Practical Software and Systems Measurement

Barriers to Measurement

Understanding & addressing what gets in the way of enablers to effective measurement

Findings and Follow-up from workshop at PSM Technical Working Group March 5-7, 2002

Facilitated by Joe Jarzombek, PMP

Steak, Sex & Stats

"Human behavior is governed by three basic requirements: the need to eat, the need to procreate, and the need to measure stuff."

– From July 2002 issue of *Inc Magazine*,
The InfoPosse reports each month on what's notable in the world of corporate information

Barriers to Measurement

Objectives:

1. Identify barriers to effective use of measurement
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   - Identify perceived challenges
2. Address what needs to be done to enable the use of measurement
   - Identify counter-arguments to challenges
   - Identify enablers for effective measurement
   - Identify steps to overcoming challenges

Workshop Participants

- Joe Jarzombek
- Tom Majewski
- Bik Adepu
- Rita Creel
- Mia Henderson
- Luis Henriquez
- Paul Januz
- Howard Blackstone
- Bruce Allgood
- Ruth Buys
- David Magidson
- Guy Mercurio
- Lisa Roberts
- RonTorezan
- Tom Coonce
- John Bailey
- Renee Schreiber

General Discussion

- Review of ISO 15939: goal is to get a consensus that there is a match between elements of the standard and the Measurement and Analysis Process Area of the CMMI; scope includes acquirer and supplier
- New PMs want to develop their own processes; there is a feeling they have too little time on the program to spend it documenting processes, but high turnover is an argument for documentation, not against it.
- Top management doesn't see pay-off; doesn't see what's in it for them
- The evidence comes from the monitoring and control practice; this is where higher maturity organizations get the benefits
- Perception is that it's just another Government requirement and that it won't benefit them
- Business CFOs need ROI from measurement programs to justify the investment.
  - Motorola, as a non-defense contractor, has an example presentation showing ROI that was given at the NDIA-SEI co-sponsored CMMI Tech Conference and Users Group; it should be available on their web site
- There is a general lack of sufficient education about measures and their value

General Discussion

- Need to be able to show there will be good results if you start a measurement program
- There seems to be a problem with how to actually make a measurement program happen; management should:
  - be asking ‘what are my information needs?’ and
  - provide enabling mechanisms, such as ‘measurement in contracts’
- Need to get agreement between supplier & acquisition organization on the information needs, then the acquisition organization needs to ask for those measures at the reviews
- Contract should specify that measurement will be done and what issues are expected to be addressed; the proposal should provide the measurement plan
- Problem is there are no CDRLs or DIDs for software measurement
- Need to know how to interpret measures and change based on the results
- Government entities often don’t want to pay for the measurement programs, then when things go wrong, Government ignores the warning signs

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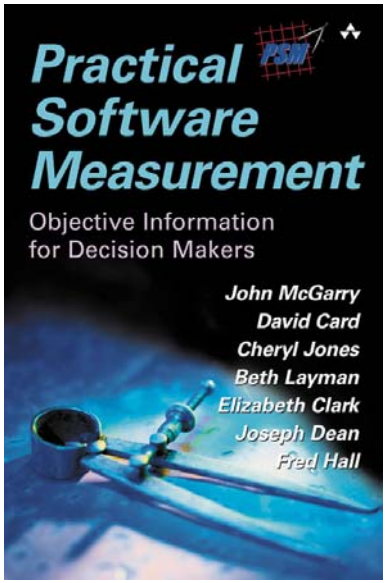
Significance of Measurement

- Integral to basic management activities
  - Regardless of discipline
- Characterizes mature organizations
  - Objective, performance based management
  - Project management focused on cost and milestone completion
  - Augmented by sophisticated analyses of process, product quality, and change management
  - Measurement integrated into life cycle processes
    - Supports management and technical decision making
    - Helps quantitatively guide improvement of products & services, as well as the processes used to develop them

Measure for Success *

- Key characteristics of measurement in top-performing organizations
  - Highly integrated into management and technical processes
  - Supported by the corporate culture

- Indications of success
  - Data collection is natural and automatic
  - Data is widely available
  - People seek data as a basis for decision making
  - Failure leads to understanding rather than blame
  - Objectives are accompanied by rational plans
  - Improvements are made regularly to the measurement process



* From PSM book, chapter 8

What Is Typically Missing?

- Collaboration & coordination
  - So the right stuff gets measured …
  - And we end up with useful, actionable guidance to inform business and technical decisions
- Measurement expertise alone won't always address the right business and technical issues
  - That requires good business perspective & deep knowledge of application domain & technology
  - *Yet* … a collaborative approach to measurement may itself help clarify the business objectives and information needs it is asked to address

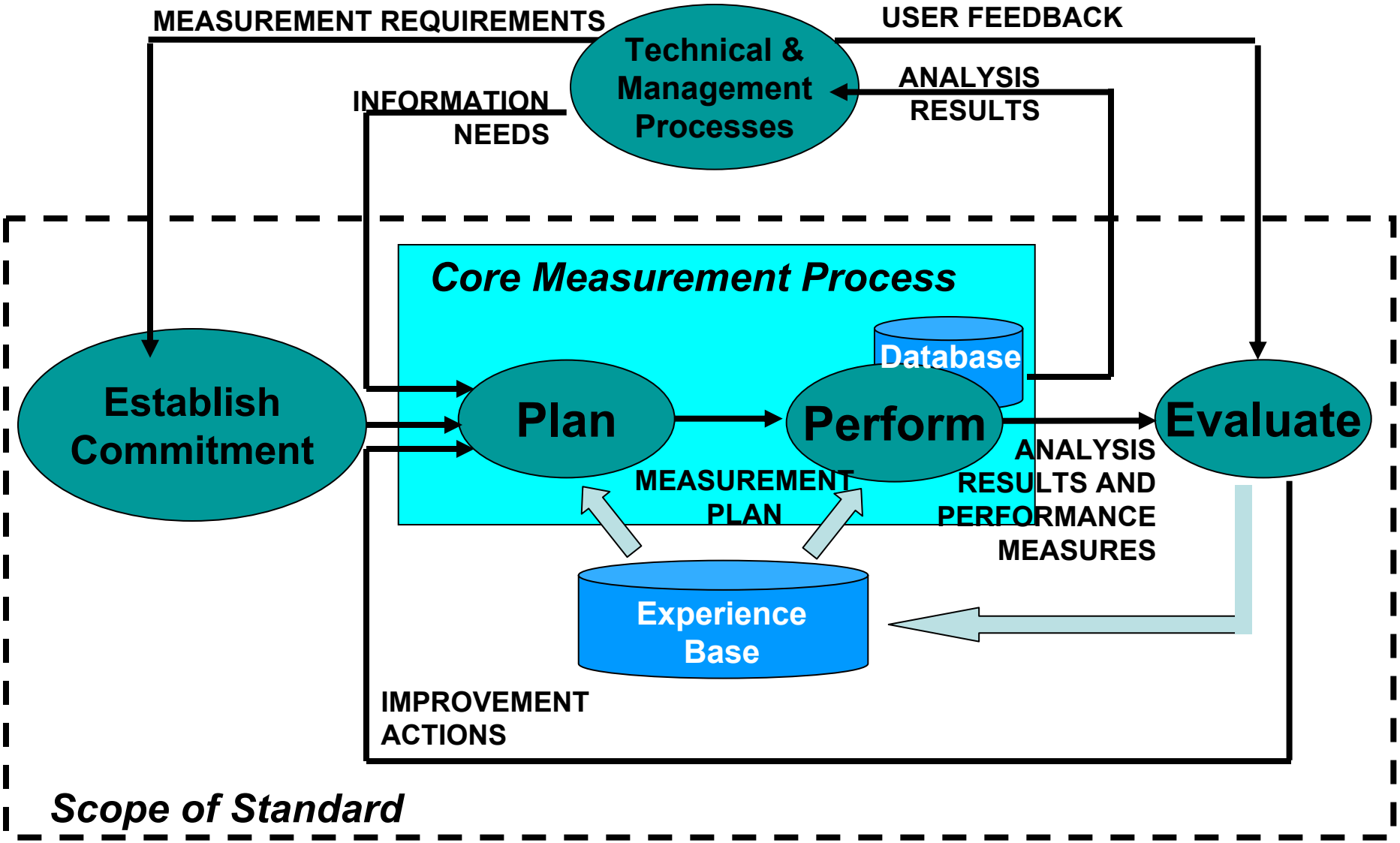
What Managers Need to Know

- Is there really a problem?
- How big is the problem
- What is the scope of the problem?
- What is causing the problem?
- Are there related problems?
- Can I trust the data?
- What should I expect; what will happen?
- What are my alternatives?
- What is the recommended course of action?
- When can I expect to see results?

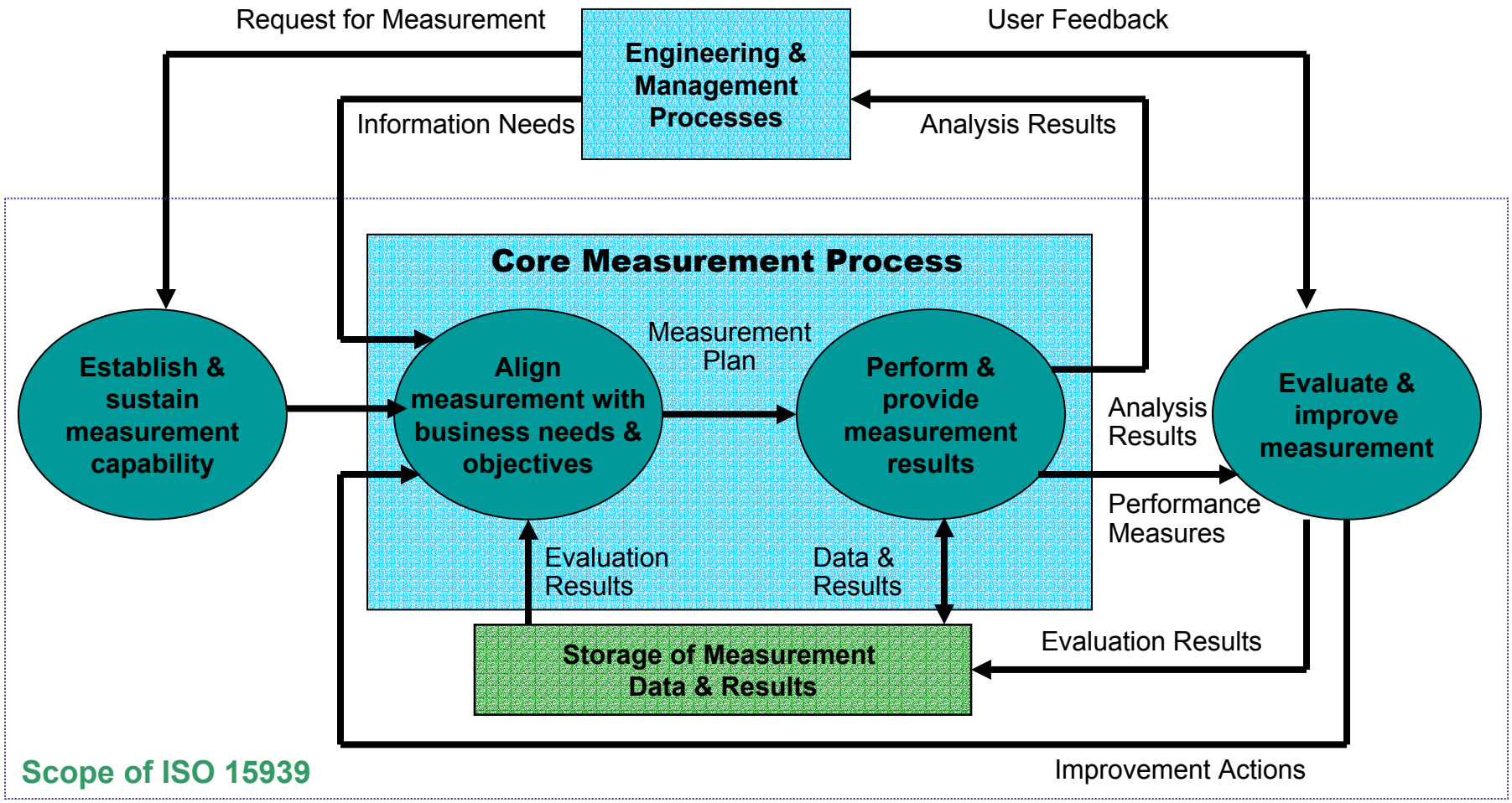
Measurement: A Key Support Process

- Almost no other implemented process has such a wide variety of interfaces and integration.
- Measurement activities can provide a common language among business functions.
- Measurement is one of the few processes that impacts almost every critical business function, and hence it is a technically challenging process.
  - Measurement users require that the process have a high level of precision, timeliness and utility.
  - Typical measurement process implementation requires integration with cost data, labor data, planning data, TPMs, technical processes and associated tools, network computers and intranet/internet resources.

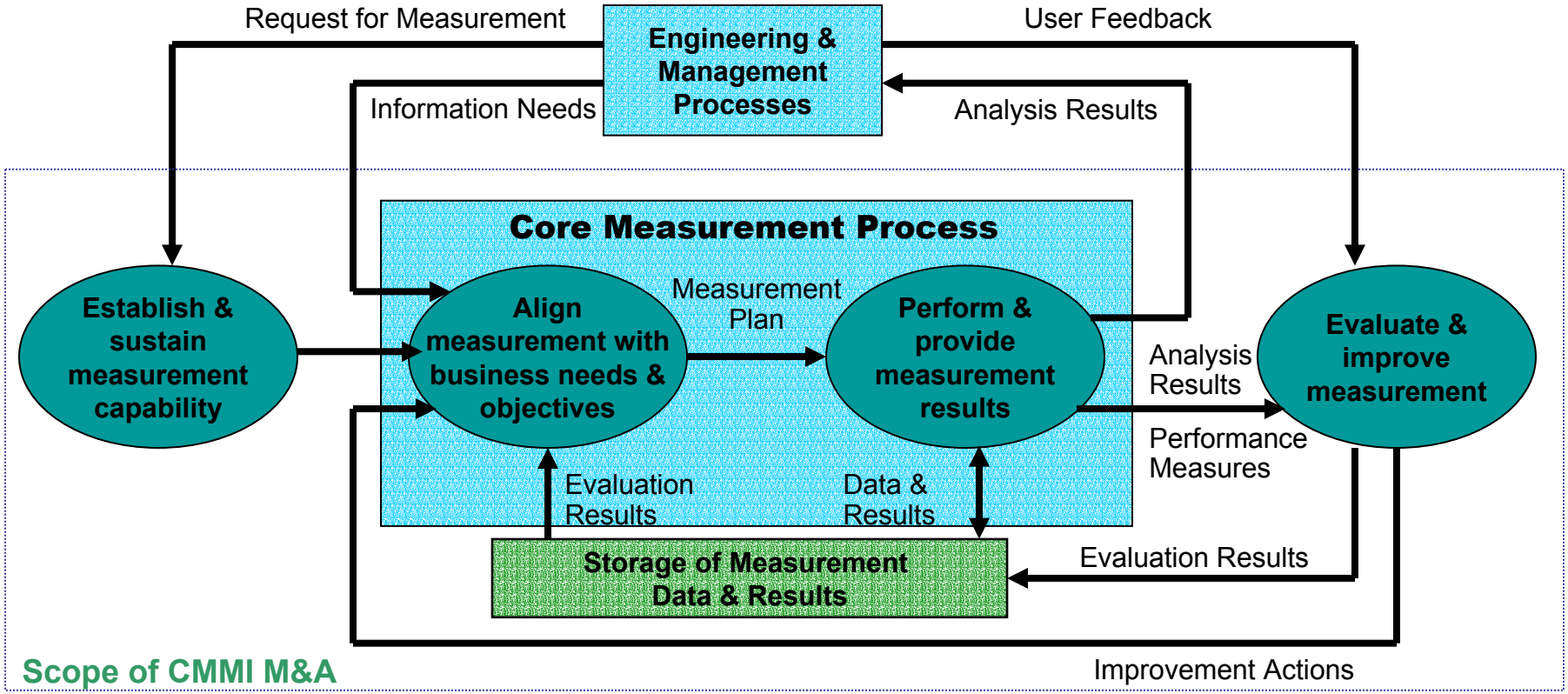
ISO 15939 Measurement Process



CMMI Measurement & Analysis / ISO 15939



Core CMMI Measurement & Analysis Practices



Align with Needs & Objectives

Perform & Provide Results

M&A Specific Goals:

1. Measurement objectives and practices are aligned with identified information needs and objectives

2. Measurement results that address identified information needs and objectives are provided

Specific Practices:

SP 1.1 Establish measurement objectives

SP 1.2 Specify measures

SP 1.3 Specify data collection & storage procedures

SP 1.4 Specify analysis procedures

SP 2.1 Collect measurement data

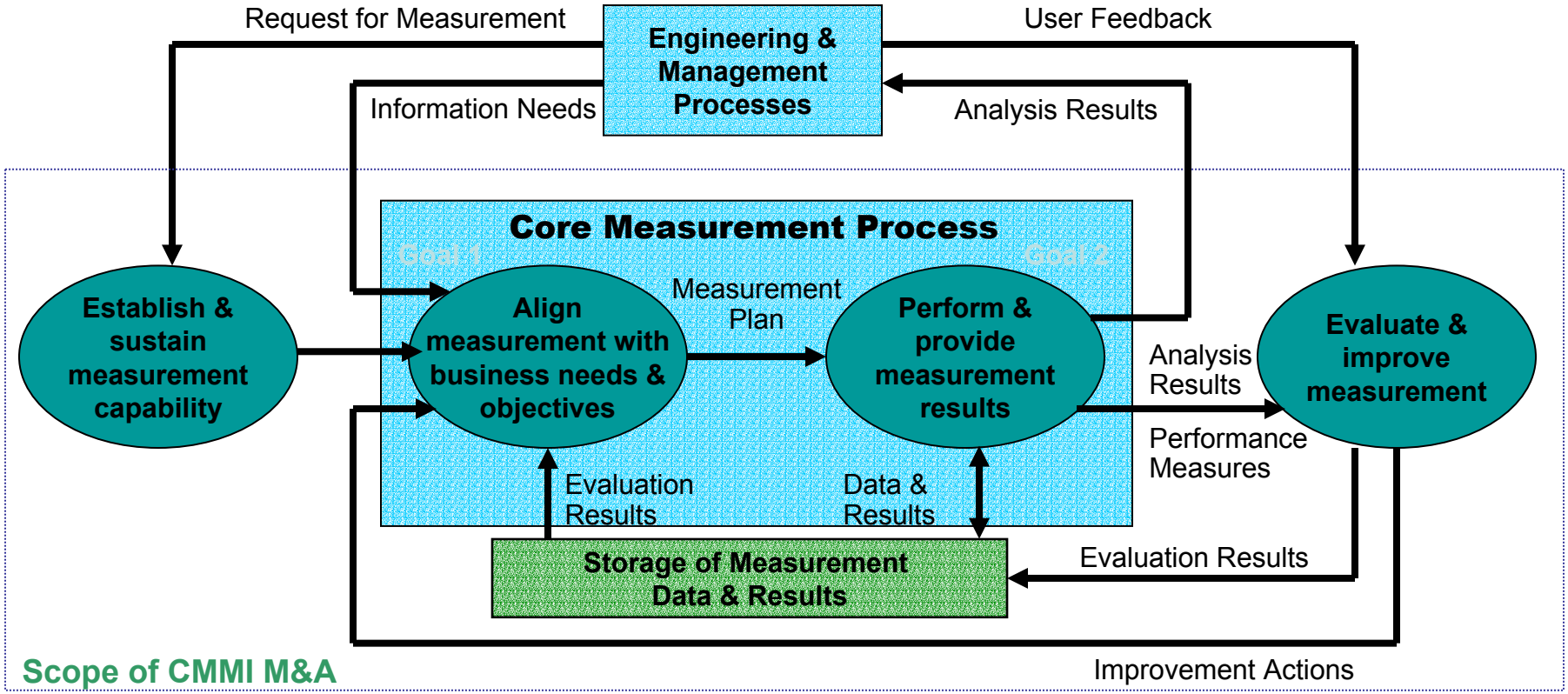
SP 2.2 Analyze measurement data

SP 2.3 Store data & results

SP 2.4 Communicate results

GP 1.1 Perform base Practices

Maturing Measurement - Generic Practices



Establish & Sustain Process

GP 2.1 Establish an organizational policy

GP 2.3 Provide resources

GP 2.4 Assign responsibility

GP 2.5 Train people

Level 2 **Level 4**

Level 3 **Level 5**

Align with Needs & Objectives

GP 2.2 Plan the process

GP 3.1 Establish defined process

GP 4.1 Establish quality objectives

GP 5.1 Ensure continuous process improvement

Perform & Provide Results

GP 2.6 Manage configurations

GP 2.7 Identify & involve relevant stakeholders

GP 4.2 Stabilize sub-process performance

Evaluate & Improve

GP 2.8 Monitor & control

GP 2.9 Objectively Evaluate adherence

GP 2.10 Review status with higher level management

GP 3.2 Collect improvement information

GP 5.2 Correct common cause of problems

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Barriers To Measurement

- Lack of understanding of how measurement can help
- Perceptions of how measurement data will be misused
- Implementation viewed as “too hard” or “too expensive”
- Disconnect between measures and information needs
- Limitations for presentation of measurement analysis
- Time & expense required to integrate data sources
- Pilot implementation difficult to roll-out & support
- No short-term benefit – questionable validity of metrics
- Lack of assistance or guidance in reaching conclusions from the data that exists in the measurement repository
- Infrastructure requirements for IT people
- Changes in corporate culture and workforce habits
- etc.

Enablers to Measurement

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Enablers To Measurement

Environment Enablers

- Documented Processes
- Corporate Culture
- Enterprise Management
  - IT Infrastructure (systems & technical architectures)
  - Reporting Mechanisms (operational architecture)
  - Contracts and Inter-organizational Agreements
- Etc

Enablers To Measurement

Enabling Technology

- Use of the web/intranet helps
  - Organizations which use web technology tend to be more successful in measurement than those that do not.
- Use of tools, that fit within the workflow of practitioners, support the automated collection and analysis of data

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Enabling Measurement

- Identify counter-arguments to challenges
  - Articulate applicable business case
    - Return on Investment (ROI),
    - timely information to support decisions
    - etc
  - List alternative strategies
    - Time phasing,
    - Resource sharing,
    - etc
- Identify steps to overcoming challenges
  - Group "like" solutions
  - Recommendations for PSM follow-up

Follow-up Action Items

- Define what objective criteria could be used to determine incentive and award fees (such as finish early + good quality = award fee)
- Research language to use to get the objective criteria written into contract language, and then provide PSM chapter on “Putting Measurement on Contract”
- Look into a case study to determine cost of setting up and sustaining a measurement program
- Work with Defense Acquisition University (DAU) on revising course material to increase measurement content, via courses for PM, SE, SAM, T&E, etc that address monitor and control
- Provide workshop to translate information needs down through indicators and derived measures to base measures
  - Include, in translating Information Needs into Base Measures, a component on potential for multiple use of base measures and formats for presentation

Follow-up Action Items

- Need to provide guidance on how to use existing data to be more predictive
- Prepare article on legal requirements for measurement (FAR, Clinger-Cohen Act/ITMRA); have article reviewed by legal staff before publication
- Prepare article on measurement success stories and pointers to URLs for others
- PSM to brief the Software-Intensive Systems (SIS) Steering Group
- Measurement to be included in a presentation at the PEOSysCom
- Schedule DoD Measurement Initiatives and PSM brief to OSD C3I, OUSD(AT&L)ARA, & DISA; show synergy among initiatives
- DoD Measurement Initiative Group team to send input to Measures Intro and Benefits Brief
- For DoD Measurement Initiative, review, revise Measures Intro and Benefits Brief; include specific actions expected from attendees

Summary

- Barriers to measurement can be countered with enablers
- Consensus was to proceed with several action items
- Follow-up actions are being taken
- More follow-up is still needed

Contact Information

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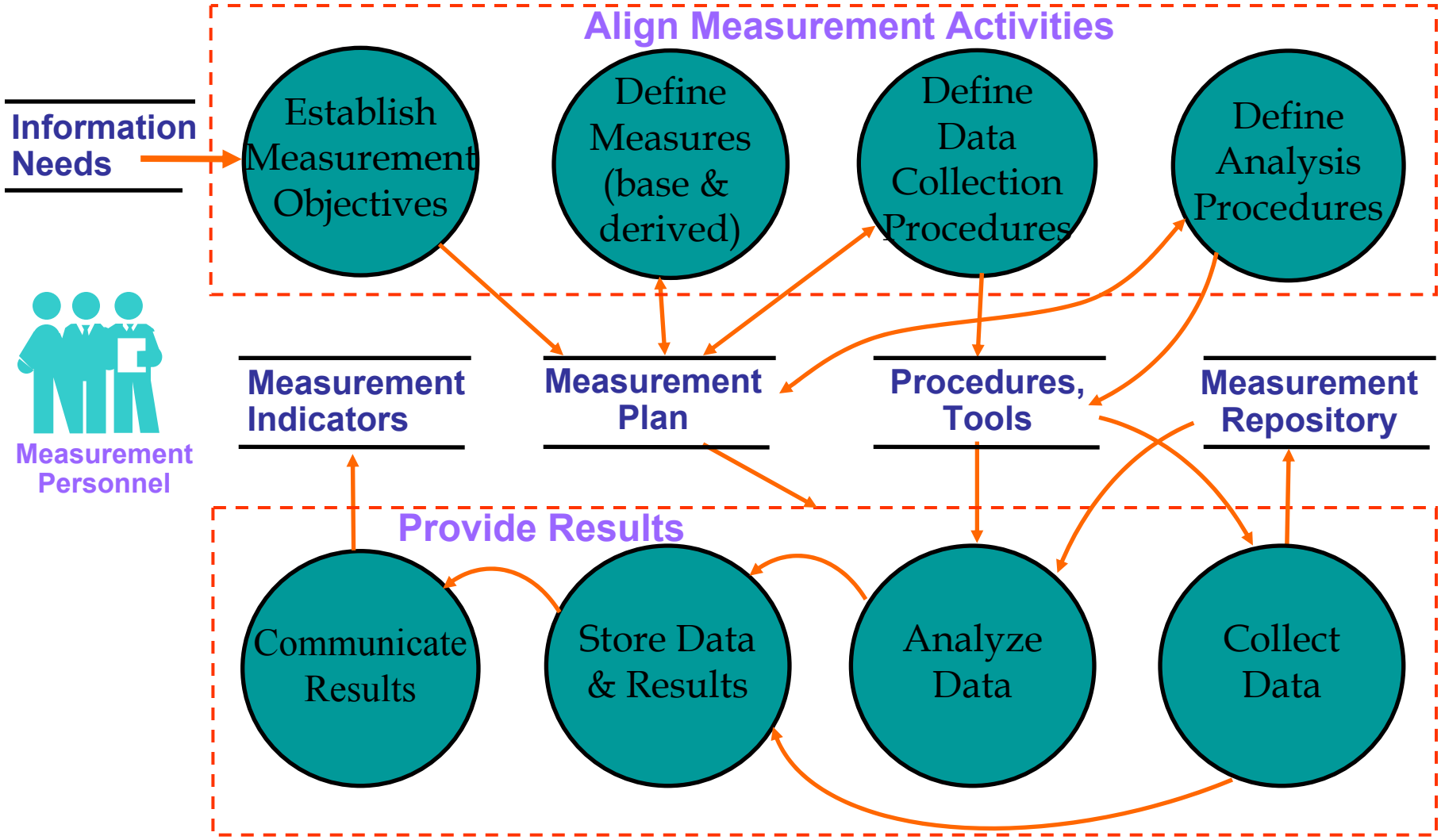
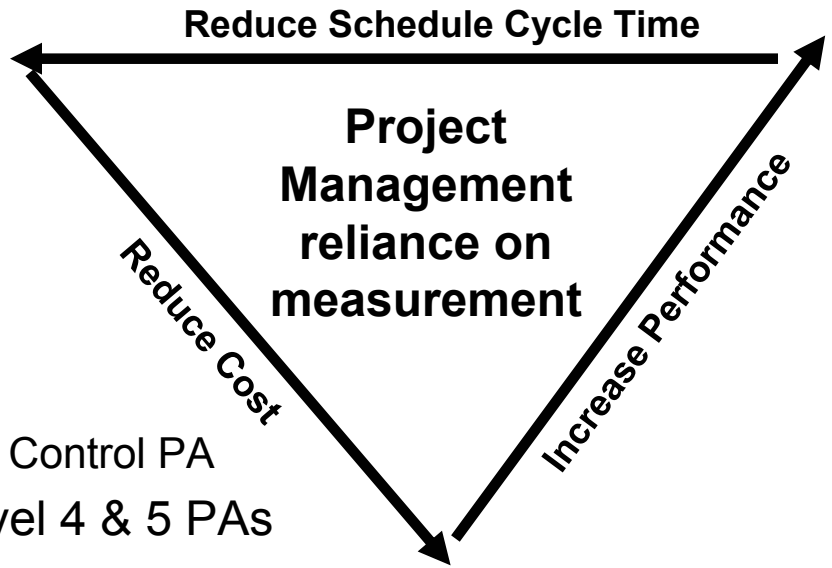
CMMI Measurement & Analysis PA



Measurement Thread:



- Level 2
  - Establish performance baselines:
    - M&A PA specific practices (activities),
    - Generic Practices (common features),
    - Project Planning PA & Project Monitoring & Control PA
  - Essential preparation for accomplishing level 4 & 5 PAs
- Level 3
  - Measurement practices are matured through Generic Practices
  - Measurement data is stored in repositories available for organization-wide use
    - Organizational Process Definition (OPD) PA specific practice (activity), “Establish and maintain the organization's measurement repository.”
  - Organizational Process Focus - provides the evaluation and improvement practice to complete the correspondence of CMMI measurement with ISO 15939
  - Analysis focuses on explicit comparisons among projects / organization roll-ups
- Level 4 & 5
  - Measurement establishes crucial baselines for comparisons made among projects and across the organization
  - More sophisticated quantitative analysis is used, such as statistical process control, structured modeling, or multivariate statistical methods