Implementing Measurements for Systems Acquisition Process Improvement: The IRS Business Systems Modernization Program

Don Gantzer, MITRE
Lloyd Anderson, IRS

PSM Users’ Group Conference
Keystone, Colorado
July 22-26, 2002
Agenda

- Introduction to the IRS
- Overview of Business Systems Modernization (BSM) Program
- MITRE’s IRS FFRDC Role
- Background on Process Improvement (PI)
- Application of the Software Acquisition Capability Maturity Model (SA-CMM®)
- Measurement Aspects of SA-CMM® and PI
- Experience So Far
- Next Steps
Vision for Modernizing America’s Tax Agency

MISSION STATEMENT

Provide America’s taxpayers top quality service by helping them understand and meet their tax responsibilities and by applying the tax law with integrity and fairness to all.

GUIDING PRINCIPLES

- Understand and solve problems from taxpayer’s point of view
- Enable managers to be accountable—knowledge, responsibility, authority, action
- Align measures of performance at all organizational levels
- Foster open, honest communication
- Insist on total integrity

GOALS

Service to Each Taxpayer:
- Make filing easier
- Provide first quality service to each taxpayer needing help with his or her return or account
- Provide prompt, professional, helpful treatment to taxpayers in cases where additional taxes may be due

Service to All Taxpayers:
- Increase fairness of compliance
- Increase overall compliance

Productivity Through a Quality Work Environment:
- Increase employee job satisfaction
- Hold agency employment stable while economy grows and service improves

Revamped Business Practices
Customer-Focused Operating Divisions
Management Roles With Clear Responsibility
Balanced Measurement of Performance
New Technology
IRS Modernization: An Enormous Business Systems Project

170 Million Individuals
45 Million Businesses
5 Million Tax Exempt and Government Entities

IRS Directly Serves More Americans Than Any Other Institution—Private or Public

102,000 People
1,000 Sites
200 Tax Law Changes / Year
23 Million Calls / Week
200 Million Returns / Year

1.9 Trillion / Year Tax Revenues

Confidence
Service
Integrity
Fairness

The Nation’s Well Being Requires Trusted and Effective Tax Administration

IRS is a Large, Complex Operation by Any Measure
Business Systems Modernization Office (BSMO) manages the acquisition of the business solutions (products, services, systems) provided by the PRIME

- In December 1998, IRS awarded the modernization contract to the PRIME Alliance for up to 15 years
- IRS BSMO is the Acquisition Organization
- Solution Provider—CSC and PRIME Partners
- Program Size—$5–$8B
- BSMO current staffing—approximately 165
- Program encompasses large scale IRS systems including tax administration systems and agency internal systems
IRS BSMO Organization Structure

Fred L. Forman
Associate Commissioner for
Business Systems Modernization

Program Risk Management

Robert F. Albicker
Deputy Associate Commissioner for Systems Integration

Configuration Management

Enterprise Architecture

Infrastructure Modernization

Systems Engineering & Integration

Release Management

Program Control and Process Management

Tax Administration Modernization

Program Management

Internal Management Modernization

Data Management Modernization

Business Management

Program Governance

Business Management

STIR

IRFoF/CC03/CRM EXAM

E-Services

EDW R1 & R2

CADE/IMF R1

CADE/IMF R2

CADE/IMF R3

CADE/BMF R1

F & PC

IRP

CAM

CCES

RC

HR Connect

Workload Mgmt

IRP Planning

Planning Analysis

EZ File

*PI Pilot projects highlighted
BSMO Drivers for Process Improvement

- BSMO realizes that its performance cannot improve without process improvement
- Meets Congressional mandate to set up a “world class” acquisition organization by following Software Engineering Institute’s (SEI) Capability Maturity Model (CMM) methodologies
- General Accounting Office (GAO) builds on and fosters this expectation and will audit using the SEI SA-CMM®
- Makes BSMO more “accountable, predictable and timely,” as required by John Reece, IRS CIO
Participants and Relationships in Systems Acquisition for Modernization

BSMO Acquirer

PRIME

Alliance Partners

Target of BSMO PI and this Assessment

Developed Products/Solutions (e.g., CADE, e-Services, etc.)

Products, Services, Systems Engineering, Integrated Solutions, Program Management Office Support, etc.

TASK ORDERS

CONTRACT TASK ORDERS
IRS / MITRE Strategic Partnership is Based on a Formal Foundation

IRS: Sponsor

- Needs a trusted FFRDC partner
  - For long-term critical need integral to its mission and operations
  - To work objectively and independently
  - Who recognizes IRS objectives as its own
- Supports the FFRDC partnership
  - Access to IRS people, resources, and data
  - Continuity of support
  - Investment in building domain and program knowledge

MITRE: FFRDC

- Strives to be a trusted, vital, and accountable partner
  - Shared mission accountability
  - Sustained technical excellence, knowledge base, and capacity
  - Strategic direction aligned to IRS needs
- Ensures sound basis for trust
  - Not-for-profit public interest
  - Free from organizational conflicts of interest
  - Restricted business activities
  - Full disclosure

IRS FFRDC Sponsor is John Reece
IRS FFRDC Program Manager is Fred Forman
MITRE FFRDC Director is Gene Cross
Relationship Governed by the Federal Acquisition Regulations (FAR)
Federally Funded Research and Development Center (FFRDC) Role and Scope of Work

- Leadership and objective advice
- Essential resource for critical skills
- Development of management and technical processes and capabilities
- Objective voice within established channels to provide guidance and perform assessments
- Special studies for problem assessment, consensus building, and decision purposes
- Enterprise leadership and integration, playing role of “honest broker”

MITRE has specific Process Improvement Tasks in support of the BSMO Program Management Office; there are also other process improvement support activities
Background on Process Improvement at the IRS / BSMO

- GAO conducted an audit in 1998 recommending improvements in IRS systems acquisition processes

- IRS / BSMO developed SA-CMM®-compliant processes in 2000
  - January 2001 informal assessment conducted on BSMO with Software Engineering Institute (SEI) indicated weaknesses
    - Instability in Organization made implementation problematic
    - Did not completely reflect intricacies of BSM environment

- Organizational stability occurred in early 2001
  - Process Improvement (PI) Management (BSM executives) Steering Group formed in August 2001
  - Solutions Acquisition Process Group (SAPG) chartered to implement PI

- Initial Goal
  - Software Capability Evaluation (SCE) for SA-CMM® Level 2 maturity in December 2002 (will be led by SEI)
Before major change can even be contemplated, top management must recognize the need and be sold on the idea.

The Must Haves

1. A compelling reason for change
2. Leadership of the change effort by the top executive in the organization—responsibility cannot be delegated
3. Informed commitment of the top management team
4. Designation of a primary PI Leader and an adequate mandate for change
5. Sound performance measures that drive change

*source: SEI/CMU*
The IDEAL* Model SM

IDEAL is a service mark of Carnegie Mellon University
*source: SEI
Application of the SA-CMM® helps establish the infrastructure to better manage acquisitions (software and systems)

Forces an “introspective” of how the organization does business and how it wants to do business—not on how the supplier (contractor) does business

Key concepts of the SA-CMM®

- It targets acquisition and management
- Someone is in charge from the acquisition organization for the management of each acquisition: a team is established
- Each acquisition is planned using specific processes and procedures
- The plan is executed and tracked
- Work is verified by senior management
- Policies, processes, descriptions, and procedures are consistent with the SA-CMM® and the way the organization wants to do business

*source: SEI/CMU
SA-CMM® is a “staged” model, similar to the Capability Maturity Model for Software (SW-CMM®).

*source: SEI/CMU*
**CMM Terminology**

<table>
<thead>
<tr>
<th>CMM Terminology</th>
<th>BSMO Terminology</th>
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<tbody>
<tr>
<td>Software Acquisition</td>
<td>Solution Acquisition</td>
</tr>
<tr>
<td>Acquisition Organization</td>
<td>BSMO</td>
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<tr>
<td>Project Manager</td>
<td>IRS Acquisition Project Manager</td>
</tr>
<tr>
<td>Project Team is the entity that is</td>
<td>IRS Acquisition Project Manager and</td>
</tr>
<tr>
<td>responsible for executing the specific</td>
<td>the Acquisition Team (staff, MITRE,</td>
</tr>
<tr>
<td>acquisition</td>
<td>Contracting Officer, Contracting</td>
</tr>
<tr>
<td></td>
<td>Officer’s Technical Representative)</td>
</tr>
<tr>
<td>Solicitation means preparation of a</td>
<td>Developing and issuing a task order</td>
</tr>
<tr>
<td>solicitation package and the selection of</td>
<td></td>
</tr>
<tr>
<td>a contractor</td>
<td></td>
</tr>
<tr>
<td>Contract</td>
<td>Task Order</td>
</tr>
<tr>
<td>Acquisition planning documents</td>
<td>Acquisition Management Plan (AMP)</td>
</tr>
<tr>
<td>Policies</td>
<td>Directives</td>
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</tbody>
</table>

*BSMO defined 7 major processes and many procedures to cover all the SA-CMM® relevant activities*
### Process Area Mapping for Level 2

<table>
<thead>
<tr>
<th>CMM Key Process Area—Level 2</th>
<th>BSMO Process Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Software Acquisition Planning</td>
<td>Acquisition Project Planning</td>
</tr>
<tr>
<td>Project Management</td>
<td>Acquisition Project Management</td>
</tr>
<tr>
<td>Contract Tracking and Oversight</td>
<td>Task Order Monitoring</td>
</tr>
<tr>
<td>Solicitation</td>
<td>Task Order Development and Issuance</td>
</tr>
<tr>
<td>Requirements Development and Management</td>
<td>Requirements Development and Management</td>
</tr>
<tr>
<td>Evaluation</td>
<td>Systems Evaluation</td>
</tr>
<tr>
<td>Transition to Support</td>
<td>Transition to Support</td>
</tr>
</tbody>
</table>
Business Systems Modernization Office
Process Improvement Infrastructure

- The Enablers
- The Change Agents
- The Practitioners

**Charter & Strategic Plan**

**Management Steering Group (MSG)**

**Solutions Acquisition Process Group (SAPG)**

**Process Improvement Focus Groups (PIFGs)**

- PI Plans

- Charter
- Tactical Plans
- Major processes
- Some procedures
- Process measurement
BSMO PI Process Document Hierarchy

Senior Management Policy

Directives

Process Descriptions

Procedures

Templates

What Tasks are Performed

[standardized for pilots]

Tools to Help

Process measurement identified

Could include measurements

[projects can tailor]
Major Steps to Date in BSMO PI

- Obtained BSMO executive management sponsorship
- Identified BSMO pilot PI Management Steering Group (MSG) and Solutions Acquisition Process Group (SAPG)
- Developed BSMO PI Strategic Plan and Schedule
- Developed Process Architecture (mapping, procedures*)
- Developed BSMO PI Communications and Training Plans
- Provided PI training to SAPG team members, projects, executives
- Developed and rolled-out 7 major processes and associated procedures*; Process Measurement is integrated
- Conducted informal CMM Based Application-Internal Process Improvement (CBA-IPI) with SEI-led team in June 2002 to determine status, strengths, and PI opportunities (MITRE is part of team)

*e.g., some procedures for Task Order Monitoring are status meetings, deliverable reviews, cost and schedule evaluation, issue tracking
• Developed a Measurement Plan
• Provided PSM Executive Overview for SAPG
• Ensured each Process Description had a section on Process Measurement; also emphasized in Acquisition Project Planning process / procedure
• Developed some typical examples: plan vs. actual progress
• Offered Measurement workshops to projects using PSM methodology; terms tailored for IRS / BSM
  – Conducted one (to date) and drafted measurement implementation plan with project consideration
  – Offered consulting / guidance as needed*
• Using June 2002 CBA-IPI findings to focus on measurement activities to improve by December 2002 SCE

*SEI has provided consulting support to us
Business Goals and How They are Measured
Drive Performance of PI Teams

Long Range Perspective of BSMO PI Measurement Program

source: SEI/CMU
BSMO PI Measurement Workshop Agenda

- **Measurement Overview (why, what, how)**

- **Conduct Workshop exercise (PSM Methodology)**
  - Identify concerns (e.g., objectives, constraints, issues, risks)
  - Group into similar concerns; prioritize importance
  - Clarify into concrete, measurable terms (ask questions)
  - If time permits, outline some possible visual graphics
  - Identify any current measurements (may be applicable)
  - Capture implementation issues
    - Resources, responsibilities, tools, validity, ad hoc demands

- **Next Steps after initial workshop**
  - Draft measurement plan and review
  - Assist and follow up
The focus here is on Process Measures, which are similar to project measures (e.g., effort, schedule, product), but have a different purpose (e.g., to baseline, to characterize and understand, and to improve).
Workshop Continued: Measurement Orientation for Process Improvement

- Executives want to know impact / return on investment
  - Long term: requires stability and capability to roll-up across organizations
  - Links with BSMO Enterprise Performance Management

- Most Capability Maturity Models will indicate need for certain projects / product measures (e.g., cost, schedule, requirements, defects, TPMs, etc.) for particular process areas

- Common feature for institutionalization requires need for measures of each process area (e.g., resources, cycle-time, output quality)
Workshop Continued: Why Measure?

- The SA-CMM® says so: it’s a best practice!
- You can’t improve what you don’t measure
- Need objective evidence to understand
  - How long something takes
  - How much effort is necessary to do it right
- It’s difficult to know when you’ll get there if you don’t know where you are or how you got there
- You need a baseline for planning and estimation
Workshop Continued:
What’s Valuable for Your Project?

- Credible, objective evidence to make your life easier
  - Demonstrate successes
  - Identify critical issues / risks early
  - Guide difficult decisions

- If it’s not used, don’t bother collecting it
  - Collect it, store it, manage it
  - Analyze it, report it, present it
  - Review it and take corrective actions as necessary

Support from Dennis Goldenson, SEI
Workshop Continued: Typical Candidates for Measurement

- You need to status your process activities and products to become effective*

- Typical examples
  - Process compliance
  - Schedule and cycle-time
  - Effort and resources expended on process activities
  - Quality defects in work products and deliverables; rework effort, time

* not only for statusing, but for developing a database for understanding and planning / estimation
**Workshop Continued:**

**Keep it Simple!**

- Keep it simple and practical
- **Measure what you really need**
  - Reuse existing measures if possible
- **Integrate with processes—not separately**
- **Let all know what is being collected and why**
  - Share results
  - Don’t use to punish, but to inform and learn
- **Measures are an aid—not a replacement for all one needs to manage efficiently and effectively**

Support from Dennis Goldenson, SEI
June 2002 Informal CMM Based Assessment - Internal Process Improvement

Some Draft / Preliminary Results

- Not enough time has past to implement all new processes / procedures across full acquisition life cycle
- Some pilot projects are not yet in a phase to trigger some processes / activities
- Some pilot projects cannot fully implement process measurements until new processes / procedures are fully underway [e.g., stable]
- Opportunity of doing additional measurements beyond the very simple / basic [e.g., plan vs actual key activities] is a challenge
- A few indicate contractor measures (e.g., EV) would relate to acquisition project’s process measures
BSMO PI Measurement Experience So Far

- Projects attempting Level 2 of a CMM must first be fully aware of new processes / procedures before process measurements can be most useful.

- **Start simple and small...but useful**
  - Limited resources dictate that only the most useful and efficient measures be implemented (keep asking why for each desired measure).
  - Collecting effort data in an organization is challenging if not part of an infrastructure with a Work Breakdown Structure at an appropriate level.

- **Some projects are schedule driven and resource constrained, and additionally react to “ad-hoc” work requests**
  - This behavior illustrates need for effort, schedule, and quality measurements to back up need for more resources and reasonable schedules.

- **BSMO has traditionally depended mostly on PRIME for detailed planning and estimation**
  - This recognized shortcoming is now being worked (with MITRE support).
  - Again, illustrates another reason for the need for a good measurement program and database to improve planning / estimation capability.
BSMO PI and Measurement Next Steps

- Update processes and procedures, including measurements, based on CBA-IPI findings
- Implement more training, including measurement workshops, to institutionalize and gain further experience in repeatability
- Develop more specific measurement examples as appropriate
- Begin developing an organizational measurement database for improving estimation and impact analysis, risk analysis, etc.
- After Software Capability Evaluation in December
  - Further fine tuning, as necessary
  - Begin to roll out processes / procedures to all BSMO projects
  - Begin preparing for SA-CMM® Level 3 maturity goals
  - Consider Systems Engineering processes (e.g., CMMI, SECM)
- Integrate Estimation and Enterprise / Program Performance Management measurement aspects into an overall approach
Contact Information

- Lloyd Anderson, IRS Business Systems Modernization Office (BSMO) - IRS Sponsor, PI Lead
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- Dennis Goldenson, Software Engineering Institute - consults to IRS
dg@sei.cmu.edu
- Arnold Smith, The MITRE Corporation - leads support to IRS PI Program
  - awsmith@mitre.org
Questions?
Backup Slides
## Taxpayer Characteristics (Estimates)

<table>
<thead>
<tr>
<th></th>
<th>Wage and Investment</th>
<th>Small Business and Self-Employed</th>
<th>Large and Mid-Size Business</th>
<th>Tax Exempt and Government Entities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Filers</td>
<td>88 million</td>
<td>45 million</td>
<td>210,000</td>
<td>2.4 million</td>
</tr>
<tr>
<td>Number of individual taxpayers</td>
<td>116 million</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Total tax liability (billions)</td>
<td>$380</td>
<td>$915</td>
<td>$466</td>
<td>$103</td>
</tr>
<tr>
<td>Average tax liability per filer</td>
<td>$4,310</td>
<td>$20,231</td>
<td>$2,231,274</td>
<td>$42,698</td>
</tr>
<tr>
<td>Gross cash paid (billions)</td>
<td>$46</td>
<td>$790</td>
<td>$712</td>
<td>$221</td>
</tr>
<tr>
<td>Average number of transactions with IRS per filer/year</td>
<td>1 – 4</td>
<td>4 – 60</td>
<td>60+</td>
<td>60+</td>
</tr>
<tr>
<td>Percent preparing own returns</td>
<td>59%</td>
<td>20%</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Assets regulated</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>$7 trillion</td>
</tr>
<tr>
<td>Average number of returns filed per filer</td>
<td>1.1</td>
<td>2.7</td>
<td>3.5</td>
<td>1.7</td>
</tr>
</tbody>
</table>
As a public interest company, in partnership with the government, MITRE addresses issues of critical national importance, combining systems engineering and information technology to develop innovative, viable solutions that make a difference.

Working in the public interest to operate a federally funded research and development center under the sponsorship of the IRS, we are dedicated to advancing enterprise modernization across government.

*CEM is MITRE’s IRS FFRDC*
Process Measurement Activity Flow

Issues? Questions? Measures

define

Measurement Plan

execute

people resources

product

measure

control

improve

report

djGantzer
Measuring a Process

Pre-process

\[ \text{Procedure } a \rightarrow \text{Procedure } b \rightarrow \text{Procedure } c \]

\[ p_0 \rightarrow p_1 \rightarrow p_2 \rightarrow P \]

\[ t_1, r_1, q_1 \rightarrow t_2, r_2, q_2 \]

\[ T, R, Q \]

Post-process

\[ t = \text{time [cycle-time]} \]
\[ r = \text{resources [$, effort]} \]
\[ q = \text{quality [defects]} \]
\[ p = \text{product size, units} \]

Effectiveness = \( q/p \)

Productivity = \( p/t, p/r \)

Efficiency = \( f \)

[productivity, effectiveness, a norm]