

INCOSE 97 SYMPOSIUM

Development and Integration of Engineering Processes at Oerlikon Aerospace

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*Development and Integration
of Engineering Processes*

AGENDA

- | *Introduction*
- | *Software Engineering Process Development*
- | *Systems Engineering Process Development*
- | *Integration of Engineering Processes*
- | *Management of Change*
- | *Lessons Learned*
- | *Next Steps*
- | *Conclusion*

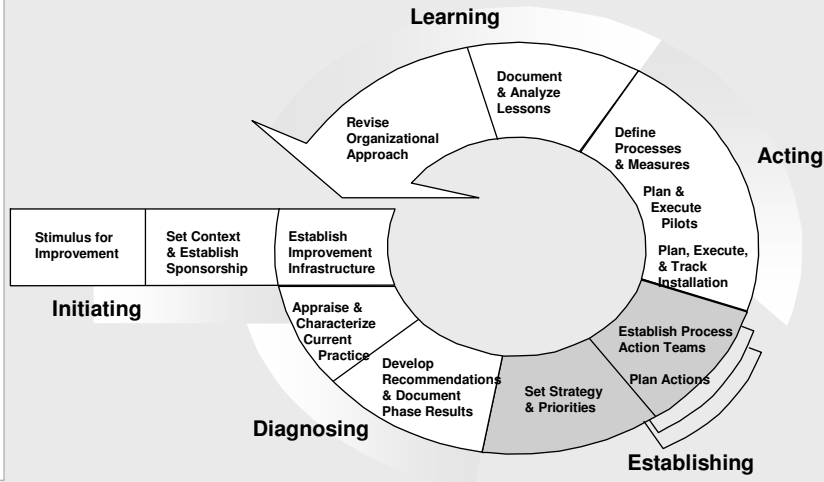
n **Systems Integrator**

- | *Laser-Guided Missile Air Defence System*
- | *40 Systems Engineers*
- | *40 Software Engineers*

n **APPLICATION DOMAINS AT OA**

- | *Command & Control*
- | *Communication & Intelligence*
- | *Sensors and Weapon Systems*
- | *Training & Simulation*
- | *Instrumentation & Test*
- | *Consoles*

n **OUR APPROACH TO PROCESS ENGINEERING 1**



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n **OUR APPROACH TO PROCESS ENGINEERING 2**

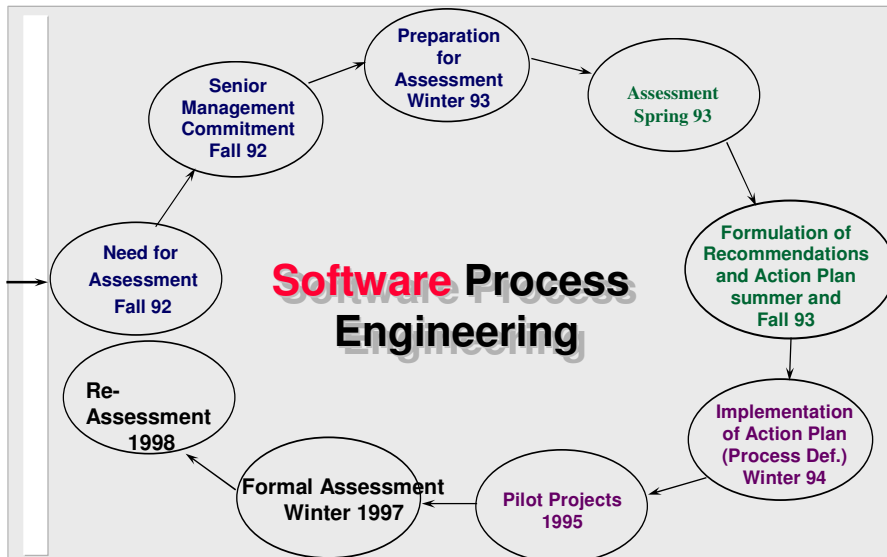
- | *Define a Process and bring it under management control.*
- | *Support the Process with engineering Methods appropriate to the application.*
- | *Support the process and engineering methods with automated Tools integrated into a consistent environment.*
- | *Train personnel to use these Processes, Methods, and Tools.*

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n SOFTWARE ENGINEERING PROCESS

| Strategy

- ê Software Engineering is a Core Competence at Oerlikon
- ê Base our process on the Software Engineering Institute's Capability Maturity Model for Software
- ê Use the results of the Winter 97 formal Assessment
- ê Put in place SEI level 3 and 4 practices
- ê Re-assess in late 1998 early 1999

n PROCESS DEFINITION STEPS - 1

- | *Review the Findings of the Assessment*
- | *Introduction to the Capability Maturity Model (CMM)*
- | *Preparation of a Plan by the Working Group*
- | *Brainstorm on current strengths and weaknesses*
- | *Understand the Current Process*
- | *Compare the Current Process with the CMM*
- | *Describe first level process steps (Top View)*
- | *Describe second level of the process using notation*
- | *Describe/Update, if necessary, third level components:*
 - ê Procedures
 - ê Users' Guides
 - ê Checklists

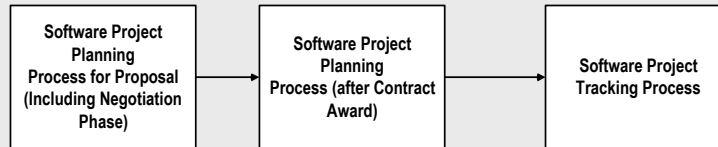
n PROCESS DEFINITION STEPS - 2

- | *Review Process Steps (CMM)*
- | *Select a Pilot Project*
- | *Brief Participants*
- | *Monitor the Pilot*
- | *Modify the Process*
- | *Institutionalize the Process*
 - ê *Modify, if necessary, policies and procedures*
 - ê *Develop the Training Material*
 - ê *Train all users (technical and others) of the Process*
 - ê *Monitor the utilization of the Process*
 - ê *Measure the Process and Products*
 - ê *Improve the Process*

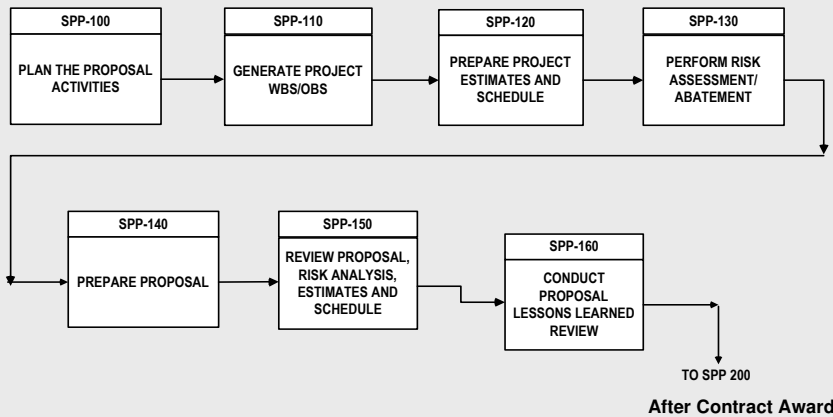
n GUIDANCE DOCUMENT FOR WORKING GROUPS

- | *Content*
 - ê *Goal*
 - ê *Scope and Complexity*
 - ê *Expected Involvement of the Organization*
 - *Process Owner*
 - *Key Players*
 - ê *Facilitator*
 - ê *Suggested Implementation Steps*
 - ê *Risk Issues*
 - ê *Reasonable Timetable for Implementation*
 - ê *Effort Commitment*
 - ê *Reference Documents*

n) **VIEW OF FIRST LEVEL OF THE
PLANNING AND TRACKING PROCESS**

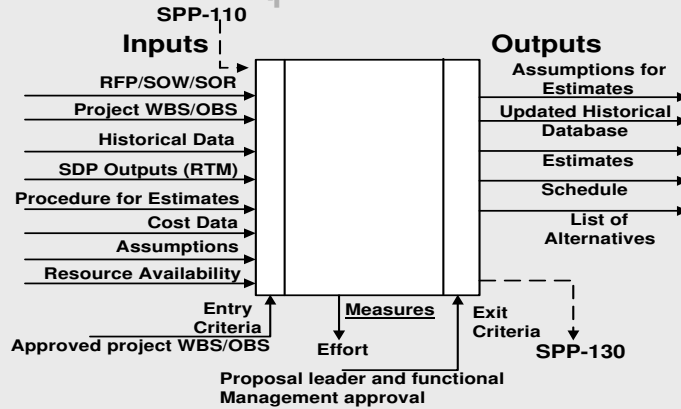


n) **VIEW OF SECOND LEVEL OF THE
PLANNING AND TRACKING PROCESS**



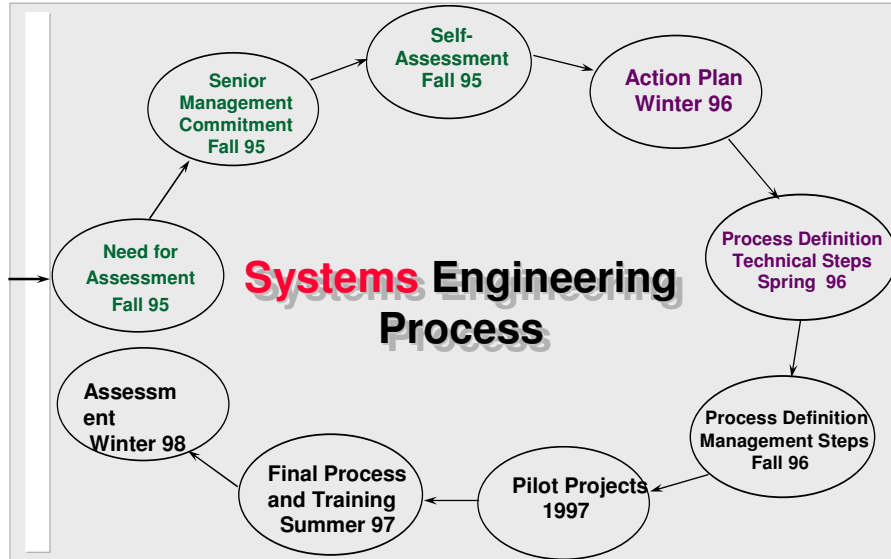
n **VIEW OF THIRD LEVEL**

STEP 120 - Prepare Estimates and Schedule



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SYSTEMS ENGINEERING PROCESS

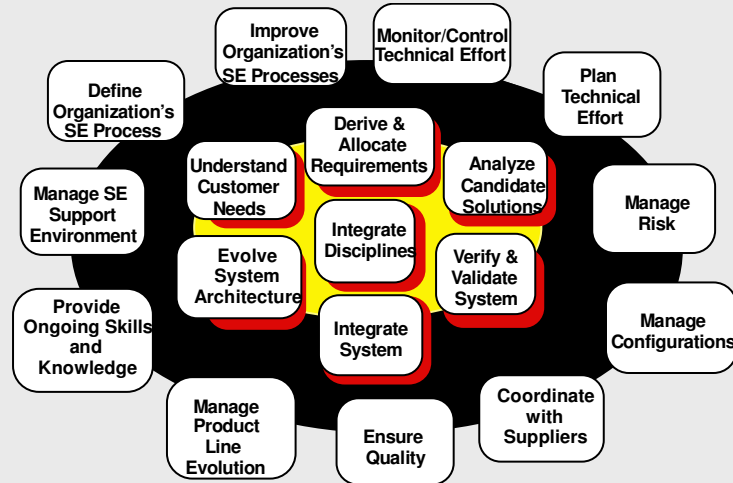
I. Strategy

- ê Systems Engineering is a core competence at Oerlikon.
- ê Base our process engineering on the Systems Engineering Capability Maturity Model, GSEP and ISSEP.
- ê Use the results of the Fall 95 Self-assessment.
- ê Put in place level 2 and 3 Practices.
- ê Formal assessment in Winter 1998.

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SYSTEMS ENG.- CMM PROCESS AREAS



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DEVELOPMENT STEPS of SYSTEMS ENGINEERING PROCESS

- | *Establish One Multi-Disciplined Working Group*
 - ê Systems Engineers and Sub-Systems Engineers
 - ê Software Engineers
 - ê Quality Assurance Representative
 - ê Software Engineering Process Group Members
- | *Use SE-CMM, GSEP and ISSEP as frameworks*
- | *Define Technical Activities of the SE Process*
- | *Define Management Activities of the SE Process*
- | *Use Beta Version of Process in Pilot Projects*
- | *Revise Process, Train Practitioners, and Deploy in Organization*
- | *Formal Assessment of Systems Engineering Process*

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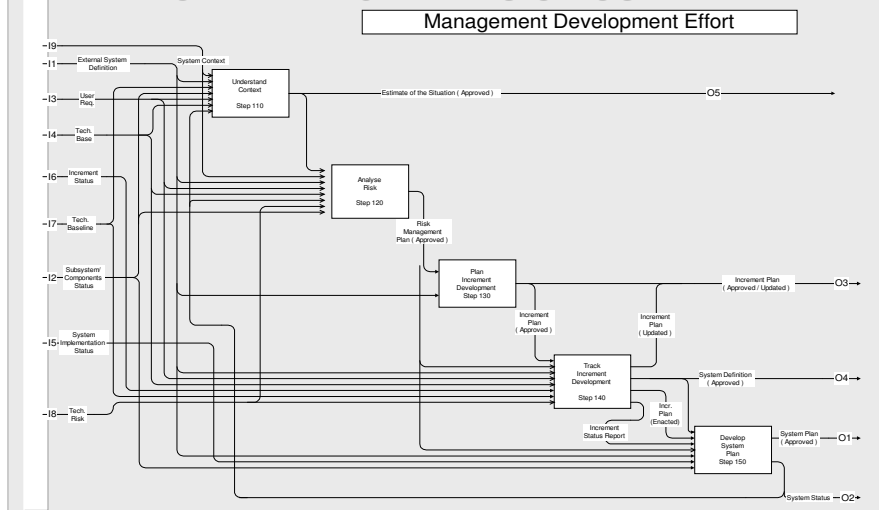
n SYSTEMS ENG. PROCESS WORKING GROUP: SECONDARY TASKS

- | *Identify Process and Product Metrics*
- | *Identify Methods, Practices and Tools*
- | *Prepare an Estimation Guideline*
- | *Monitor Interfaces with Software Eng. Process*
- | *Monitor Compliance With ISO 9001 Requirements*
- | *Develop a Systems Engineering Glossary*
- | *Establish a Systems Eng. Process Asset Library*
- | *Develop Training Material*

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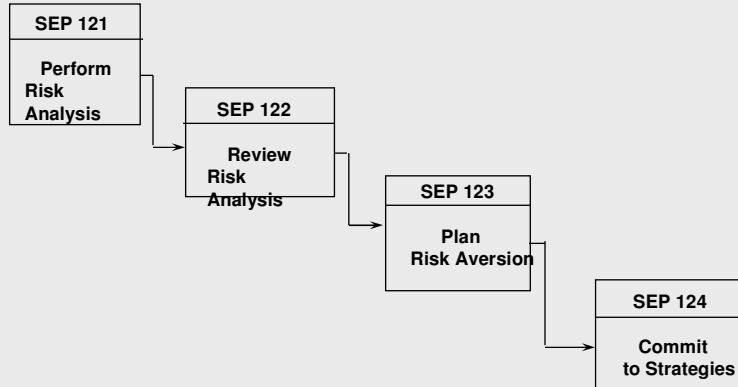
n MANAGEMENT ACTIVITIES OF GSEP



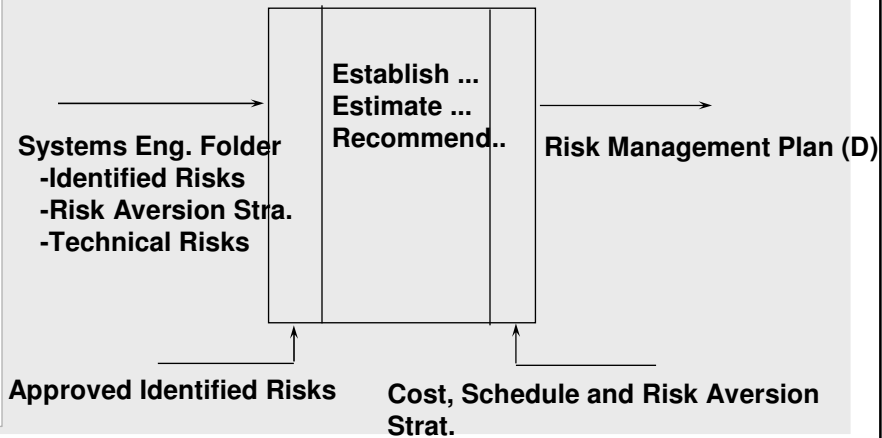
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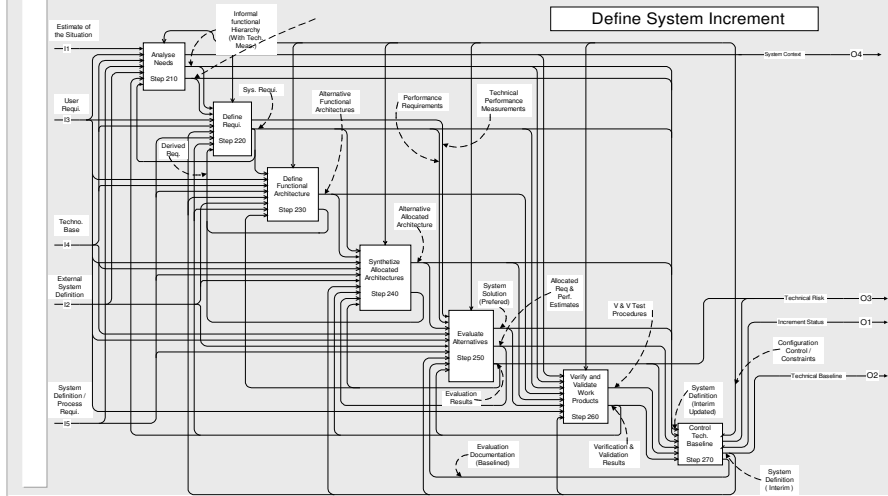
n STEP 120 - Analyze Risk



STEP 123 - Plan Risk Aversion



n TECHNICAL ACTIVITIES OF GSEP



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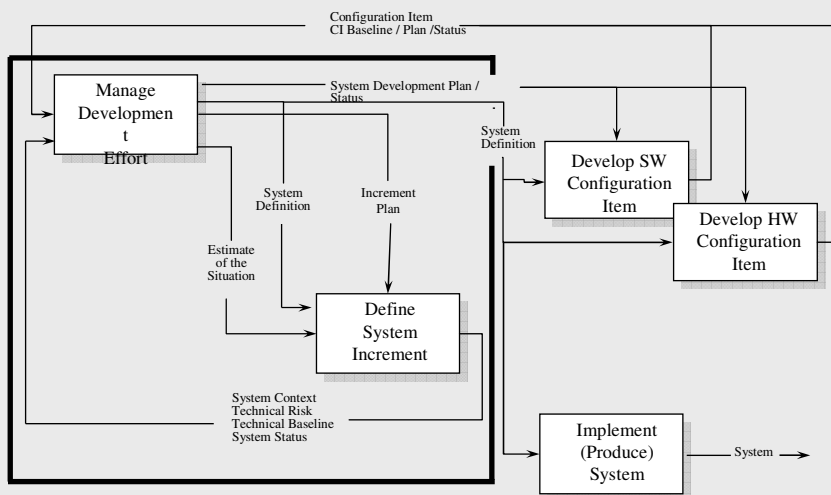
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**n Integrated Systems and Software Engineering
Process (ISSEP) from SPC**

- n Addresses the problem of large, complex systems
- n Decomposes the system such that parts can be independently developed and integrated
 - n System Level (includes segment and subsystem parts)
 - n Configuration Items (include software and hardware parts)
 - n Components

INTEGRATION OF PROCESSES



n **Integrating Supporting Processes**

- n *Subcontractor Management in SW-CMM and
Coordinate with Suppliers in SE-CMM*
- n *Quality Assurance*
- n *Risk Management*
- n *Document Inspection*
- n *Document Management*

n **Integrating Processes: Methods and Tools**

- n **Methods**
 - n **Structured Analysis and Design (SADT)**
 - n **Quality Function Deployment (QFD)**
- n **Tools**
 - n **CORE**
 - n **Software through Pictures (StP)**
 - n **RTM**

n ENGINEERING PROCESS ASSET LIBRARY

- èPolicies
- èProcess Descriptions
- èGuides, Forms and Templates
- èExamples of Documents Produced
 - èBusiness Cases
 - èProposals
 - èEngineering Plans
 - èSpecifications
- èTailored Processes
- èProcess and Product Measures
- èLessons Learned
- èCharter of Process Engineering Groups
- èTraining Material
- èMetrics (Process and Product)
- èHistorical Data

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MANAGEMENT OF CHANGE

| *Surveys:*

- ê **Implementation History Assessment**
 - *Analysis of previous implementation barriers and lessons learned*
 - ê **Culture Assessment**
 - *Evaluation of the fit between the Planned Change and the current Organizational Culture or Subcultures*
 - ê **Team Evaluation Questionnaire**
- ### | *Articles in Oerlikon's Newsletter*
- ### | *Multi-Discipline Working Groups*
- ê **Meeting Facilitator with each working group**

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n LESSONS LEARNED - 1

- | **Create common Vision for Mgmt and Practitioners**
 - ê Reduce Cycle Time
 - ê Increase Quality and Productivity
- | **Develop a Process Improvement Plan**
 - ê Link Between Project Requirements and Process Activities
 - ê Multi-Year Plan to show long term commitment
- | **Use Pilot Projects**
 - ê Members of Pilots have a Safety Net for "mistakes"
 - ê Success of Pilots facilitates adoption of technologies

n LESSONS LEARNED - 2

- | **Fix the Process not the People**
 - ê Focusing on Process allows Practitioners to learn while using the new Process, Method or Tool.
 - ê Mistakes are Acceptable If we learn from them
- | **The Management of the "Soft Issues" are as important as the "Hard Issues"**
 - ê *it is 25% SW, 25% HW & 50% "Peopleware"*

n AGENDA

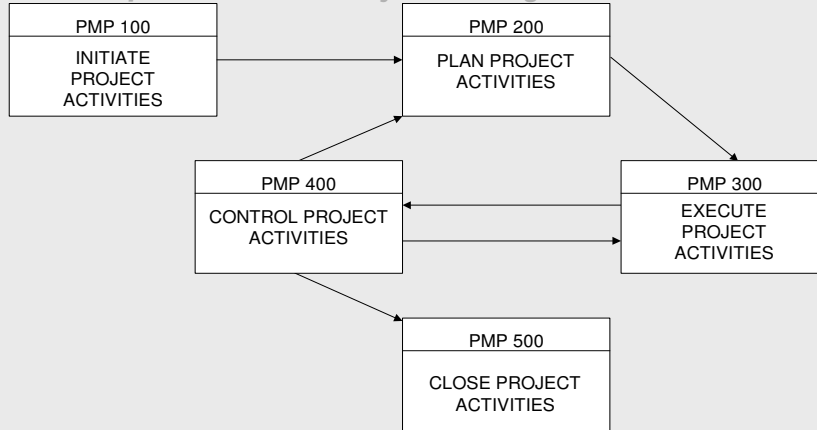
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n NEXT STEPS

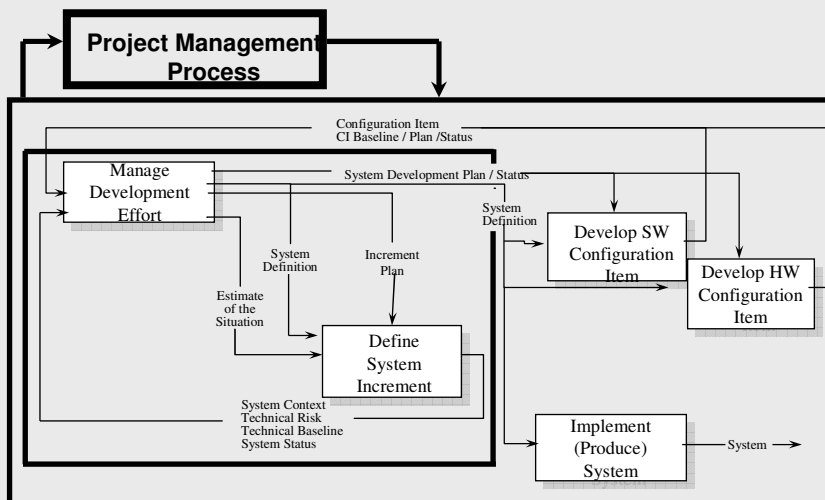
- | *Integrating Engineering Processes with Project Management Process*
- | *Electronic Process Asset Library on Local Area Network (INTRANET)*
- | *Evaluation and adoption of Systems and Software Methods and Case Tools (I-CASE environment)*
- | *Migration towards Integrated Product Teams*
 - ê **Modify Organizational Structure and clarify of Roles and Responsibilities**
 - ê **Modification to Performance Management Program**
 - (e.g. *Team Based Performance*)

Project Management Process

Adapted from the Project Management Institute



Project Management and Systems Eng.



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n CONCLUSION

- | *OUR Organization is making substantial effort to define and improve both Software and Systems.*
- | *Significant Progress in Process Improvement also implies a Cultural Change in the organization:*
 - ê A Shift From the **NIH** (Not Invented Here) to the **NRH** (Not Re-invented Here) resulting in mission-oriented teams.
- | *Systems and Software Engineering Processes need to be defined and integrated for **EFFICIENCY** and **EFFECTIVENESS** to get the “**BANG FOR THE BUCK**”*