



# Issues in Using a Process as a Game Changer by Dr. Stephen Sherman – Data Analysts

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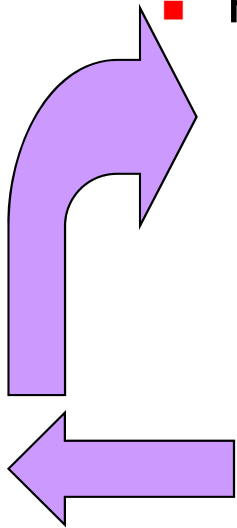
Observations Based on 10 Years as a Process Engineer-Contractor in the Systems Engineering Process Group of the 554 Electronic Systems Wing (Process Implementer) and Experiences as a Programmer and Manager in Software Engineering (Process User)



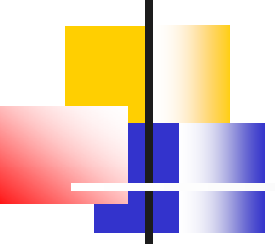
## Where do Processes Appear?

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- Discover the Technology
- Conceptualize the use of the Technology to “Change the Game”
- “Change the Game” with a New Product that Utilizes the Technology and Processes related to the New Product
  - Product Lifecycle – **Defined with Processes**
    - Develop the Product (New Product or Product Version)
      - Requirements, Design, Build, Test
    - Manufacture the Product (If Required)
    - Field the Product
    - Use the Product Operationally
    - Maintain the Product
    - Retire the Product



# Overview

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- Other Views Process Implementation Issues
  - Process
    - Replicating a Product vs. Producing Different Products
    - Process Goals
    - Improving the Organization
  - Issues and Approaches
    - Organizational
    - Improvement
    - Process Presentation
    - Process Execution
  - Conclusion

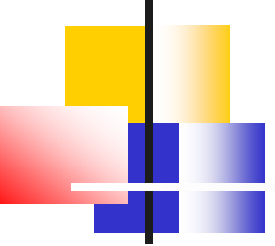


## Other Views of Process Implementation Issues

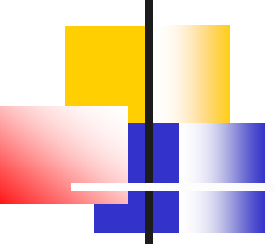
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- Why is Process Improvement so Hard by Karl Wiegers  
<http://www.processimpact.com/handbooks.shtml#spihb>
  - Not Enough Time
  - Lack of Knowledge
  - Wrong Motivations
  - Dogmatic Approaches
  - Insufficient Commitment
- A Framework for Software Product Line Practice, Version 5.0 by the Software Engineering Institute  
[http://www.sei.cmu.edu/product\\_lines/](http://www.sei.cmu.edu/product_lines/)
  - Process Mismatch
  - Process Doesn't Address Product Line Needs
  - Inadequate Process Support
  - Uneven Process Quality
  - Lack of Buy-In
  - Dictatorial Introduction
  - Processes Not Enforced
  - Stagnant Processes

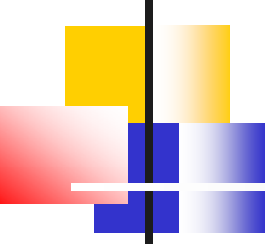
# Two Types of Processes

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- Replicating a Product  
Example: Produce a Light Bulb or Automobile (Classic Demming)
    - More Efficient Process
      - Reduce Cost per Product
      - Reduce Time per Product
    - More Effective Process
      - Produce a Better Quality Product
        - Reduce Risk of Failure
        - Less Defects at Delivery
        - More Desirable Features
        - Reduce Maintenance (Cost or Time)
          - Conformance to Specifications

## Two Types of Processes (Continued)

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- Producing Different but Related Products
    - Example: Produce a Software System or Project
      - Each Product is Unique but has Similarities
        - Similar Concepts, Skills, Facilities, Assets
          - Problem and Solution Space - Technology, Problem Set, User Population, Environment
          - Solution Skills - Scheduling, Budgeting, Configuration Management, Customer Support, Engineering, Contracting, Security, Organizational Policies
          - Unique Details - Requirements, Design, Production, Testing, Maintenance

# Process Goals - Different Products

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- Improve the Organization that Produces the Products (Parts) so that, in the Future, the Organization becomes:
    - More Efficient
      - Reduce Cost per Quantified Product
      - Reduce Time per Quantified Product
    - More Effective
      - Produce Better Quality Products as Quantified
        - Reduce Risk of Failure
        - Less Defects at Delivery
        - More Desirable Features
        - Reduce Maintenance (Cost or Time)
          - Corrective, Adaptive, and Perfective
          - Altering the Delivered Product or Specifications



## Improve the Organization - Transition from Cottage Industry to Capital Industry

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- Cottage Industry – Example: Weaver
  - Artisans – Quality & Productivity Related to Skill
  - Custom Made Products by Looms
- Capital Intensive Industry – Example: Cloth Factory
  - Automation of Repetitive Tasks
  - Less Skill Required to Operate
  - Higher Productivity & Consistent Quality
  - Requires Investment
  - Products for the Mass Market
- Mass Customization – Example: Computer Hardware Retailer
  - After Achieving a Capital Intensive Industry
  - Automation of Specific Customization Options





## Improve the Organization – Improving Personnel

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- Pros All: People are the Key to any Project
- Cons All: Personnel may Leave
  - Experience from Working on Projects
    - Cons: Experience May not Transition
    - Pros: Personal Reuse is the Easiest and Most Efficient to Implement.
  - Training to Improve Skills
    - Cons: Expense, too Specific or General, too Early or Late
    - Pros: New Ideas may Foster Better Approaches
  - Replacing Personnel by More Skilled Personnel
    - Cons: May Effect Morale and be Expensive
    - Pros: There is a 10 to 1 difference between the Most Productive & Least Productive Personnel (Software).

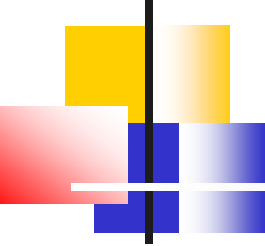


## Improve the Organization – Creating Assets

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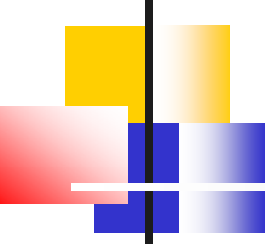
- Harvest and Use Products & Tools from Projects
  - Usually Requires Extra Generalization
  - Usually Requires Extra Documentation
  - Asset Library & Tool Crib for Storage & Retrieval
- Plan for a Reuseable System
  - Create an Architecture & Related Tools for the Line of Business
  - Populate the Architecture with Modules
- Either Approach Requires a Disciplined Process

# Improve the Organization – Using Processes

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- Facilitate Personnel and Teams working Together
    - Describe Responsibilities and Interactions for Developing Work Products
    - Show how Human Resources are Shared across Products
    - Describe the Use of Organizational Assets and Tools
  - Support Management of Product Development and Maintenance
    - Support Planning and Measurement of Product Progress and Process Compliance
    - Produce Accurate Predictions of Product Cost and Schedule
    - Identify where Organizational Communication is Required

## Improve the Organization – Using Processes (Cont)

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- Support Process Improvement
    - Use Lessons Learned from the Best and Worst Experiences.
    - Integrate General Processes and Organizational Policies into a Coordinated Process and Describe the Change Process

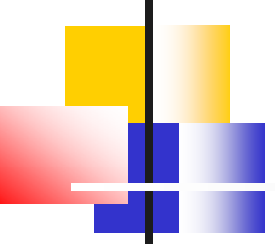


# Organizational Issue: Focus on Achieving Real Organizational Goals

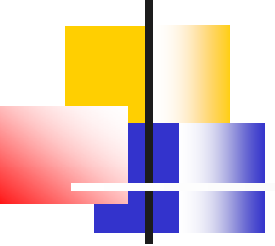
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- Help the Organization Execute its Business Strategy.
  - Improvement Goals
    - Maintain the Current Level or Improve Efficiency or Effectiveness
    - Deliver a Quality Product within Schedule and Budget
    - Achieve and Sustain a Competitive Advantage
  - Low Improvement Business Goals
    - Perform a Mandated Function or No Competition in the Product Area
    - No Extra Resources
      - Low Overhead Organization
      - The Future is Now – Just Get it Done

# Organizational Issue: Enforcing Long Term Goals

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- Processes usually have Long Term Goals related to the Improvement of the Organization.
    - Improve by Globally Optimizing Efficiency and Effectiveness for Products and adding Value to Organizational Assets.
  - Individuals usually have Short Term Goals related to Demonstrating Accomplishment.
    - Limited Assignments. Example: Design, Code and Test Module X

# Organizational Issue: Enforcing Long Term Goals (Cont)

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- Mid Level Managers usually have Mid-Range Goals related to Optimizing the Performance of their Organization.
    - With X People, my Group must provide the (Security Package, Configuration Management Support, Independent Test Approval) for Y Products this Year
  - Senior Management with Short Term Assignments tend to Focus on Short Term Results.



# Organizational Issue: New Preventive Process Activities Outnumber and Outrank New Productivity Process Activities

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- Preventive Activity - Activity in a Process that exists because a Previous Project had a Historically Significant Screw-Up, that is, there was a Very Painful Lesson Learned.
  - Generated by Management Chartered Tiger Teams after Disasters
  - Can't save the Current Project, but will assure that the Particular Disaster won't Happen again
- Productivity Activity - Activity in a Process that exists because a Series (1 or More) of Previous Projects improved their Efficiency or Effectiveness by Performing those Tasks.
  - Proposed by Project Personnel. Need to Convince Others that Improvement was Real and not caused by Variability in Personnel or Product Details.





# Approaches for Organizational Issues

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- Management must decide on the real organizational business goals and let that guide the implementation of the organizational process.
  - No process
  - Pretend we have a process
  - Have a process for some activities
  - Have a fully defined process and process improvement
- Management must agree on the Implementation of the process from Top Management to the First Level Manager.
  - Management must understand the process at the appropriate level of detail.



## Approaches for Organizational Issues (Cont)

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- Management needs to Support (Enforce) the generation of data and assets to support the process.
  - Management needs to decide on the process effort in a project as a percentage of the project and schedule budget accordingly.
  - Management must utilize the process in determining success and evaluation of personnel
- Avoid short term Management assignments.
- Management must carefully consider the addition of preventative activities to the process and allow projects with low risk or importance to avoid or curtail those activities even if it means a Senior Management decision on individual projects.

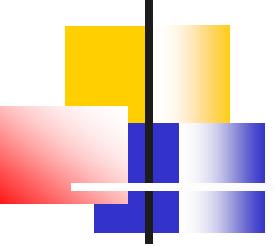


## Approaches for Organizational Issues (Cont)

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- Management must remember there is no free lunch in processes that cover different products.
  - “If you think that all the tasks (activities and products) you have to complete to execute your project are described by your process or that the tasks you have to do to follow your process all lead to the completion of your project, then you don’t understand your process or you don’t understand your project or both.” from a Lockheed Project Manager

## Improvement Issue: Showing that One Process is Better than Another Process for Different Products.

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- Difficult to determine if Differences in Efficiency or Effectiveness are related to Product Variability, Human Variability or Process Issues.
    - Ideally, one could experiment and hold some of these factors fixed to see if the differences are related to changes in the other changing factor. However, that is not realistic. This is a general problem in Software Engineering.



## Approaches to the Improvement Issue

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- Need to quantify the products to compare results.
  - Refer to Putnam and Myers book Five Core Metrics: The Intelligence Behind Successful Software Management which discusses and relates size, schedule time, effort (cost), defects, and process productivity.
  - Utilize Function Points for Size, Track effort in Person Months, capture schedule time and count defects.
  - Without these measures or similar ones, claims of improvements are very subjective.



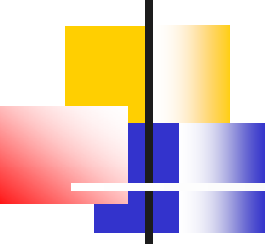
## Presentation Issue: Present a Process that is Easy to Understand and Maintain

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- For a Process that is easy to understand, the process presentation has to take several forms. The process user should be able to see a process overview and then get more detail as needed. The process user should be able to get increased detail based on phase, activity, work product or agent (role) among other parameters. The process information should be both graphic or verbal. The more options that the user has to understand the process, the better.
- For a process to be easy to maintain, a formal description of the process is needed that can be used to determine if changes in one part of the process will affect other parts of the process. In addition, the formal description should be used to automatically generate as much as possible the informal descriptions that are used to make the process understandable.

# Approach to the Presentation Issue

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- Design a Process that is Easy to Understand
    - Identify the Activities to be Performed
    - Identify the Agents (Roles) that Perform the Activities
    - Identify the Work Products that Result from the Activities  
Examples: Verbal Descriptions, Graphs, Responsibility Charts, Templates, Checklists, Forms and Supported Tools for Products and Project Support.  
<http://public.gunter.af.mil/applications/sep/menus/main.aspx>
  - Design a Process that is Easy to Maintain
    - Formal Process Definition  
Example: Object Management Group's Software Process Engineering Metamodel has an object-oriented scheme for representing software processes.  
<http://www.omg.org/technology/documents/formal/spem.htm>



## Process Execution Issue: For Different Products, Some Process Activities Depend on the Ingenuity of the Agents and those Activities are Difficult to Evaluate

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- Examples of Activities Dependent on Ingenuity
  - Create a High Level Design
    - Create or update a high-level design, including both functional and non-functional requirements, organize the product into components, and select the technical approach associated with the components.
  - Validate Quality Attributes of the Requirements
    - Validate both functional and non-functional requirements for quality. Some quality characteristics of requirements are: understandable, concise, not conflicting with other requirements, unambiguous, testable, singular, achievable, and precise.
- It is Relatively Easy to Pretend to Execute a Process.





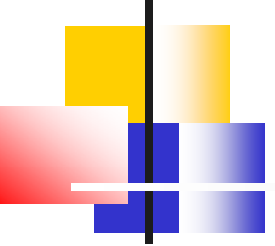
## Approach to Process Execution Issue

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- There is no substitute for good people with ability to execute the difficult activities.
- Good people are also needed to examine the work products produced by process activities.
- Another approach is to provide more direction by limiting the variability of the products.
  - Have several processes instead of one to allow more explicit direction for classes of products.
  - Within the procedures, create cases within the activities that define more detailed activities for specific classes of products.

# Conclusions

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- There are issues when implementing a process that sometimes seem to overwhelm the potential benefits that processes provide.
  - Almost all of these issues are related to people and resources.
  - The Organizational Issues are the most pervasive issues
    - Management Leadership and Involvement is the key component to successfully implement a process.
    - The implementation will require resources to address the other issues.
    - Although long term improvements appear promising, there is no free lunch when implementing a process to “Change the Game”.