There are 10 kinds of people in the world.

Those who think in binary,
and those who don't.

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Extreme Programming (XP)
Six Sigma
CMMI

How they can work together – A JPMorgan Chase case study

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Disclaimer

Any statements made do not necessarily represent the views or opinions of JPMorgan Chase.

Topics

Background

Overview

- Six Sigma
- Extreme Programming
- CMMI

Case Study

- Six Sigma Findings
- XP Implementation
- Results
- CMMI Plans

Summary

Q&A

Background

Who Are We?

Why Did We Try XP?

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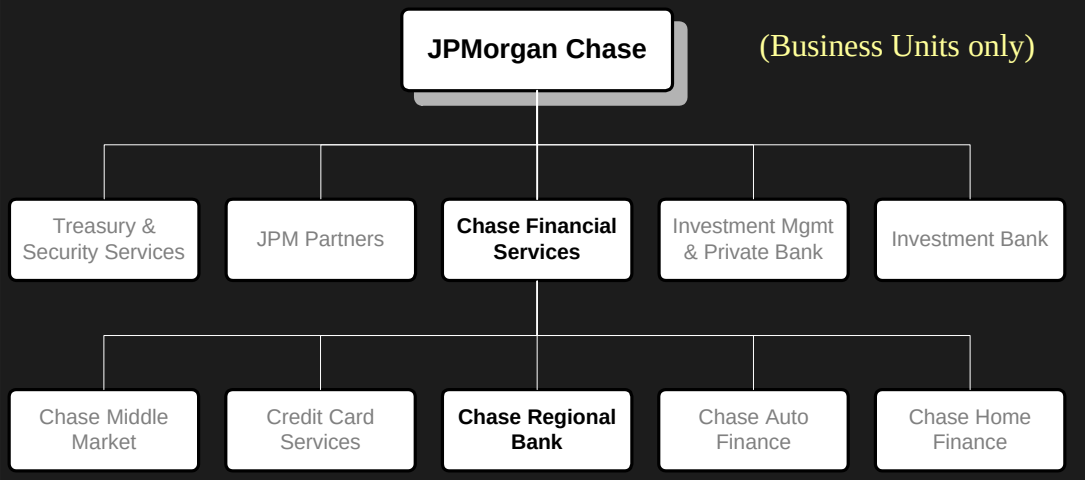
Who Are We?



Why Did We Try XP?

Typical Environment

- Project estimate accuracy
- Business – Technology working relationship
- Defect levels
- Overtime

Improvement Desired

- Better
- Cheaper
- Faster
- Work – Life Balance

Overview

Six Sigma

Extreme Programming

CMMI

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Six Sigma

A Very Brief Overview

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Who's Using Six Sigma?

JPMorgan	$1.45 Billion since 1998
GE	$5 Billion in 2000
Honeywell	Average of $600MM/year since 1995
Johnson & Johnson	$3 Billion in savings since 1995
Motorola	$1.5 Billion in 1999
Toshiba	$1.16 Billion (¥130 B) in 2000/2001
Kodak	$85MM early 2000
American Express	$2.5 Billion in 1999

Numbers through 2001

Publicly traded companies that strategically highlight quality (Six Sigma / Baldridge Quality award winning companies) outperformed the S&P 500 by 4.8 to 1.[1]

1. American Society for Quality, Quality Progress, April 2000.

What is Six Sigma (at JPMC)?

It's our approach to managing our business

- Focus on clients, facts, measurement

It's a process improvement methodology

- Improve existing processes
- Build new processes

It's a calculation

- Allows us to measure quality consistently

Key Drivers

Voice of the Customer (VOC)

- Critical to Quality (CTQs)
- CTQ Measures
- Voice of the …
  - Business
  - Employee

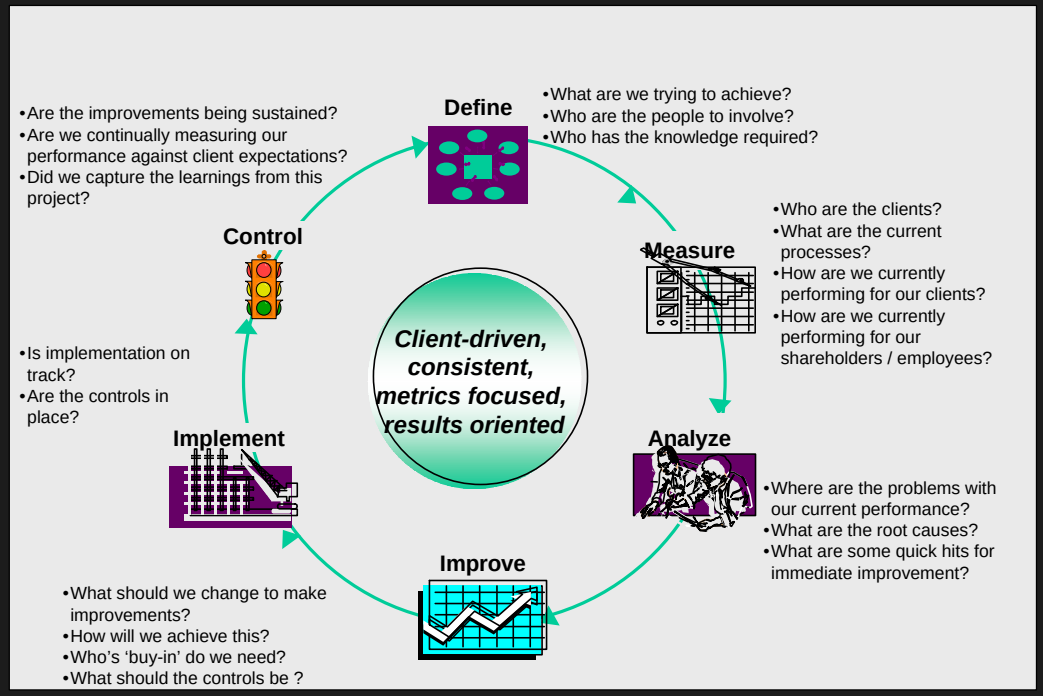
Statistical Tools

- Analyze current state
- Verify results

Tollgates

- At every phase

A DMAIIC Overview



DMAIIC and DFSS

Most projects begin as DMAIIC
- ❒ Defect Reduction or Elimination
- ❒ Few key CTQs that drive performance
- ❒ Project focus

DMAIIC: Process Improvement

Define → Measure → Analyze → Improve → Implement → Control

***Checkpoint:** A process/ service does not exist

***Checkpoint:** Current process is not capable of providing more

***Checkpoint:** Improvement requires a new process/service

Project Launch Checkpoint

- ❒ Defect Prevention
- ❒ Optimizing a design across multiple CTQs
- ❒ Process or Product Focus
- ❒ Vehicle to enhance speed to market
- ❒ Flexible approach to answering business requirements

Design for Six Sigma (DFSS): Process / Service Design

Define → Assess → Select → Design → Implement → Control

DMAIIC projects may turn into DFSS projects.
If DMAIIC can be used, it should be the first choice.

Extreme Programming

XP Context

What is Agile?

- An adaptive approach to solving business problems that focuses on communication, collaboration, delivery and change.
- "Outside the room."

What is Extreme Programming?

- One of several agile methods.
- An innovative, deliberate and disciplined approach to software development.
- Developers, QA and Business in the same room (where applicable)
- "Inside the room."

The Agile Manifesto

We are uncovering better ways of developing software by doing it and helping others do it. Through this work we have come to value:

Individuals and interactions	over	processes and tools
Working software	over	comprehensive documentation
Customer collaboration	over	contract negotiation
Responding to change	over	following a plan

That is, while there is value in the items on the right, we value the items on the left more.

Why “Extreme”?

XP is a highly disciplined approach to software development that places quality at its core, and takes quality practices to the “extreme”:

- Testing
  - Failed unit tests = entry criteria for coding
  - Unit tests = 100%
- Peer reviews
  - Pair programming
- Customer involvement
  - On-site, daily
  - Customer-driven iteration content

XP – Basic Principles

- Rapid feedback
- Assume simplicity
- Incremental change
- Embracing change
- Quality work

Simple Rules

"Simple, clear purpose and principles give rise to complex, intelligent behavior."

"Complex rules and regulations give rise to simple, stupid behavior."

Dee Hock
Founder and CEO emeritus, Visa International

CMMI

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Why CMMI?

Situation

- Overlap among existing CMMs
  - Enterprise Process Improvement Collaboration (EPIC) Software Engineering CMM (SE-CMM)
  - International Council on Systems Engineering (INCOSE) Systems Engineering Capability Assessment Model (SECAM)
  - Software Acquisition CMM
  - People CMM
  - Integrated Product Development CMM
- SW-CMM Version 2.0 near completion

Why CMMI?

Decision

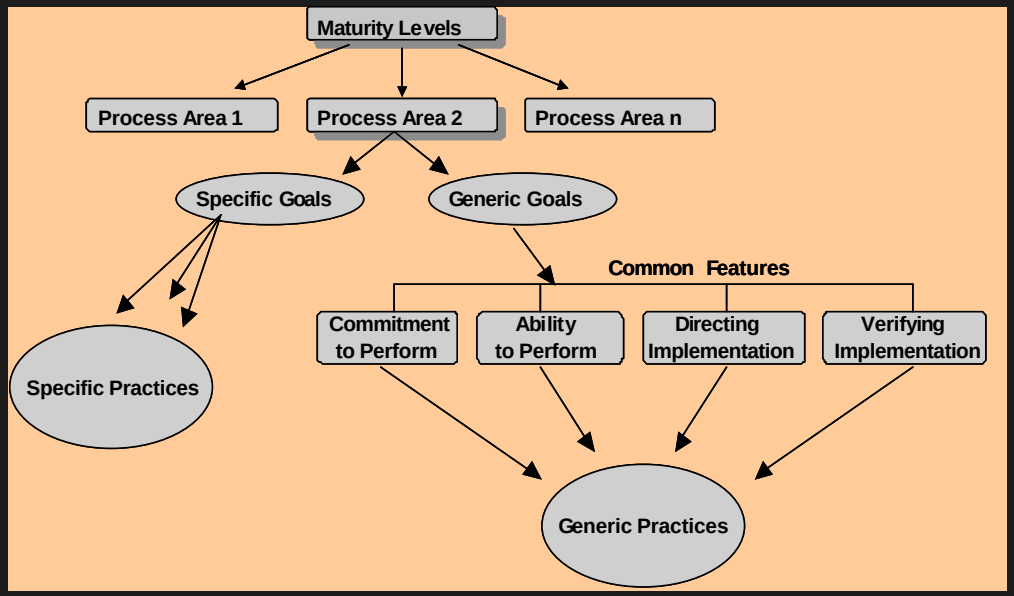
- Office of Secretary of Defense (OSD) directed CMMI project as a collaborative industry, government and SEI effort.
  - Cancel SW-CMM v2.0, and make it the software version of the CMMI product suite.

CMMI Models

Currently there are four bodies of knowledge available when selecting a CMMI model:

- **Software Engineering (SW)** covers the development of software systems.
- **Systems Engineering (SE)** covers the development of total systems, which may or may not include software.
- **Integrated Product and Process Development (IPPD)** is a systematic approach that achieves a timely collaboration of relevant stakeholders throughout the life of the product to better satisfy customer needs, expectations, and requirements.
- **Supplier Sourcing (SS)** provides guidance to allow projects to benefit from enhanced source analysis and from monitoring supplier activities before product delivery.

CMMI - Staged Representation



2 - Managed

- Requirements Management ← *RM*
- Project Planning ← *SPP*
- Project Monitoring and Control ← *SPTO*
- Supplier Agreement Management ← *SSM*
- Measurement and Analysis ← *QPM*
- Process and Product Quality Assurance ← *SQA*
- Configuration Management ← *SCM*

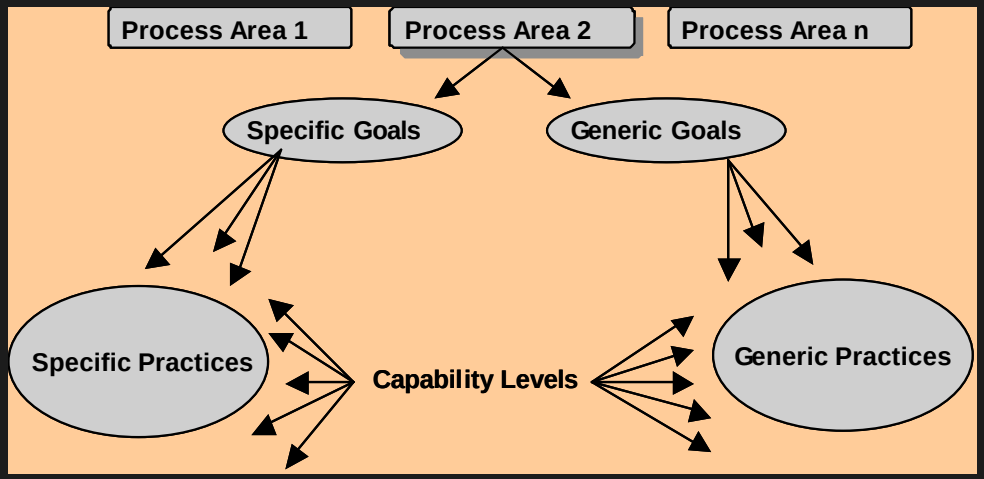
Convention

- Practice Area ← *CMM KPA(s) that address similar practices*

3 - Defined

- Requirements Development ←*SPE*
- Technical Solution ←*SPE*
- Product Integration ←*SPE*
- Verification ←*SPE, PR*
- Validation ←*SPE*
- Organizational Process Focus ←*OPF*
- Organizational Process Definition ←*OPD*
- Organizational Training ←*TP*
- Risk Management ←*ISM, SPP*
- Decision Analysis and Resolution ←*New, Abilities, Me, Ve*

Continuous



Continuous – Capability Levels

- 0. Incomplete
- 1. Performed
- 2. Managed
- 3. Defined
- 4. Quantitatively Managed
- 5. Optimizing

Continuous Representation Results

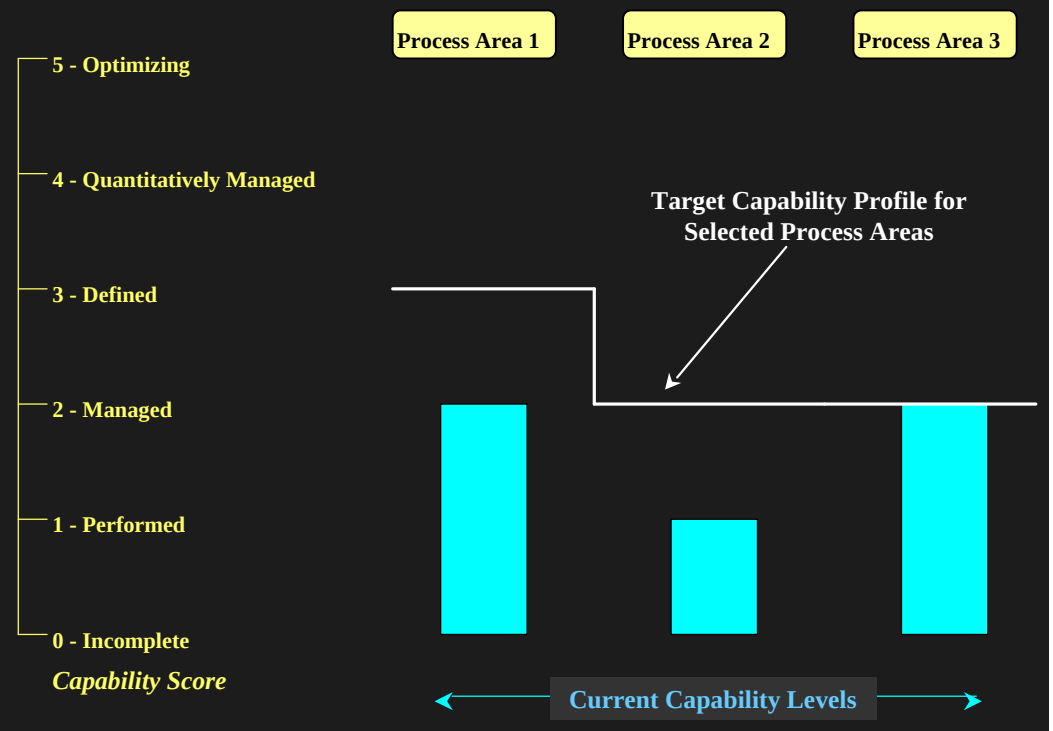
Capability Level Profiles

- In the continuous representation, a capability level profile is a list of process areas and their corresponding capability levels. This profile is a way for the organization to track its capability level by process area.

Target Staging

- Target staging is a sequence of target profiles that describe the path of process improvement to be followed by the organization.

Continuous Representation Example



Case Study

Six Sigma Findings

XP Implementation

Results

CMMI Plans

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Lofty Goals

Better

- Fewer defects

Cheaper

- Reduce project effort

Faster

- Reduce project duration

Quality of Life

- Enjoy work life better
- Do less of it

Executive Sponsorship

Business

- SVP – Internet Channel
- Senior Product Manager

Technology

- SVP / CTO – Regional Bank
- CTO – Internet Technology

Six Sigma Findings

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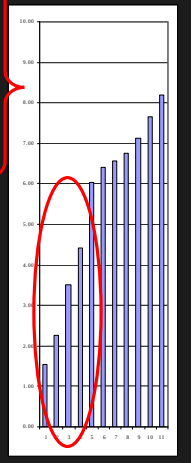
VOC - Business

For business: better, on-time delivery of agreed functionality (stories) are most important.

#	Wtd	Voice of the Customer (VOC)	Critical to Quality (CTQ)	CTQ Measures
1	1.54	Quality product	Minimum defects	# defects found in QA / UAT / production per unit of functionality # defects found in user sign-off per unit of functionality
2	2.26	On-time delivery	All agreed stories delivered on time	% stories delivered for each iteration
3	3.52	All scoped functionality delivered	All committed iteration stories delivered	% stories delivered for each iteration
4	4.42	Faster time to market	Reduce time from story delivery to production	# days / unit of functionality
5	6.04	Sound architecture Best in class technology	Applications are scalable, secure	# hours of technology-driven rework
6	6.40	On budget	No cost overruns	$ variance
7	6.58	Accurate project scoping	All committed stories included in release	# committed stories not included
8	6.76	Technical input on alternatives	Business understand technical trade-offs that may impact their decisions	# unapproved technical / infrastructure stories requested by development
9	7.12	Business understands about technology / infrastructure / application limits	Informed business decisions are made	# hours of technology-driven rework
10	7.66	Technology works within the business structure	Business can ensure their other touch-points are included as needed	# hours waiting for business dependencies
11	8.20	Development activities fit in business resource constraints	Eliminate redundant documents / activities Decrease distractions (bus & tech)	# hours spent on redundant docs # hours / week distractions



CTQ Data

Top CTQs / CTQ Measures from VOC / VOB / VOE were combined to eliminate overlap (particularly around defect measures).

- Committed Features
  - % stories delivered
- Defects
  - # total defects / unit of functionality
  - # TRs related to requirements mis-match (WAD)
- Costs
  - $ / unit of functionality
  - # XP resources – deployment
- Duration
  - # days duration / unit of functionality
- Miscellaneous
  - # missed communication plan events
  - # manual steps - deployment

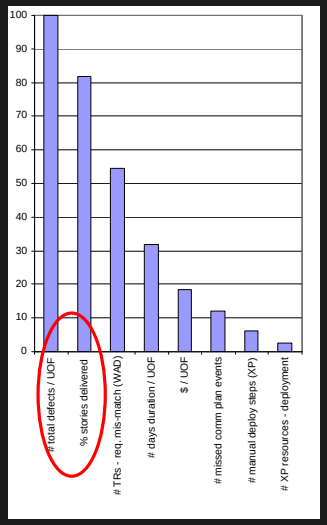
QFD – House 1

High quality and delivery of committed functionality (on time delivery) are top priority.

Symbol	Meaning	Score
H	High	9
M	Medium	3
L	Low	1

Critical to Quality (CTQs)	# total defects / UOF ↓	% stories delivered ↑	# TRs - req. mis-match (WAD) ↓	# days duration / UOF ↓	$ / UOF ↓	# missed comm plan events ↓	# manual deploy steps (XP) ↓	# XP resources - deployment ↓	VOC Score	Importance
Minimize defects	H		H						1.54	4.46
Deliver project success criteria	H	H	M	M	L		L		1.61	4.39
Committed stories delivered on time	M	H		L					2.26	3.74
Correct code delivered	M	M						L	3.67	2.33
Shorten duration - story to production				H			L		4.42	1.58
Maximize development ROI / effort					H				4.48	1.52
Communication plan executed						H			4.68	1.32
Importance	**100**	**82**	**54**	**32**	**18**	**12**	**6**	**2**		
Target	0	100	0	*	*	0	2	1		
Specs	*	95 100	*	*	*	0 1	1 2	0 1		

Key: * - Still to be defined
UOF - Unit of Functionality (size metric)
CTQ Importance = 6 - VOC Score (rank)



XP Implementation

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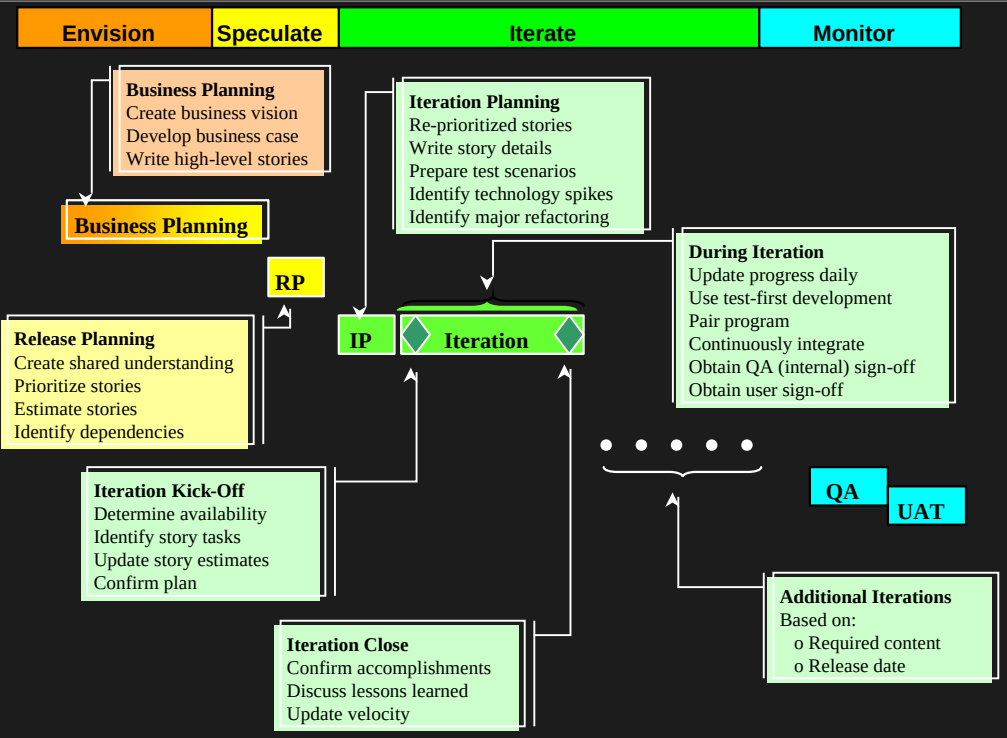
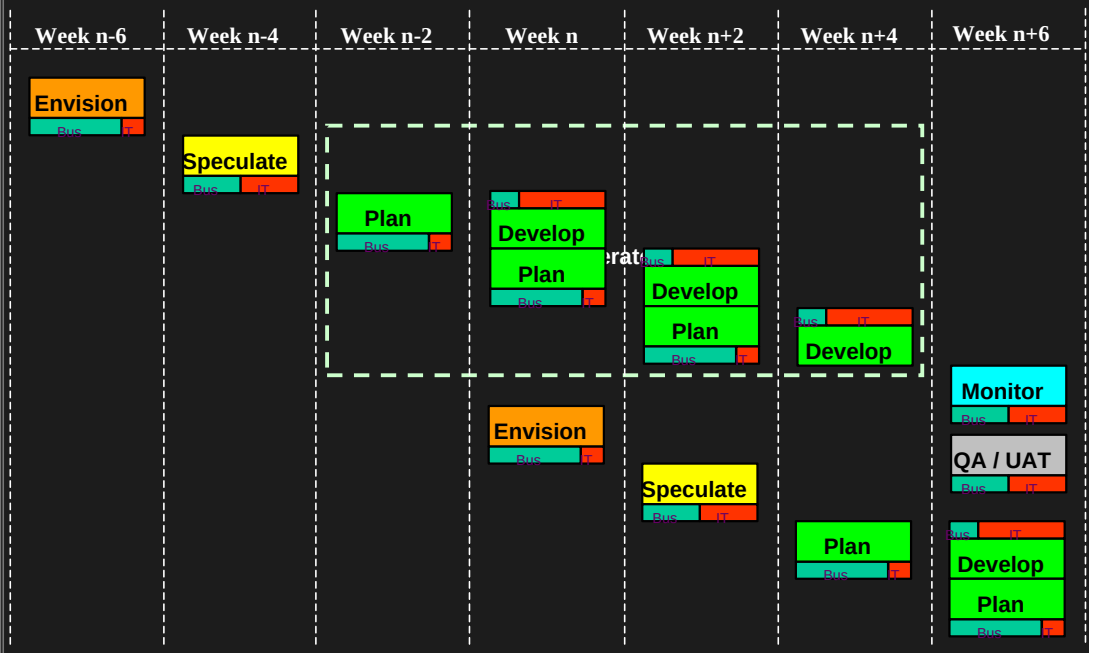
Anatomy of an Iteration



Parallel Activities



XP Stories


EXTREME PROGRAMMING
I CAN'T GIVE YOU ALL OF THESE FEATURES IN THE FIRST VERSION.
AND EACH FEATURE NEEDS TO HAVE WHAT WE CALL A "USER STORY."
OKAY, HERE'S A STORY: YOU GIVE ME ALL OF MY FEATURES OR I'LL RUIN YOUR LIFE.
www.dilbert.com scottadams@aol.com
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The Story

The story is a unit of functionality in an XP project. We demonstrate progress by delivering tested, integrated code that implements a story.

Story Evolution

- Business Vision
  - Long-term functionality view (6-18 months)
- High-level Stories
  - Functionality that delivers value
  - Small enough to estimate
  - Prioritized
- Story Details
  - "Just enough" detail
  - Use cases work well
  - Includes high-level test scenarios
  - Updated to reflect reality

Story Tracking

Future

Ready

Active

User Ready

QA Ready

Done

Release Ready

External QA

Real World

Sample

Revised Direct Deposit Landing Page

Iteration	Owner	P	H	C	D	B	TR #
I-1-2004-SS	Robert	2	13	X			
Iteration Development		121				Self-Service	

User Sign-Off

Results

“In God we trust.

All others must provide data.”

W. Edwards Deming

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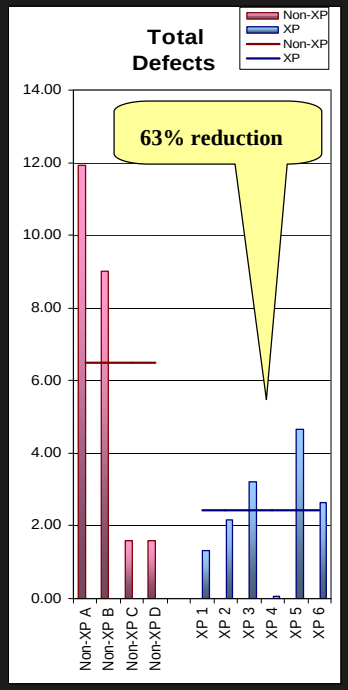
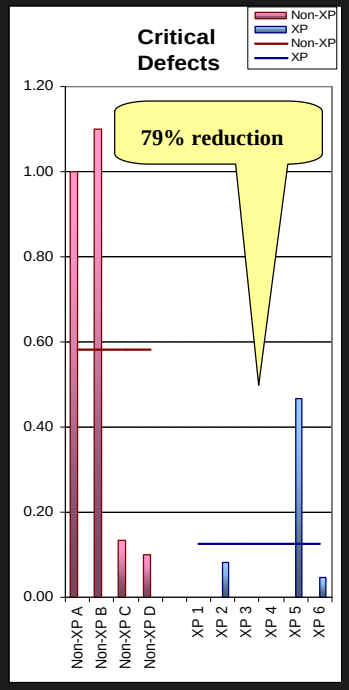
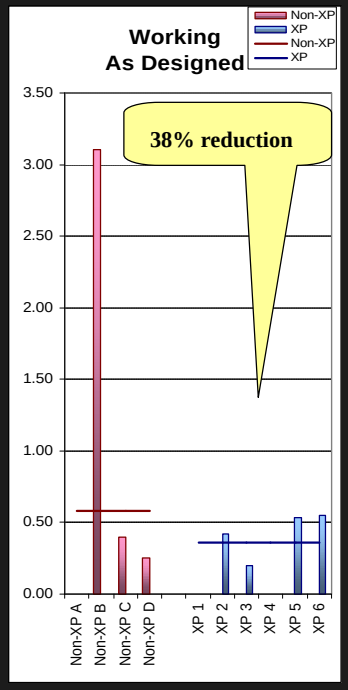
Results - Metrics

Defects	
➢ Total	Include all severities
➢ Critical	Only the highest severity
➢ Working as Designed	Points to business / technology disconnect
Effort & Duration	Cost & calendar time
Size - QA test cases	Best size metric
Quality of Life	
➢ Business	**81%** better / much better
➢ Technology	**77%** better / much better

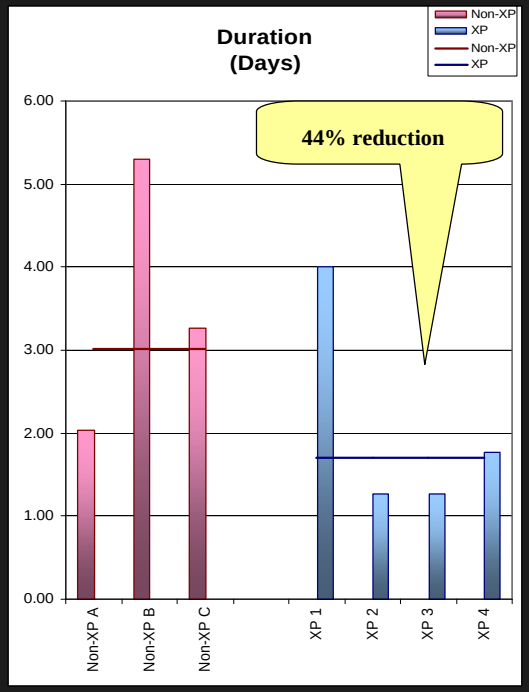
Metrics – Defects

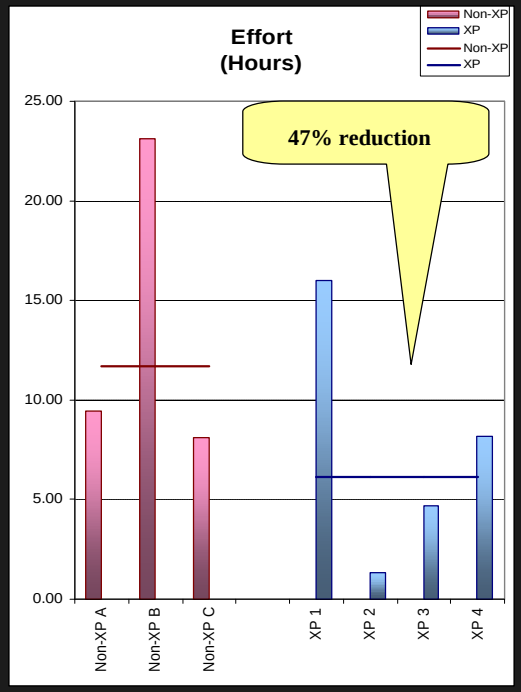






Metrics – Effort / Duration





Other XP Metrics

How We Measure Ourselves

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Metrics Categories

Release Level

- Defects
  - Total
  - Critical
  - Working as Designed (WAD)
- Effort / Duration

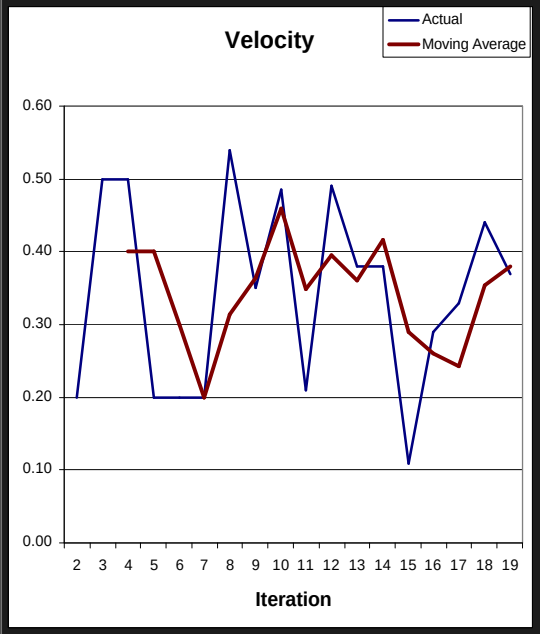
Iteration Level

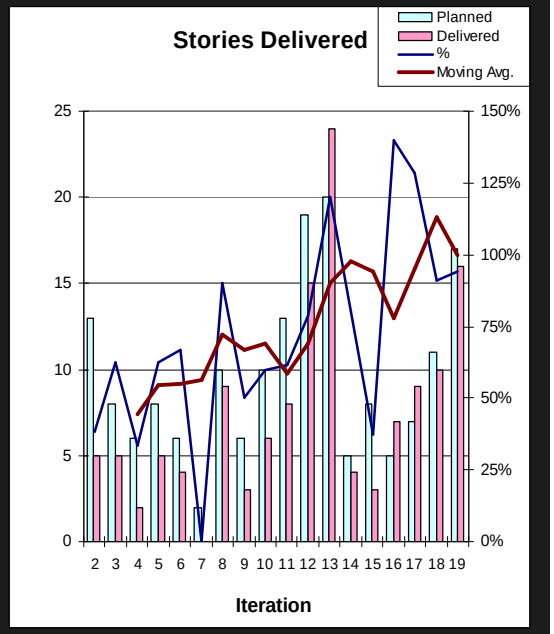
- Velocity
- Stories Delivered

Daily

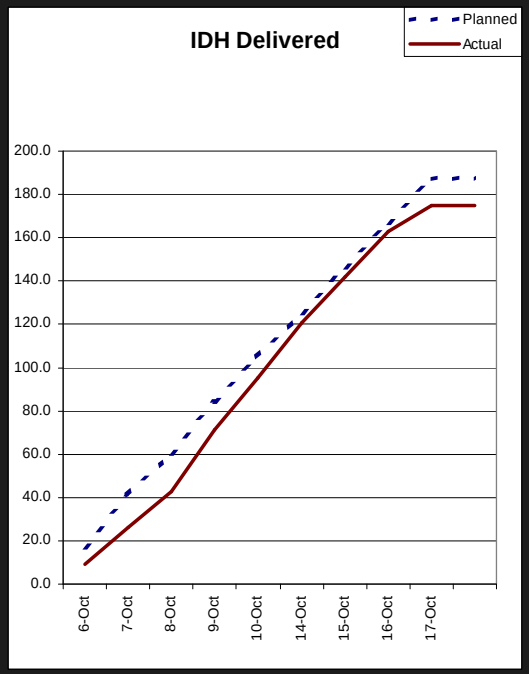
- IDH Delivered
- IDH Remaining

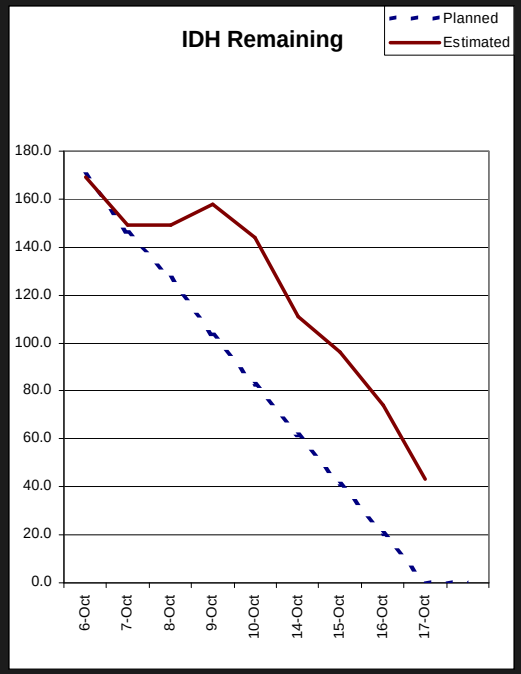
Metrics – Iteration





Metrics – Daily





CMMI Plans

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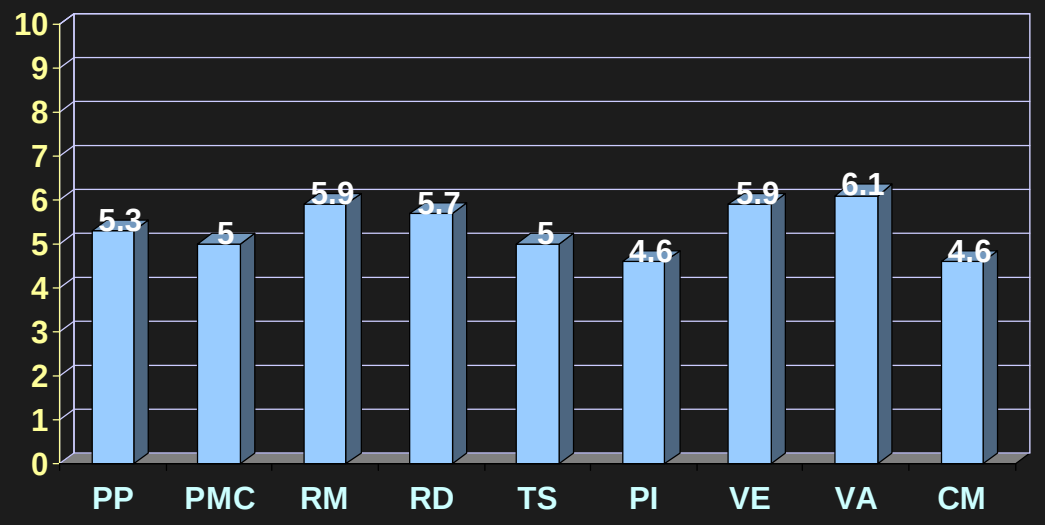
CMMI - Preliminary Targets

	Process Area	CL Target	Comments
Process Management	Organizational Process Focus	2 / 3	This is covered in the wider context by the CRB iT Process Initiative
	Organizational Process Definition	2 / 3	This is covered by the CRB iT Process Initiative's Process Library Tool- ESP Plus
Project Management	Project Planning	2 / 3	Establish basic (light weight) project management processes with due consideration to effective estimation and the establishment of artifacts that support tracking
	Project Monitoring and Control	2 / 3	Establish basic (light weight) project tracking processes that enable adequate levels of governance, reporting and support corrective action
	Risk Management	2 / 3	Establish a robust method for eliciting, defining and baselining, tracing and managing requirements
Engineering	Requirements Development	2 / 3	Establish a method for iteratively refining and reworking requirements (an innate feature of XP)
	Technical Solution	2 / 3	Establish a design methodology fully supported by internal standards and conventions
	Product Integration	2 / 3	Establish a process for supporting an integration strategy covering the entire project lifecycle
	Verification	2 / 3	Establish and deploy a set of standard QA methods encompassing Peer Reviews through QA Testing
	Validation	2 / 3	Establish and deploy a method for ensuring that client/end-user needs are addressed (VOC, Client surveys)
Support	Configuration Management	2 / 3	Establish a standard means for identifying, storing and controlling artifacts (code, documents, environments)
	Process and Product Quality Assurance	2 / 3	This is covered in the wider context by the CRB iT Process Initiative
	Measurement and Analysis	2 / 3	This is covered in the wider context by the CRB iT Process Initiative

Scoring Guide

0-1	Poor/Inadequate	
2-3	Weak/Evolving	
4	Fair	
5	Transitioning	Capability Level 2
6	Marginally Qualified	
7	Qualified	Capability Level 2+ Capability Level 3
8	Fully Qualified	
9-10	Outstanding/World Class	

Preliminary Results



CMMI Results / Plans

Formal Assessment

- December 2003 – Class B L-2 Appraisal (Staged)
  - Close, but no cigar

Plans

- 60 day plan to address shortfall areas
- 1st quarter – Class A Appraisal (Staged)

Reality

- Bank One merger announcement

Current Plans

- 2nd quarter – Class A Appraisal (Staged)
- 4th quarter – Class A Appraisal (Continuous)

Summary

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Complementary Approaches

Six Sigma

- Driven by business needs
- Disciplined implementation
- Results verified through metrics

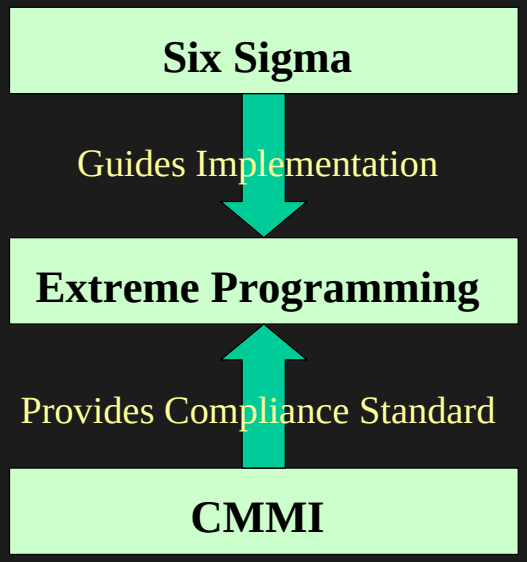
Extreme Programming

- Better / cheaper / faster
- Improved quality of life

CMMI

- Recognized framework
- Lends legitimacy

Complementary Approaches



Q&A

Audience Participation Encouraged

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