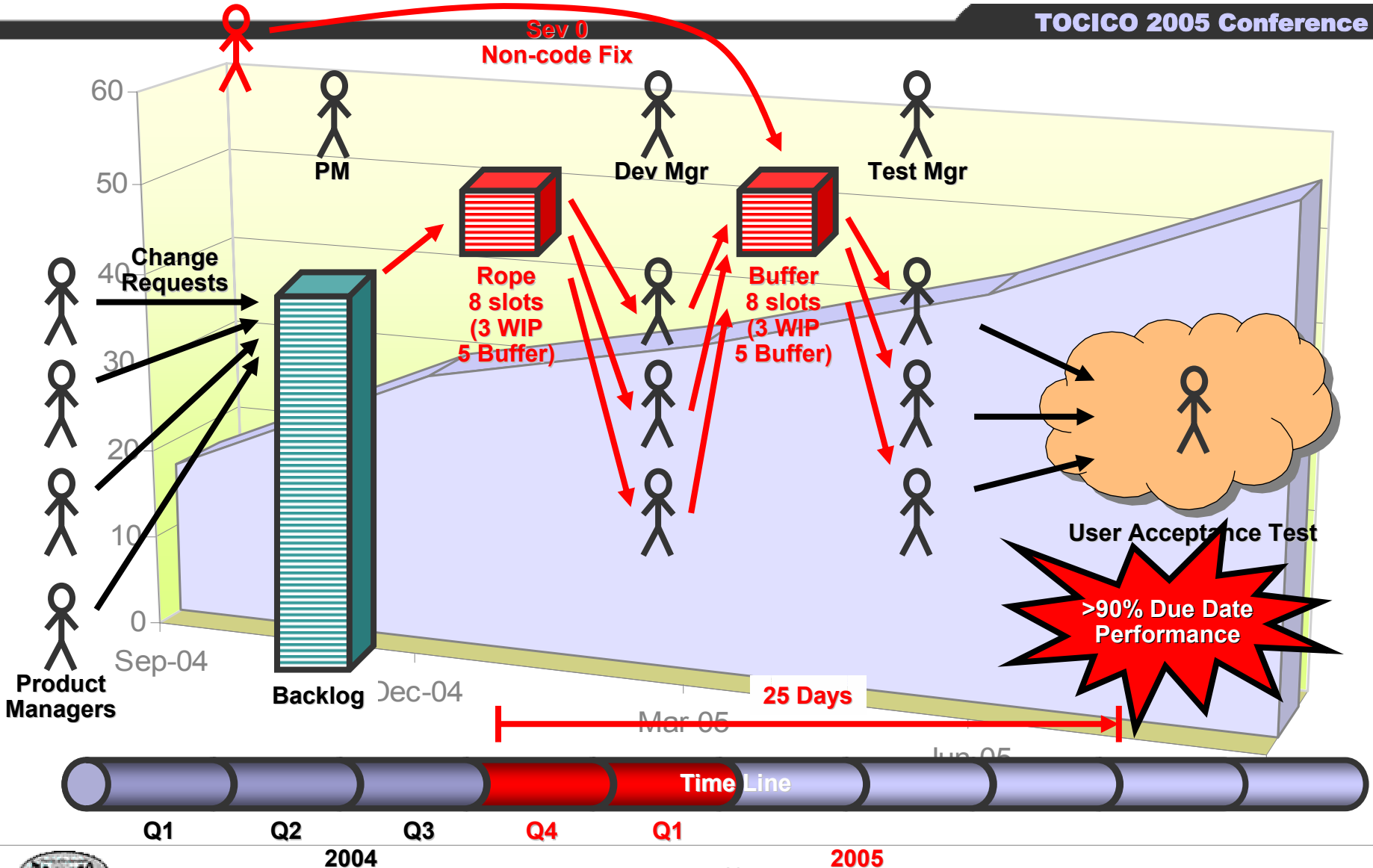


# Injection 1 – a Drum, a Buffer and a Rope

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Sev 0  
Non-code Fix

- **Development Buffer**

- Typically enough for WIP + 7 days

- **Ready for Test Buffer**

- Typically enough for WIP + 7 days

- **Control input – predict lead time**

- **Stem off demand at rate it can be consumed**

- **Reduces lead time by insuring single-tasking**

- **Focuses customer acutely on selection of highest priority (urgency) requests for insertion into empty buffer slots**

Q1

Q2

Q3

Q4

Q1

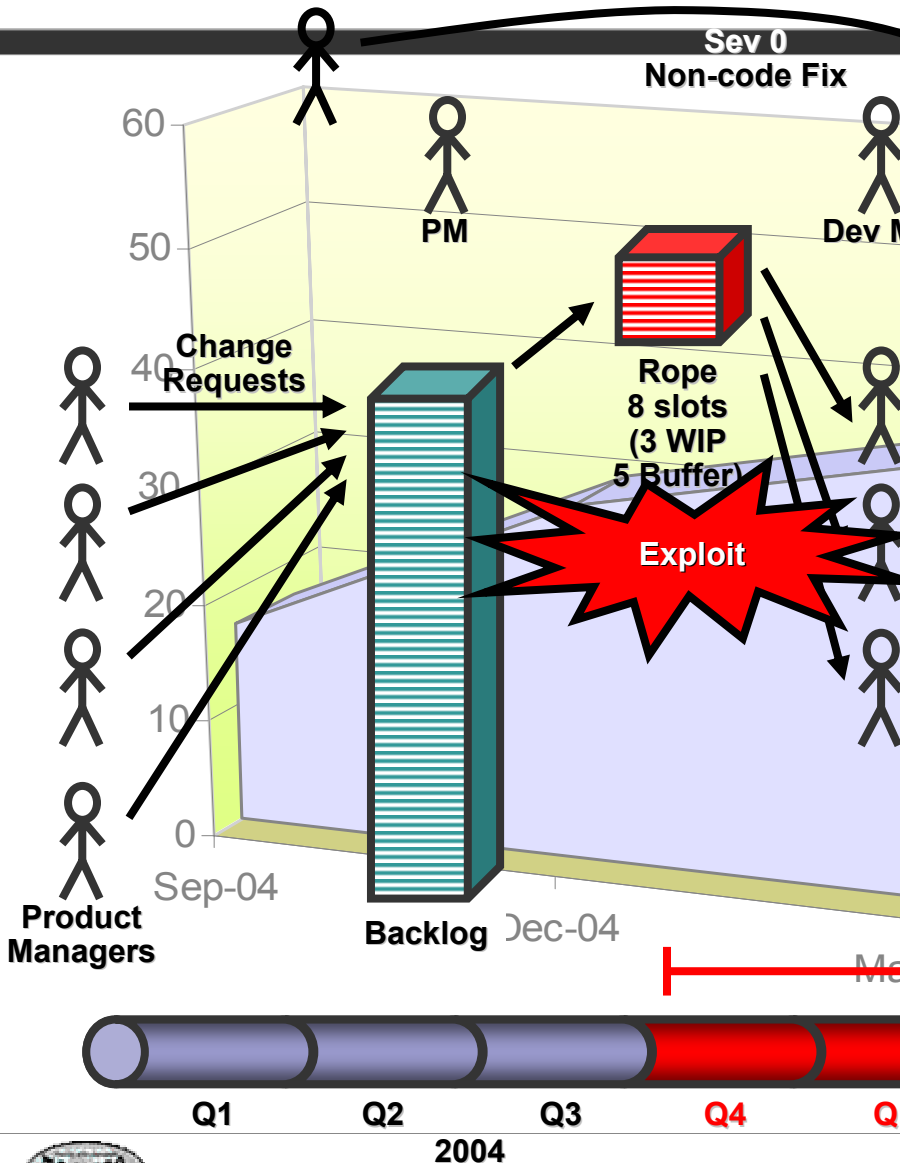
2004

2005



# Injection 2 – Stop Estimating

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- ROM activity abandoned
- Freed up 40% capacity
- Instant boost to productivity numbers
- Edge cases
  - Too big (take risk, identify once in development)
  - Too expensive (don't care)
- Following Deming's advice
  - manage for the normal and treat exceptions as exceptional

# Injection 2 – Stop Estimating

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Sev 0  
Non-code Fix

Subordinate

- **Stop cost accounting**

- No such thing as a cost of change request
- Costs are fixed
- Funding is spent with vendor on 12 month contract and paid out on monthly burn rate

- **All changes would be treated equally for cost purposes**

- Based on average of 5 business days through development

- **ROM activity abandoned**

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Q1

Q2

Q3

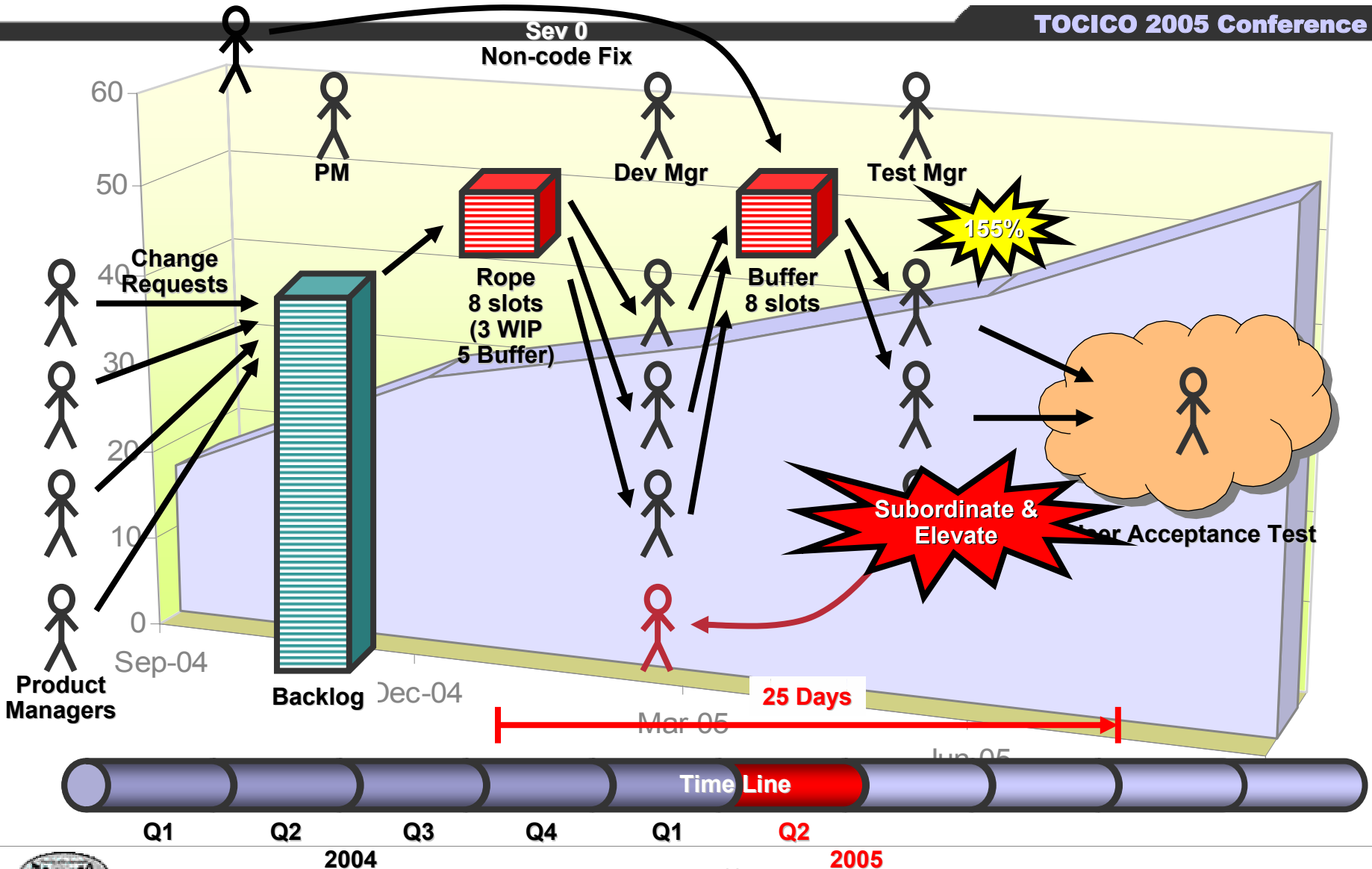
Q4

Q

2004

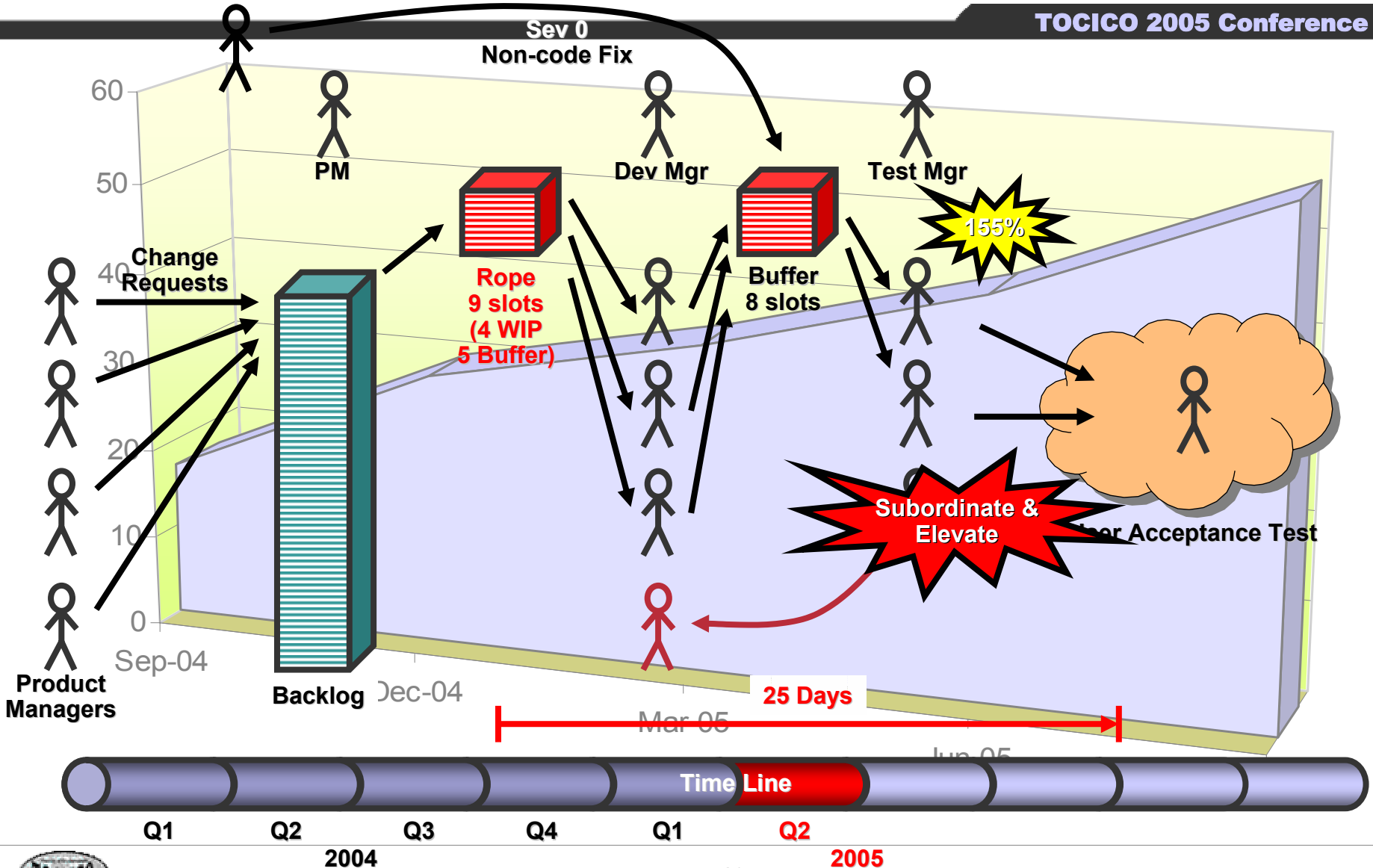


# Injection 3 – Reallocate Resources



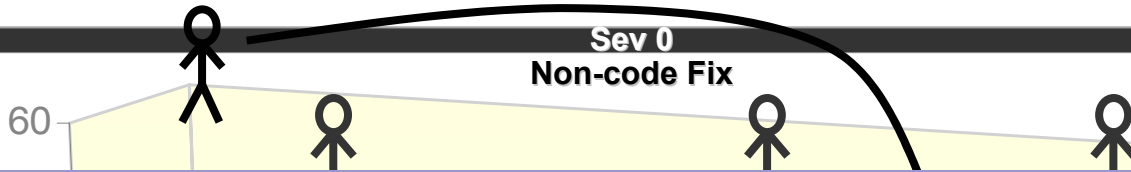
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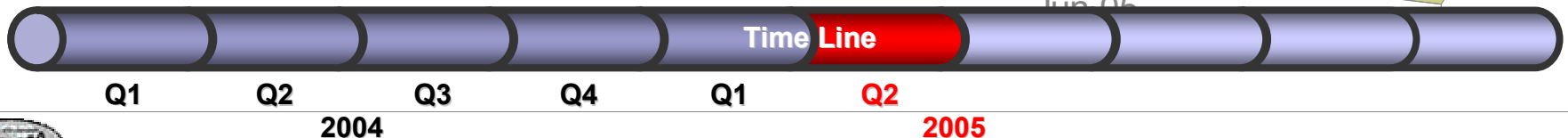


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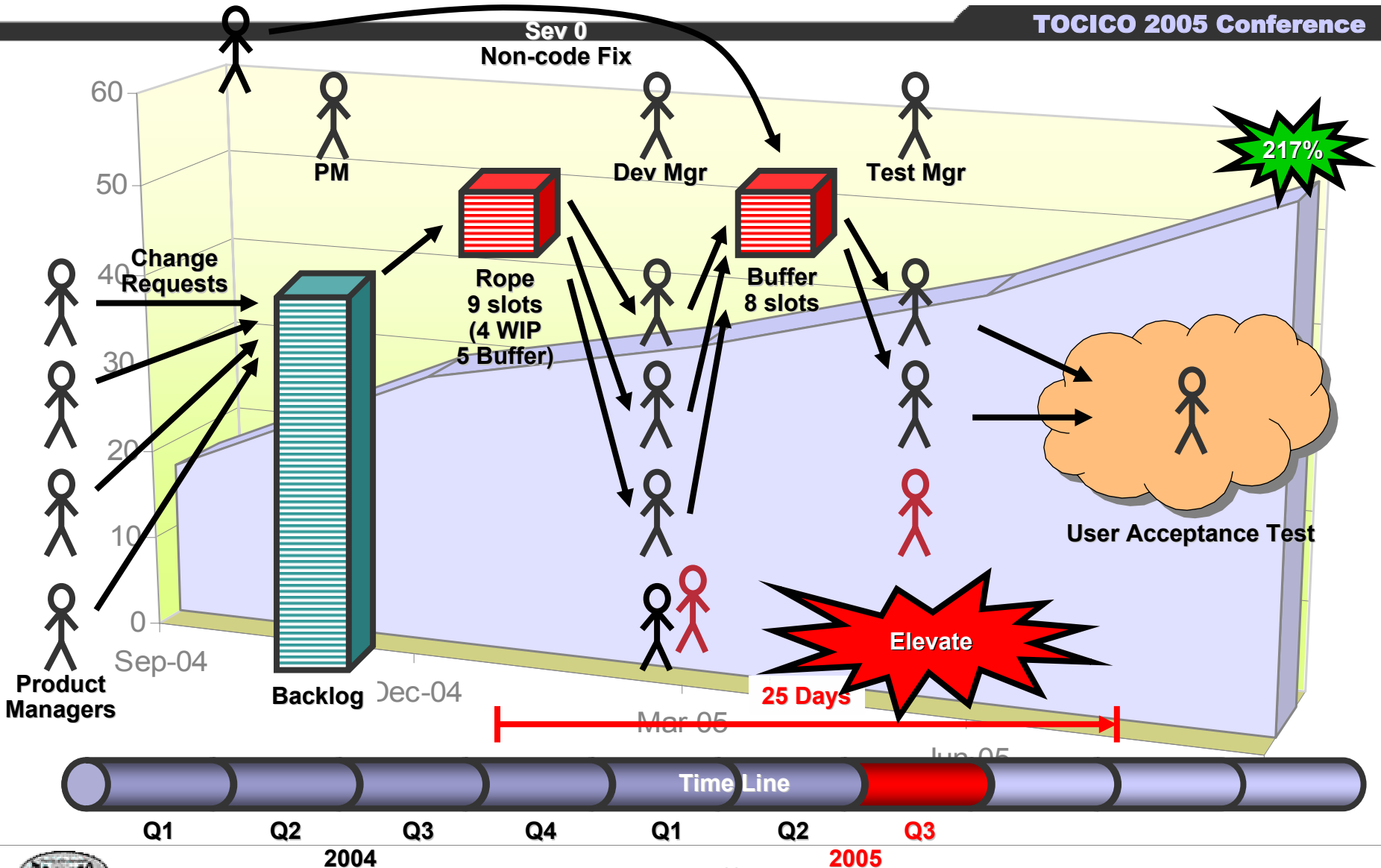


- Buffer insertion and ROM eradication should produce slack time in test
- Historical data suggests ratio of dev:test is 2:1 but XIT SE has 1:1 ratio (July 2004)
- Visit India, observe team, after first two changes
- Ask vendor to reallocate resource from test to dev
- 4:2 ratio
- Instant improvement in productivity



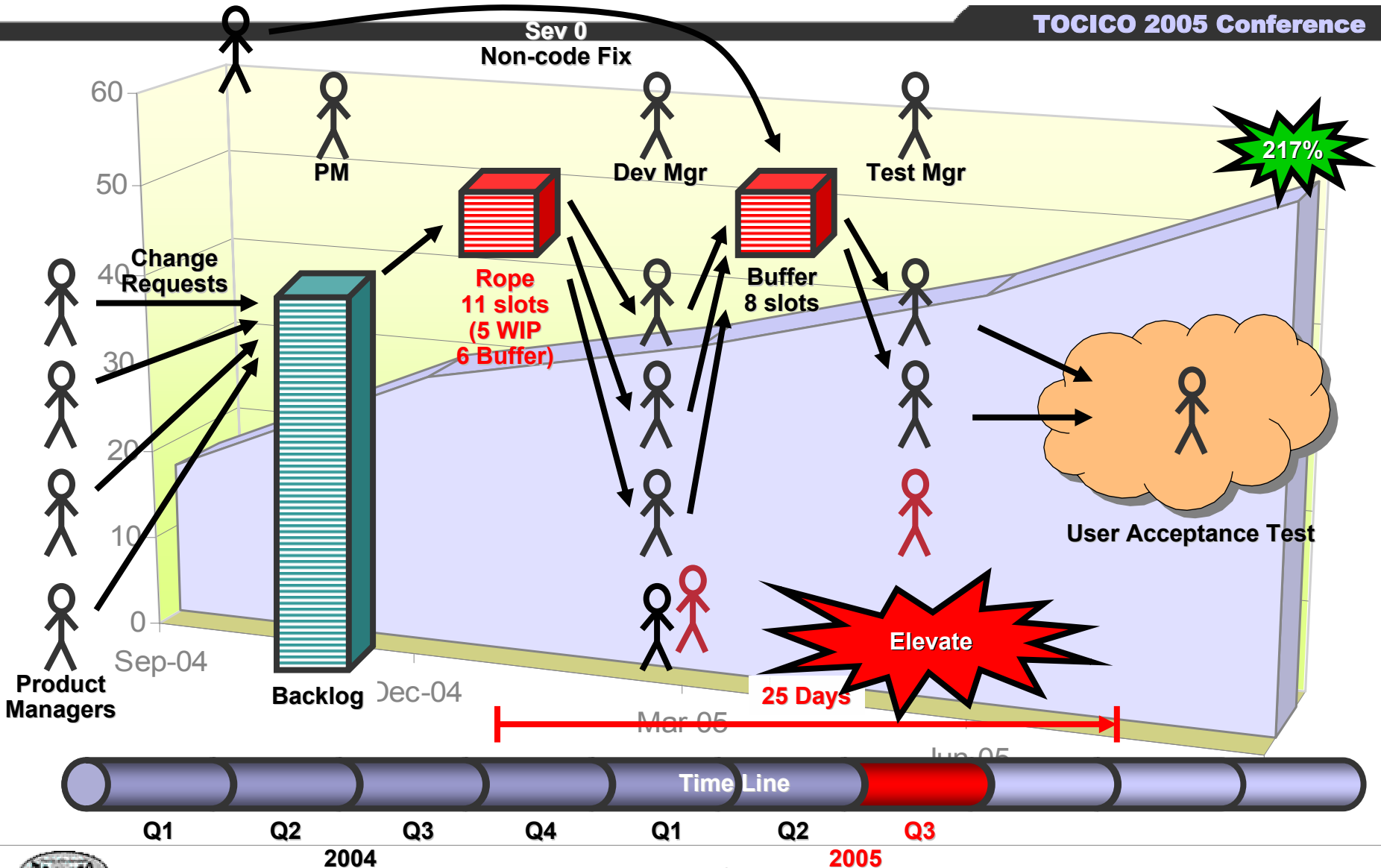
# Invest for Yet More Throughput

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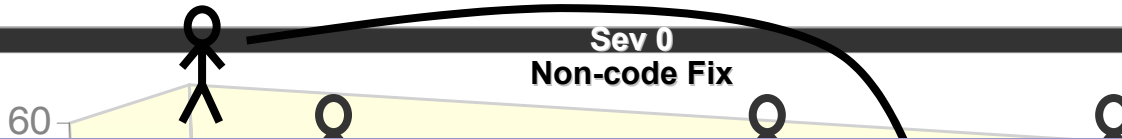
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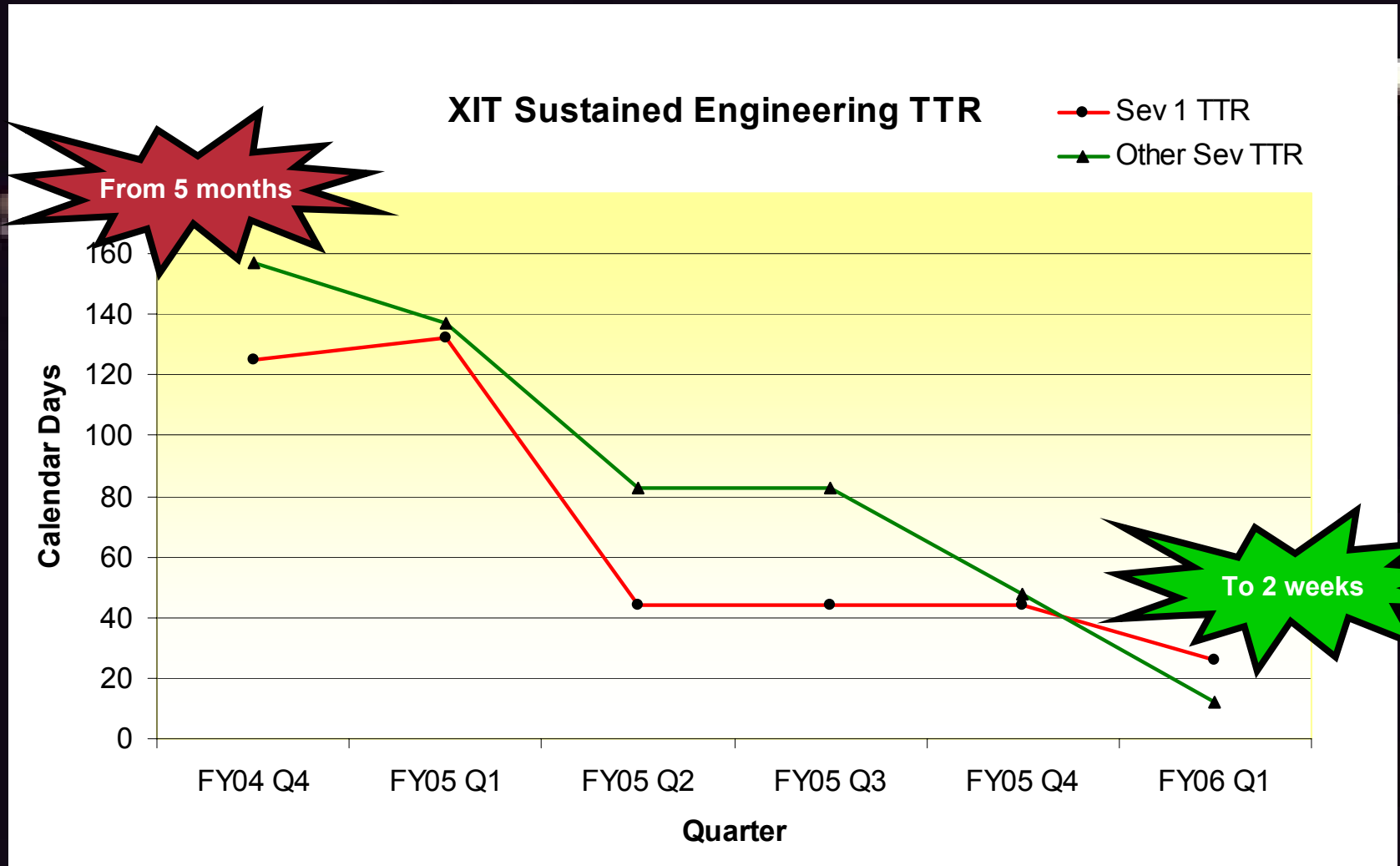
- Having fully exploited the developers as the CCR
  - Buffer
  - Remove ROM estimate waste
- And having subordinated the rest of the system to the decision to fully exploit developers
  - Cease cost accounting
  - remove ROM estimate waste
  - Re-write SLAs with customer
  - Change prioritization and delay commitment
- Total Improvement of 155% in productivity, but more was needed...
- Increase staff to 5:3 dev:test ratio in July 2005 to gain a 217% productivity improvement over 15 months

Pro  
Man



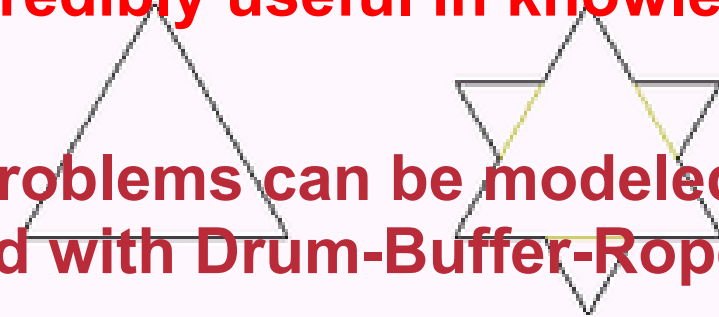
# Official Lead Time Metric

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# Conclusions

- **5 Focusing Steps are incredibly useful in knowledge work problems**
- **Software Development Problems can be modeled as flow problems and solved with Drum-Buffer-Rope**
- **Results can be outstanding**
  - **What CIO wouldn't want a 200% improvement in productivity from his software development people?**
- **No need to resort to Critical Chain scheduling**
- **No exotic trees based on The Thinking Processes**



*The first four iterations of the Koch snowflake*

# About Dragos G. Dumitriu

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Dragos visiting his team in Hyderabad, India.

Dragos' former career as an athlete and stuntman helped him develop unique strategies in persuasion and communication.

He is a Program Manager with the IT Department at Microsoft Corporation in Redmond, WA. He has 12 years of combined experience in development, testing, support, and project management for software engineering.

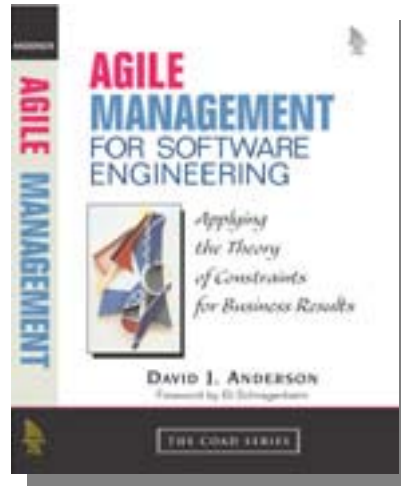
He holds degrees in Communications, Management of Information Systems & Operations Management.

More recently, Dragos became fascinated by the Theory of Constraints and sleeps with David's book under his pillow.

To be continued...



# Questions?...



David J. Anderson

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<http://www.agilemanagement.net/>

# About David J. Anderson

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David Anderson is a software engineering methodologist and Program Manager with Microsoft Corporation in Redmond WA. He has 23 years experience in the software development business starting with computer games in the early 1980's. As a pioneer in the agile software movement David has run around 20 software projects in the Fortune 100. He is currently creating the next generation of MSF (Microsoft Solution Framework), a set of process guidance and development tooling which enables the latest thinking in working practices and management techniques for software engineering.

David authored the popular and well received textbook, **Agile Management for Software Engineering – Applying the Theory of Constraints for Business Results**, published in 2003 by Prentice Hall, which introduced the concepts of Drum-Buffer-Rope, Critical Chain and Throughput Accounting for software engineering.

David has held management positions with Sprint PCS and Motorola before being attracted to Microsoft and the opportunity to bring his paradigm shifting thinking in software management to a wider audience.

He holds a degree in Computer Science & Electronics from the University of Strathclyde, Glasgow, Scotland where he specialized in control systems engineering.



# Contact Details

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- Dragos Dumitriu [ddumitri@microsoft.com](mailto:ddumitri@microsoft.com)
- More details on using the Theory of Constraints in software engineering from...
- <http://www.agilemanagement.net>