Office of the Chief Information Officer/G6

U.S. Army Aviation and Missile Command
(AMCOM)
Redstone Arsenal, Alabama

Lean, Six Sigma and CMMI… Working Together to Achieve High Success

by:
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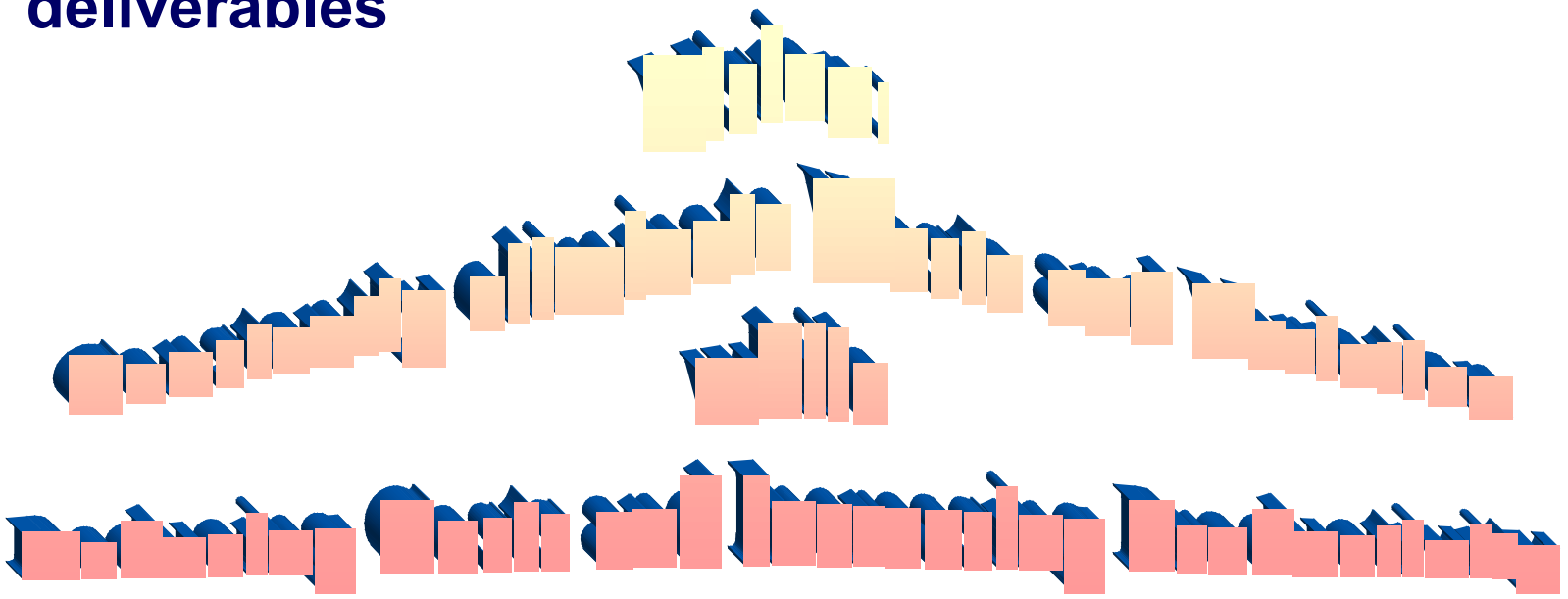
November 2007

Why Lean, Six Sigma and CMMI?

- AMC/DA directives
- Supports Software Engineering Process (SEP) Improvement
- Integrate and compliment one another
- Gives insight into reality
  - Data-based decision making
  - Measure variation
  - Know when to react
- Used for problem solving

Lean, Six Sigma and CMMI

- All are process improvement methodologies
- Lean focuses on speed, efficiency, and removing waste
- Six Sigma is aligned with precision and accuracy
- CMMI supports best practices for software development including risk reduction, increasing efficiency, and improving the overall quality of products and deliverables



Organization Background

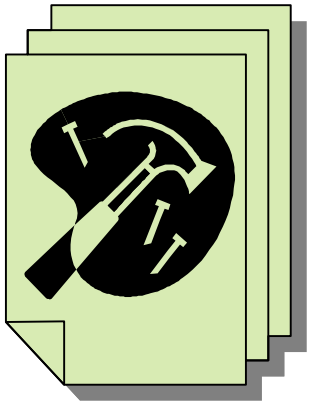
- Small, Federal organization (140 civilian/contractor)
- Achieved SW-CMM Level 2, August 2002
- Lean approach implemented, Feb 2005
- Achieved CMMI Level 2 and Capability Level 3 in 9 Process Areas rated, May 2007
- Working toward CMMI Level 3, Class A appraisal planned for Mar 2008

Lean Improvement Benefits

- VSM Conducted Feb 2005 resulting in 14 Kaizen events and many tasks
- Kaizen improvements yielded new Software Engineering Process (SEP) iterations
- Improved metrics – data driven management
- Eliminated unnecessary steps identified as wastes
- Provided customer's first critical needs faster
- Test driven approach focused on FTQ
- Improved workload/workflow management/staffing
- Better communication through teaming
- Reduced backload

SEP Processes Rolled Out

- The SEP processes have been rolled out incrementally by versions since June 2005. SEP Implementations were:
  - June 2005, Version 5 (Interim)
  - December 2005, Version 6 (Loop 1 Rollout)
  - February 2006, Version 6.1
  - February 2006, Version 6.2
  - March 2006, Version 7 (Loop 2 Rollout)
  - July 2006, Version 8
  - August 2006, Version 9
  - September 2006, Version 10 (Loop 3 Rollout)
  - November 2006, Version 10.1
  - January 2007, Version 11.0
  - February 2007, Version 11.1
  - April 2007, Version 11.2
  - August 2007, Version 11.3
  - October 2007, Version 12.0 (CMMI ML3 Remaining Process Rollout)



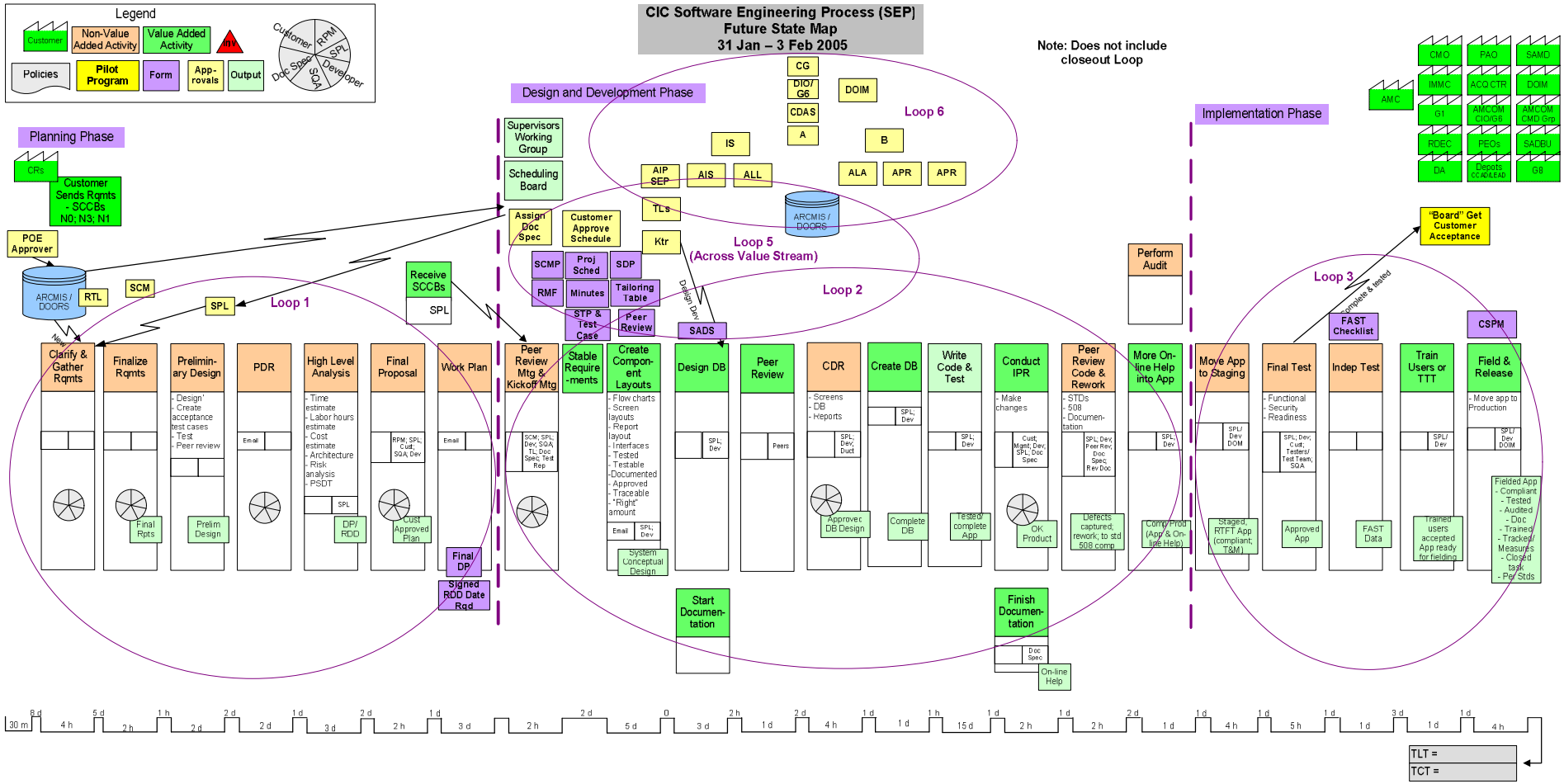
VSM Projected/Actual Results

Category	Metric	Current State Baseline	Future State Projected	FY06	FY07
Flow	Total # Jobs/yr	25	> 50	33	47
	Tot # AKO pgs			27	12
	Backlog	21 CRs	< 10	6	6
	Lead Time	374 days	< 90 days	Changed goal < 105 days	165 138 (G6 Ready for Production)
Process	Phases-Loops	9	4	4	4
	# Activities	63	24	22	22
	# Approvals	65	18	7	13
	# Documents	25	11	8	8
Process Maturity	CMM/CMMI Level	2 (CMM)	3 (CMMI)	2 (CMM)	2(CMMI) CL3 in 9 Process Areas
	DA Compliance	TBD	100%	100% FISMA, AR 70-1, etc*	100% FISMA, AR 70-1, etc*

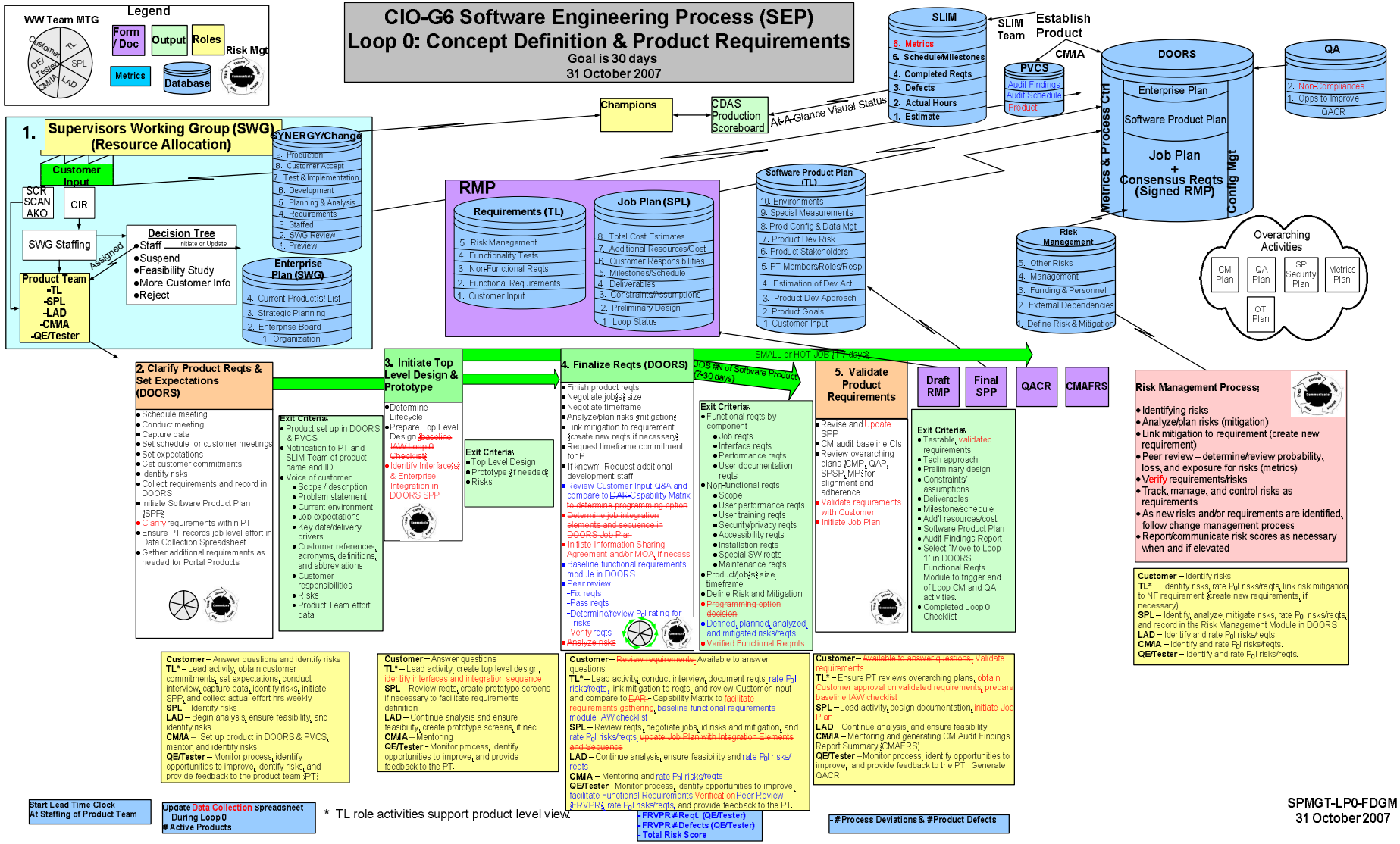
FY 08 Projected Events

Event	FY08 Projected
Assessments	SCAMPI-C (November) SCAMPI-B (January) SCAMPI-A (March)
Value Stream Maps/ SEP Readiness Reviews	1 – VSM (May)
Kaizen Events	1 - Workplace Organization 5 – Projected from VSM
Town Hall Meetings	Jan – SCAMPI B Results Mar – SCAMPI A Results 3rd Qtr – SEP Version 12.2 Rollout
Training	1 – Risk Management 1 – Functionality Test Cases 1 – CMMI v1.2 training 4 – SEP Version release training (V12.1, V12.2, V12.3, V12.4)
TOTAL	20

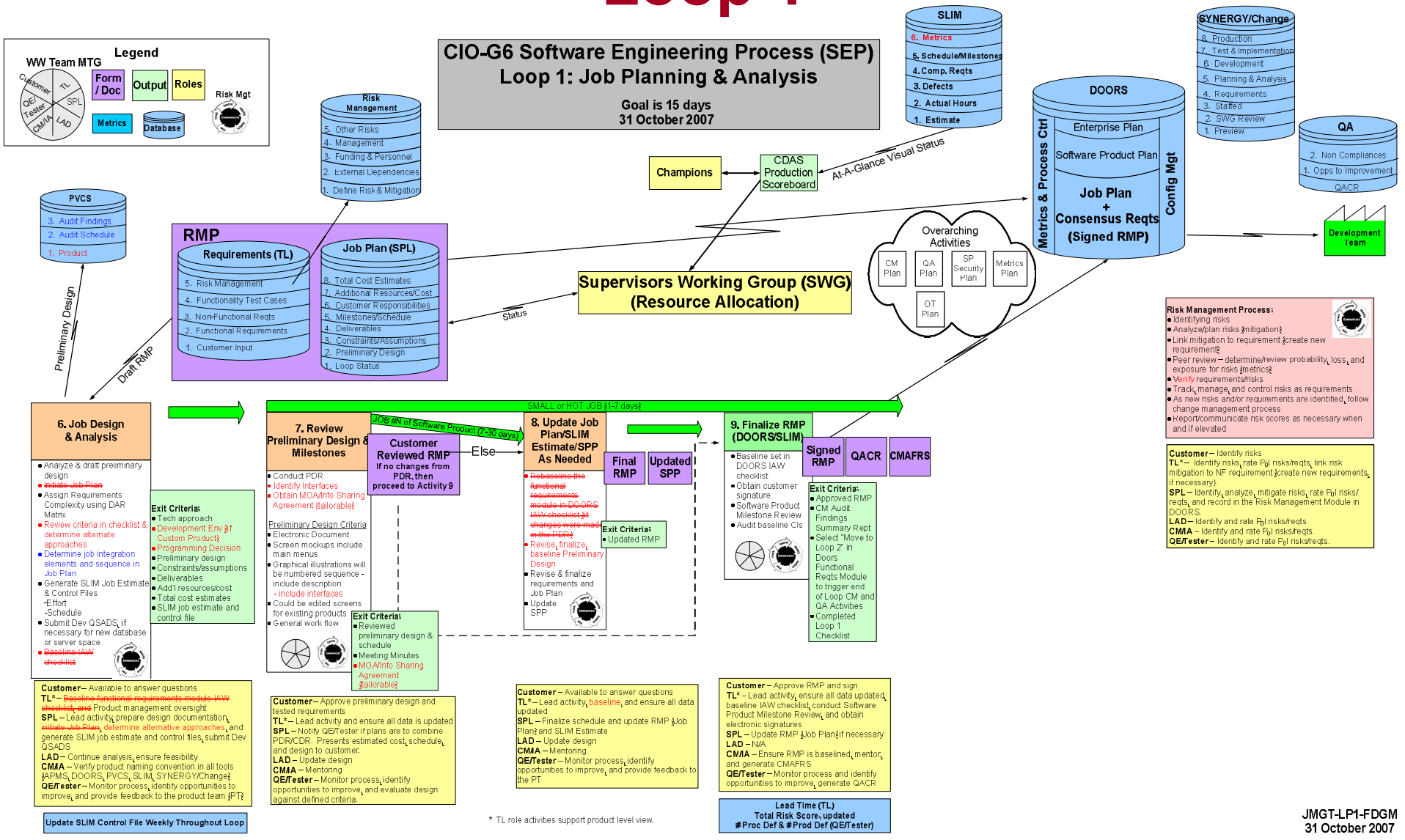
Value Stream Map



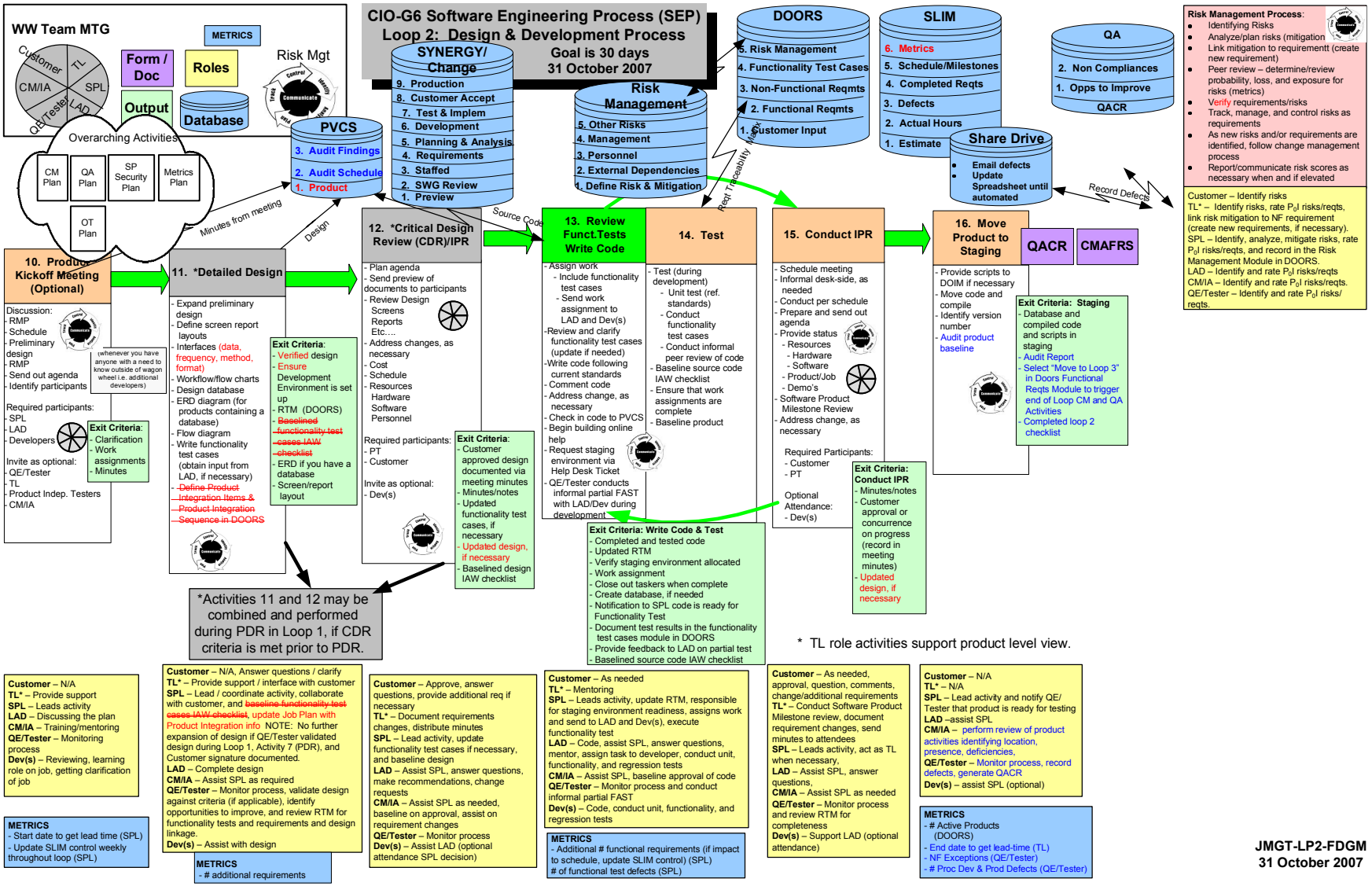
Loop 0


Legend
WW Team MTG
Form / Doc
Output
Roles
Risk Mgt
Metrics
Database
CIO-G6 Software Engineering Process (SEP)
Loop 0: Concept Definition & Product Requirements
Goal is 30 days
31 October 2007
1. Supervisors Working Group (SWG) (Resource Allocation)
Customer Input
SCR SCAN AKO
CIR
SWG Staffing
Assigned
Decision Tree
Staff
Initiate or Update
Suspend
Feasibility Study
More Customer Info
Reject
Product Team -TL -SPL -LAD -CMMA -QE/Tester
SYNERGY/Change
9. Production
8. Customer Accept
7. Test & Implementation
6. Development
5. Planning & Analysis
4. Requirements
3. Staffed
2. SWG Review
1. Preview
Enterprise Plan (SWG)
4. Current Product(s) List
3. Strategic Planning
2. Enterprise Board
1. Organization
Champions
CDAS Production Scoreboard
At-A-Glance Visual Status
SLIM
6. Metrics
5. Schedule/Milestones
4. Completed Reqts
3. Defects
2. Actual Hours
1. Estimate
SLIM Team
Establish Product
CMMA
PVCS
Audit Findings
Audit Schedule
Product
DOORS
Enterprise Plan
Software Product Plan
Job Plan + Consensus Reqts (Signed RMP)
Config Mgt
Metrics & Process Ctrl
QA
2. Non-Compliances
1. Opps to Improve
QACR
RMP
Requirements (TL)
5. Risk Management
4. Functionality Tests
3. Non-Functional Reqts
2. Functional Requirements
1. Customer Input
Job Plan (SPL)
8. Total Cost Estimates
7. Additional Resources/Cost
6. Customer Responsibilities
5. Milestones/Schedule
4. Deliverables
3. Constraints/Assumptions
2. Preliminary Design
1. Loop Status
Software Product Plan (TL)
10. Environments
9. Special Measurements
8. Prod Config & Data Mgt
7. Product Dev Risk
6. Product Stakeholders
5. PT Members/Roles/Resp
4. Estimation of Dev Act
3. Product Dev Approach
2. Product Goals
1. Customer Input
Risk Management
5. Other Risks
4. Management
3. Funding & Personnel
2. External Dependencies
1. Define Risk & Mitigation
Overarching Activities
CM Plan
QA Plan
SP Security Plan
Metrics Plan
OT Plan
2. Clarify Product Reqts & Set Expectations (DOORS)
Schedule meeting
Conduct meeting
Capture data
Set schedule for customer meetings
Set expectations
Get customer commitments
Identify risks
Collect requirements and record in DOORS
Initiate Software Product Plan (SPP)
Clarify requirements within PT
Ensure PT records job level effort in Data Collection Spreadsheet
Gather additional requirements as needed for Portal Products
Exit Criteria:
Product set up in DOORS & PVCS
Notification to PT and SLIM Team of product name and ID
Voice of customer
Scope / description
Problem statement
Current environment
Job expectations
Key date/delivery drivers
Customer references, acronyms, definitions, and abbreviations
Customer responsibilities
Risks
Product Team effort data
3. Initiate Top Level Design & Prototype
Determine Lifecycle
Prepare Top Level Design IAW Loop 0 Checklist
Identify Interface(s) & Enterprise Integration in DOORS SPP
Exit Criteria:
Top Level Design
Prototype if needed
Risks
4. Finalize Reqts (DOORS)
Finish product reqts
Negotiate job(s) size
Negotiate timeframe
Analyze/plan risks (mitigation)
Link mitigation to requirement (create new reqts if necessary)
Request timeframe commitment for PI
If known: Request additional development staff
Review Customer Input Q&A and compare to DAR-Capability Matrix to determine programming option
Determine job integration elements and sequence in DOORS Job Plan
Initiate Information Sharing Agreement and/or MOA, if necess
Baseline functional requirements module in DOORS
Peer review
-Fix reqts
-Pass reqts
-Determine/review PoI rating for risks
-Verify reqts
Analyze risks
SMALL or HOT JOB (1-7 days)
JOB (IAW of Software Product) (7-30 days)
Exit Criteria:
Functional reqts by component
Job reqts
Interface reqts
Performance reqts
User documentation reqts
Non-functional reqts
Scope
User performance reqts
User training reqts
Security/privacy reqts
Accessibility reqts
Installation reqts
Special SW reqts
Maintenance reqts
Product/job(s) size, timeframe
Define Risk and Mitigation
Programming option decision
Defined, planned, analyzed, and mitigated risks/reqts
Verified Functional Reqmts
5. Validate Product Requirements
Revise and Update SPP
CM audit baseline CIs
Review overarching plans (CMP, QAP, SPSP, MP) for alignment and adherence
Validate requirements with Customer
Initiate Job Plan
Exit Criteria:
Testable, validated requirements
Tech approach
Preliminary design
Constraints/ assumptions
Deliverables
Milestone/schedule
Add'l resources/cost
Software Product Plan
Audit Findings Report
Select "Move to Loop 1" in DOORS Functional Reqts. Module to trigger end of Loop CM and QA activities.
Completed Loop 0 Checklist
Draft RMP
Final SPP
QACR
CMAFRS
Risk Management Process:
Identifying risks
Analyze/plan risks (mitigation)
Link mitigation to requirement (create new requirement)
Peer review – determine/review probability, loss, and exposure for risks (metrics)
Verify requirements/risks
Track, manage, and control risks as requirements
As new risks and/or requirements are identified, follow change management process
Report/communicate risk scores as necessary when and if elevated
Customer – Identify risks
TL* – Identify risks, rate PoI risks/reqts, link risk mitigation to NF requirement (create new requirements, if necessary).
SPL – Identify, analyze, mitigate risks, rate PoI risks/reqts, and record in the Risk Management Module in DOORS.
LAD – Identify and rate PoI risks/reqts
CMA – Identify and rate PoI risks/reqts.
QE/Tester – Identify and rate PoI risks/reqts.
Customer – Answer questions and identify risks
TL* – Lead activity, obtain customer commitments, set expectations, conduct interview, capture data, identify risks, initiate SPP, and collect actual effort hrs weekly
SPL – Identify risks
LAD – Begin analysis, ensure feasibility, and identify risks
CMA – Set up product in DOORS & PVCS, mentor, and identify risks
QE/Tester – Monitor process, identify opportunities to improve, identify risks, and provide feedback to the product team & PT
Customer – Answer questions
TL* – Lead activity, create top level design, identify interfaces and integration sequence
SPL – Review reqts, create prototype screens if necessary to facilitate requirements definition
LAD – Continue analysis and ensure feasibility, create prototype screens, if nec
CMA – Mentoring
QE/Tester – Monitor process, identify opportunities to improve, and provide feedback to the PT.
Customer – Review requirements, Available to answer questions
TL* – Lead activity, conduct interview, document reqts, rate PoI risks/reqts, link mitigation to reqts, and review Customer Input and compare to DAR- Capability Matrix to facilitate requirements gathering, baseline functional requirements module IAW checklist
SPL – Review reqts, negotiate jobs, id risks and mitigation, and rate PoI risks/reqts, update Job Plan with Integration Elements and Sequence
LAD – Continue analysis, ensure feasibility and rate PoI risks/reqts
CMA – Mentoring and rate PoI risks/reqts
QE/Tester – Monitor process, identify opportunities to improve, facilitate Functional Requirements Verification Peer Review (FRVPR), rate PoI risks/reqts, and provide feedback to the PT.
Customer – Available to answer questions, Validate requirements
TL* – Ensure PT reviews overarching plans, obtain Customer approval on validated requirements, prepare baseline IAW checklist
SPL – Lead activity, design documentation, initiate Job Plan
LAD – Continue analysis, and ensure feasibility
CMA – Mentoring and generating CM Audit Findings Report Summary (CMAFRS).
QE/Tester – Monitor process, identify opportunities to improve, and provide feedback to the PT. Generate QACR.
Start Lead Time Clock At Staffing of Product Team
Update Data Collection Spreadsheet During Loop 0 # Active Products
* TL role activities support product level view.
-FRVPR # Reqt. (QE/Tester)
-FRVPR # Defects (QE/Tester)
-Total Risk Score
-# Process Deviations & # Product Defects
SPMGT-LP0-FDGM
31 October 2007

Loop 1


Legend
WW Team MTG
Customer
TL
QE/ Tester
SPL
CM/IA
LAD
Form / Doc
Output
Roles
Risk Mgt
Metrics
Database
CIO-G6 Software Engineering Process (SEP)
Loop 1: Job Planning & Analysis
Goal is 15 days
31 October 2007
SLIM
6. Metrics
5. Schedule/Milestones
4. Comp. Reqts
3. Defects
2. Actual Hours
1. Estimate
SYNERGY/Change
8. Production
7. Test & Implementation
6. Development
5. Planning & Analysis
4. Requirements
3. Staffed
2. SWG Review
1. Preview
QA
2. Non Compliances
1. Opps to Improvement
QACR
Risk Management
5. Other Risks
4. Management
3. Funding & Personnel
2. External Dependencies
1. Define Risk & Mitigation
Champions
CDAS Production Scoreboard
At-A-Glance Visual Status
DOORS
Metrics & Process Ctrl
Enterprise Plan
Software Product Plan
Job Plan + Consensus Reqts (Signed RMP)
Config Mgt
Development Team
PVCS
3. Audit Findings
2. Audit Schedule
1. Product
RMP
Requirements (TL)
5. Risk Management
4. Functionality Test Cases
3. Non-Functional Reqts
2. Functional Requirements
1. Customer Input
Job Plan (SPL)
8. Total Cost Estimates
7. Additional Resources/Cost
6. Customer Responsibilities
5. Milestones/Schedule
4. Deliverables
3. Constraints/Assumptions
2. Preliminary Design
1. Loop Status
Supervisors Working Group (SWG) (Resource Allocation)
Status
Overarching Activities
CM Plan
QA Plan
SP Security Plan
Metrics Plan
OT Plan
Preliminary Design
Draft RMP
SMALL or HOT JOB (1-7 days)
JOB #N of Software Product (7-30 days)
6. Job Design & Analysis
Analyze & draft preliminary design
Initiate Job Plan
Assign Requirements Complexity using DAR Matrix
Review criteria in checklist & determine alternate approaches
Determine job integration elements and sequence in Job Plan
Generate SLIM Job Estimate & Control Files
-Effort
-Schedule
Submit Dev QSADS, if necessary for new database or server space
Baseline IAW checklist
Exit Criteria:
Tech approach
Development Env (if Custom Product)
Programming Decision
Preliminary design
Constraints/assumptions
Deliverables
Add'l resources/cost
Total cost estimates
SLIM job estimate and control file
Customer – Available to answer questions
TL* – Baseline functional requirements module IAW checklist, and Product management oversight
SPL – Lead activity, prepare design documentation, initiate Job Plan, determine alternative approaches, and generate SLIM job estimate and control files, submit Dev QSADS
LAD – Continue analysis, ensure feasibility
CM/A – Verify product naming convention in all tools (APMS, DOORS, PVCS, SLIM, SYNERGY/Change)
QE/Tester – Monitor process, identify opportunities to improve, and provide feedback to the product team (PT)
Update SLIM Control File Weekly Throughout Loop
7. Review Preliminary Design & Milestones
Conduct PDR
Identify Interfaces
Obtain MOA/Info Sharing Agreement (tailorable)
Preliminary Design Criteria
Electronic Document
Screen mockups include main menus
Graphical illustrations will be numbered sequence - include description - include interfaces
Could be edited screens for existing products
General work flow
Customer Reviewed RMP
If no changes from PDR, then proceed to Activity 9
Else
Exit Criteria:
Reviewed preliminary design & schedule
Meeting Minutes
MOA/Info Sharing Agreement (tailorable)
Customer – Approve preliminary design and tested requirements
TL* – Lead activity and ensure all data is updated
SPL – Notify QE/Tester if plans are to combine PDR/CDR. Presents estimated cost, schedule, and design to customer.
LAD – Update design
CM/A – Mentoring
QE/Tester – Monitor process, identify opportunities to improve, and evaluate design against defined criteria.
8. Update Job Plan/SLIM Estimate/SPP As Needed
Rebaseline the functional requirements module in DOORS IAW checklist (if changes were made in the PDR)
Revise, finalize, baseline Preliminary Design
Revise & finalize requirements and Job Plan
Update SPP
Final RMP
Updated SPP
Exit Criteria:
Updated RMP
Customer – Available to answer questions
TL* – Lead activity, baseline, and ensure all data updated
SPL – Finalize schedule and update RMP (Job Plan) and SLIM Estimate
LAD – Update design
CM/A – Mentoring
QE/Tester – Monitor process, identify opportunities to improve, and provide feedback to the PT
9. Finalize RMP (DOORS/SLIM)
Baseline set in DOORS IAW checklist
Obtain customer signature
Software Product Milestone Review
Audit baseline CIs
Signed RMP
QACR
CMAFRS
Exit Criteria:
Approved RMP
CM Audit Findings Summary Rept
Select "Move to Loop 2" in Doors Functional Reqts Module to trigger end of Loop CM and QA Activities
Completed Loop 1 Checklist
Customer – Approve RMP and sign
TL* – Lead activity, ensure all data updated, baseline IAW checklist, conduct Software Product Milestone Review, and obtain electronic signatures
SPL – Update RMP (Job Plan) if necessary
LAD – N/A
CM/A – Ensure RMP is baselined, mentor, and generate CMAFRS
QE/Tester – Monitor process and identify opportunities to improve, generate QACR
Lead Time (TL)
Total Risk Score, updated
#Proc Def & #Prod Def (QE/Tester)
* TL role activities support product level view.
Risk Management Process:
Identifying risks
Analyze/plan risks (mitigation)
Link mitigation to requirement (create new requirement)
Peer review – determine/review probability, loss, and exposure for risks (metrics)
Verify requirements/risks
Track, manage, and control risks as requirements
As new risks and/or requirements are identified, follow change management process
Report/communicate risk scores as necessary when and if elevated
Customer – Identify risks
TL* – Identify risks, rate P&I risks/reqts, link risk mitigation to NF requirement (create new requirements, if necessary).
SPL – Identify, analyze, mitigate risks, rate P&I risks/reqts, and record in the Risk Management Module in DOORS.
LAD – Identify and rate P&I risks/reqts
CM/A – Identify and rate P&I risks/reqts.
QE/Tester – Identify and rate P&I risks/reqts.
JMGT-LP1-FDGM
31 October 2007

Loop 2


WW Team MTG
METRICS
Customer
TL
CM/IA
SPL
QE/Tester
LAD
Form / Doc
Roles
Risk Mgt
Output
Database
Overarching Activities
CM Plan
QA Plan
SP Security Plan
Metrics Plan
OT Plan
CIO-G6 Software Engineering Process (SEP)
Loop 2: Design & Development Process
Goal is 30 days
31 October 2007
SYNERGY/ Change
9. Production
8. Customer Accept
7. Test & Implem
6. Development
5. Planning & Analysis
4. Requirements
3. Staffed
2. SWG Review
1. Preview
PVCS
3. Audit Findings
2. Audit Schedule
1. Product
Risk Management
5. Other Risks
4. Management
3. Personnel
2. External Dependencies
1. Define Risk & Mitigation
DOORS
5. Risk Management
4. Functionality Test Cases
3. Non-Functional Reqmts
2. Functional Reqmts
1. Customer Input
SLIM
6. Metrics
5. Schedule/Milestones
4. Completed Reqts
3. Defects
2. Actual Hours
1. Estimate
QA
2. Non Compliances
1. Opps to Improve
QACR
Share Drive
Email defects
Update Spreadsheet until automated
Risk Management Process:
Identifying Risks
Analyze/plan risks (mitigation
Link mitigation to requirementt (create new requirement)
Peer review – determine/review probability, loss, and exposure for risks (metrics)
Verify requirements/risks
Track, manage, and control risks as requirements
As new risks and/or requirements are identified, follow change management process
Report/communicate risk scores as necessary when and if elevated
Customer – Identify risks
TL* – Identify risks, rate P$_o$I risks/reqts, link risk mitigation to NF requirement (create new requirements, if necessary).
SPL – Identify, analyze, mitigate risks, rate P$_o$I risks/reqts, and record in the Risk Management Module in DOORS.
LAD – Identify and rate P$_o$I risks/reqts
CM/IA – Identify and rate P$_o$I risks/reqts.
QE/Tester – Identify and rate P$_o$I risks/ reqts.
Minutes from meeting
Design
Source Code
Req't Traceability Matrix
Record Defects
10. Product Kickoff Meeting (Optional)
Discussion:
- RMP
- Schedule
- Preliminary design
- RMP
- Send out agenda
- Identify participants
(whenever you have anyone with a need to know outside of wagon wheel i.e. additional developers)
Required participants:
- SPL
- LAD
- Developers
Invite as optional:
- QE/Tester
- TL
- Product Indep. Testers
- CM/IA
Exit Criteria:
- Clarification
- Work assignments
- Minutes
11. *Detailed Design
- Expand preliminary design
- Define screen report layouts
- Interfaces (data, frequency, method, format)
- Workflow/flow charts
- Design database
- ERD diagram (for products containing a database)
- Flow diagram
- Write functionality test cases (obtain input from LAD, if necessary)
- Define Product Integration Items & Product Integration Sequence in DOORS
Exit Criteria:
- Verified design
- Ensure Development Environment is set up
- RTM (DOORS)
- Baselined functionality test cases IAW checklist
- ERD if you have a database
- Screen/report layout
12. *Critical Design Review (CDR)/IPR
- Plan agenda
- Send preview of documents to participants
- Review Design Screens Reports Etc….
- Address changes, as necessary
- Cost
- Schedule
- Resources Hardware Software Personnel
Required participants:
- PT
- Customer
Invite as optional:
- Dev(s)
Exit Criteria:
- Customer approved design documented via meeting minutes
- Minutes/notes
- Updated functionality test cases, if necessary
- Updated design, if necessary
- Baselined design IAW checklist
13. Review Funct.Tests Write Code
- Assign work
- Include functionality test cases
- Send work assignment to LAD and Dev(s)
-Review and clarify functionality test cases (update if needed)
-Write code following current standards
- Comment code
- Address change, as necessary
- Check in code to PVCS
- Begin building online help
- Request staging environment via Help Desk Ticket
- QE/Tester conducts informal partial FAST with LAD/Dev during development
14. Test
- Test (during development)
- Unit test (ref. standards)
- Conduct functionality test cases
- Conduct informal peer review of code
- Baseline source code IAW checklist
- Ensure that work assignments are complete
- Baseline product
Exit Criteria: Write Code & Test
- Completed and tested code
- Updated RTM
- Verify staging environment allocated
- Work assignment
- Close out taskers when complete
- Create database, if needed
- Notification to SPL code is ready for Functionality Test
- Document test results in the functionality test cases module in DOORS
- Provide feedback to LAD on partial test
- Baselined source code IAW checklist
15. Conduct IPR
- Schedule meeting
- Informal desk-side, as needed
- Conduct per schedule
- Prepare and send out agenda
- Provide status
- Resources
- Hardware
- Software
- Product/Job
- Demo's
- Software Product Milestone Review
- Address change, as necessary
Required Participants:
- Customer
- PT
Optional Attendance:
- Dev(s)
Exit Criteria: Conduct IPR
- Minutes/notes
- Customer approval or concurrence on progress (record in meeting minutes)
- Updated design, if necessary
16. Move Product to Staging
QACR
CMAFRS
- Provide scripts to DOIM if necessary
- Move code and compile
- Identify version number
- Audit product baseline
Exit Criteria: Staging
- Database and compiled code and scripts in staging
- Audit Report
- Select "Move to Loop 3" in Doors Functional Reqts Module to trigger end of Loop CM and QA Activities
- Completed loop 2 checklist
*Activities 11 and 12 may be combined and performed during PDR in Loop 1, if CDR criteria is met prior to PDR.
* TL role activities support product level view.
Customer – N/A
TL* – Provide support
SPL – Leads activity
LAD – Discussing the plan
CM/IA – Training/mentoring
QE/Tester – Monitoring process
Dev(s) – Reviewing, learning role on job, getting clarification of job
METRICS
- Start date to get lead time (SPL)
- Update SLIM control weekly throughout loop (SPL)
Customer – N/A, Answer questions / clarify
TL* – Provide support / interface with customer
SPL – Lead / coordinate activity, collaborate with customer, and baseline functionality test cases IAW checklist, update Job Plan with Product Integration info. NOTE: No further expansion of design if QE/Tester validated design during Loop 1, Activity 7 (PDR), and Customer signature documented.
LAD – Complete design
CM/IA – Assist SPL as required
QE/Tester – Monitor process, validate design against criteria (if applicable), identify opportunities to improve, and review RTM for functionality tests and requirements and design linkage.
Dev(s) – Assist with design
METRICS
- # additional requirements
Customer – Approve, answer questions, provide additional req if necessary
TL* – Document requirements changes, distribute minutes
SPL – Lead activity, update functionality test cases if necessary, and baseline design
LAD – Assist SPL, answer questions, make recommendations, change requests
CM/IA – Assist SPL as needed, baseline on approval, assist on requirement changes
QE/Tester – Monitor process
Dev(s) – Assist LAD (optional attendance SPL decision)
Customer – As needed
TL* – Mentoring
SPL – Leads activity, update RTM, responsible for staging environment readiness, assigns work and send to LAD and Dev(s), execute functionality test
LAD – Code, assist SPL, answer questions, mentor, assign task to developer, conduct unit, functionality, and regression tests
CM/IA – Assist SPL, baseline approval of code
QE/Tester – Monitor process and conduct informal partial FAST
Dev(s) – Code, conduct unit, functionality, and regression tests
METRICS
- Additional # functional requirements (if impact to schedule, update SLIM control) (SPL)
# of functional test defects (SPL)
Customer – As needed, approval, question, comments, change/additional requirements
TL* – Conduct Software Product Milestone review, document requirement changes, send minutes to attendees
SPL – Leads activity, act as TL when necessary,
LAD – Assist SPL, answer questions,
CM/IA – Assist SPL as needed
QE/Tester – Monitor process and review RTM for completeness
Dev(s) – Support LAD (optional attendance)
Customer – N/A
TL* – N/A
SPL – Lead activity and notify QE/ Tester that product is ready for testing
LAD –assist SPL
CM/IA – perform review of product activities identifying location, presence, deficiencies,
QE/Tester – Monitor process, record defects, generate QACR
Dev(s) – assist SPL (optional)
METRICS
- # Active Products (DOORS)
- End date to get lead-time (TL)
- NF Exceptions (QE/Tester)
- # Proc Dev & Prod Defects (QE/Tester)
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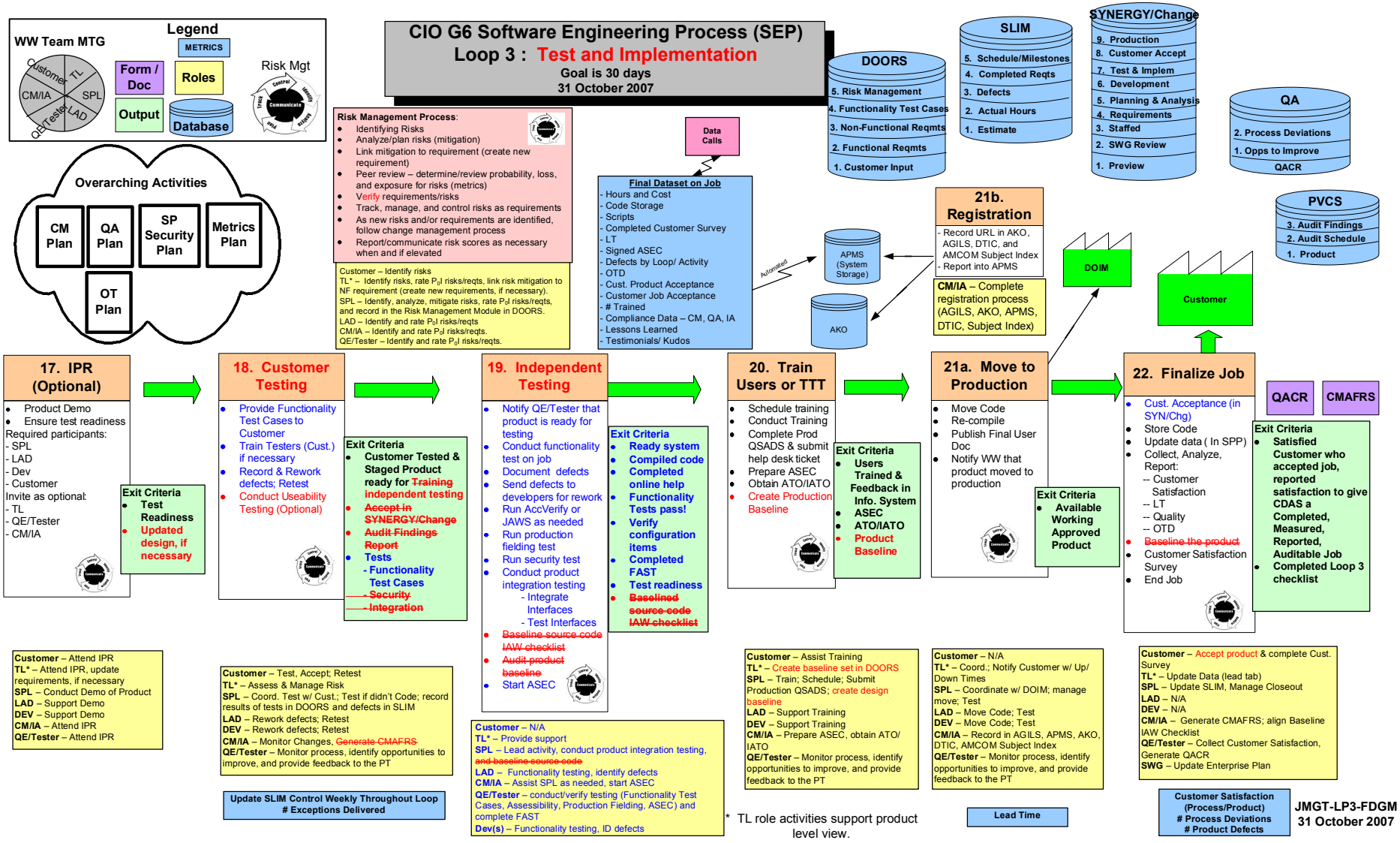
31 October 2007

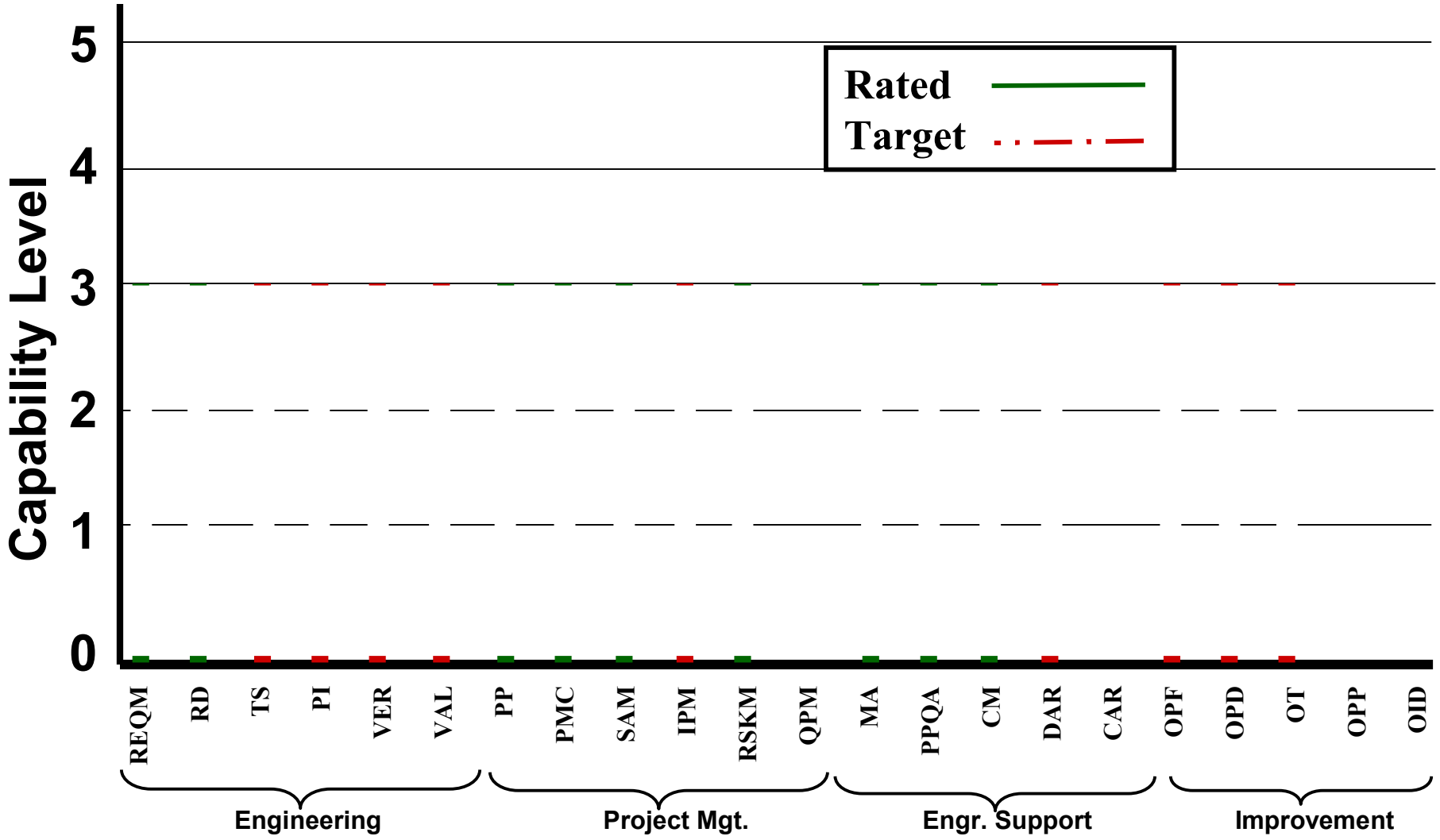
Loop 3


Legend
WW Team MTG
METRICS
Form / Doc
Roles
Output
Database
Risk Mgt
Customer
TL
SPL
LAD
QE/Tester
CM/IA
CIO G6 Software Engineering Process (SEP)
Loop 3 : Test and Implementation
Goal is 30 days
31 October 2007
Overarching Activities
CM Plan
QA Plan
SP Security Plan
Metrics Plan
OT Plan
Risk Management Process:
Identifying Risks
Analyze/plan risks (mitigation)
Link mitigation to requirement (create new requirement)
Peer review – determine/review probability, loss, and exposure for risks (metrics)
Verify requirements/risks
Track, manage, and control risks as requirements
As new risks and/or requirements are identified, follow change management process
Report/communicate risk scores as necessary when and if elevated
Customer – Identify risks
TL* – Identify risks, rate P/I risks/reqts, link risk mitigation to NF requirement (create new requirements, if necessary).
SPL – Identify, analyze, mitigate risks, rate P/I risks/reqts, and record in the Risk Management Module in DOORS.
LAD – Identify and rate P/I risks/reqts
CM/IA – Identify and rate P/I risks/reqts.
QE/Tester – Identify and rate P/I risks/reqts.
Data Calls
Final Dataset on Job
- Hours and Cost
- Code Storage
- Scripts
- Completed Customer Survey
- LT
- Signed ASEC
- Defects by Loop/ Activity
- OTD
- Cust. Product Acceptance
- Customer Job Acceptance
- # Trained
- Compliance Data – CM, QA, IA
- Lessons Learned
- Testimonials/ Kudos
Automated
APMS (System Storage)
AKO
DOORS
5. Risk Management
4. Functionality Test Cases
3. Non-Functional Reqmts
2. Functional Reqmts
1. Customer Input
SLIM
5. Schedule/Milestones
4. Completed Reqts
3. Defects
2. Actual Hours
1. Estimate
SYNERGY/Change
9. Production
8. Customer Accept
7. Test & Implem
6. Development
5. Planning & Analysis
4. Requirements
3. Staffed
2. SWG Review
1. Preview
QA
2. Process Deviations
1. Opps to Improve
QACR
PVCS
3. Audit Findings
2. Audit Schedule
1. Product
21b. Registration
- Record URL in AKO, AGILS, DTIC, and AMCOM Subject Index
- Report into APMS
CM/IA – Complete registration process (AGILS, AKO, APMS, DTIC, Subject Index)
DOIM
Customer
17. IPR (Optional)
Product Demo
Ensure test readiness
Required participants:
- SPL
- LAD
- Dev
- Customer
Invite as optional:
- TL
- QE/Tester
- CM/IA
Exit Criteria
Test Readiness
Updated design, if necessary
18. Customer Testing
Provide Functionality Test Cases to Customer
Train Testers (Cust.) if necessary
Record & Rework defects; Retest
Conduct Useability Testing (Optional)
Exit Criteria
Customer Tested & Staged Product ready for ~~Training independent testing~~
~~Accept in SYNERGY/Change~~
~~Audit Findings Report~~
Tests
- Functionality Test Cases
~~- Security~~
~~- Integration~~
19. Independent Testing
Notify QE/Tester that product is ready for testing
Conduct functionality test on job
Document defects
Send defects to developers for rework
Run AccVerify or JAWS as needed
Run production fielding test
Run security test
Conduct product integration testing
- Integrate Interfaces
- Test Interfaces
~~Baseline source code IAW checklist~~
~~Audit product baseline~~
Start ASEC
Exit Criteria
Ready system
Compiled code
Completed online help
Functionality Tests pass!
Verify configuration items
Completed FAST
Test readiness
~~Baselined source code IAW checklist~~
20. Train Users or TTT
Schedule training
Conduct Training
Complete Prod QSADS & submit help desk ticket
Prepare ASEC
Obtain ATO/IATO
Create Production Baseline
Exit Criteria
Users Trained & Feedback in Info. System
ASEC
ATO/IATO
Product Baseline
21a. Move to Production
Move Code
Re-compile
Publish Final User Doc
Notify WW that product moved to production
Exit Criteria
Available Working Approved Product
22. Finalize Job
Cust. Acceptance (in SYN/Chg)
Store Code
Update data (In SPP)
Collect, Analyze, Report:
-- Customer Satisfaction
-- LT
-- Quality
-- OTD
~~Baseline the product~~
Customer Satisfaction Survey
End Job
QACR
CMAFRS
Exit Criteria
Satisfied Customer who accepted job, reported satisfaction to give CDAS a Completed, Measured, Reported, Auditable Job
Completed Loop 3 checklist
Customer – Attend IPR
TL* – Attend IPR, update requirements, if necessary
SPL – Conduct Demo of Product
LAD – Support Demo
DEV – Support Demo
CM/IA – Attend IPR
QE/Tester – Attend IPR
Customer – Test, Accept; Retest
TL* – Assess & Manage Risk
SPL – Coord. Test w/ Cust.; Test if didn't Code; record results of tests in DOORS and defects in SLIM
LAD – Rework defects; Retest
DEV – Rework defects; Retest
CM/IA – Monitor Changes, ~~Generate CMAFRS~~
QE/Tester – Monitor process, identify opportunities to improve, and provide feedback to the PT
Update SLIM Control Weekly Throughout Loop
Exceptions Delivered
Customer – N/A
TL* – Provide support
SPL – Lead activity, conduct product integration testing, ~~and baseline source code~~
LAD – Functionality testing, identify defects
CM/IA – Assist SPL as needed, start ASEC
QE/Tester – conduct/verify testing (Functionality Test Cases, Assessibility, Production Fielding, ASEC) and complete FAST
Dev(s) – Functionality testing, ID defects
Customer – Assist Training
TL* – Create baseline set in DOORS
SPL – Train; Schedule; Submit Production QSADS; create design baseline
LAD – Support Training
DEV – Support Training
CM/IA – Prepare ASEC, obtain ATO/IATO
QE/Tester – Monitor process, identify opportunities to improve, and provide feedback to the PT
Customer – N/A
TL* – Coord.; Notify Customer w/ Up/Down Times
SPL – Coordinate w/ DOIM; manage move; Test
LAD – Move Code; Test
DEV – Move Code; Test
CM/IA – Record in AGILS, APMS, AKO, DTIC, AMCOM Subject Index
QE/Tester – Monitor process, identify opportunities to improve, and provide feedback to the PT
Lead Time
Customer – Accept product & complete Cust. Survey
TL* – Update Data (lead tab)
SPL – Update SLIM, Manage Closeout
LAD – N/A
DEV – N/A
CM/IA – Generate CMAFRS; align Baseline IAW Checklist
QE/Tester – Collect Customer Satisfaction, Generate QACR
SWG – Update Enterprise Plan
Customer Satisfaction (Process/Product)
Process Deviations
Product Defects
JMGT-LP3-FDGM
31 October 2007
* TL role activities support product level view.

Lean CMMI Benefits

- Repeatable, standard process for the organization
- Reduction of defects through Peer Reviews
- Improved planning activities
- Improved testing activities
- Better management insight into products
- Improved communication through Process Configuration Control Board – Peer Groups
- Adherence to process with improved PPQA process
- Improved metrics – data driven decision making

Target Capability Profile



Six Sigma Benefits

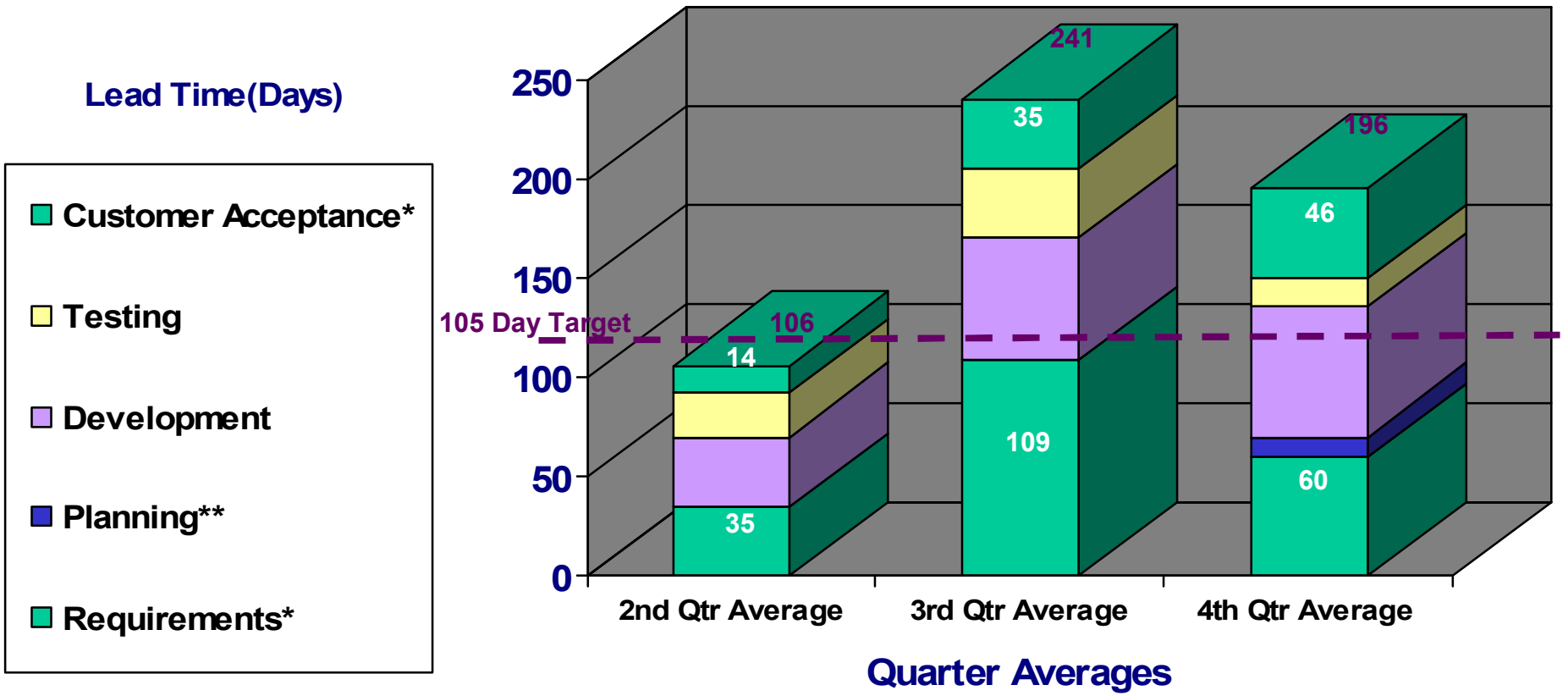
- Improved measurement process
- Manage and make decisions by the data
- Controls in place to maintain improvements
- Know when to react

Six Sigma Black Belt Project

- **Goals**
  - Reduce Loop Lead Time by 10%
  - Reduce Lead Time for Loops 0-1 from 113 days to less than 100
  - Increase meeting Customer Negotiated Delivery Date by 10%
  - Increase number of jobs delivered by 3 during the FY
- **Projected Cost Savings**
  - Job average calculated ~ $51,484
  - Increase productivity by 3 jobs each year
  - Savings of $154,451 annually

Do more with less!

Average Lead Time for FY07 Jobs



* Requirements and Customer Acceptance states rely heavily upon customer involvement

** Began capturing Planning Lead Time in April 2007

DMAIC Methodology

Structured, data-based, problem-solving process

- Specific activities in specific sequence
- Gathering data to facilitate decision making
- Using problem solving techniques to ensure elimination of the problem

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- Develop the charter
- Review existing data related to problem
- Draft a high level process map
- Create plan and guidelines (scope, how to measure success)

Define ⇨ **Measure** ⇨ Analyze ⇨ Improve ⇨ Control

- **Heart of what makes LSS work**
- **Evaluate existing measurement system**
- **Observe the process**
- **Gather data**
- **Map the process in more depth**

Define ⇨ Measure ⇨ **Analyze** ⇨ Improve ⇨ Control

- Use data to confirm source of delays, waste, and poor quality
- Stick to the data
- Look for patterns
- Find root causes
- Identify the most critical factors to control

Define ⇨ Measure ⇨ Analyze ⇨ **Improve** ⇨ Control

- **Make changes that eliminate waste, reduce costs, and are tied to goals**
- **Identify a range of possible solutions**
- **Review Best Practices**
- **Develop criteria for selecting solutions**
- **Pilot or simulate solution**
- **Plan for implementation**

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Define ⇨ Measure ⇨ Analyze ⇨ Improve ⇨ **Control**

- **Purpose: make sure the changes will last**
- **Document new, improved process**
- **Conduct training to the workforce**
- **Implement the change**

Summary

- Lean, Six Sigma, and CMMI work together for success
  - Improved Quality
  - Data based decision making
  - Maintain improvements
  - Repeatable process that is standard across organization

Questions?