SPI 98
Monte Carlo

Development and Integration Issues about Software Engineering, Systems Engineering and Project Management Processes

Claude Y. Laporte - Process Engineering

- **AGENDA**
  - *Introduction*
  - *Engineering Process Development*
  - *Support Process Development*
  - *Integration Facilitators*
  - *Lessons Learned*
  - *Conclusion*

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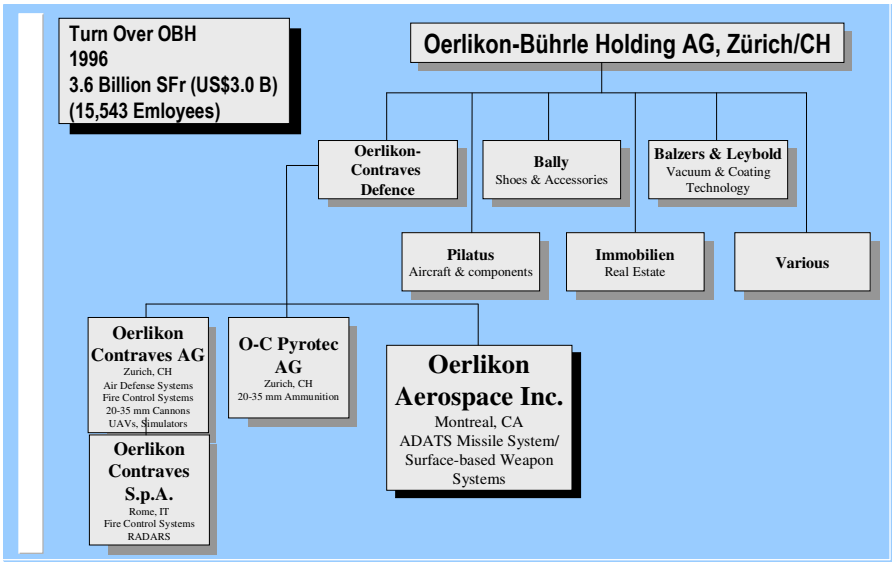

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- OERLIKON AEROSPACE
  - System Integrator of an Air Defense System
  - Certified as Level 2 - Software Engineering Institute in 1997
    - ⇨ Has also met 8 of the 17 Level 3 Goals
      - ⇨ Peer Review
      - ⇨ Software Product Engineering
  - ISO 9001 since 1993
  - NATO Secret Organization
  - Over 120 Systems and Software Engineers

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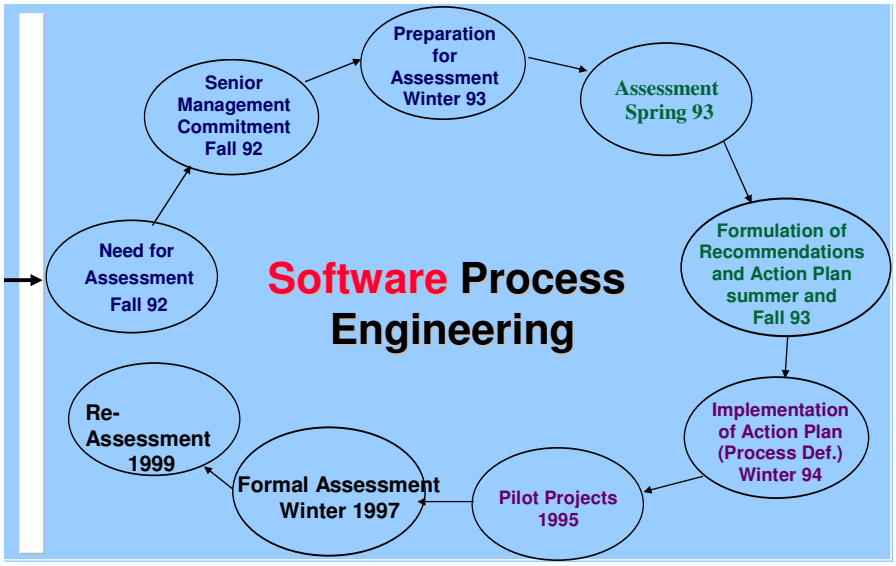

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■ FIRST LEVEL OF THE PLANNING AND TRACKING PROCESS

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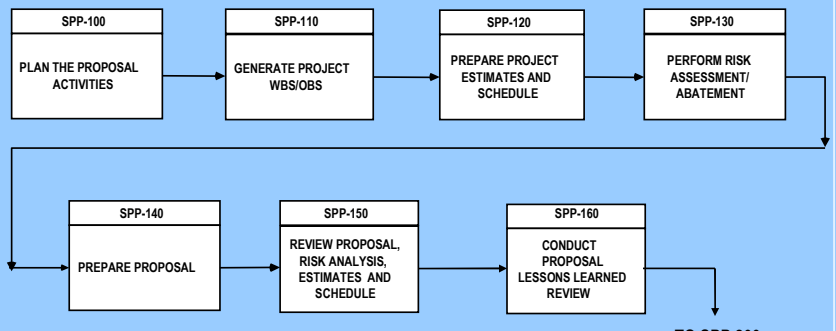
■ SECOND LEVEL OF THE PLANNING AND TRACKING PROCESS



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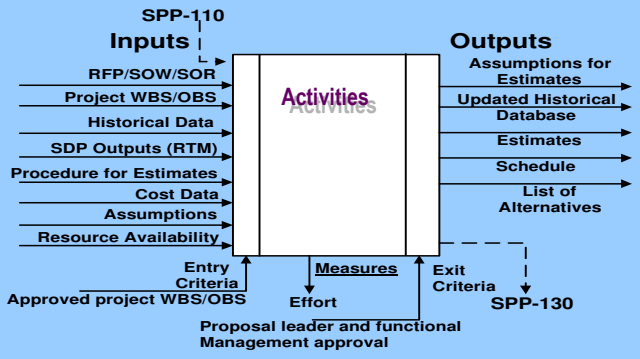
- THIRD LEVEL OF THE PLANNING AND TRACKING PROCESS

STEP 120 - Prepare Estimates and Schedule



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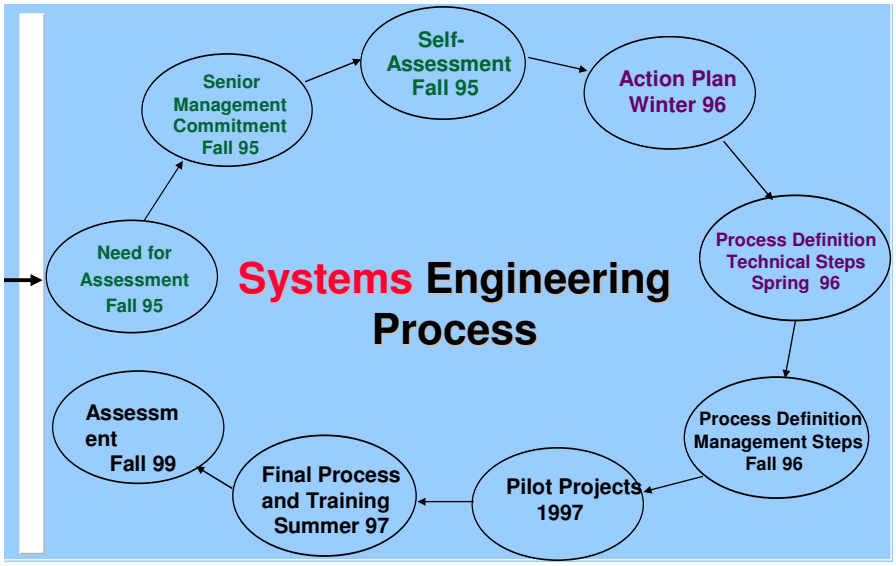

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SYSTEMS ENGINEERING PROCESS

- *Adapted from SPC's Generic Systems Engineering Process (GSEP)*
- *Process integrates both technical and engineering management activities*
- *Tailorable process*
- *Supports incremental development*

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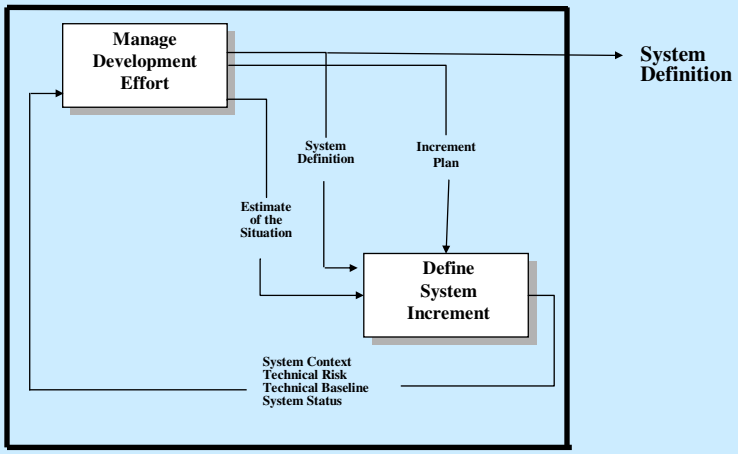
SYSTEMS ENGINEERING PROCESS



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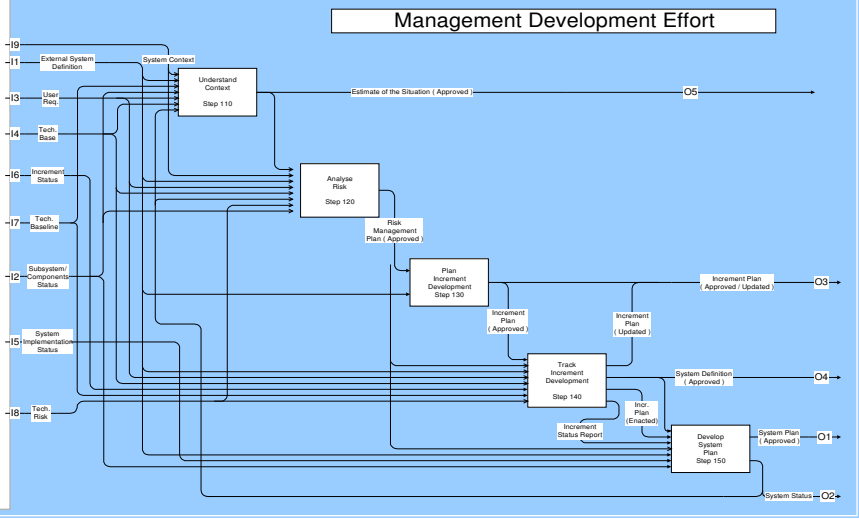
MANAGEMENT ACTIVITIES OF SEP



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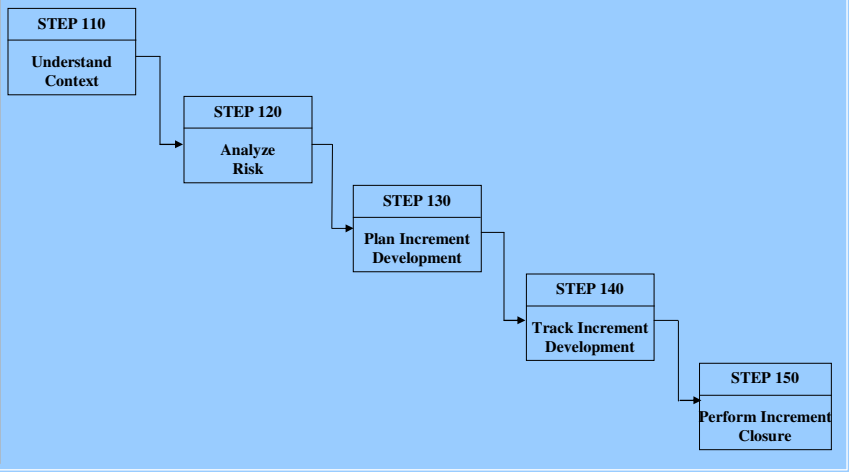

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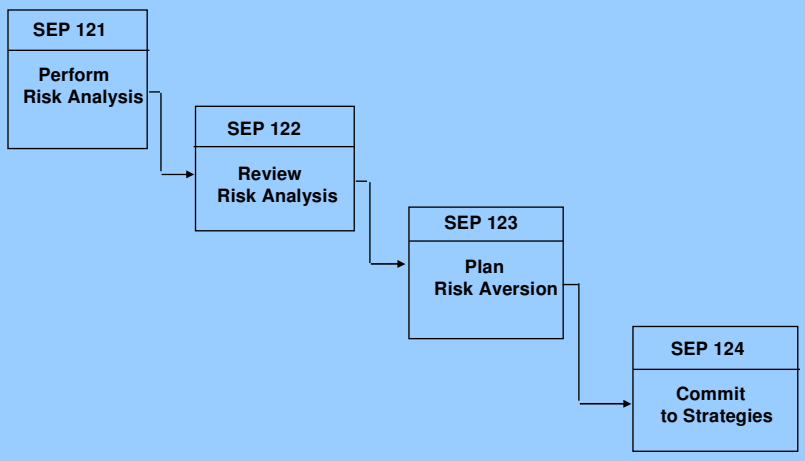
STEP 120 - Analyze Risk



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Step 120 - Analyze Risks

- Risk Management Plan
  - Risk Descriptions and Impacts
    - Budget overrun, schedule delays, integration risks due to concurrency, new technologies
    - Documented, updated and stored in a database
  - Mitigation Strategies
    - Pilot projects, engineering models, mock-ups
    - Analyses
    - Component and subsystem modeling
    - Training
    - Reviews with stakeholders

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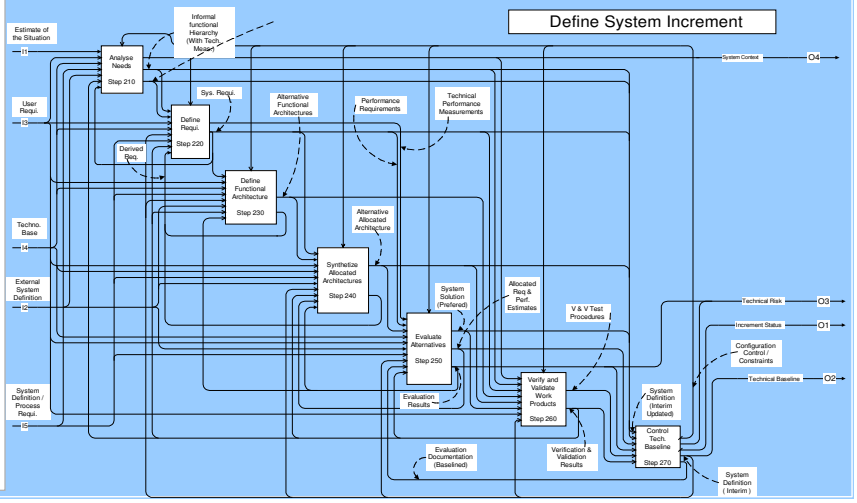
■ TECHNICAL ACTIVITIES OF SEP



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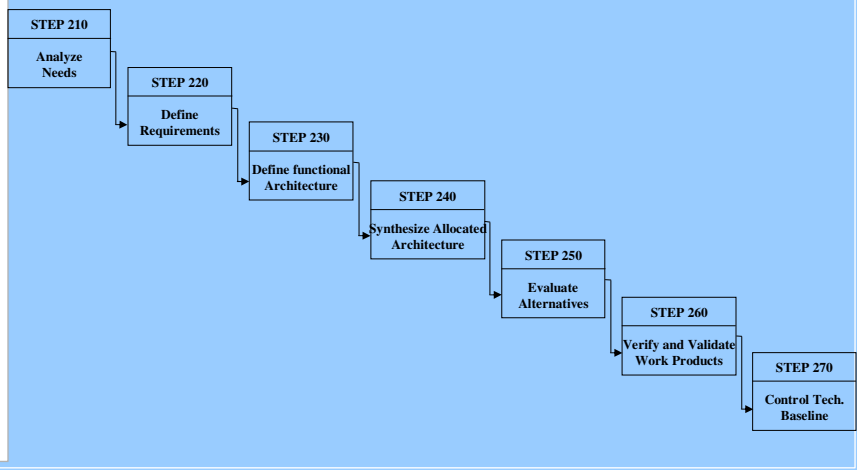
■ TECHNICAL ACTIVITIES OF SEP



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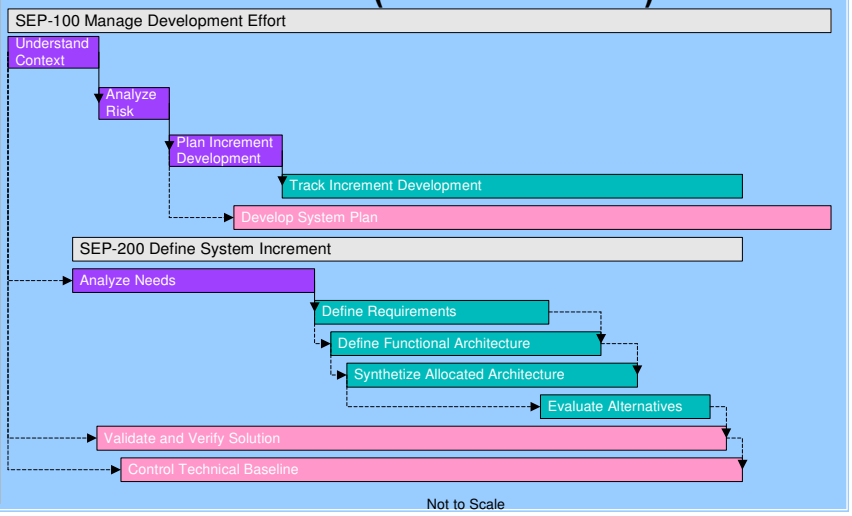
■ A SEP INCREMENT (*THE REAL LIFE*)



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■ INTEGRATED SYSTEMS AND SOFTWARE ENGINEERING PROCESS

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

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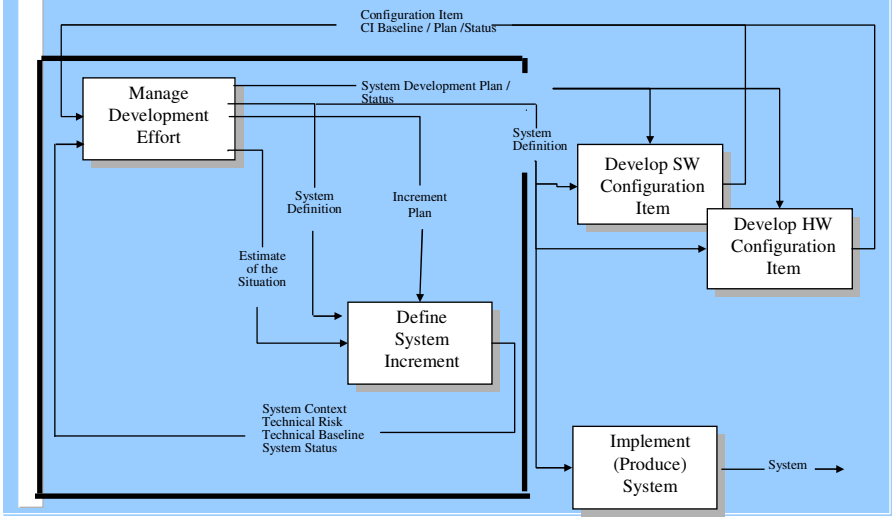
■ INTEGRATION of PROCESSES



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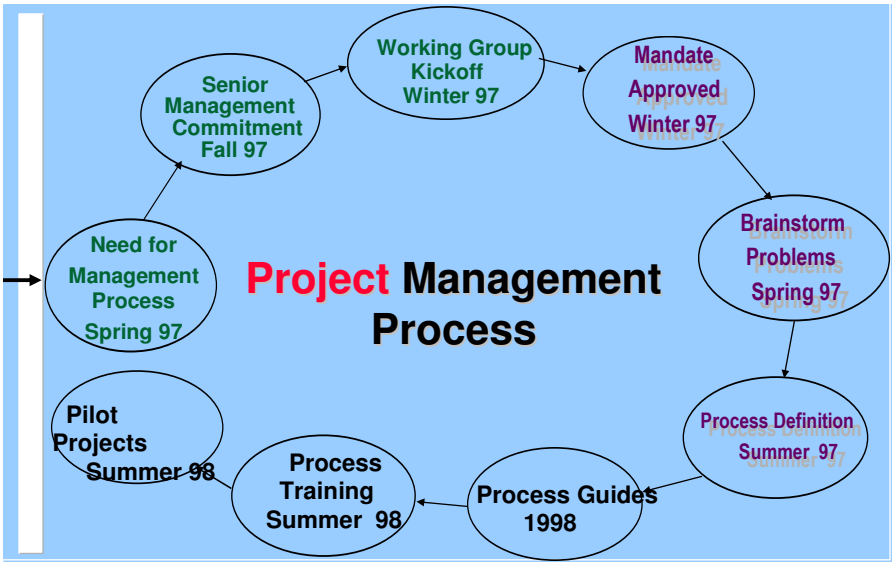

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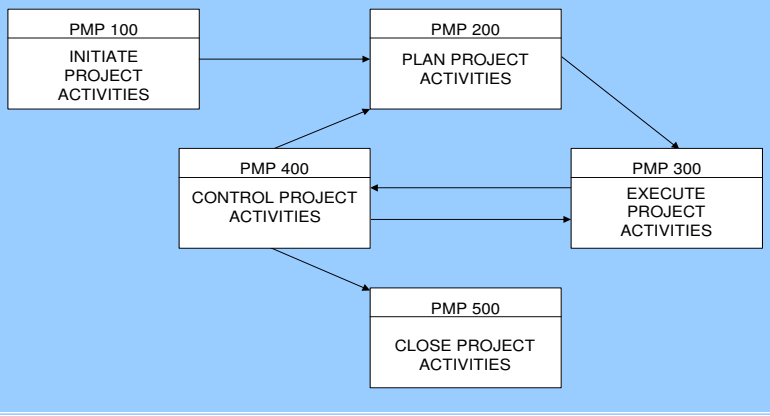
■ PROJECT MANAGEMENT PROCESS

- *Adapted from the Project Management Institute*



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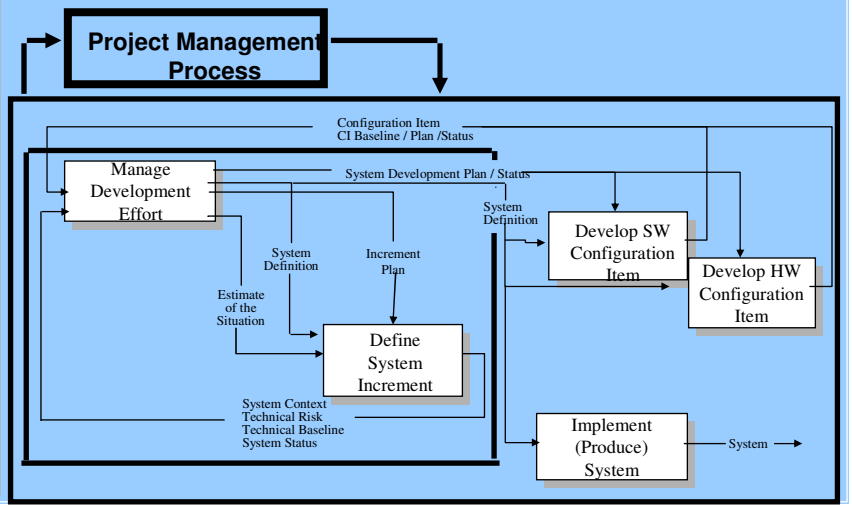
■ PROJECT MANAGEMENT AND ENGINEERING



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INTEGRATION FACILITATORS

- Common Process Development Approach
  - 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 tools integrated into a consistent environment.
  - Train personnel to use these processes, methods, and tools.

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Integration Facilitators Processes

- *Common Process Description*
  - ⇨ Policies, Standards and Procedures
  - ⇨ Inputs and Outputs
  - ⇨ Entry and Exit Criteria
  - ⇨ Activities
  - ⇨ Specified Roles
  - ⇨ Measurements
  - ⇨ Templates and Checklists

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INTEGRATION FACILITATORS

- *Common Process Notation*
  - ETVX
- *Common Vocabulary*
  - e.g. prototype
- *Common Processes*
  - Documentation Management
  - Quality Assurance (Audits)
  - Configuration Management
  - Performance Management

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INTEGRATION FACILITATORS

- Organizational Process Oversight
  - Process Action and Coordination Team (PACT)
    - *Functions*
      - Establish objectives for organizational processes
      - Liaise with other executives
      - Provide support for process improvement activities
      - Review results of audits or assessments
      - Charter working groups
      - Monitor process performance
    - *Members*
      - Vice-Presidents (Project, Finance & Contract, HR)
      - Quality Assurance Manager
      - Process Coordinator

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Development and Integration Issues

INTEGRATION FACILITATORS

- *Organizational Process Oversight*
  - ⇨ Process Owners
    - *Focal point for process improvement activities*
    - *Review project plan tailoring*
      - If conflict between process owner and project manager, a senior manager or an executive will take decision
    - *Prepare Annual Process Improvement Plans*
    - *Report progress to Process Action and Coordination Team*

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INTEGRATION FACILITATORS

- Common Methods
  - ⇨ Structured Analysis and Design (SADT)
- Common Tools
  - ⇨ CORE
  - ⇨ Software through Pictures (StP)
  - ⇨ RTM

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- **Integration Facilitators**
  - **PROCESS ASSET LIBRARY**
    - Policies
    - Process Descriptions
    - Guides, Forms and Templates
    - Examples of Documents Produced
      - ⇨Business Cases
      - ⇨Proposals
      - ⇨Engineering Plans
      - ⇨Specifications
    - Tailored Processes
    - Lessons Learned
    - Charter of Process Engineering Groups
    - Training Material
    - Metrics (Process and Product)
    - Historical Data

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- **INTEGRATION ISSUES**
  - *Activities performed differently in different processes*
    - ⇨ e.g. risk management, development plans (e.g. software, system and project plans)
  - *Activities mandated by different frameworks*
    - ⇨ e.g. subcontractor management
      - *SW-CMM*
      - *SE-CMM*
      - *Body of Knowledge - Project Management Institute*
  - *Processes called by other Processes*
    - ⇨ Need well defined interfaces between processes

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PEOPLE ISSUES

- *To facilitate adoption*
  - ⇨ Process developed by future users
  - ⇨ Process developed by multi disciplinary teams
  - ⇨ Training of all users and people affected by a process
    - *e.g. for Systems Engineering Process*
      - system engineers, software engineers, design engineers, logistic support, quality assurance and configuration management
- *To facilitate utilization*
  - ⇨ Integration of people in a multi disciplinary team (IPT)

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PEOPLE ISSUES

- *To facilitate collaboration*
  - ⇨ Development of project charters
    - *Common Vision*
    - *Common Objectives*
    - *Common Methods*
    - *Known Responsibilities*
  - ⇨ Performance Management Process
    - *Behaviors are promoted and rewarded*
  - ⇨ Team development Approach
    - *Combination of work product development and "soft skills" development*

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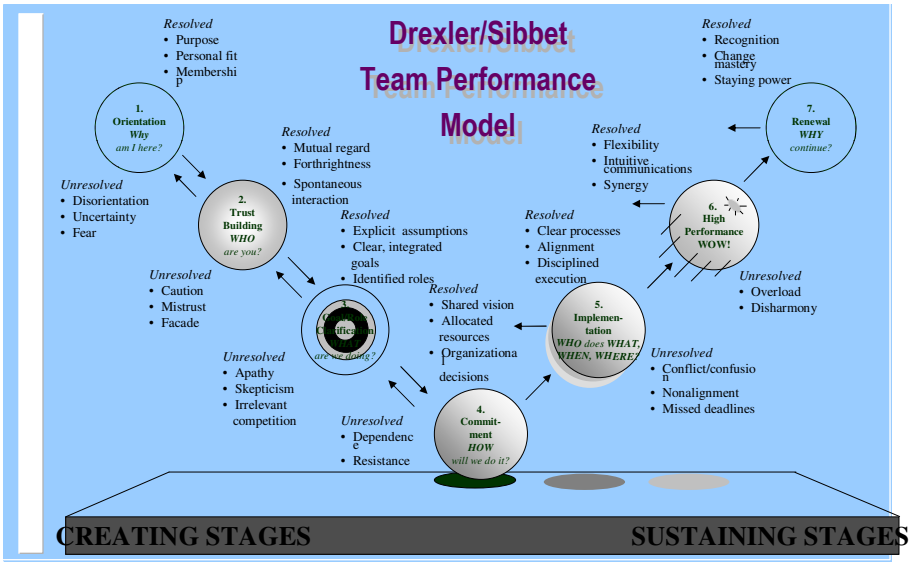

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- **PEOPLE ISSUES**
  - *Team Development Workshops*
    - ⇨ Why am I on this team ?
    - ⇨ Why are we on this team ?
    - ⇨ How do I contribute ?
    - ⇨ Who are our stakeholders and what are their needs and expectations
    - ⇨ How do we work together ?
    - ⇨ Who does what ?
    - ⇨ How do we prepare for success ?

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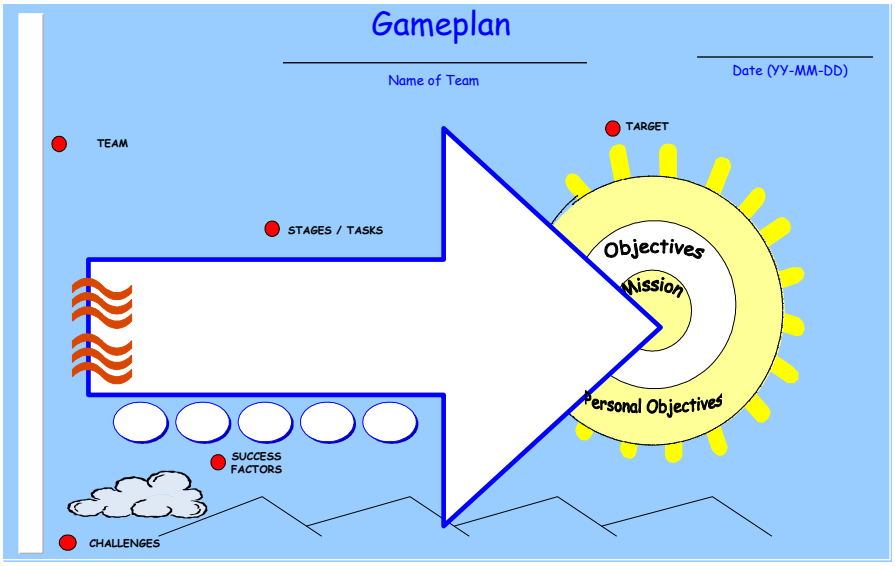

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■ PEOPLE ISSUES

- ***Transition Plans to Facilitate Technology Deployment***
  - ⇨ Establish a Transition Team
  - ⇨ Describe the Desired State
  - ⇨ Baseline the Current State
  - ⇨ Analyze the Gap
  - ⇨ Develop a Transition Management plan
  - ⇨ Roll Out the Solution(s)
  - ⇨ Analyze Lessons Learned

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Many of the problems or dysfunctions stem from operating out of the assumptions that parts, people or departments are separate and unrelated.

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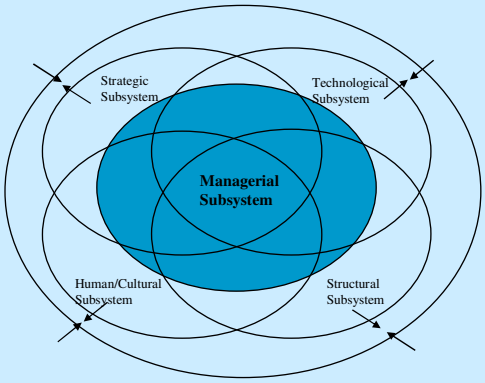
■ INTEGRATION ISSUES

● *A System View of the Organization*

Inputs:
- Human
- Financial
- Technological
- Material



Outputs:
- Products
- Services

Legend: ⟶⟵ Input-output flow of materials, energy, information

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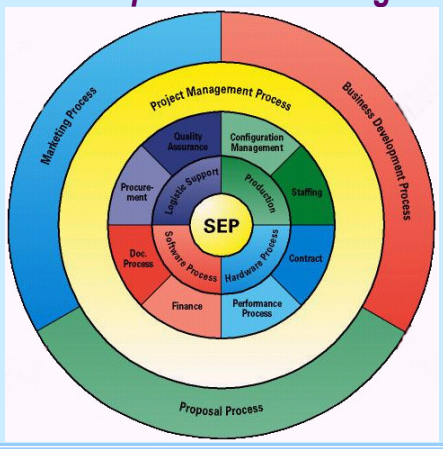
■ INTEGRATION ISSUES

- *A System Perspective of the Organization*



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■ LESSONS LEARNED

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

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■ LESSONS LEARNED

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

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■ LESSONS LEARNED

- *If Possible Start from the Top Level Processes*
- Integration of Processes should be planned for at the beginning of a process initiative
- Organizational Culture is like a "sleeping lion". As soon as you start tampering with him, the lion will wake up and may start "showing his crows" to the challengers.

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NEXT STEPS

- *Integrating Engineering Processes with Project Management Process*
- *Electronic Process Asset Library on Local Area Network (INTRANET)*
- *Migration towards Integrated Product Teams*
  - ⇨ Modify Organizational Structure
  - ⇨ Clarification of Roles and Responsibilities
  - ⇨ Modification of Performance Management Process
    - *e.g. moving from individual performance evaluation to team performance evaluation and reward*

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CONCLUSION

- *OUR Organization is making substantial effort to define and improve both Engineering and Management Processes*
- *Significant Progress in Process Improvement also implies a Cultural Change in the organization:*
  - ⇨ 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"*