



# Making the Business Case for **AGILE** MANAGEMENT

*Simplifying the complex system of software engineering*

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# AGENDA



- **Making a business case**

- 4 challenges for 21<sup>st</sup> Century Software Engineering

- **AGILE MANAGEMENT**

- **WHY**

- Management Science provides the foundation and theory to justify the agile approach

- **HOW**

- Practical Implementation with Feature Driven Development

- **WHAT**

- Recognizing the results with Management Accounting & Reporting

# Making a Business Case



- **4 Challenges for 21<sup>st</sup> Century Software Engineering**

- **TRANSPARENCY**

- How can we provide transparency and visibility into software engineering activities?

- **ALIGNMENT**

- How do we align the day-to-day activities of software engineers with the best interests of the stock holders?

- **PRODUCTIVITY**

- How to return more on investment and deliver greater profits?

- **GOVERNANCE**

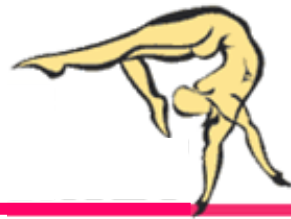
- How can we make better quality decisions about allocating resources



**WHY**

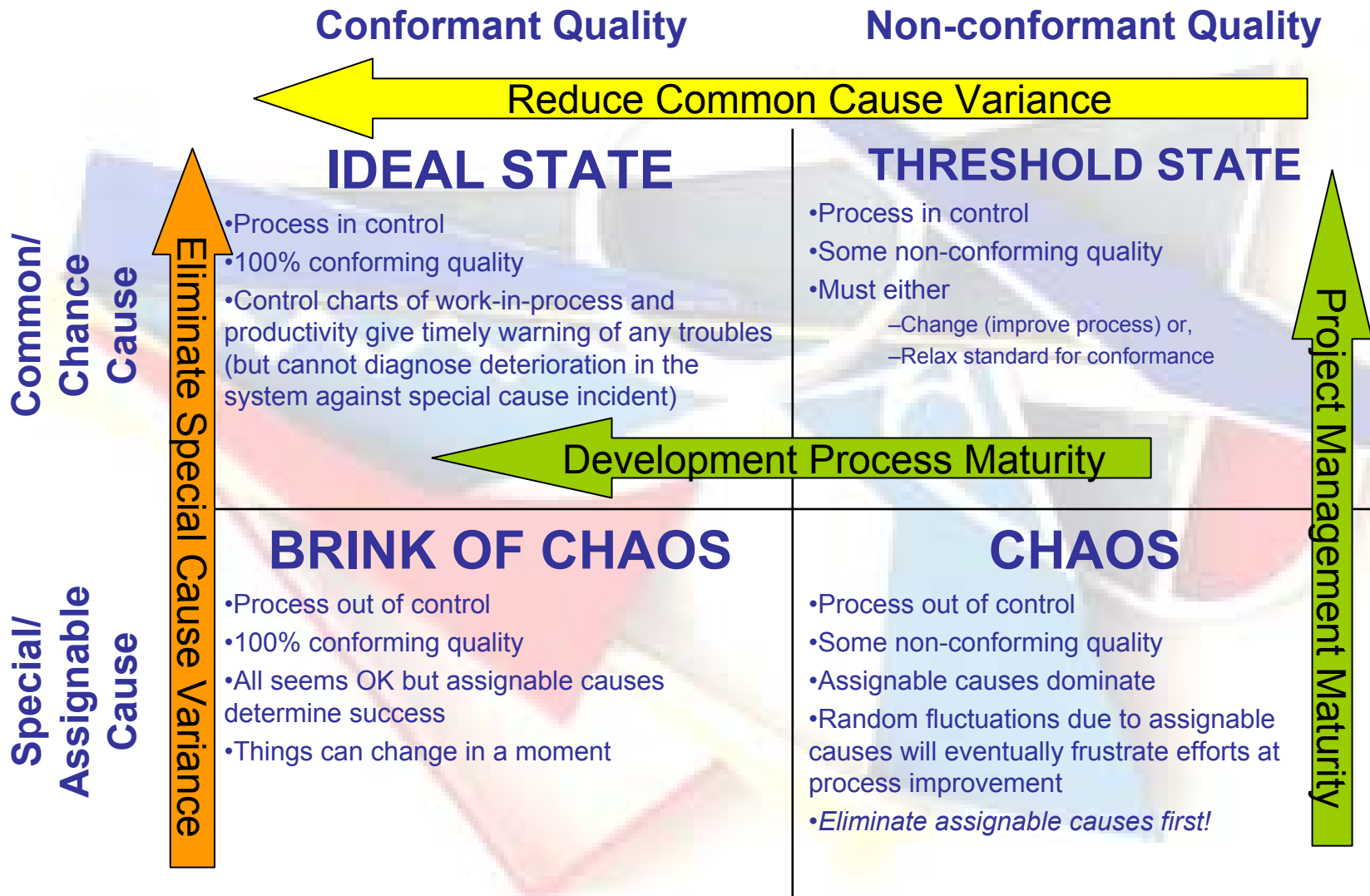
Management Science for Software  
Engineering

# Management Science



- **Peter Drucker** (1950s) Value not Cost
  - “value” can only be defined by the customer – product cost is irrelevant
- **Michael Porter** (1970s) Value Chain
  - Value can only be determined by the consumer at the end of the chain
- **Peter Senge** (1990) Systems Thinking
  - Feedback loops, complex cause-effect
  - Archetypes e.g. “virtuous cycle”, “vicious cycle”, “tragedy of the commons” and “limits to growth”

# Variation and Six Sigma



# Lean Production



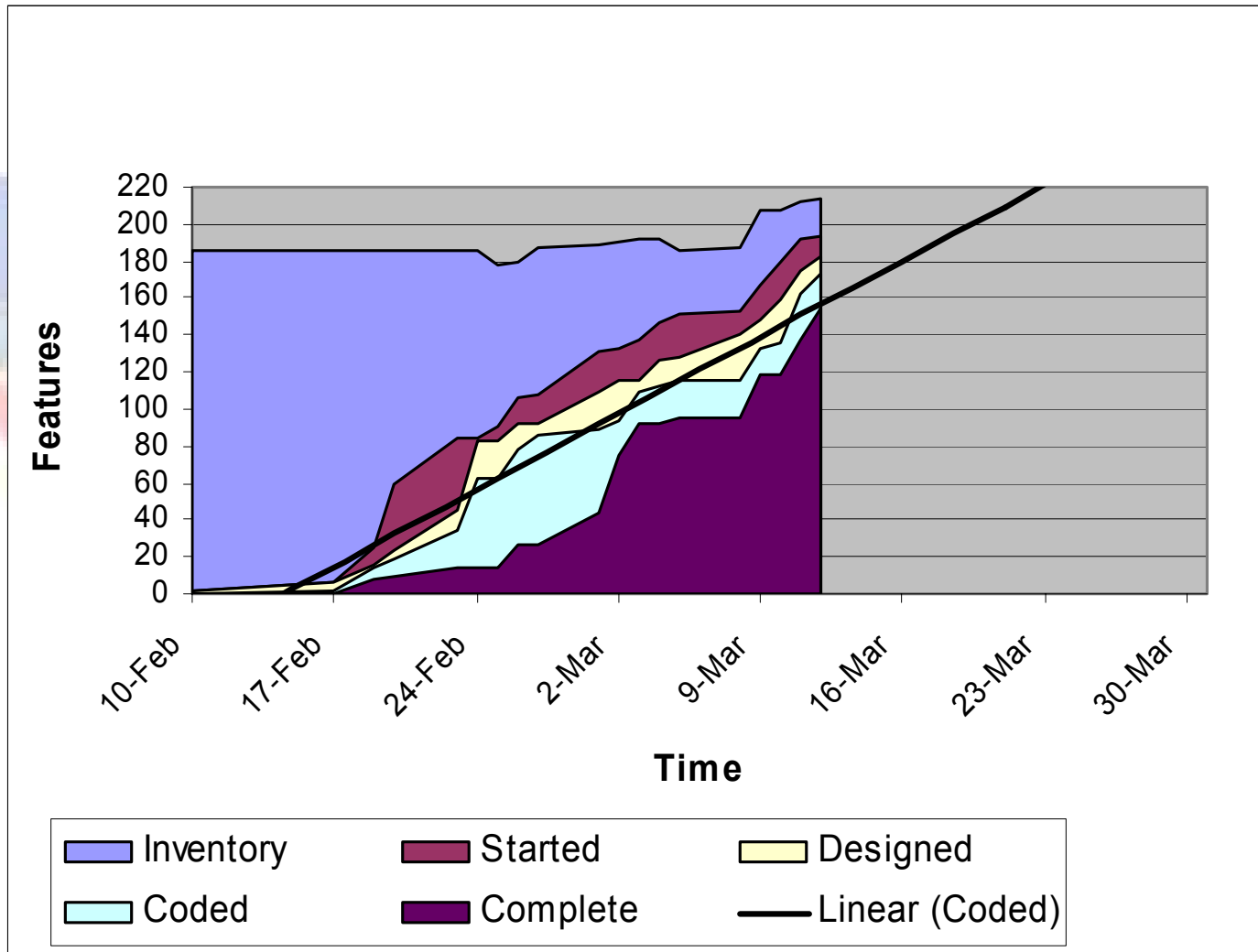
- **James Womack and Daniel Jones (1991)**
  - Based on study of the Toyota Production System
  - A combination of Just-in-time and Deming's Quality Assurance
  - Deming's work based in Statistical Process Control (SPC) of Walter Shewhart
  - Principles: Self-organizing flow of value, quality assurance, eliminate waste, build integrity in, design out possibility of failure, right first time, empower workers, think holistically, reduce inventory, shorten lead times

# Information Flow & Depreciation



- **Marvin Patterson (1993) Accelerating Innovation**
  - design is a process of discovery of information
  - Flow of value is achieved by increasing the certainty of information being discovered
- **Donald Reinertsen (1997) Design Factory**
  - **Inventory** is design in process (DIP)
  - Track DIP flow with Cumulative Flow Diagram from Lean Production
  - Design is perishable! – inventory depreciates

# Cumulative Flow Diagram

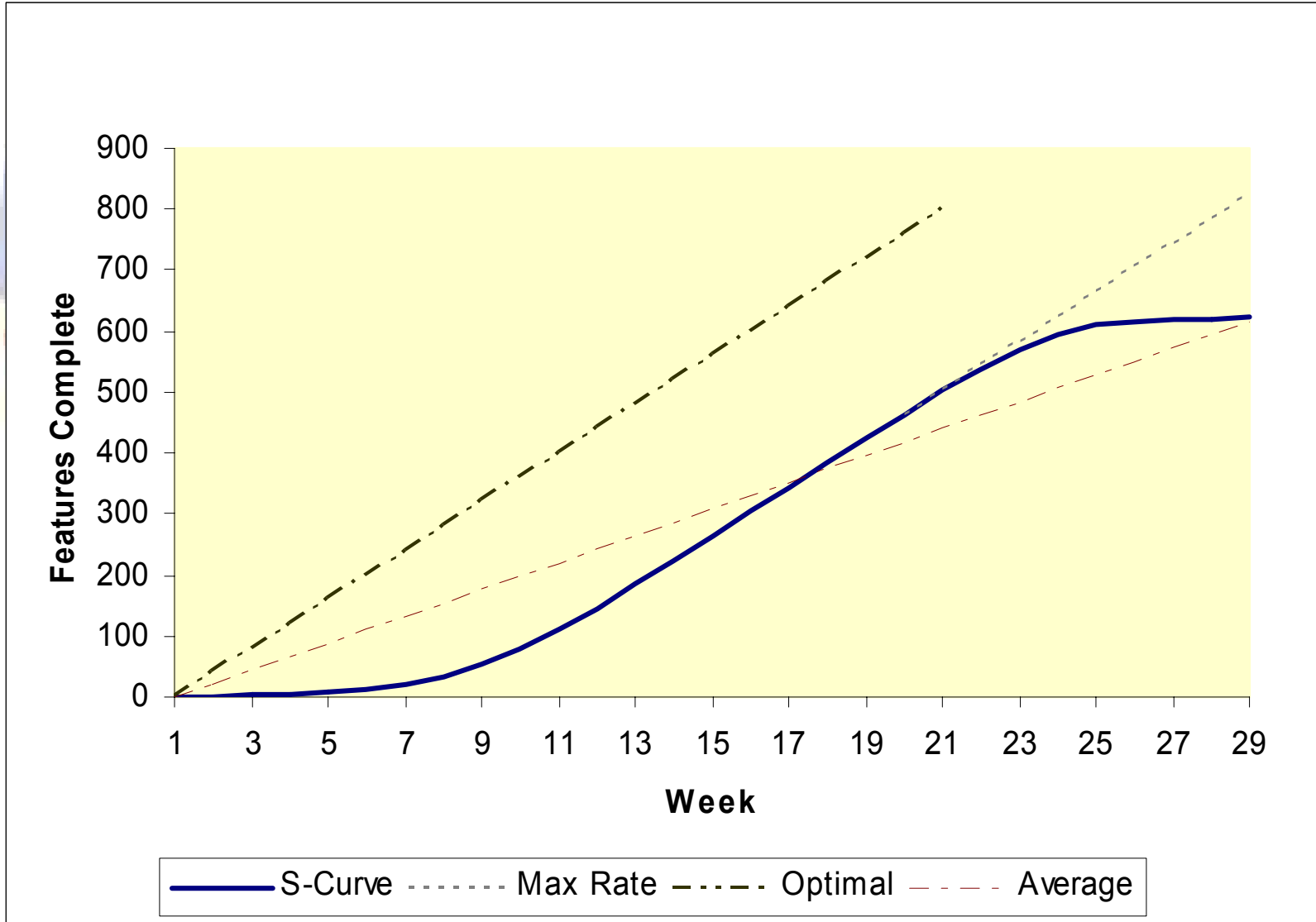


# Theory of Constraints



- **Eli Goldratt (1990) Theory of Constraints**
  - a generic solution for “limits to growth” problems
  - Maximize ROI by focusing investment (time, money, management attention) on the one thing constraining growth
  - Process exhibits an S-curve when graphed
  - Thinking Processes for other system archetypes
  - A generic approach to simplifying complex systems and optimizing them holistically

# Limits to Growth S-Curve



# Agile Management



- Software development, driven by client-valued functionality, managed by tracking flow of value, exhibits a “limits to growth” system archetype
- Value is defined as perfect information in the form of working code which passes quality assurance tests
- Value-added is defined as the ever increasing reduction of uncertainty of information
- Use simple, relevant, self-generating, leading metrics
- Identify bottlenecks with cumulative flow monitoring
- Achieve continuous improvement, through elimination of bottlenecks, and the separation of concern for common cause and special cause variation

# Constraints & Variance



- Schedule
  - Fixed or highly predictable, hard to break due to effect on wider program (beyond engineering)
- Budget
  - More variable, more uncertain, but due to annual planning cycle reasonably fixed during single project iteration
- Scope
  - Client/customer defined
  - Fickle, most subject to change, highest uncertainty, largest variance



# Probabilistic not Deterministic

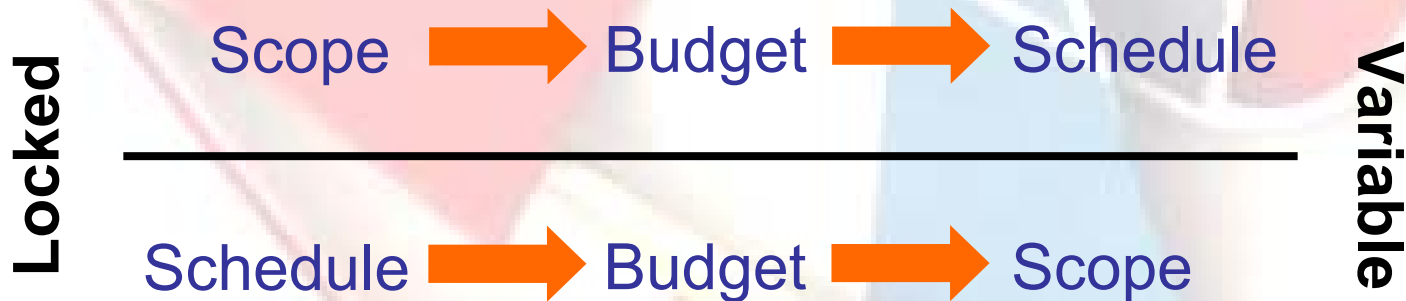
- Goldratt (1997) **Critical Chain**
  - TOC solution for project scheduling
  - Accepts that project flow is not deterministic
  - Uses buffers based on certainty of task completion and a project buffer to protect delivery date
  - Assumes date is fixed as it has the lowest variance
  - Manages variance in scope through buffers
- Leach (2000) **CCPM multi-project (PMO)**
  - Master scheduling paced with system CCR

# Agile Project Management



- Traditional methods fix scope
- Most agile processes fix the delivery date in iterations and vary the scope
- Compatible with the Critical Chain solution

## PMI / SDLC / ISO-9000 Model



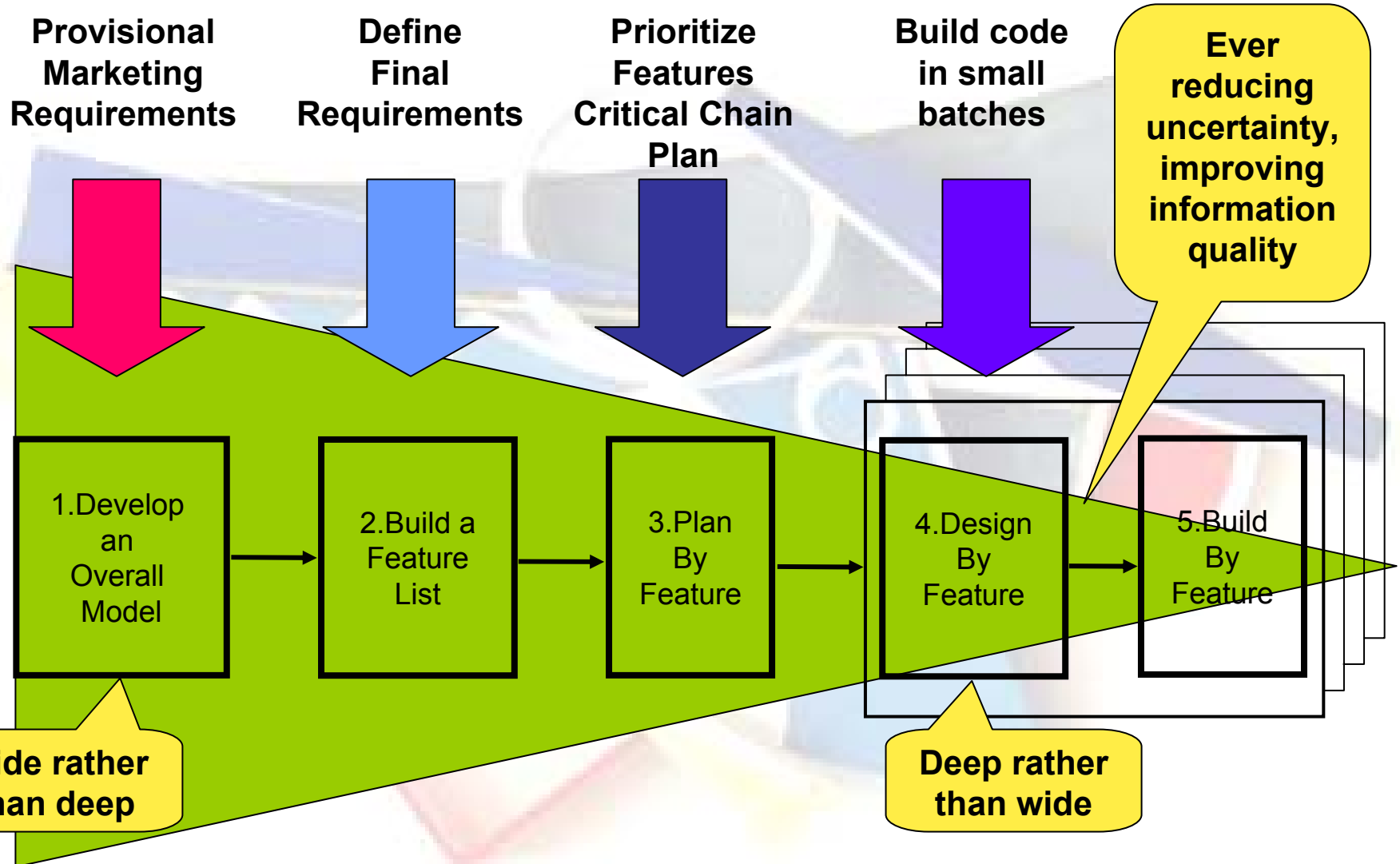
## Agile / RAD Model



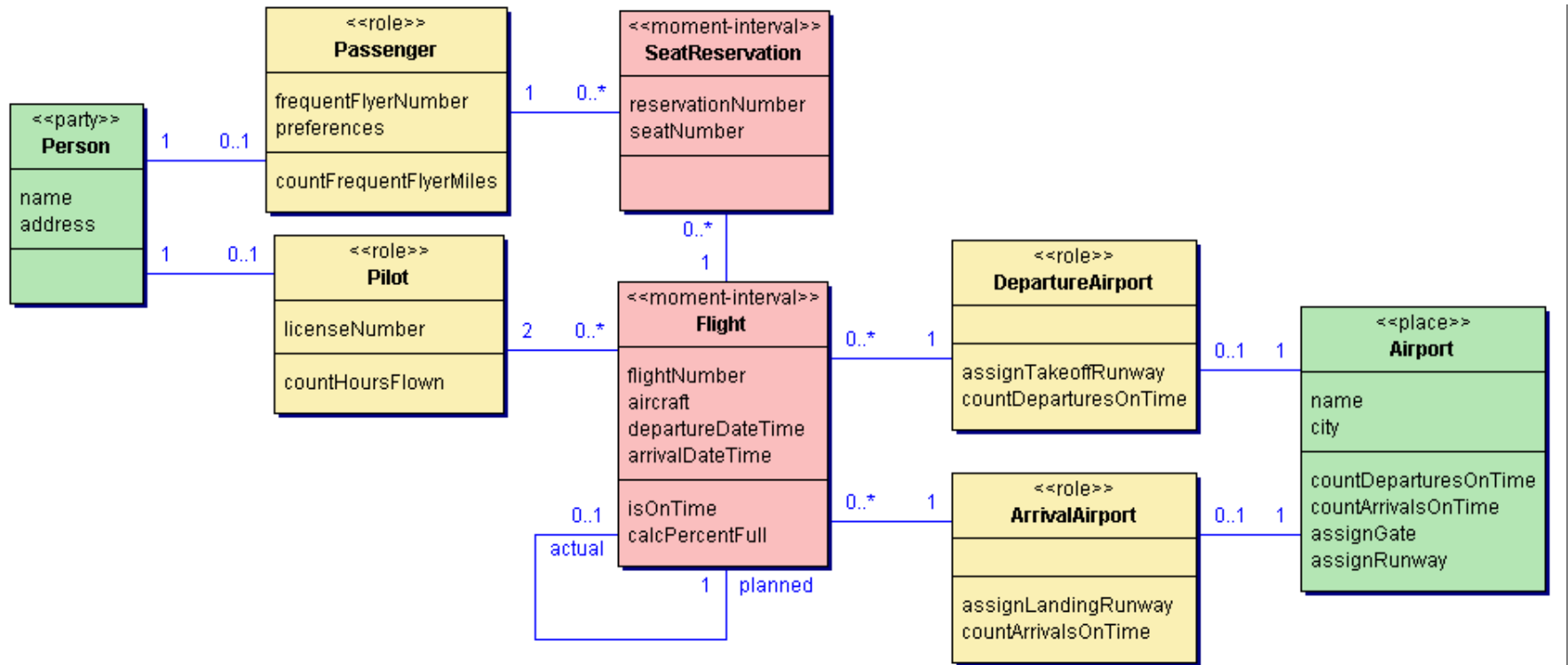
**HOW**

Implementation Example  
Feature Driven Development

# FDD 5 Step Process



# 1. Domain Model



- Domain model as “discovery” process
- Broad rather than deep, not seeking perfection
- Reduce uncertainty, improve information quality

# Defining Features



- Features are very fine grained pieces of client-valued functionality expressed in the consensus language from the Domain Model
- For example,
  - Calculate the total for the sale
  - Calculate the remaining free seats for the flight
- Features can lead to a single UML Sequence Diagram or call flow. They represent a single function in structured design

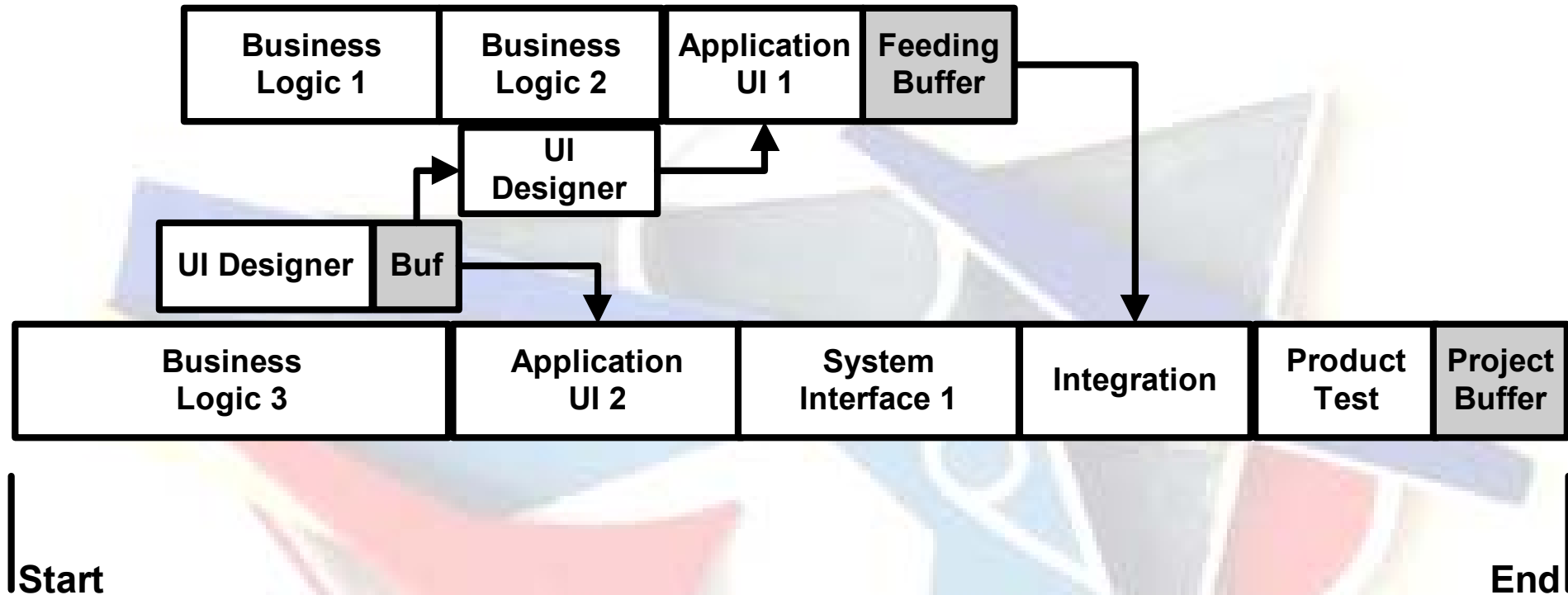
# 2. Build a Feature List



- Prioritize Features
  - 1 to 5 how important to be “in” release
  - 1 to 5 how problematic if left “out” of release
- Group Features into Sets and Sets into Subject Areas
- Groupings filtered by Release will be used for scheduling

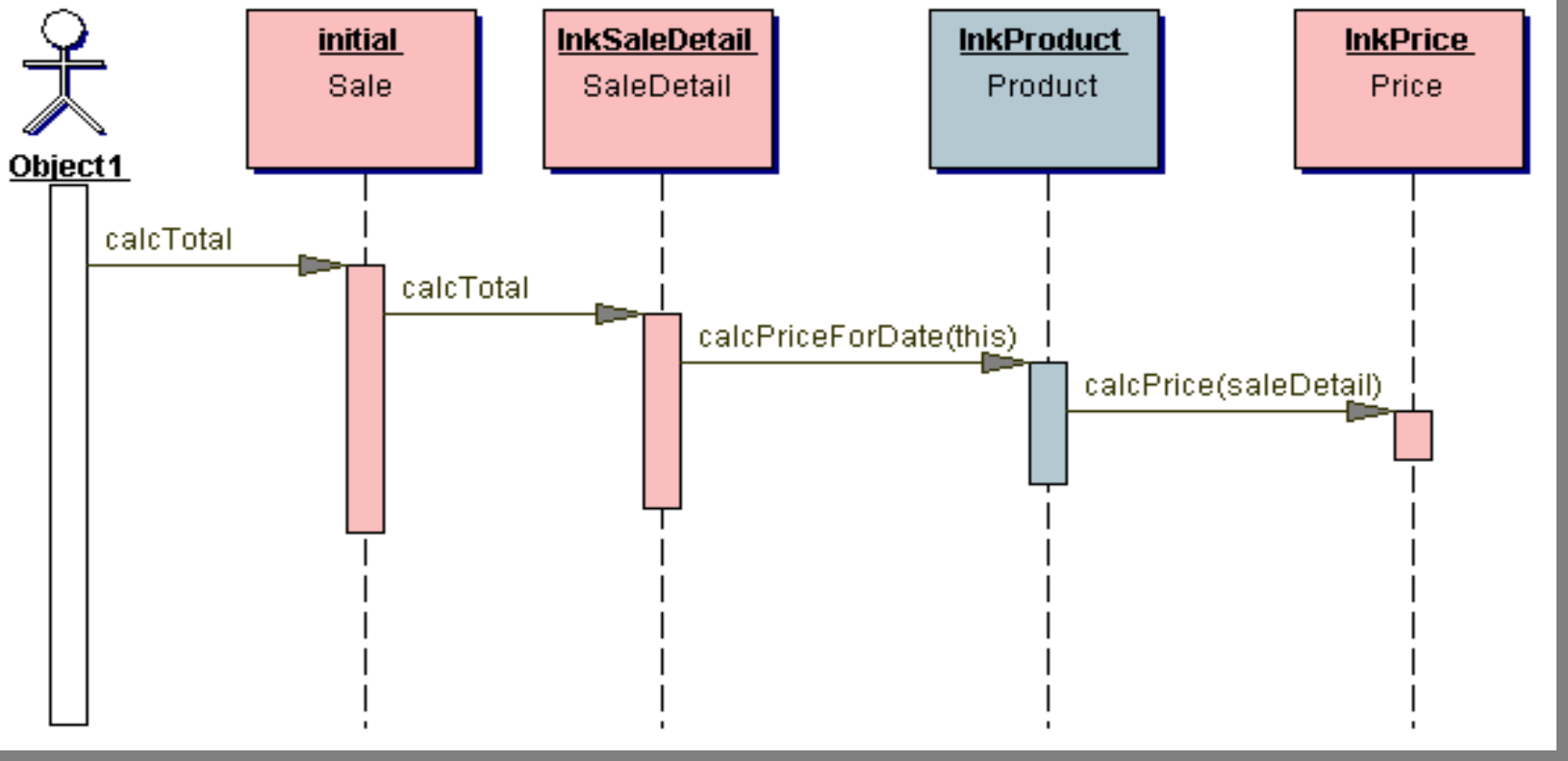
Feature / Feature	Release 1			Release 2			Release 3		
	IN	OUT	TOTAL	IN	OUT	TOTAL	IN	OUT	TOTAL
Set the Milestones for a Feature	5	5	10	5	3	8	5	5	10
List the Features for the Project/Release	5	5	10	5	5	10	5	5	10
Set the CPW for the Feature	4	3	7	5	5	10	5	5	10
Set the Subject Area for the Feature Set	4	3	7	5	5	10	5	5	10
Set the Feature Set for the Feature	3	3	6	5	5	10	5	5	10
List the Virtual Team members for the CPW	4	2	6	4	4	8	5	5	10
List the Feature Completion Dates for the Release	3	1	4	4	4	8	5	4	9
List the Feature Completion Dates for the CPW	3	3	6	4	4	8	5	5	10
Total the Features for a Product	3	1	4	4	1	5	5	5	10
Total the number of open issues in the Issue Log for a given	1	1	2	3	1	4	5	5	10
List Change Requests for the Release	1	1	2	2	2	4	4	5	9
List the Subject Areas for the Product	2	1	3	3	2	5	4	4	8
List all Feature Sets for the Subject Area	2	1	3	3	2	5	4	4	8

# 3. Critical Chain Schedule



- Schedule based on Feature Set groupings
- Buffers aggregated across many Features
- This example has UI Designer as system constraint

# 4. Design By Feature



- Sequence diagram for deep design
- Blueprint for code and unit tests
- Information high, uncertainty reduced to almost zero

# 5. Build By Feature



- Code is written in affected classes
- Unit tests are written and run
- Code inspection is performed
  - Against coding standards and architectural guidelines
  - Against design from step 4
- Feature complete means designed, coded, unit tested and inspected
  - Inspection in small batches leads to high quality with a high likelihood of defect detection

The background features a collection of overlapping, semi-transparent geometric shapes in shades of blue, red, and grey. A white line graph with a jagged, sawtooth pattern is overlaid on the shapes. The word "WHAT" is written in a bold, blue, sans-serif font, centered horizontally and partially overlapping the shapes and the graph.

**WHAT**

Tracking, Controlling, Reporting and  
Management Accounting

# Traceability - Project Dashboard



Galileo Website - Microsoft Internet Explorer

Address: http://192.168.8.71:8080/galileo/release.do?ID=16

Features			Issues		Milestones								Complete
Started	Completed	Total	Open	Blocked	Modeling		Planning		Design & Build		Ship		
Planned	Actual	Planned	Actual	Planned	Actual	Planned	Actual	Planned	Actual	Planned	Actual		
116	60	572	1	1	9/27/02	9/27/02	10/4/02	10/4/02	12/23/02				33.84%

Not Started
  Started
  Watch
  Late
  Completed

### Issue List

ID	Issue Description	Assigned to	Planned date	Solved on	Features affected:
6	Development database down.	Lang Hoang	11/4/02		507, 508, 509, 511, 515, 516, 517, 518, 519, 520, 521

Not Started
  Started
  Late
  Completed

### Subject Area Summary

ID	Subject Area Name	Features			Complete
		Started	Completed	Total	
4	content management	33	47	159	47.24%
6	device management	25	0	69	31.84%
10	Rules Engine	1	7	8	87.62%
13	Filtering	6	6	12	50.5%
17	SOAP API	0	0	1	0.0%
18	Transport	34	0	48	31.17%
19	Subscriber Management	0	0	1	0.0%
20	Admin and Deployment	0	0	62	0.0%
29	Navigation	17	0	20	59.4%
30	Messaging	0	0	45	0.0%
31	Digital Rights Management	0	0	20	0.0%

### CPW Summary

ID	Brief Description	Issues		Complete
		Open	Blocked	
11	DeviceTypeManager - bundle parsing.	0	0	99.0%
12	FilterManager - pipeline configuration and basic filtering.	0	0	100.0%
13	FilterManager - caching and device compatability updates	0	0	1.0%
14	DeviceTypeManager - load and store functionality	1	1	99.0%
15	Incompatibility Reasons	0	0	1.0%
16	FilterManager - Rules Engine	0	0	100.0%
17	Content Scanning and Verification	0	0	100.0%
18	First Content Browser	0	0	99.0%
19	Delivery Manager Implementation + Gift for MMS/HTTP, Java for HTTP	0	0	44.0%
20	Content Management: Screen Savers and Wallpaper	0	0	0.5%

# Traceability - Detailed Drilldown



Galileo Website - Microsoft Internet Explorer

Address: http://192.168.8.71:8080/galileo/fs.do?ID=40&releaseID=16

### Feature Set Detail

ID	Feature Set Name	Features			Complete
		Started	Completed	Total	
40	delivering content	32	0	41	34.34%

Not Started  
  Started  
  Watch  
  Late  
  Completed

### List of features

ID	Feature Name	Milestone					
		Walk through	Design	Design Review	Coded	Code Review	Promote to Build
491	Deliver application for MS Smartphone devices						
504	Record successful/unsuccessful confirmation for download event						
522	deliver ring tone in SMS    MIDI	10/7/02	10/14/02	10/23/02			
523	deliver ring tone in MMS    MIDI	10/7/02	10/14/02	10/23/02			
524	deliver ring tone in HTTP/VAP    MIDI	10/10/02	10/14/02	10/23/02			
525	deliver ring tone in EMS    MIDI	10/10/02	10/14/02	10/23/02			
526	deliver ring tone in SMS    IMelody	10/7/02	10/14/02	10/23/02			
527	deliver ring tone in MMS    IMelody	10/7/02	10/14/02	10/23/02			
528	deliver ring tone in HTTP/VAP    IMelody	10/10/02	10/14/02	10/23/02			
529	deliver ring tone in EMS    IMelody	10/10/02	10/14/02	10/23/02			
530	deliver ring tone in HTTP/VAP    MP3	10/10/02	10/14/02	10/23/02			
531	deliver screen saver in SMS    GIF	10/7/02	10/14/02	10/23/02			
532	deliver screen saver in MMS    GIF	10/7/02	10/14/02	10/23/02			
533	deliver screen saver in HTTP/VAP    GIF	10/10/02	10/14/02	10/23/02			
534	deliver screen saver in EMS    GIF	10/10/02	10/14/02	10/23/02			
535	deliver screen saver in SMS    WBMP	10/7/02	10/14/02	10/23/02			
536	deliver screen saver in HTTP/VAP    WBMP	10/10/02	10/14/02	10/23/02			
537	deliver screen saver in EMS    WBMP	10/10/02	10/14/02	10/23/02			
538	deliver wall paper in SMS    GIF	10/7/02	10/14/02	10/23/02			

# Traceability - Batch of Work



Galileo Website - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Forward Stop Home Search Favorites Media Messenger Bookmarks My Yahoo! Yahoo! Finance

Address http://192.168.8.71:8080/galileo/cpw.do?ID=19

Customize Search 2 FLY FREE! click here Messenger Bookmarks My Yahoo! Yahoo! Finance

### CPW Summary

Chief Programmer	Developers	Planned Date	Actual Date
John Snell	John Snell Markus Jansen	(None)	(None)

### Issue List

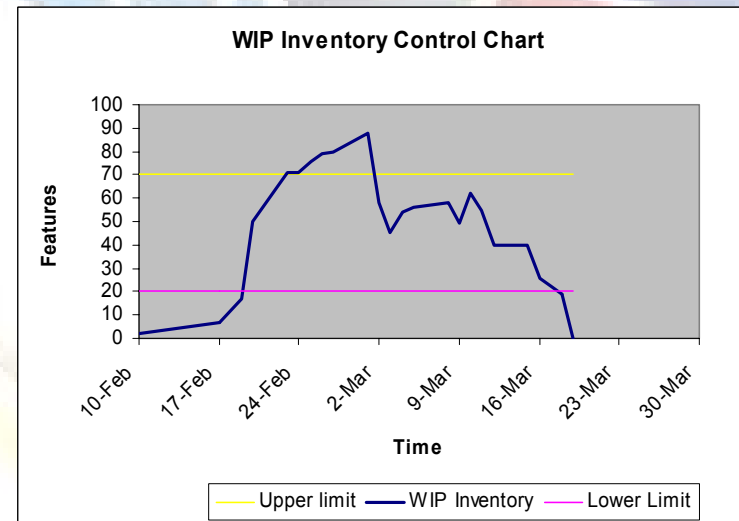
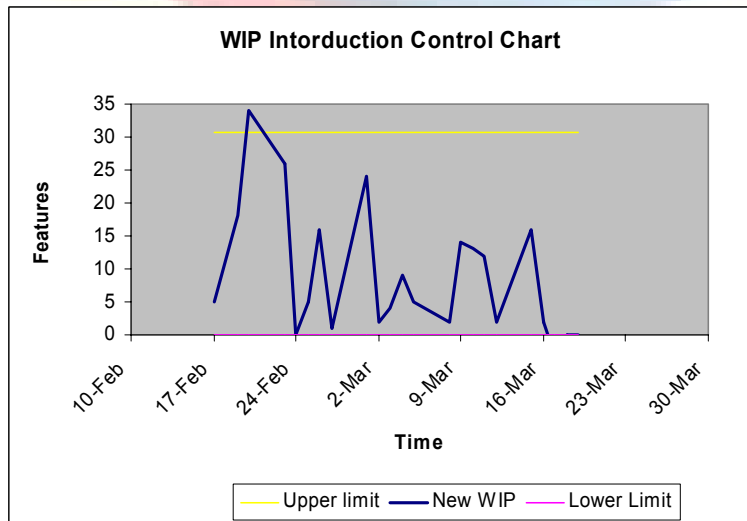
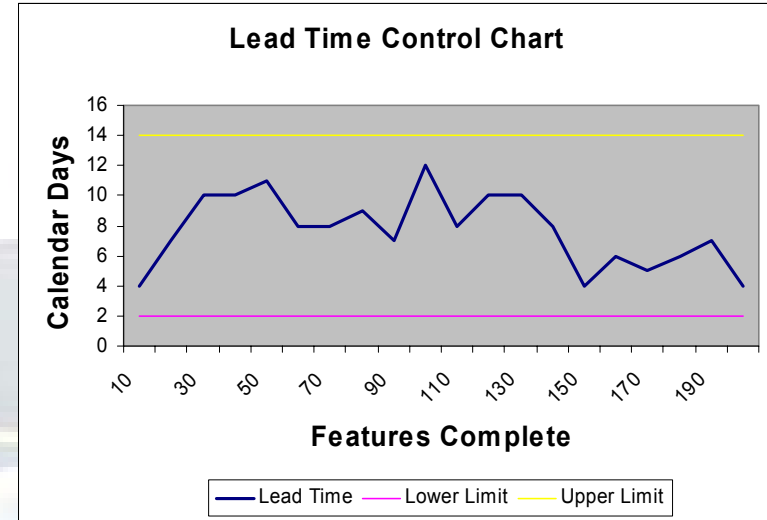
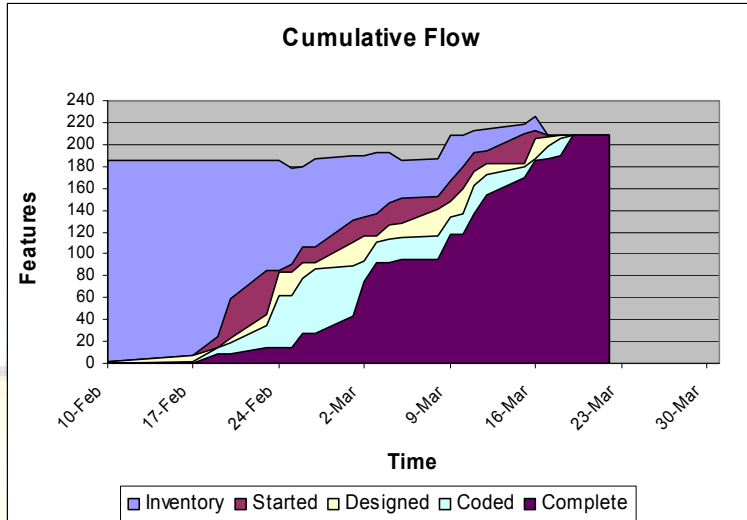
ID	Issue Description	Assigned to	Planned date	Solved on	Features affected:
2	Delivery Manager Design Review	John Snell	10/18/02	10/18/02	522 , 523 , 524 , 525 , 526 , 527 , 528 , 529 , 530 , 531 , 532 , 533 , 534 , 535 , 536 , 537 , 538 , 539 , 540 , 541 , 542 , 543 , 544 , 545 , 546 , 547 , 553 , 555 , 556 , 557 , 558 , 560 , 561 , 562 , 563 , 564
7	EADS is flaring up again. And again. And again.	John Snell	11/5/02	11/5/02	532 , 539 , 540 , 547 , 553 , 555 , 557 , 558 , 562 , 564

Not Started
  Started
  Late
  Completed

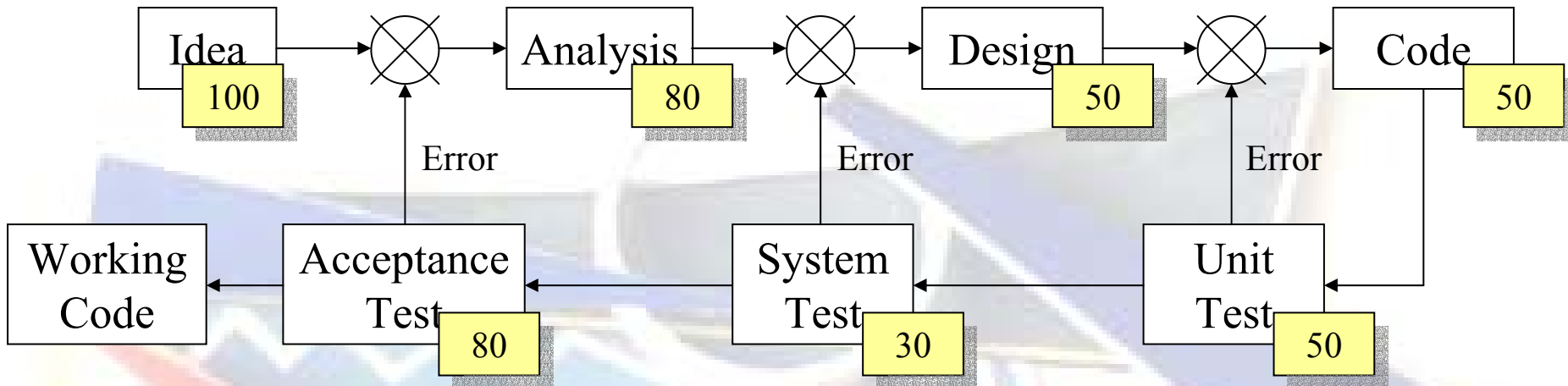
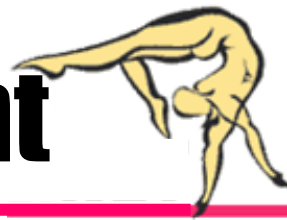
### Feature Detail

ID	Feature Name	Milestone											
		Walk through		Design		Design Review		Coded		Code Review		Promote to Build	
		Planned	Actual	Planned	Actual	Planned	Actual	Planned	Actual	Planned	Actual	Planned	Actual
532	deliver screen saver in MMS    GIF	10/7/02	10/7/02	10/14/02	10/14/02	10/15/02	10/23/02						
533	deliver screen saver in HTTP/WAP    GIF	10/10/02	10/10/02	10/14/02	10/14/02	10/15/02	10/23/02						
539	deliver wall paper in MMS    GIF	10/7/02	10/7/02	10/14/02	10/14/02	10/15/02	10/23/02						
540	deliver wall paper in HTTP/WAP    GIF	10/10/02	10/10/02	10/14/02	10/14/02	10/15/02	10/23/02						
547	deliver application in HTTP/WAP    Java	10/10/02	10/10/02	10/14/02	10/14/02	10/15/02	10/23/02						
555	receive success message from bearer	10/7/02	10/7/02	10/14/02	10/14/02	10/15/02	10/23/02						
557	check timeout for message	10/10/02	10/10/02	10/14/02	10/14/02	10/15/02	10/23/02						
560	manage time for response	10/10/02	10/10/02	10/14/02	10/14/02	10/15/02	10/23/02						

# Stabilize System Metrics

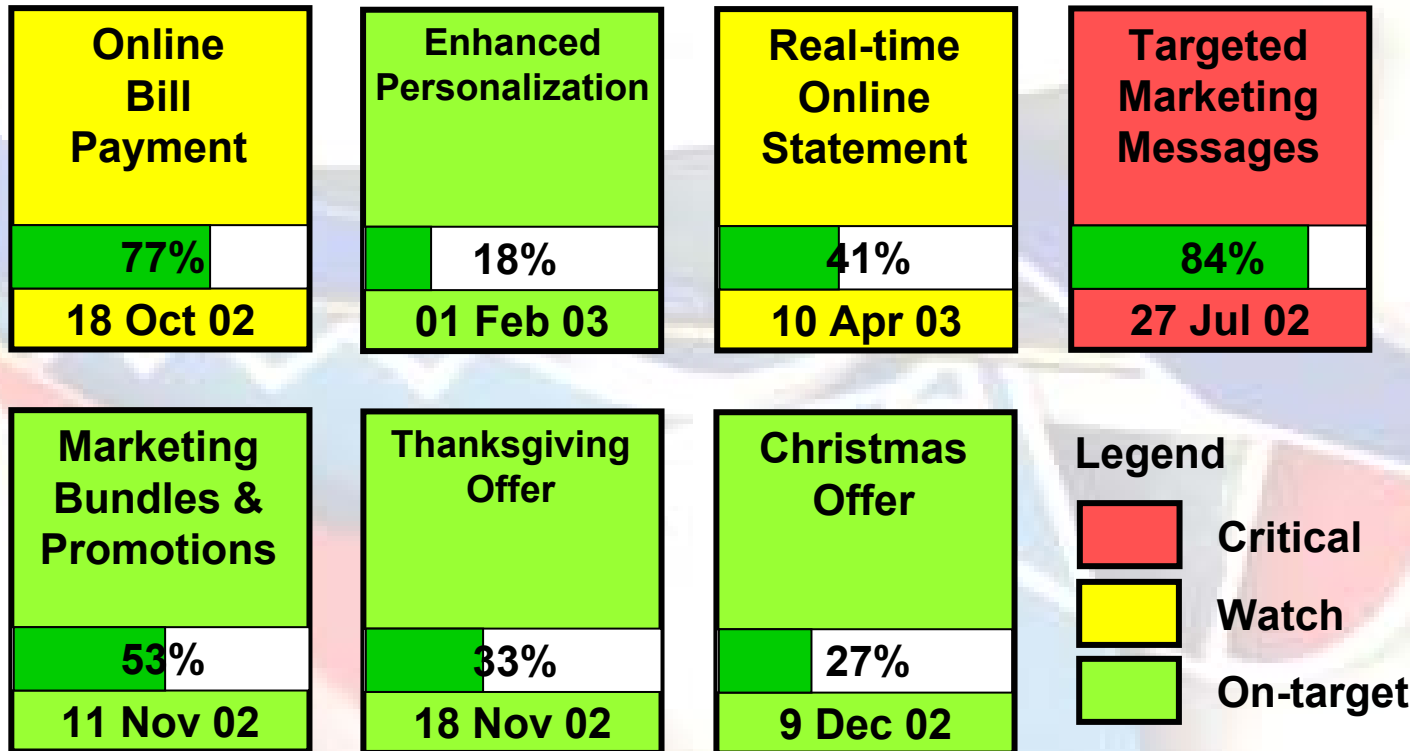


# Ops Review – Identify Constraint

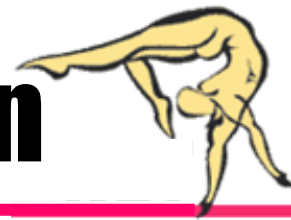


- Current CCR is System Test
- Testers relieved of all non-essential tasks, extra PMs assigned to complete administrative tasks, Analysts assigned to future Test Plans
- Requirements release restricted to 100 per quarter
- Plan to recruit 5 temporary staff immediately

# Ops Review – Report Buffer Usage



# Ops Review – Detailed Drilldown



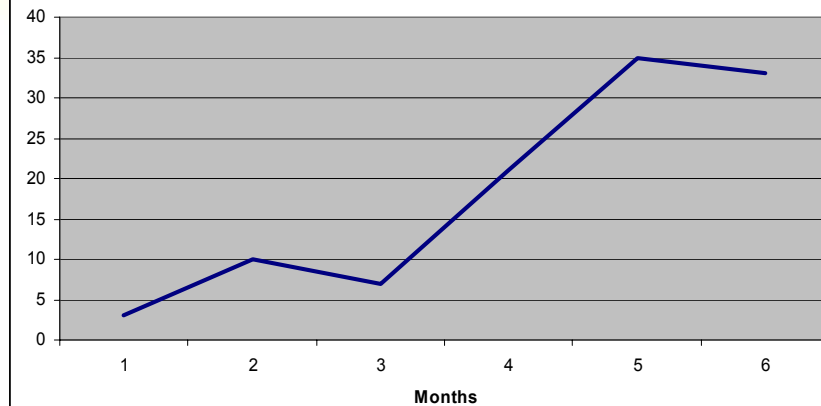
**Targeted  
Marketing  
Messages**

**84%**

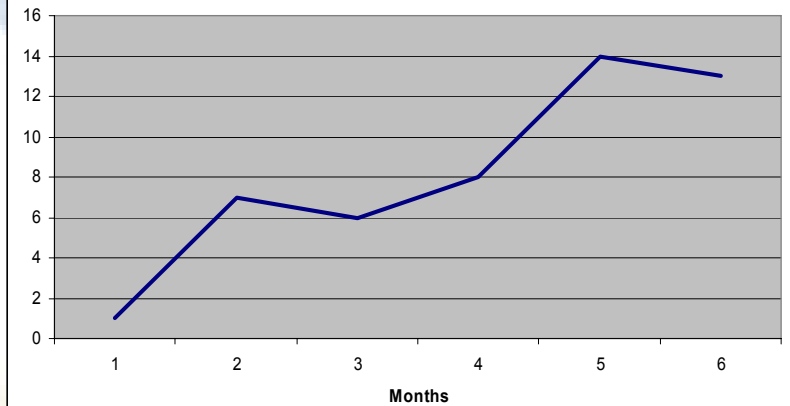
**27 Jul 02**

	Percentage Used	Days Remaining
Project Buffer	90%	2
Feeding Buffer 1	150%	0
Feeding Buffer 2	3%	17

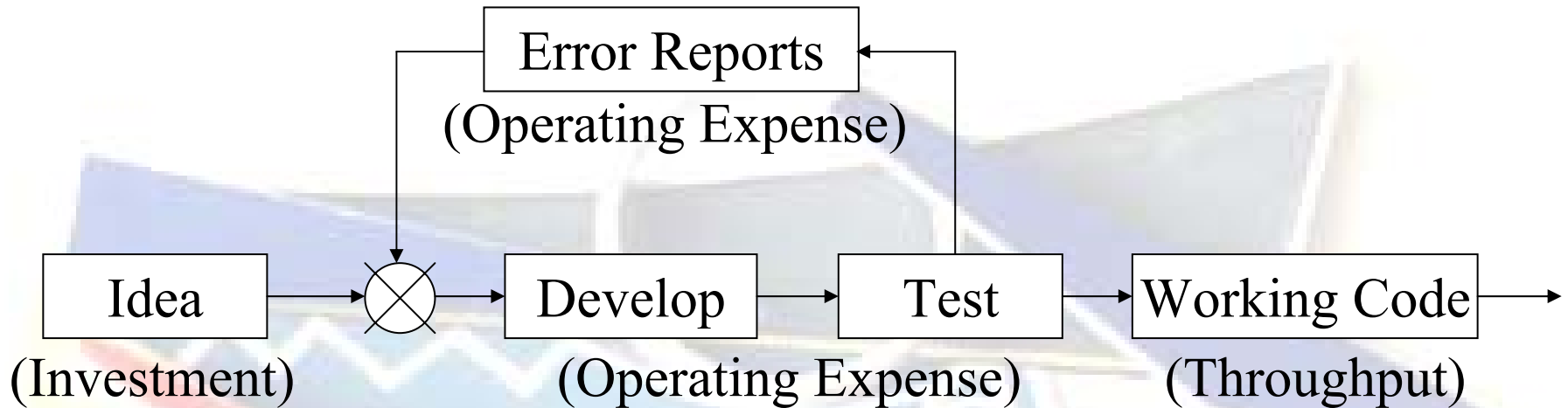
**Inventory Blocked**



**Open Issues**



# Management Accounting

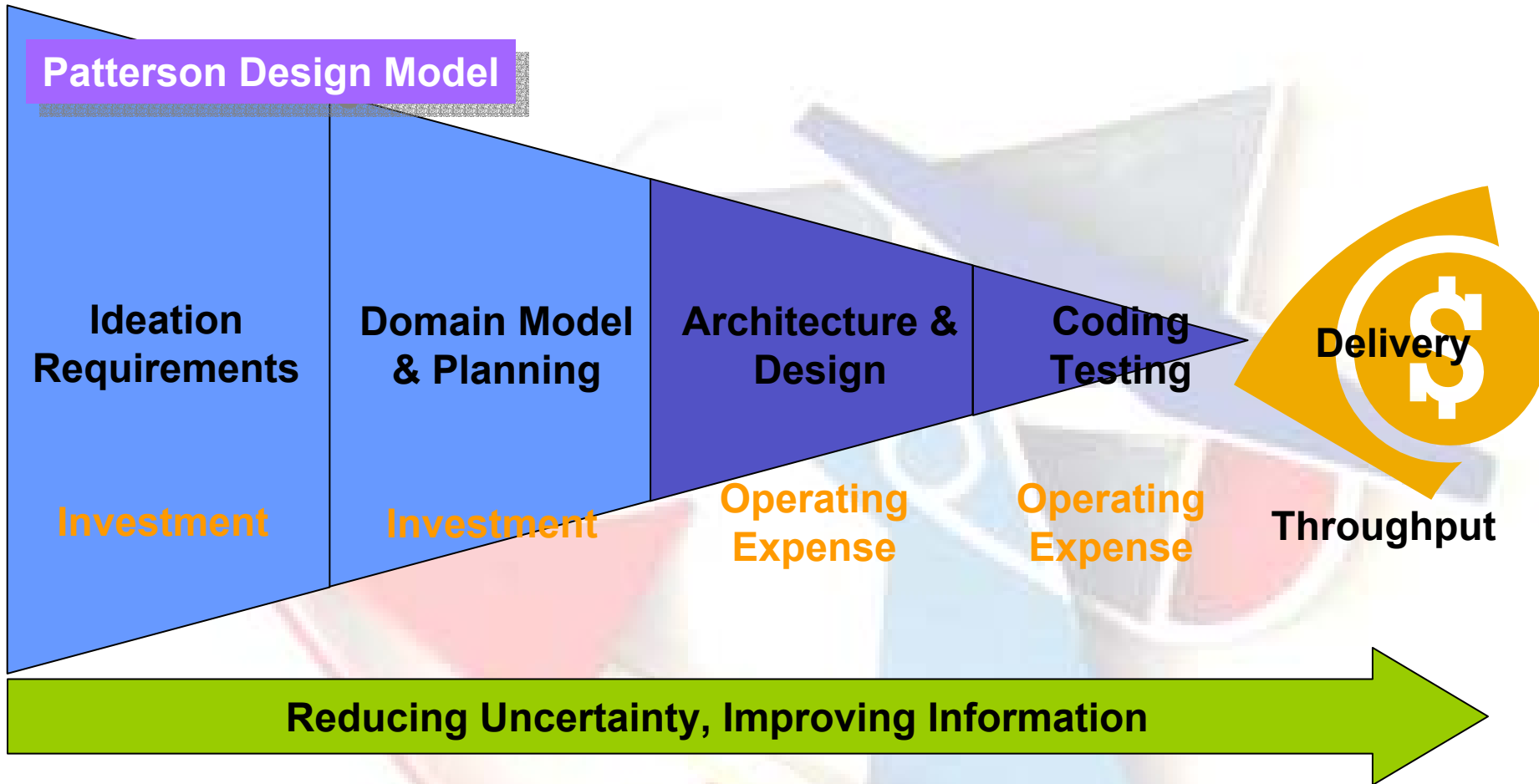


$$\text{Net Profit} = T - OE$$

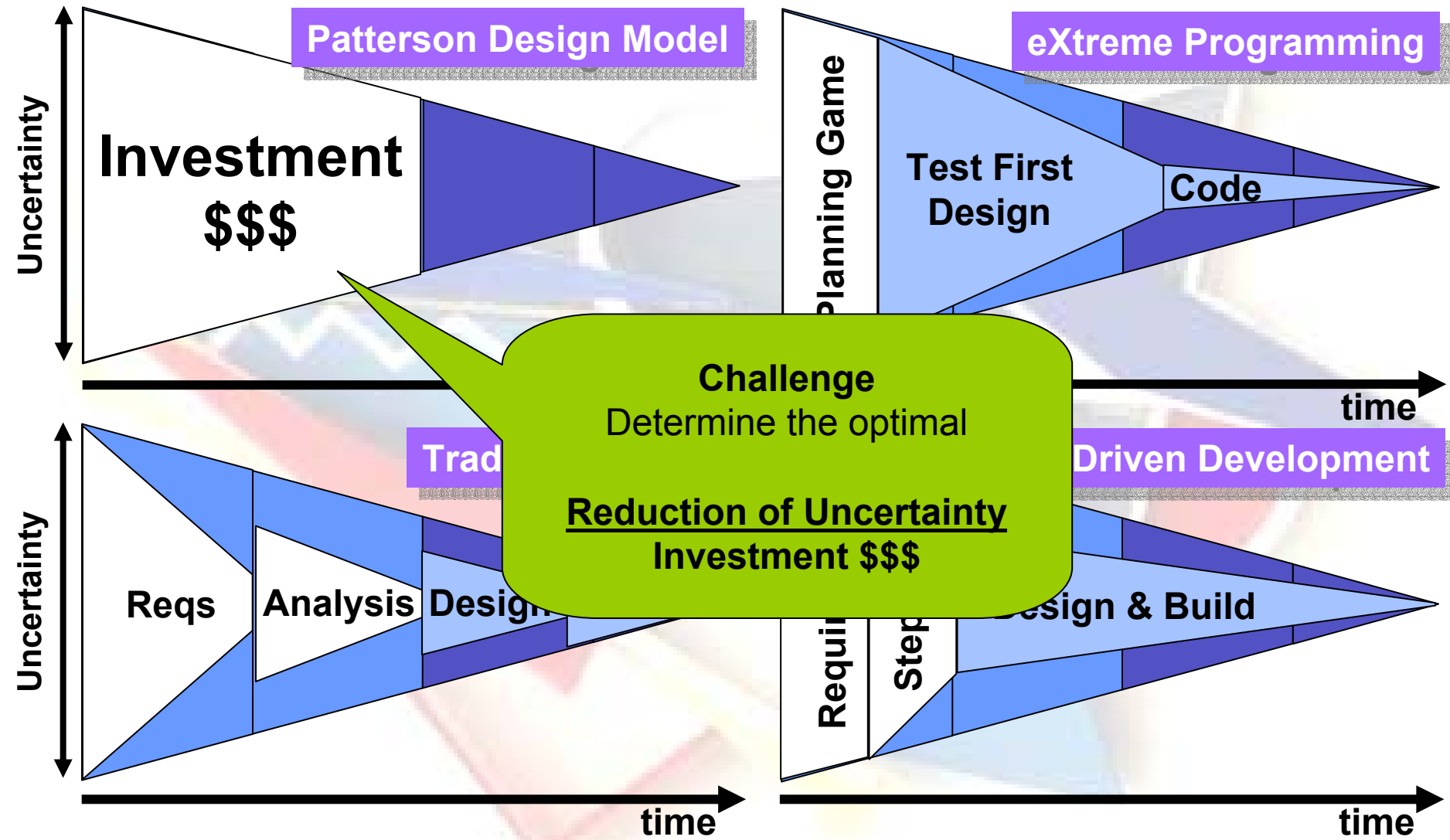
$$\text{ROI} = \frac{T - OE}{I}$$

- Management accounting isn't about reporting financials, it's about doing the right thing, making the right decision and using a financial metric to provide a normalized currency for the evaluation of alternatives
- Throughput Accounting meets these goals

# Allocating T, I & OE



# Uncertainty Reduction Cones



# Investment and OE



- Investment,  $I$ , is all the upstream costs associated with gaining the knowledge to start the coding and testing
- Operating Expense,  $OE$ , is the costs of all the engineers involved in the design, build and test
- The more time and the more people involved then the greater will be the numbers for  $I$  and  $OE$

# Throughput



Requirement / Release	Group	Rating
List the Features for the Project/Release	1	Essential
Set the Milestones for a Feature	1	Essential
Set the CPW for the Feature	1	Essential
Set the Subject Area for the Feature Set	1	Essential
List the Feature Completion Dates for the CPW	1	Essential
List the Virtual Team members for the CPW	1	Essential
Set the Feature Set for the Feature	1	Essential
List the Feature Completion Dates for the Release	2	Essential
Total the Features for a Product	2	Essential
List all Feature Sets for the Subject Area	3	Desired
List the Subject Areas for the Product	3	Desired
List Change Requests for the Release	4	Optional
Total the number of open issues in the Issue Log for a given Release	4	Optional

Free				
\$0 - \$500	Feature Group 4			
\$500 - \$1,000				
> \$1,000		Feature Group 1 Group 2	Feature Group 2 Group 3	
Price per Seat / User Role	Project Mgr	Development Mgr	Program Mgr	Product Mgr

Table 16-2 (page 145)

Free				
\$0 - \$500	\$10,000			
\$500 - \$1,000				
> \$1,000		\$70,000 \$30,000	\$30,000 \$20,000	
Price per Seat / User Role	Project Mgr	Development Mgr	Program Mgr	Product Mgr

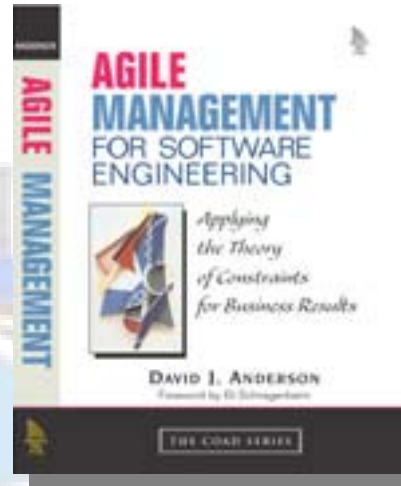
Table 16-3 (page 145)

# Product Mix Prioritization



Requirement / Release	Group	# Man Hours to Test	Group Total Testing	Throughput	\$ / hour of CCR
List the Feature Completion Dates for the Release	2	32			
Total the Features for a Product	2	32	64	\$60,000	\$937.50
List the Features for the Project/Release	1	8			
Set the Milestones for a Feature	1	8			
Set the CPW for the Feature	1	16			
Set the Subject Area for the Feature Set	1	20			
List the Feature Completion Dates for the CPW	1	16			
List the Virtual Team members for the CPW	1	8			
Set the Feature Set for the Feature	1	8	100	\$70,000	\$700
List all Feature Sets for the Subject Area	3	16			
List the Subject Areas for the Product	3	20	36	\$20,000	\$555.56
List Change Requests for the Release	4	64			
Total the number of open issues in the Issue Log for a given Release	4	64	128	\$10,000	\$78.13

# Contact Details



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# References



- [Anderson 2003] Anderson, David J., ***Agile Management for Software Engineering – Applying the Theory of Constraints for Business Results***, Prentice Hall, Upper Saddle River, NJ, 2003
- [Corbett 1997] Corbett, Thomas, ***Throughput Accounting***, North River Press, Great Barrington, MA 1997
- [De Marco 1999] De Marco, Tom & Timothy Lister, ***Peopleware – Productive Projects and Teams, 2nd edition***, Dorset House, New York, NY, 1999
- [Goldratt 1984] Goldratt, Eliyahu M., ***The Goal***, The North River Press, Great Barrington, MA 1984
- [Goldratt 1990] Goldratt, Eliyahu M., ***What is this thing called The Theory of Constraints***, North River Press, 1990
- [Goldratt 1997] Goldratt, Eliyahu M., ***Critical Chain***, North River Press, 1997
- [Leach 2000] Leach, Lawrence, ***Critical Chain Project Management***, Artech House, 2000

# References



- [McGrath 1995] McGrath, Michael E., ***Product Strategies for High-Technology Companies – How to achieve growth, competitive advantage and increased profits***, McGraw Hill, New York, NY 1995
- [Palmer 2002] Palmer, Stephen R, and John M. Felsing, ***A Practical Guide to Feature Driven Development***, Prentice Hall PTR, Upper Saddle River, NJ 2002
- [Patterson 1993] Patterson, Marvin, ***Accelerating Innovation***, Van Nostrand Reinhold, New York, NY 1993
- [Porter 1980] Porter, Michael E., ***Competitive Strategy – Techniques for Analyzing Industries and Competitors***, Free Press, New York, NY 1980
- [Poppendieck 2003] Poppendieck, Mary and Tom Poppendieck, ***Lean Software Development – an agile toolkit***, Addison Wesley, New York, NY 2003
- [Reinertsen 1997] Reinertsen, Donald G., ***Managing the Design Factory – A Product Developer’s Toolkit***, Free Press, New York, NY 1997
- [Senge 1990] Senge, Peter M., ***The Fifth Discipline – The Art and Practice of the Learning Organization***, Currency Doubleday, New York, NY 1990

# References



- [Smith 1776] Smith, Adam, ***An inquiry into the wealth and causes of The Wealth of Nations***, reprinted by Modern Library, 1994
- [Taylor 1911] Taylor, Frederick Winslow, ***The Principles of Scientific Management***, reprinted by Dover Publications, 1998
- [Weinberg 1992] Weinberg, Gerald M., ***Quality Software Management Volume 1: Systems Thinking***, Dorset House, New York, NY 1992
- [Womack 1991] Womack, James P., Daniel T. Jones & Daniel Roos, ***The Machine that Changed the World***, Harper Perennial, 1991
- [Womack 1996] Womack, James P., Daniel T. Jones, ***Lean Thinking – Banish Waste and Create Wealth in Your Corporation***, Simon & Schuster, 1996
- [Wheeler 1992] Wheeler, Donald J., and David S. Chambers, ***An Introduction to Statistical Process Control***, SPC Press, 1992