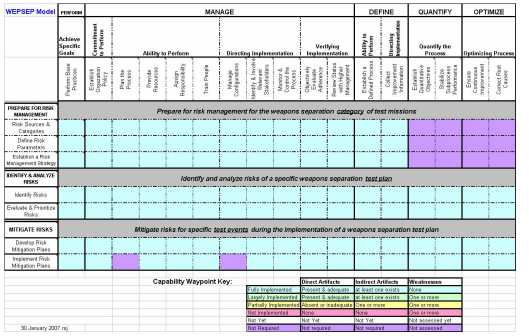
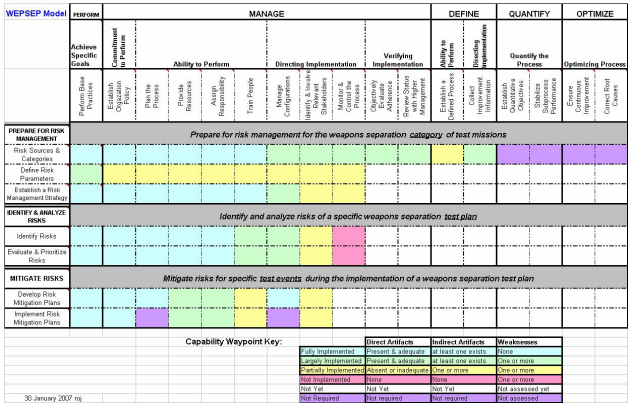
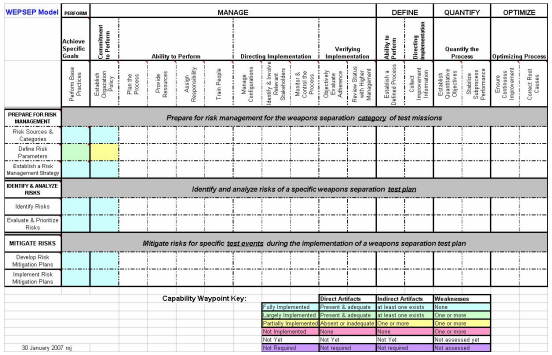
Visualizing Improvement with Capability Waypoints







Robert O. Jacob,
Naval Air Systems Command,
Patuxent River MD

Ron Abler,
Sabre Systems,
Lexington Park, Maryland

RANGE SAFETY

Our specific goals are similar to CMMI-DEV RSKM process area

Range Safety manages risk in support of different product lines. Each product line presents different range hazards and requires facilities, equipment, and skills to ensure safe operation.

SPECIFIC GOAL 1: Prepare for risk management.
Establish policies and procedures at this level...

Mission Areas

Weapons Separation

Supersonic Operations

Targeting Lasers

Airborne and Surface Gunfire

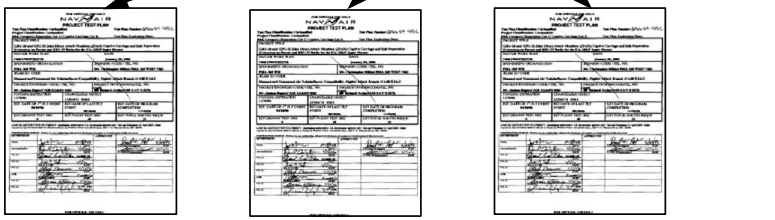
Tactical Missiles

UAVs

Test Plans

Each mission area has multiple test plans associated with it.

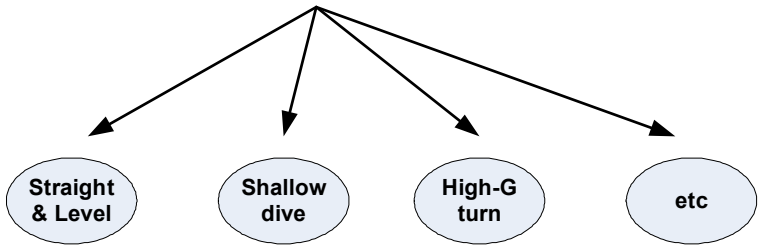
SPECIFIC GOAL 2: Identify and analyze risks at this level



Test Events

Each test plan has multiple test events.

SPECIFIC GOAL 3: Mitigate risks. Develop and implementing risk mitigation plans at this level.



How can Range Safety be improved?

- **What is our current performance?**
  - Can we provide management with a õmetricò?
  - What is our desired performance?
  - How can we excel?
- **What is “improvement”?**
  - Improving effectiveness?
  - Improving efficiency?
  - Can we do both?
- **What should our strategy for improvement be?**
  - Lean / Six Sigma ?
  - CMMI ?

MMI to visualize improvement?

Our Questions: Will a CMMI improvement effort be useful?

- Will the benefits be clear?
  - Will the benefit in effectiveness or efficiency justify the depth, breadth, time, and cost of the CMMI improvement effort?

Problem: To the novice, the benefit of implementing CMMI is offset by its intimidating complexity.

- The Intro to CMMI course is a sip out of a very large fire hydrant.
  - The sheer volume of information delivered in three days is overwhelming, intimidating, and discouraging to students.
- How does CMMI help?
- How can we use the CMMI tool to measure and improve our current performance?

Solution: The **Capability Waypoint Matrix** tool can show at a glance:

- Capability levels of specific practices
- Effectiveness of individual process areas.
- Efficiency of individual process areas
- Simple but detailed insight into the improvement status of the entire organization.

ypoint Concept of Improvement

ñIncrease effectiveness, efficiency, or bothò

Å **Effectiveness**

- ï *Meet process area specific goals, if…*
- ï *Specific goals are traceable to organization's mission objectives*

Å **Efficiency:**

- ï Meet goals faster, cheaper, better
- ï Increasing CMMI capability levels implies improvement in schedule, cost, and quality

veness and Efficiency

Range Safety example

- **Range Safety Effectiveness:**

  Meet organization's goals

  - Technical competency & proficiency in safety support of weapons tests
    - *"Prepare for risk management"*
  - Conduct weapons tests without unacceptable risk to personnel or property
    - *"Identify and analyze risks"*
    - *"Develop & implement risk mitigation plans"*

- **Range Safety Efficiency:**

  Meet goals faster, cheaper, better, smarter

  - Minimize costs of risk management without compromising safety
  - CMMI model capability levels address improvement in cost, schedule and performance

- **Improvement:** Increase effectiveness, efficiency, or both

Range Safety Specific Goals & Practices

Effectiveness *means "meeting specific goals"*

1. Prepare for Risk Management

Different for various categories of test events (Bombs, guns, lasers, UAVs, etc)

- Determine risk sources and categories
- Define risk parameters
- Establish a risk management strategy

2. Identify and Analyze Risks

For each test plan

- Identify risks
- Evaluate, categorize, and prioritize risks

3. Mitigate Risks

For each test event

- Develop risk mitigation plans
- Implement risk mitigation plans

We are effective if we are proficient in all range safety practices and achieve the range safety specific goals.

We are ineffective if range safety specific goals are not met.

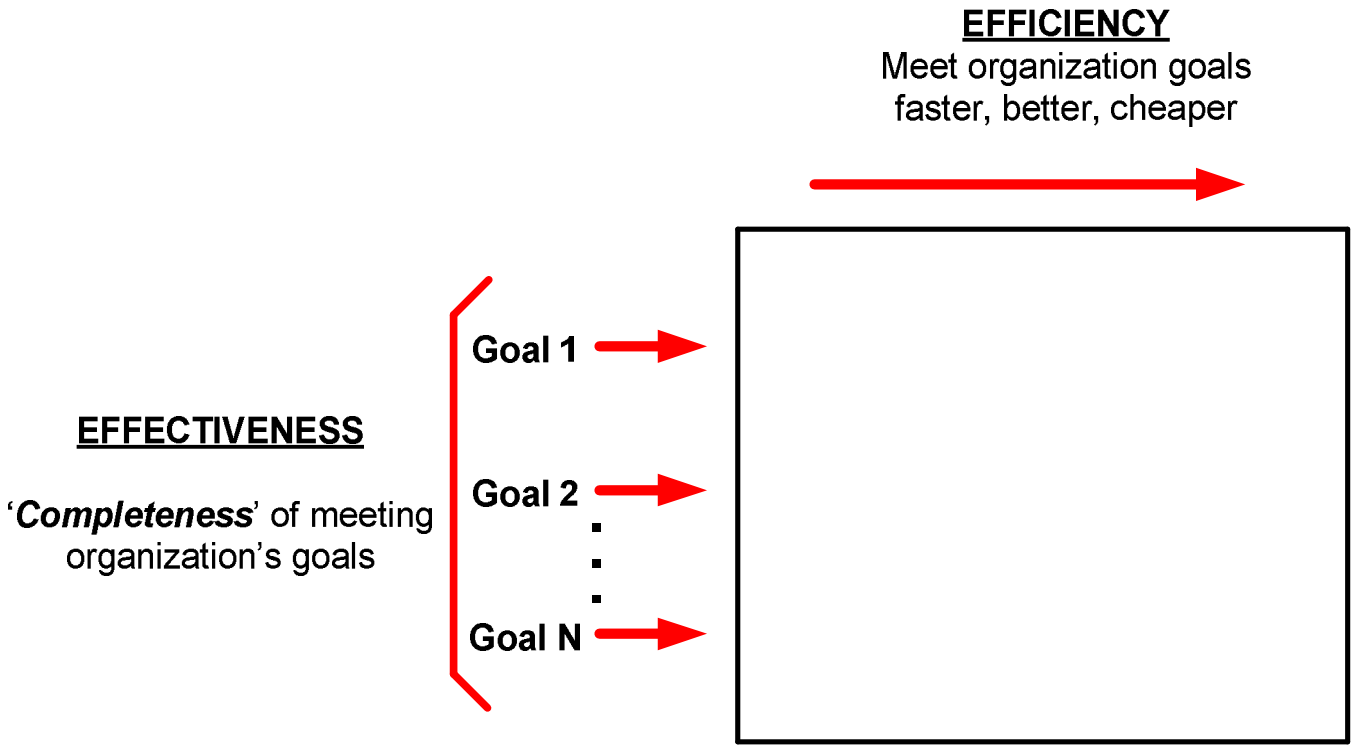
ity Levels as a Measure of Efficiency

*ability levels results in improved **quality** and **efficiency***

- **Capability Level 1 "PERFORM"**
  (i.e., "Be Effective")
  - Achieve specific goals *
    - Perform base practices
- **Capability Level 2 "MANAGE"**
  (i.e., better, smarter, etc.)
  - Commitment to perform *
    - Establish organization policy
  - Ability to perform
    - Plan the process
    - Provide resources
    - Assign responsibility
    - Train people
  - Direct implementation
    - Manage configurations
    - Involve stakeholders
    - Monitor & control process
  - Verify implementation
    - Objectively evaluate adherence
    - Review status with higher management
- **Capability Level 3 "DEFINE"**
  - Ability to perform
    - Establish a defined process
  - Directing implementation
    - Collect improvement information
- **Capability Level 4 "QUANTIFY"**
  - Quantify the Process
    - Establish quantitative objectives
    - Stabilize sub process performance
- **Capability Level 5 "OPTIMIZE**
  - Optimizing Process
    - Ensure continuous improvement
    - Control root causes

** "Common Features" terminology (commitment to perform, ability to perform, direct implementation, etc.) , used in CMMI-DEV version 1.1 but not in version 1.2, are retained because they help us explain the value and importance of generic practices.*

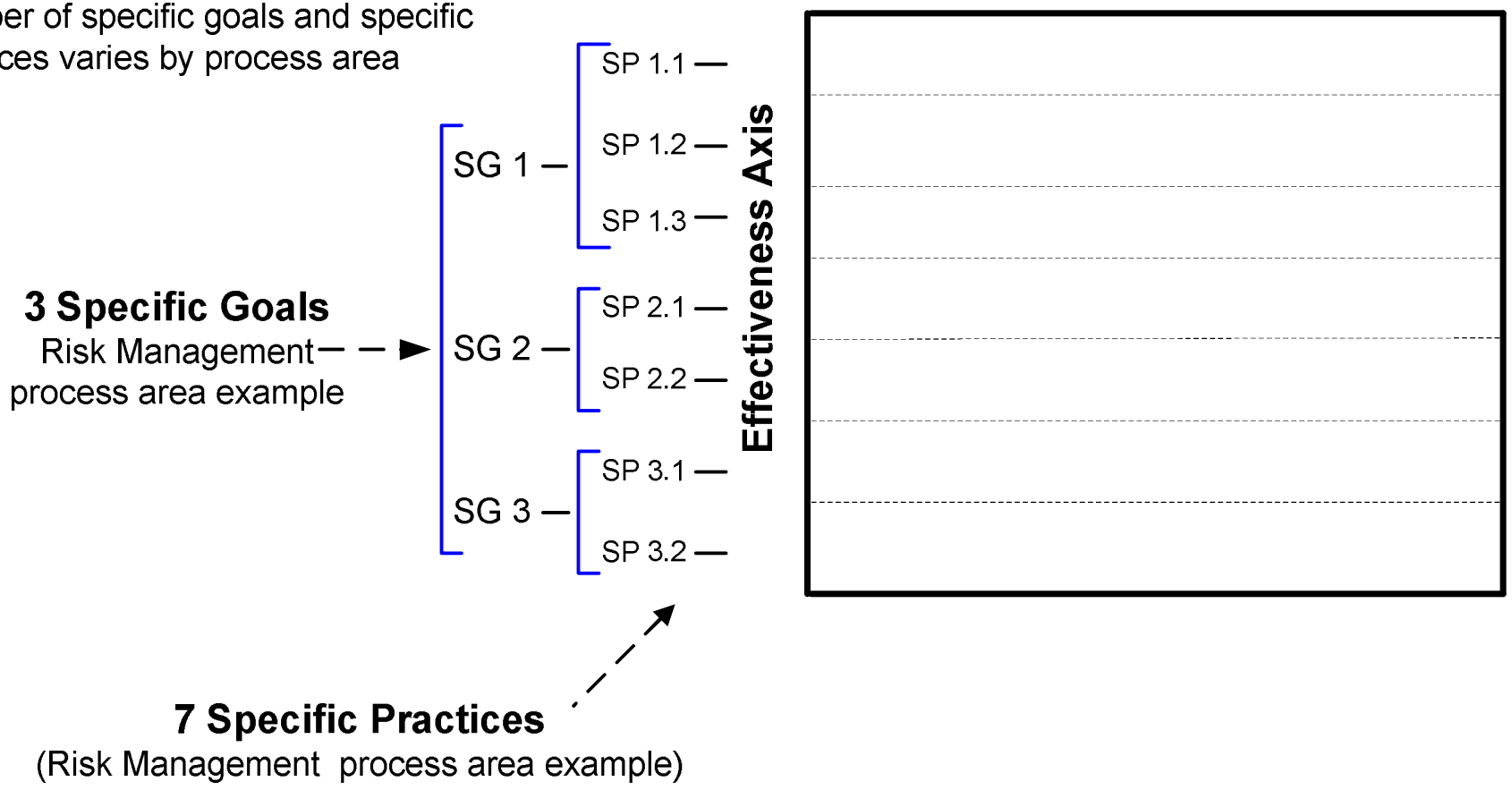
ualizing Improvement



The Effectiveness Axis

Effectiveness Axis

- Completeness in process area specific goals
- Proficiency in specific practices required to meet those goals
- Number of specific goals and specific practices varies by process area

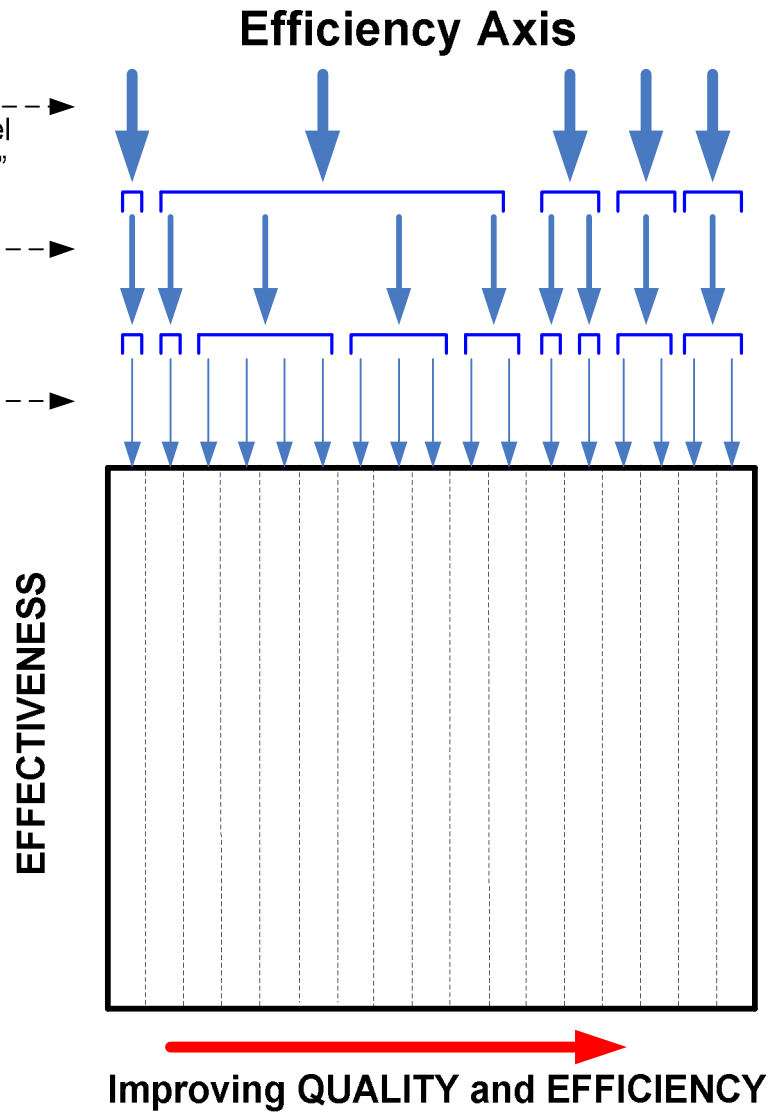


fficiency Axis

5 CMMI Capability Levels
Represent continuous improvement from Capability Level 1: "PERFORM" through Capability Level 5: "OPTIMIZE"

9 Generic Goals
Derived from the 5 CMMI Capability Levels

17 Generic Practices
Derived from the 9 Generic Goals



Visualizing Improvement

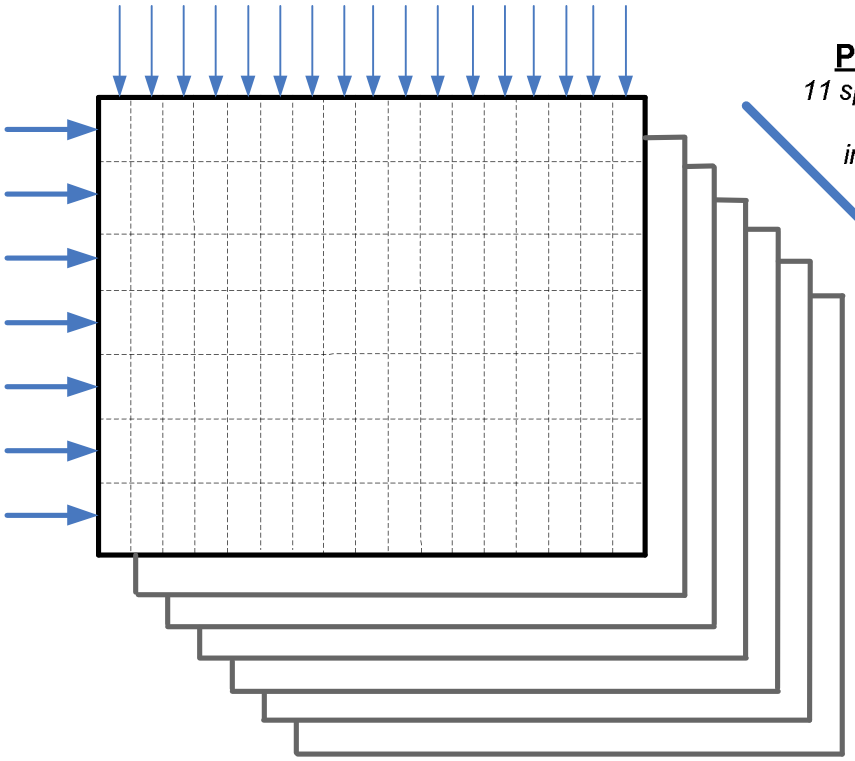
EFFICIENCY
CMMI Capability Levels
Improving Capability

*17 **Generic Practices** define*
*5 **capability levels***

EFFECTIVENESS

- Completeness in Risk Management Goals
- Proficiency in specific practices required to meet those goals

Specific Practices
*7 **Specific Practices** required to accomplish 3 **Specific Goals** for **Risk Management** process area*



Product Lines
11 specialized areas of support in Range Safety

Visualizing Improvement

EFFICIENCY
CMMI Capability Levels
Improving Capability

17 ***Generic Practices*** *define*
5 ***capability levels***

EFFECTIVENESS

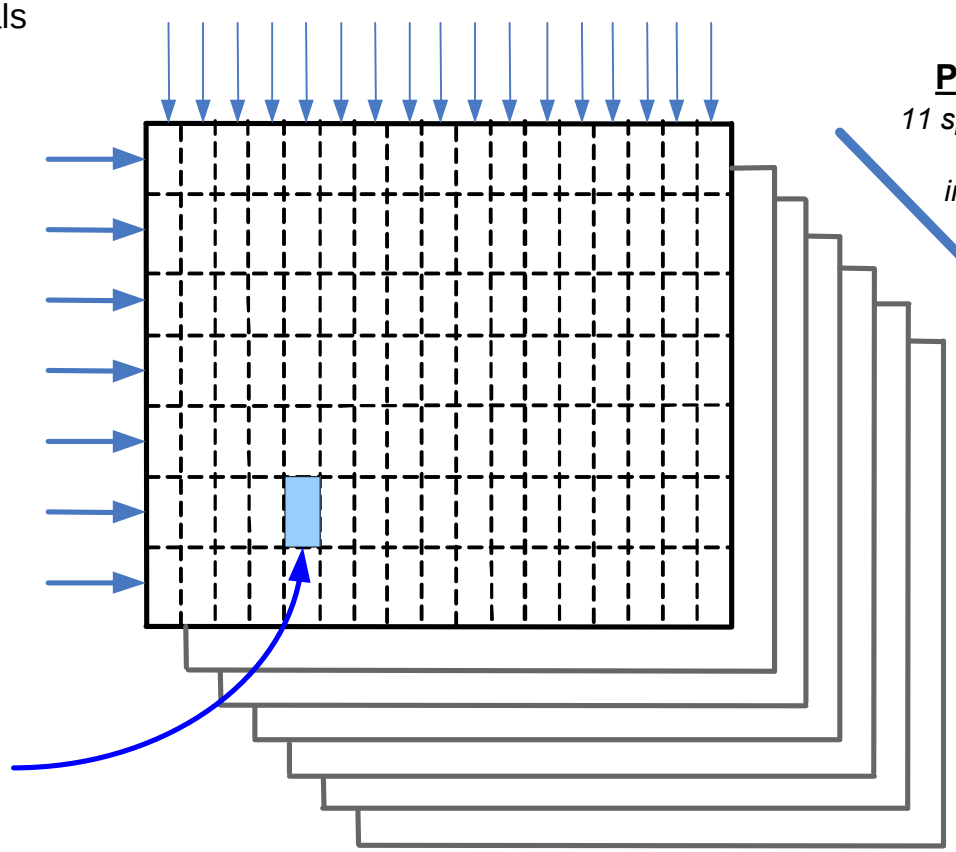
- Completeness in Risk Management Goals
- Proficiency in specific practices required to meet those goals

Specific Practices
7 ***Specific Practices*** *required to accomplish 3* ***Specific Goals*** *for* ***Risk Management*** *process area*

Capability Waypoints
Detailed improvement milestones

Color codes
- Fully implemented
- Largely implemented
- Partially implemented
- Not implemented
- Not assessed yet
- Not required

Range Safety model
- 119 waypoints per product line
- 11 Product lines



Product Lines
11 specialized areas of support in Range Safety

sures of Implementation

Using color to indicate waypoint status

	Direct Artifacts	Indirect Artifacts	Weaknesses
Fully Implemented	Present & Adequate	One or more	None
Largely Implemented	Present & Adequate	At least one exists	One or more
Partially Implemented	Absent or inadequate	At least one exists	One or more
Not Implemented	None	None	One or more
Not Assessed Yet	Not yet	Not yet	Not assessed yet
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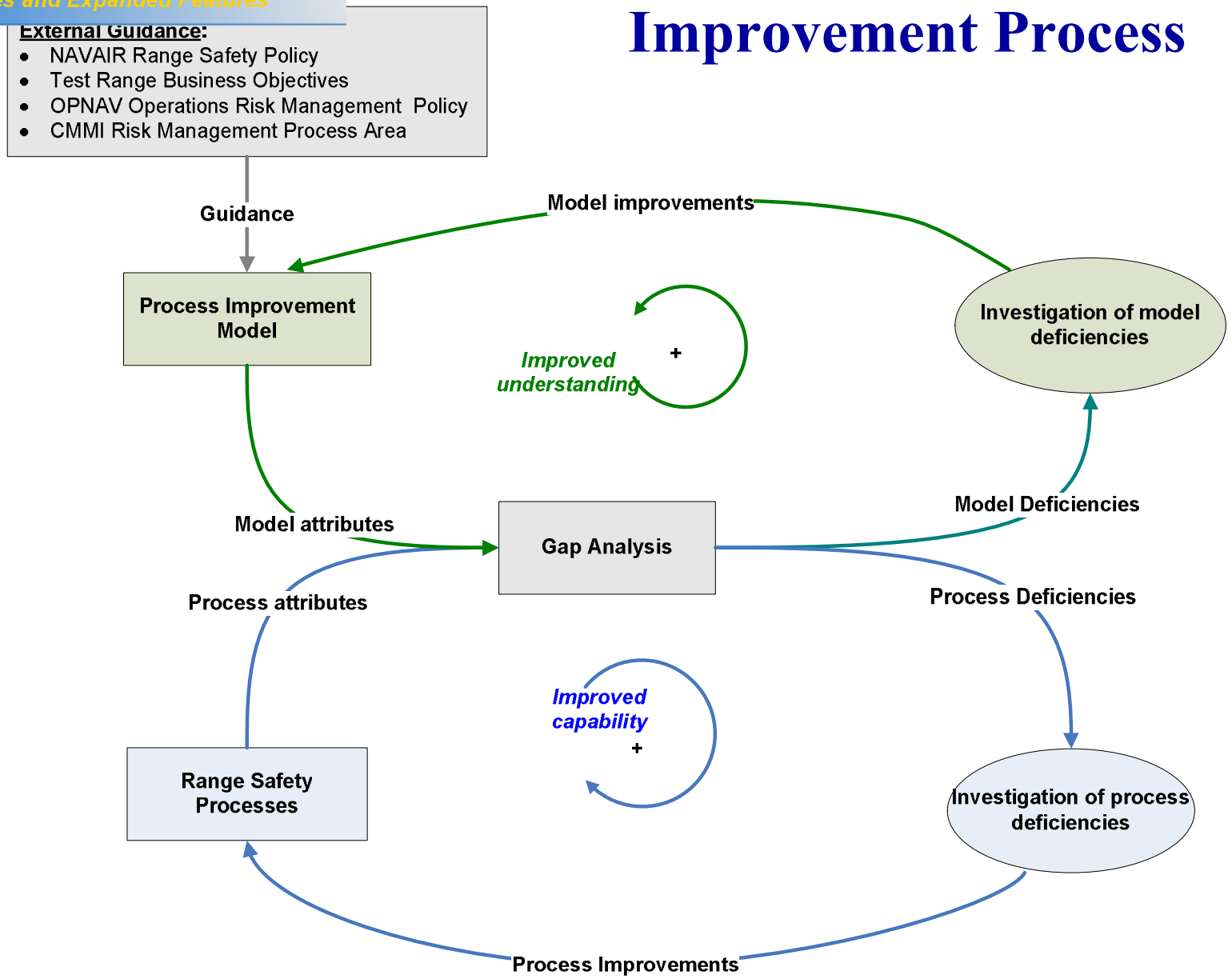
Adapted from SCAMPI Method Definition Document

Standard CMMI Appraisal Method for Process Improvement (SCAMPI) A, Version 1.2: Method Definition Document, August 2006

Notional Test Range Safety Improvement Process



Capability Waypoint Checklist

Checklist is used to capture details of each capability waypoint

- Details recorded in a document or database
- Document is continuously referred to and updated during the improvement process

Checklist addresses:

- **Waypoint identity** – which waypoint is it?
  - In terms of specific practice, generic practice, and product line (or mission area)
- **Waypoint Amplification** – Why is it important?
  - Relevance in terms of supporting specific goal
- **Waypoint Evidence** – How do we know its current status?
  - Direct artifacts – direct tangible output from the process
  - Indirect artifacts – side effects which indicate process is performed
- **Waypoint Improvement Opportunities** – What will make it better?
  - Significant weaknesses – what is the impact on specific goal?
  - Desired improvements & Priority
    - What will the improvement accomplish in terms of supporting specific goal?
- **Date reviewed** – When did someone last review it?

l start of model review é

Product Line A	PERFORM	MANAGE										DEFINE		QUANTIFY		OPTIMIZE	
	Achieve Specific Goals	Commitment to Perform	Ability to Perform				Directing Implementation			Verifying Implementation		Ability to Perform	Directing Implementation	Quantify the Process		Optimizing Process	
	Perform Base Practices	Establish Orgazation Policy	Plan the Process	Provide Resources	Assign Responsibility	Train People	Manage Configurations	Identify & Involve Relevant Stakeholders	Monitor & Control the Process	Objectively Evaluate Adherence	Review Status with Higher Management	Establish a Defined Process	Collect Improvement Information	Establish Quantitative Objectives	Stabilize Subprocess Performance	Ensure Continuous Improvement	Correct Root Causes
PREPARE FOR RISK MANAGEMENT																	
Risk Sources & Categories																	
Define Risk Parameters																	
Establish a Risk Management Strategy																	
IDENTIFY & ANALYZE RISKS																	
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nt in need of Improvement …

t of a document linked to the waypoint matrix

- **Waypoint identity** ï which waypoint is it?
  - ï SP 1.2 Define Risk Parameters, & GP2.1 Establish Organization Policy
  - ï Product line ñAò
- **Waypoint Amplification** ï Why is it important?
  - ï Risk parameters must be included in approved policy and procedure documentation so safety personnel and decision authorities understand the basis of the risk decisions.
- **Waypoint Evidence** ï How do we know its current status?
  - ï Direct artifacts ï Inadequate explanation in procedures manual section 8.1.
  - ï Indirect artifacts ï Several key folks were asked and did not understand parameters linked to product line A risks
- **Waypoint Improvement Opportunities** ï What will make it better?
  - ï Need more depth and clarity of these risk parameters in procedures manual.
- **Date reviewed** ï 11 Nov 2007 RJ

isualization after significant review é

Product Line A	PERFORM	MANAGE										DEFINE		QUANTIFY		OPTIMIZE	
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Now, can use Lean, Six Sigma, Theory of Constraints for further improvement …

	Tools			Outcomes	
	Lean	**TOC**	**Six Sigma**	**Quality & Productivity**	**Risk & Waste**
Capability Level 0 – INCOMPLETE: Specific goals not met.	**N/A**	**N/A**	**N/A**		**XXXXX**
Capability Level 1 – PERFORMED: Specific goals are met. Supports work needed to produce work products.	**N/A**	**N/A**	**N/A**	**X**	**XXXX**
Capability Level 2- MANAGED. Performed processes with infrastructure to establish commitment to perform, ability to perform, direct implementation, and verify implementation.	**Use Lean to define processes**	**Begin collecting data.**	**Begin collecting data.**	**XX**	**XXX**
Capability Level 3- DEFINED: Managed processes use organization-wide standardized processes.		**Apply TOC to defined processes.**	**Refine data.**	**XXX**	**XX**
Capability Level 4 – QUANTITATIVELY MANAGED: Defined processes are controlled using statistical and other quantitative techniques.			**Apply 6σ to quanti-tatively managed processes**	**XXXX**	**X**
Capability Level 5 – OPTIMIZING: Quantitatively managed processes are improved based on understanding of variation in the processes.				**XXXXX**	

# of desired improvement goal state é

Product Line A	PERFORM	MANAGE										DEFINE		QUANTIFY		OPTIMIZE	
	Achieve Specific Goals	Commitment to Perform	Ability to Perform				Directing Implementation			Verifying Implementation		Ability to Perform	Directing Implementation	Quantify the Process		Optimizing Process	
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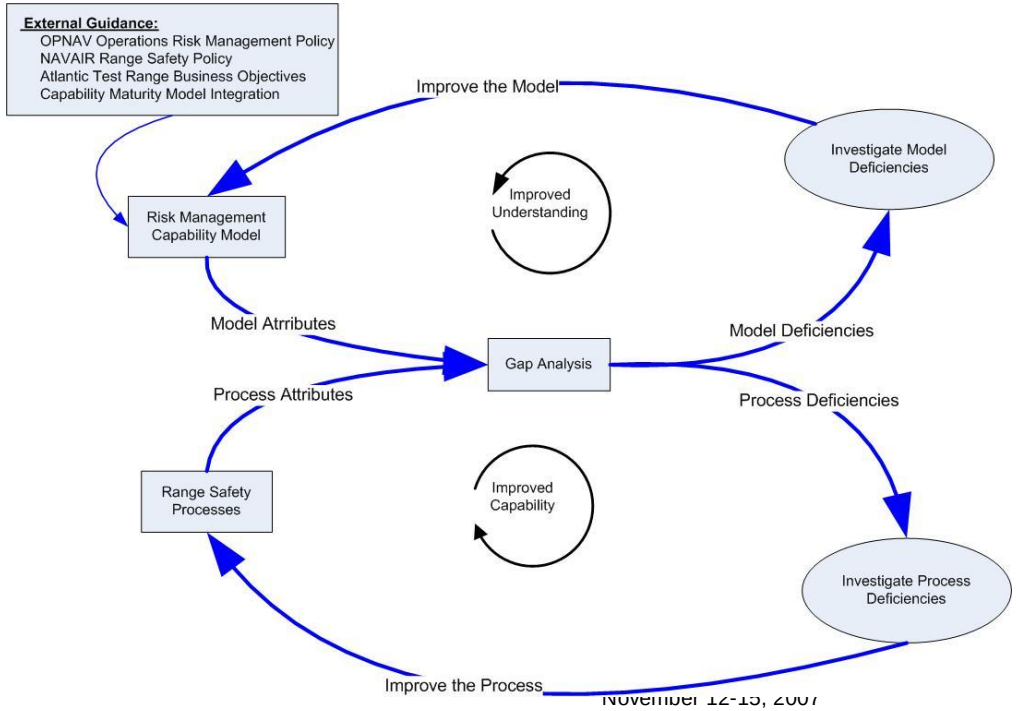
...ability Waypoint Model:

- ...s
  - Explicit definitions of improvement, effectiveness, efficiency
  - Improvement is traceable from waypoint to process area to organizationôs mission objectives

- **Path to improvement is obvious**
  - Strong and weak areas easy to visualize from a high level
  - Simple path to dig into the details to address problem areas

- **Can be applied to any process area**

- **CMMI- and SCAMPI-compliant**



Visualizing Improvement

Simple!

Clear!

Inexpensive!

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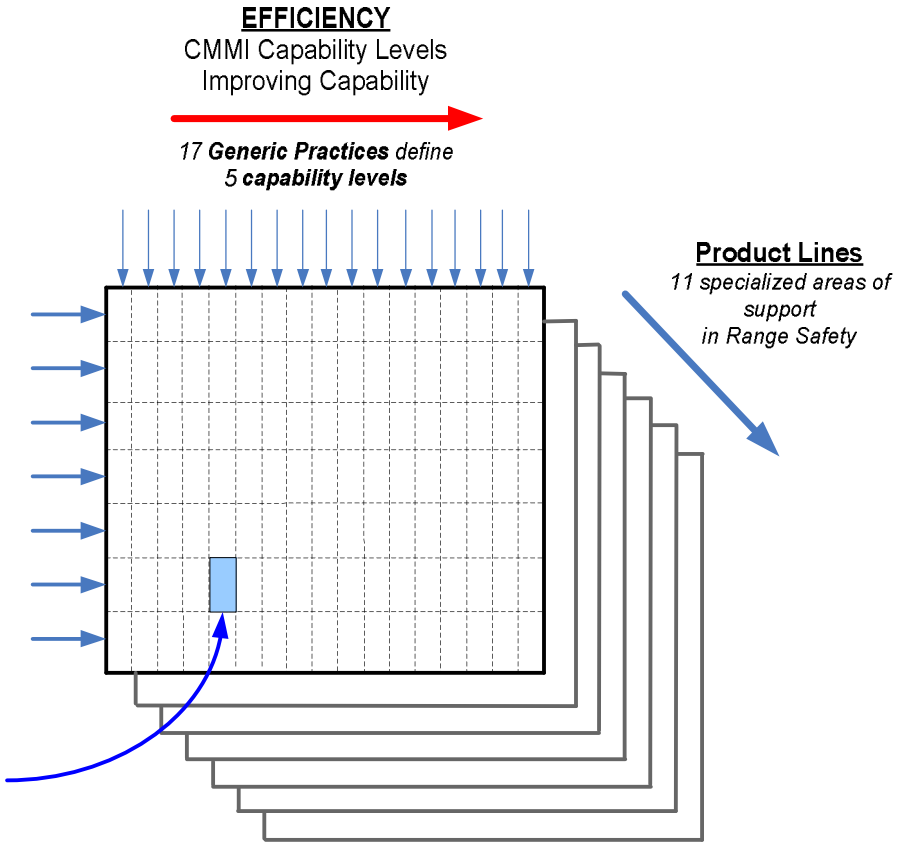

Questions?