Feature-Driven Development
Towards a TOC, Lean & Six Sigma Solution
for Software Engineering

Presented By:  David J. Anderson, Microsoft Corp.
Date:  25th October 2004
Track:  Expert E 2.4
How Do You Charge For Your Art?

By the square inch or by how long it takes to create it?

By how beautiful it is!
The Coad Method
Frequent, Tangible, Working Results

On-time, on-budget with agreed function

De Luca’s 1st Law
80% Psychology, 20% Technology
Manifesto for Agile Development

Jon Kern,
Director of Consulting
at Togethersoft stands
in for Peter Coad at
Snowbird, Feb 2001

Kent Beck  James Grenning  Robert C. Martin
Mike Beedle  Jim Highsmith  Steve Mellor
Arie van Bennekum  Andrew Hunt  Ken Schwaber
Alistair Cockburn  Ron Jeffries  Jeff Sutherland
Ward Cunningham  Jon Kern  Dave Thomas
Martin Fowler  Brian Marick
Paradigm Shifting Dilemma

Feature Driven Development (FDD)

- Highly Effective
- High Quality
- Faster To Market
- Team working
- No Overtime
- Productivity
  - 2 to 10 fold improvement
- Quality improvement
  - 3:1 to 2:100

But...

- No Time Tracking
- No Gantt Charts
- No Task Tracking
- No Time on Task Estimates

How to communicate it to a skeptical audience?
Engineering process

Marketing Requirements

- Develop an Overall Model
- Build Feature List
- Plan By Feature
- Design By Feature
- Build By Feature

Engineering Lead Time

- Test By Feature
- Finished Code
- Weekly Build Cycle
- Bug Reports
- Weekly Build Cycle

Engineering Lead Time
“Java Modeling in Color: Enterprise Components and Process”,
Coad, Lefebvre and De Luca, PTR-PH 1999
Conference Application Example
Postponement (of component definition)

- Pinks and yellows are re-usable across multiple greens – the core Enterprise Components

Greens and blues are re-usable across discrete Enterprise Applications modeled as sequences of pinks
Definition of a Feature

• Tiny piece of client-valued functionality which can be delivered in less than 2 man weeks

• Business Logic Feature
  - <action> <result> [of|to|from|for] <object>
  - E.g. list availability of conference venues for given dates and attendee numbers
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

<table>
<thead>
<tr>
<th>Feature / Feature</th>
<th>Release 1</th>
<th></th>
<th>Release 2</th>
<th></th>
<th>Release 3</th>
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<tr>
<td></td>
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<td>TOTAL</td>
<td>OUT</td>
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<td>10</td>
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<td>10</td>
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<td>10</td>
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<td>5</td>
<td>10</td>
<td>5</td>
<td>10</td>
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<td>Set the CPW for the Feature</td>
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<td>7</td>
<td>5</td>
<td>10</td>
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<td>Set the Subject Area for the Feature Set</td>
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<td>7</td>
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<td>4</td>
<td>4</td>
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<td>6</td>
<td>4</td>
<td>8</td>
<td>5</td>
<td>5</td>
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<tr>
<td>Total the Features for a Product</td>
<td>3</td>
<td>4</td>
<td>4</td>
<td>8</td>
<td>5</td>
<td>5</td>
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<tr>
<td>Total the number of open issues in the Issue Log for a given release</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>5</td>
</tr>
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<td>List Change Requests for the Release</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>5</td>
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<td>List the Subject Areas for the Product</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>5</td>
<td>4</td>
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<tr>
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<td>2</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td>5</td>
<td>4</td>
</tr>
</tbody>
</table>
• Schedule based on Feature Set groupings
• Buffers aggregated across many Features
• This example has UI Designer as system constraint
FDD – How it works

Feature List

Subject Area

Feature Set
Feature Set
Feature Set

Subject Area

Feature Set
Feature Set
Feature Set

Subject Area

Feature Set
Feature Set
Feature Set

Individual Features
Epiphany!

Features As Inventory!

Read This! Let’s see if we can figure out how it can help!
• Marvin Patterson (1993)
  - 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 processes can track the flow of information discovery, design in process (DIP) is analogous to “inventory” in production processes
  - Track with Cumulative Flow Diagram from Lean Production
  - Design is perishable – inventory depreciates over time
Achieving Smooth Flow

Achieving Smooth Flow

Device Management Ike II Cumulative Flow

Features

Time

10-Feb 17-Feb 24-Feb 2-Mar 9-Mar 16-Mar 23-Mar 30-Mar

Inventory Started Designed Coded Complete

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Ragged Flow

![Project B Cumulative Flow Graph]

- Features vs. Time (9-Oct, 23-Oct, 6-Nov, 20-Nov, 4-Dec, 18-Dec, 1-Jan, 15-Jan, 29-Jan, 12-Feb, 26-Feb, 11-Mar)
- Key Points:
  - Inventory
  - Started
  - Designed
  - Coded
  - Complete

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Variation and Six Sigma

Conformant Quality
- Process in control
- 100% conforming quality
- Control charts of work-in-process and productivity give timely warning of any troubles (but cannot diagnose deterioration in the system against special cause incident)

Non-conformant Quality
- Process in control
- Some non-conforming quality
- Must either
  - Change (improve process) or,
  - Relax standard for conformance

IDEAL STATE

THRESHOLD STATE

BRINK OF CHAOS
- Process out of control
- 100% conforming quality
- All seems OK but assignable causes determine success
- Things can change in a moment

CHAOS
- Process out of control
- Some non-conforming quality
- Assignable causes dominate
- Random fluctuations due to assignable causes will eventually frustrate efforts at process improvement
- Eliminate assignable causes first!

Common/Chance Cause
- Eliminate Special Cause Variance

Special/Assignable Cause
- Development Process Maturity
- Project Management Maturity

Reduce Common Cause Variance

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Using Control Charts with CFDs

Cumulative Flow

Features Complete

WIP Introduction Control Chart

WIP Inventory Control Chart

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Buffering Scope Uncertainty

Scope Specification Limit

Features

150
160
170
180
190
200
210
220
230

Time

10-Feb 17-Feb 24-Feb 2-Mar 9-Mar 16-Mar 23-Mar 30-Mar

Upper limit Total Scope Lower Limit

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Requirements Uncertainty

![Chart showing the growing gap to designed features over time from 10-Feb to 30-Mar. The chart tracks Inventory, Started, Designed, Coded, and Complete features over time.]
Architecture or Refactoring

Growing Gap from Designed to Coded

Features

Time

Inventory  Started  Designed  Coded  Complete

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Just-in-time Domain Analysis

Problematic for project stakeholders and managers – no end date

Reflected a bottleneck in personnel for domain analysis...

...and ambiguity in the requirements for an essentially new product category
• 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
Report Buffer Usage

Legend
- Critical
- Watch
- On-target

Online Bill Payment
- 77%
- 18 Oct 02

Enhanced Personalization
- 18%
- 01 Feb 03

Real-time Online Statement
- 41%
- 10 Apr 03

Targeted Marketing Messages
- 84%
- 27 Jul 02

Marketing Bundles & Promotions
- 53%
- 11 Nov 02

Thanksgiving Offer
- 33%
- 18 Nov 02

Christmas Offer
- 27%
- 9 Dec 02
## Throughput Accounting

<table>
<thead>
<tr>
<th>Requirement / Release</th>
<th>Group</th>
<th>Rating</th>
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<tbody>
<tr>
<td>List the Features for the Project/Release</td>
<td>1</td>
<td>Essential</td>
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<tr>
<td>Set the Milestones for a Feature</td>
<td>1</td>
<td>Essential</td>
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<tr>
<td>Set the CPW for the Feature</td>
<td>1</td>
<td>Essential</td>
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<tr>
<td>Set the Subject Area for the Feature Set</td>
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<tr>
<td>List the Feature Completion Dates for the CPW</td>
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<td>List the Virtual Team members for the CPW</td>
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<td>Total the Features for a Product</td>
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<td>List all Feature Sets for the Subject Area</td>
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<td>List the Subject Areas for the Product</td>
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<td>Total the number of open issues in the Issue Log for a given Release</td>
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### Table 16-2 (page 145)

<table>
<thead>
<tr>
<th>Price per Seat / User Role</th>
<th>Project Mgr</th>
<th>Development Mgr</th>
<th>Program Mgr</th>
<th>Product Mgr</th>
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<td>$500 - $1,000</td>
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<td>Feature Group 3</td>
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<td>&gt; $1,000</td>
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### Table 16-3 (page 145)

<table>
<thead>
<tr>
<th>Price per Seat / User Role</th>
<th>Project Mgr</th>
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<th>Program Mgr</th>
<th>Product Mgr</th>
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<tbody>
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# Product Mix Prioritization

<table>
<thead>
<tr>
<th>Requirement / Release</th>
<th>Group</th>
<th># Man Hours to Test</th>
<th>Group Total Testing</th>
<th>Throughput</th>
<th>$/ hour of CCR</th>
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<td>Set the CPW for the Feature</td>
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<tr>
<td>Set the Subject Area for the Feature Set</td>
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<tr>
<td>List the Feature Completion Dates for the CPW</td>
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<td>List the Virtual Team members for the CPW</td>
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<tr>
<td>Set the Feature Set for the Feature</td>
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<td>List all Feature Sets for the Subject Area</td>
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<td>List the Subject Areas for the Product</td>
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<td>64</td>
<td>128</td>
<td>$10,000</td>
<td>$78.13</td>
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</tbody>
</table>
David Anderson is a software engineering methodologist and Program Manager with Microsoft Corporation in Redmond WA. He has 22 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 development.

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 Development.

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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