Air

Land

Sea

Space

Cyberspace

Innovation. In all domains.

CMMI®-- The Way It Should Be

Simpler ways to CMMI-compliant appraisal solutions

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Raytheon Missile Systems

Outline

- Background: RMS Business Environment
- Ways to Overpay for a Successful Appraisal
  - Team Behaviors
  - Evidence Collection
  - Model Interpretation
- Questions
- Presenter Biography
- Backup

Raytheon Missile Systems' CMMI® Environment

- # Raytheon is comprised of multiple businesses
  - One business is Raytheon Missile Systems (MS)
    - Characterized by high-(defense) volume, complex systems--"Rocket Science"
    - 12,000 people, >5000 engineers
  - Each Raytheon business manages its own CMMI® goals and appraisals
    - Knowledge sharing across business units
    - Prior Raytheon and RMS experience with SW-CMM, CMMI appraisals
  - Missile Systems has been appraised at Maturity Level 5 for CMMI for Development version 1.2 +IPPD
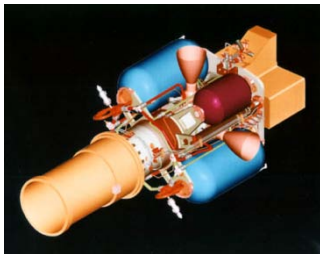
Does your organization do this?
[We did]

- Evidence Collection
  - Collect something to cover everything possible in the CMMI model?
  - Address each and every sub-practice?
  - Provide an example for each discipline in your organization?
  - Collect evidence even when a demonstration or interview would more readily provide the evidence or affirmation?

- Team Behavior
  - Bow to the understandings and "expectations" of the appraisal team, even then they differ from, or are more restrictive than, the CMMI model?

- Model Interpretation
  - If a compound statement (such as GP3.2) is given in the CMMI, then provide evidence to address every element of that compound statement?
  - If something is good, then providing more of it must be better?

Evidence Collection-1
"A Thread for All Disciplines"

We used to provide evidence threads for all disciplines. . .

- Decision Analysis and Resolution [DAR] examples shown
  - Software Thread

    [It must be good because we passed SW CMM with it!]
    - E.g., software DAR – which board support package vendor to use
  - Hardware Thread

    [Yeah, more than just SW…let's add a HW example too!]
    - E.g., hardware DAR – microprocessor choice

Paul Schofield, in "A Man for All Seasons"

  - Systems Engineering Thread

    [Let's combine SW and HW, and show some tradeoffs and "big picture" stuff!]
    - E.g., decision to do hardware or software filtering of images
  - "Glue-ware" and others

    [Hmm, we've got more stuff than SW, HW, & SysEng, what do we do with that?]
    - To explain how the choices are related to a program or how they connect
    - E.g. a make or buy decision, where to rent a test facility, etc.
- We probably don't need all these

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- When generic practices [GP's] contain compound statements, we used to fill out the entire "bingo card"
  - GP "Tsar's" were appointed to ensure completeness of each GP's "bingo card"
    - We gathered examples to address as many permutations as possible
  - Examples
    - GP 2.3 Provide Resources
      - ☐ Schedule, Budget, People, Tools, Facilities, Resources
    - GP 3.2 Collect Improvement Information
      - ☐ Work Products, Measures, Measurement Results, Improvement Information
    - *"It would be curious if . . .*"*
      - ☐ *We didn't have anything in some rows or columns, but we don't need a full "Bingo Card"*

PA	Excal	JSOW	TTL	KA	NLOS
CM GP3.2	1	1	1		1
DAR GP3.2		1	1		1
IPM SP1.5	1		1	1	1
PI GP3.2	1	1	1		
PMC GP3.2	1		1	1	1
PPQA GP3.2		1			
SAM GP3.2	1		1		1
TS GP3.2	1	1	1		
VAL GP3.2	1	1	1		
VER GP3.2	1	1	1		

* Thanks to JFR Consulting for the use of this phrase

Evidence Collection – 3
Putting it All Together (yikes!)
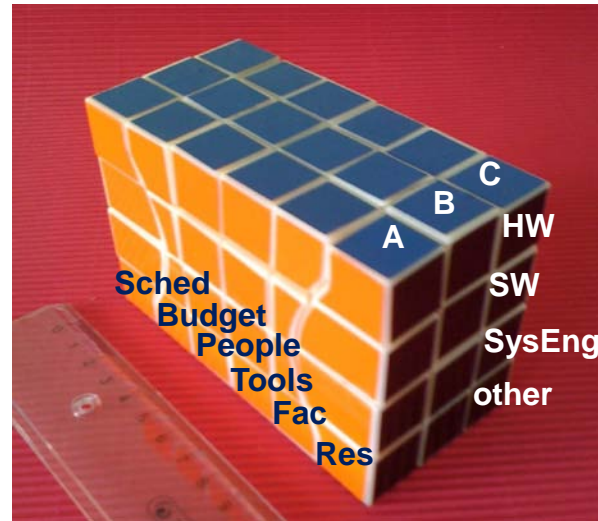
- Programs:
  - A
  - B
  - C
- Disciplines:
  - Hardware
  - Software
  - Systems Engineering
  - [Radar, Optics, Propulsion, Guidance…]
- GP2.3 elements:
  - Schedule
  - Budget
  - People
  - Tools
  - Facilities
  - Resources

- 3 * 4 * 6 = 72 pieces of evidence for each GP2.3!
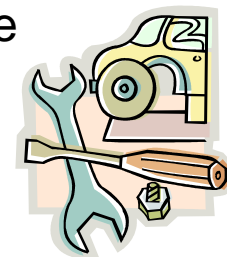
Evidence Collection – 4
More Fun with Generic Practices

■ GP 2.2 Plan the Process

- Establish and maintain the plan for performing <x> process
  - From page 620 of CMMI v1.2 for Development (glossary):
    - ["Establish and Maintain"] means more than a combination of its component terms; it includes documentation and usage. For example, "Establish and maintain an organizational policy for planning and performing the organizational process focus process" means that not only must a policy be formulated, but it must be documented and it must be used throughout the organization."
  - Some appraisal teams insist on finding original release of plan, plus revision to the plan
  - Alternatively, references to the plan; interview citations; other indications of use (for instance, peer review references to the plan or of the plan) also show maintenance
  - We may not need that "extra" piece of "maintain" evidence

Evidence Collection – 5
Shotgun Approach to Evidence

- Hmm, I'm not sure how well this addresses the practice, so

- I'll provide multiple examples… in fact, I'll provide

- An example for each subpractice

- And if I'm not sure, then I'll provide multiple examples for each subpractice, because

- Each one should cover a little of the practice, and

- All together, they should be good, and

- The appraisal team will pick the ones they like best!

KA-BOOM!

(Somebody in this room once provided 13 examples for a single practice.)

Collect Evidence We Don't Need

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- We can collect indirect, even though we expect we will get affirmations during interviews—let's be sure

- We plan to hold a demonstration, but let's collect screenshots of the demonstration content anyway… you never know

- The evidence in this practice complies with the CMMI, but I would feel better. . .
  - If we had a little more evidence in this area
    - Because most of our evidence has three or four and examples; this one only has two (that meet the model), or
  - If we had more kinds of examples, or
  - If we had the exact same kind of evidence from each program, or
    - If we had some of the programs re-work their evidence to match the format of the other programs, or
  - If we could send a message to the program that they need to change because I don't like how they do it…even though I guess it <u>does</u> meet CMMI. But I don't like it. It's not what I'm used to seeing.

Team Behavior – 1
True Statements from Team Members

- Let's write this up to change the program/organization behavior because even though it complies to the model, they need to change

- If one thread is good, then three should be better

- If we are uncertain about a particular process area, we can provide more examples

- If some evidence is good, then more is better

- What I expect to see is…

- Do everything that the Appraisal Team Lead wants—unquestioningly
  - The Lead Appraiser has one (albeit important) vote on the team
- Do everything that each appraisal team member wants or expects
  - We have to do this—we've always done it this way in our other appraisals
  - The CMMI model is a wonderful resource – consult it and the Method Definition Document [MDD] often
 - Maybe it doesn't say quite what you remember!

Model Interpretation – 1
Ways to Focus on the Wrong Things

- ## We need to get our CMMI certificate, so. . .
  - We are going to drive changes to the program to support the quantitative processes we have selected
    - We will disrupt and perturb programs, but we will get our certificate, so that's OK--It doesn't matter whether the changes "stick"

  Versus

- ## We need to help our organization improve, so. . .
  - Let's find what our programs and organizations need to focus on to meet their goals
  - Let's use our Six Sigma and CMMI model tools and best practices to support meeting those goals
    - Programs are satisfied and will agree to work with us again
   - Programs keep new behaviors that helped them address their risks
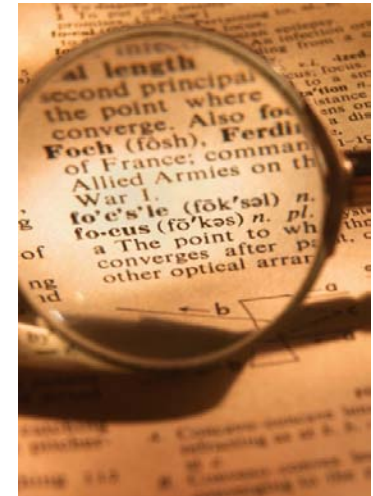
Model Interpretation – 2
# If Some is Good, All is Great

- **Measurement and Analysis Process Area**
  - MA can be used for all other process areas
  - Therefore, it <u>should</u> be used for all process areas, so
  - We are going to invent at least one metric that will measure something about each process area, and
  - We will mandate them to every project
  - Then we will improve everything!
    - (At least we will have a giant database of metrics, and we can figure out later what is most important)
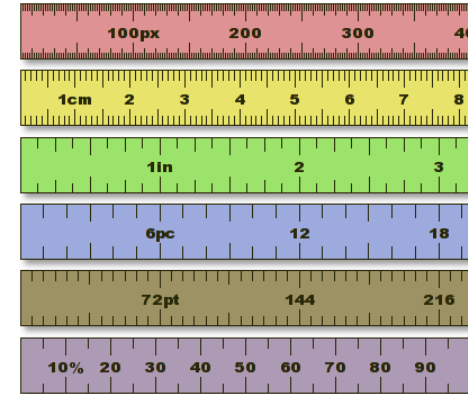
  Ooops!
  - Let's think about which are the key factors that affect our performance to our goals, and prioritize measurement and analysis of those
    - A selective application of MA can make sense in many organizations
    - A metric of "DAR's planned versus DAR's executed" may not be the best way to expend resources
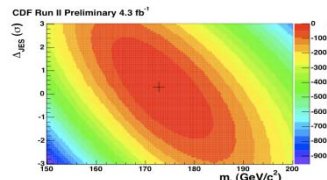
Summary

- Barriers to efficient, effective appraisals include
  - Misguided evidence collection
  - Certain team behaviors
  - CMMI model misinterpretations
- Ways to avoid these barriers
  - Live through these mistakes
    - And learn from them
  - Learn from somebody else's mistakes
  - Be brave about using common sense
  - Make the project and organizational goals your guiding principles
    - Don't think about things from the CMMI model/appraiser perspective first
    - The programs and organizations are your customer and priority
- Cautions
  - Sometimes you do need multiple pieces of evidence or threads
  - Sometimes you should listen to your appraisal lead! ☺

Questions?
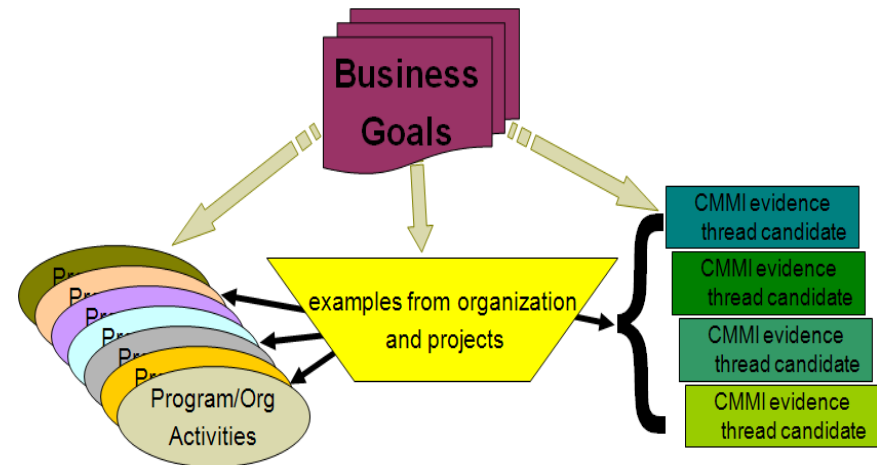
Presenter Biography
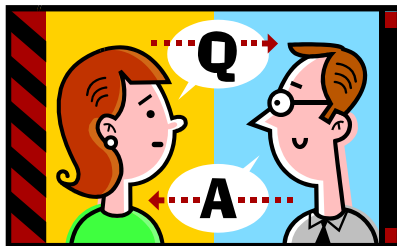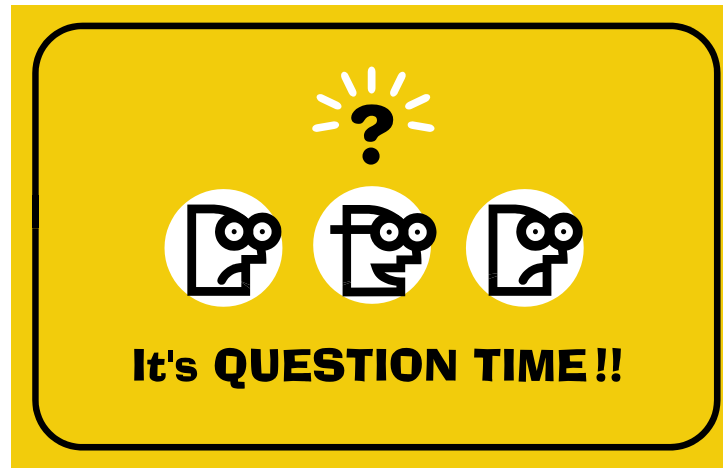
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Recent role
- Raytheon Missile Systems CMMI program manager
- Site appraisal manager
- Member of several CMMI appraisal teams

27 years engineering experience
- Functions: software, systems engineering, program management liaison, process improvements
- Industries: cell phones, industrial automation, missile systems
  - 3 patents – high-reliability systems, redundancy, inter-process communication

Personal
- Long-time science fair judge
- Officer of the International Lilac Society
- Together with his wife Debbie, is a rated geocacher in the desert southwest
- Cat rescue

BACKUP SLIDES

Abstract

- **Abstract ID:** **10779**
- **Title:** **CMMI-The Way It Should Be**
- **Abstract Text:** **CMMI-The Way It Should Be**
- Why have three times as many artifacts as necessary when doing a CMMI appraisal? Why complicate the data collection and appraisal process by providing excess information and elaboration?
- Many organizations have evolved their approaches to CMMI compliance by building on prior work in the CMM and CMMI. Too often, these approaches focus on software as the lead thread, and supplement this with hardware, systems engineering, and disciplinary threads. Frequently these approaches represent an amalgamation of early successes and lessons learned that have been cobbled together to cover all the CMMI process areas. Sometimes they take the approach that if something from one discipline is good, it needs to be replicated in all disciplines. This approach can result in redundant or less-value-added effort to the appraised organization.
- Why not instead begin with a truly integrated approach that does not segregate or isolate disciplines? (After all, "Integration" is the "I" in "CMMI"!) The author proffers that using an integrated approach as a starting point for improving using the CMMI as framework saves cost and time, simplifies data collection and the actual appraisal process, and does not increase the risk to the organization.
- Examples from our organization's recent CMMI Level 5 appraisal will be cited to show the differences between the Raytheon Missile Systems approach and the approach we have seen presented by many others. In particular, aspects of data collection, data and thread coverage, and ways to meet the requirements of the CMMI and the Method Description Document (MDD) will be addressed. The presentation will also discuss training and "big picture" views of this approach to CMMI and appraisals.