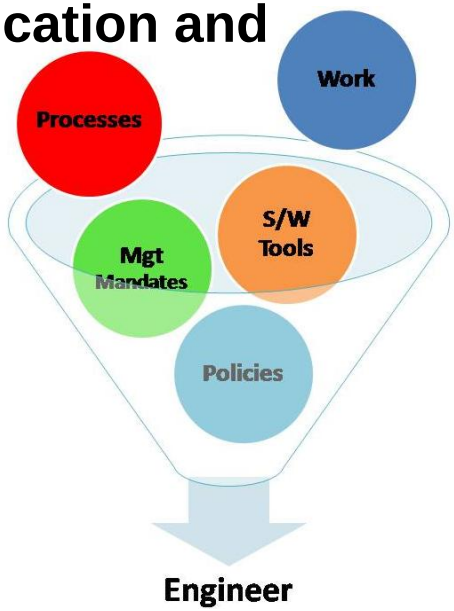
Ground Support Systems
Integrated Defense Systems

Improving Systems Engineering Execution and Knowledge Management

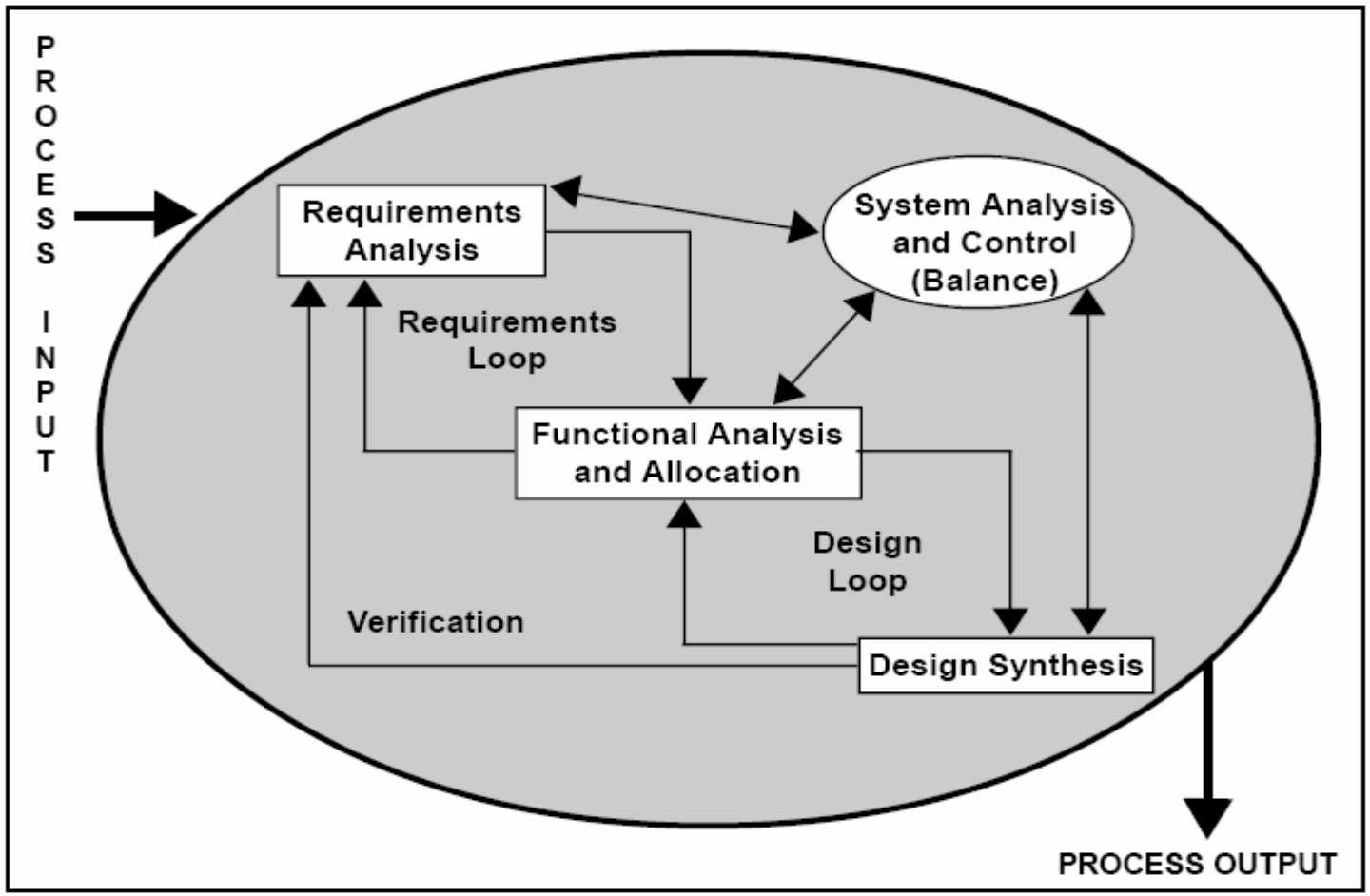
Steve Head

Objective

- **Refocus programs back to basic objectives of Systems Engineering execution including oversight of product developmental life cycle**
  - Requirements, design, implementation, test, delivery, product feedback and sustainment
- **Identify methods of simplifying and presenting key domain knowledge (need to know) to the engineer**
  - Processes, procedures, and technical
- **Provide simplified approaches to improve communication and better manage products and teams**
  - Use of web, database tools and improvement focals
- **Provide ability to better understand and manage products in an age of sometimes overwhelming conditions**
  - Reduce the apparent bottleneck caused by engineering teams interpreting the overlapping requirements and mandates



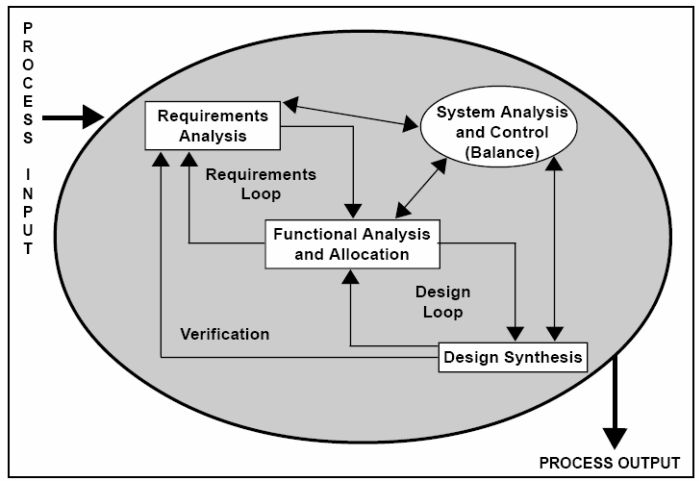
Traditional Systems Engineering



Source: Systems Engineering Fundamentals – DOD Publication, Defense Acquisition University Press

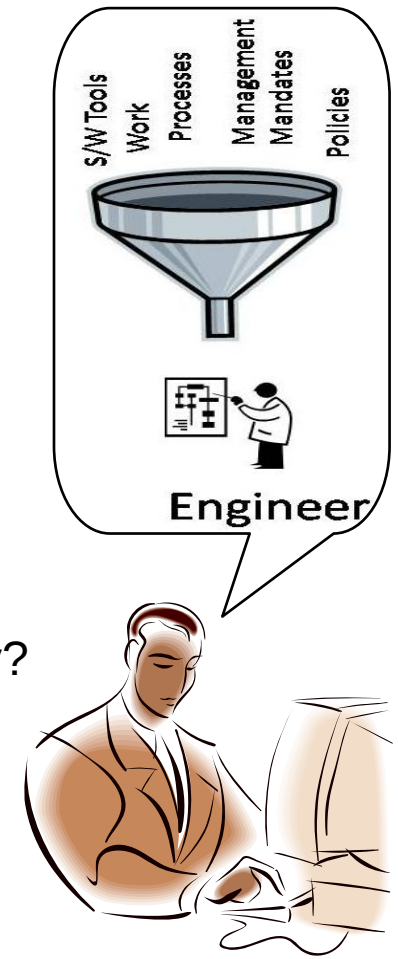
Traditional Systems Engineering Activities

- **Fundamental Systems Engineering Activities**
  - Requirements Analysis
  - Functional Analysis and Allocation
  - Design Synthesis
- **All balanced by techniques and tools called System Analysis and Control**
  - Track Decisions and Requirements
  - Manage Interfaces
  - Manage Risks
  - Track Cost and Schedule
  - Track Technical Performance
  - Verify Requirements
  - Review and audit progress



Can we improve Systems Engineering?

- **Processes, Procedures and Technical Information**
  - Decrease excess of supporting documentation including variations of same?
    - SEI CMM®, SEI CMMI®, corporate, program, team, etc
  - Legacy programs struggle?
    - Baseline to one set, then an “improved” set is flowed down (sometimes before the initial baseline is completed)
  - Identify specific information related to engineering role?
    - Easy to get lost and confused
- **Systems Engineering Oversight**
  - Provide oversight during code/build to decrease chances of major rework down the road?
  - Evaluate metrics at developmental stages and post delivery?
    - Build upon successful program practices and lessons learned
    - Continuous improvement
  - Utilize Improvement Councils with dedicated focals?

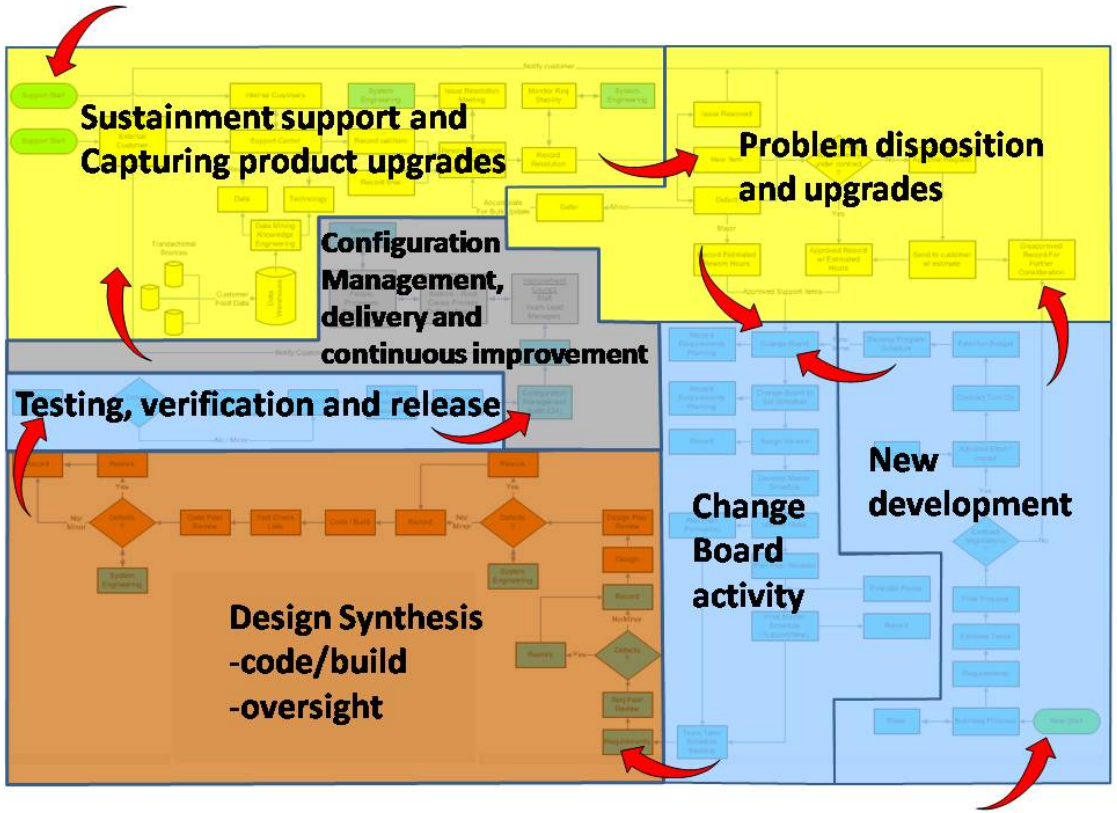


Previous Assessment Findings

- **Quick Assessment Guidelines**
  - Begin with quick assessment of group developmental status
  - Identify common and unique enterprise software tools
  - Identify artifacts, processes, procedures and supporting documentation
  - Identify all change boards and other review boards
  - Identify methods for group communication and status
- **Results of Evaluation**
  - Determined that many processes, procedures, and documentation were already in use accessible via program only
  - Programs were collecting some information (give credit where credit is due)
  - Included common and unique tools such as Finance/Budgeting, Earned Value System, Risk Tracking, Quality and Selloff documentation, Requirements tracking, Change Process/CCB, and some levels of metrics
  - Big picture of program not always apparent to team members

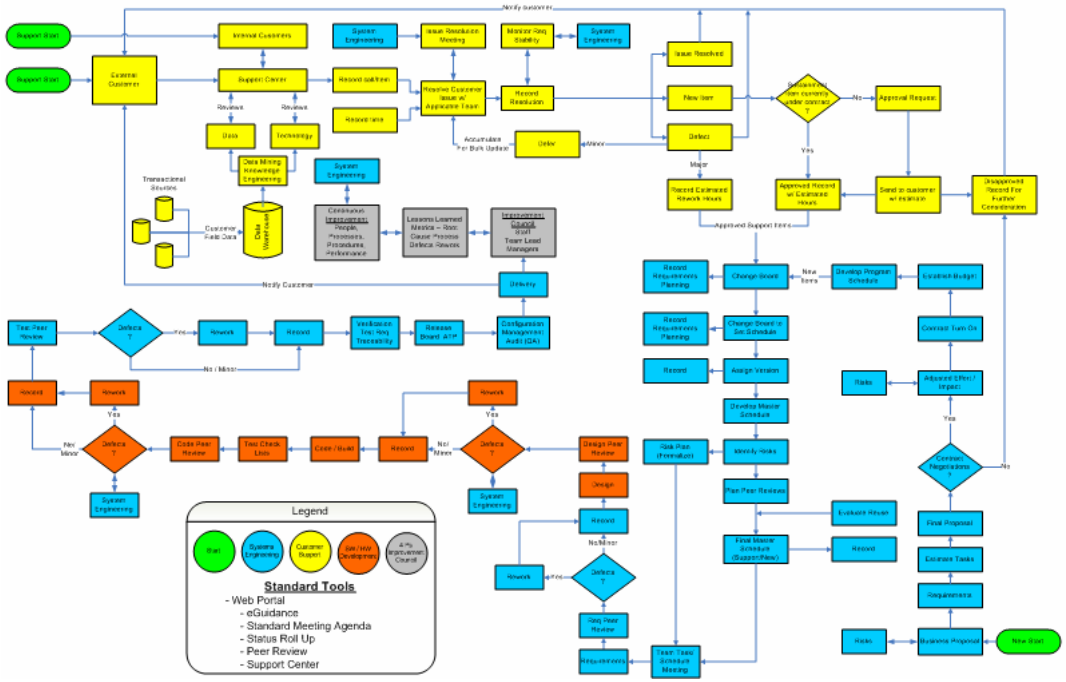
Focus on Following Standard Work Flow

- Engineering development should follow a basic work flow
- Problems occur when basic development steps are marginalized, minimized, or omitted



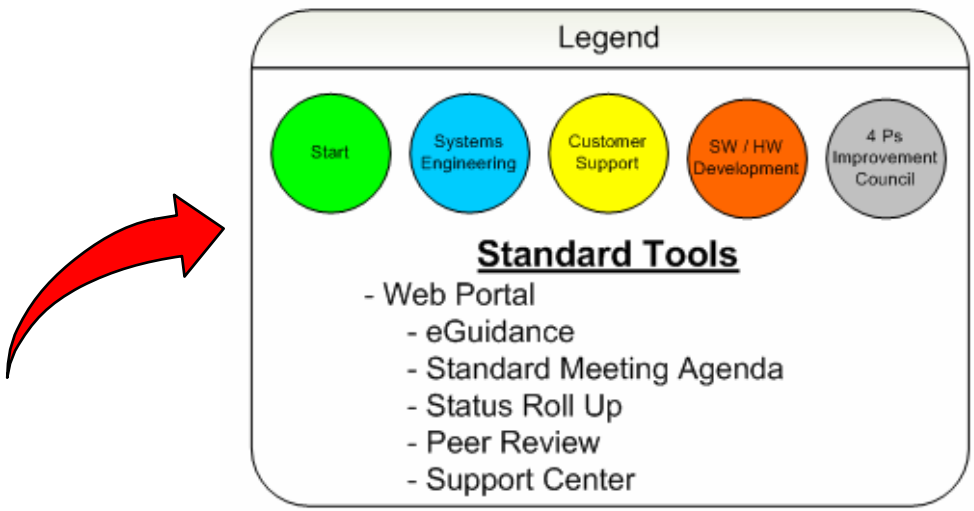
Work Flow Visualization

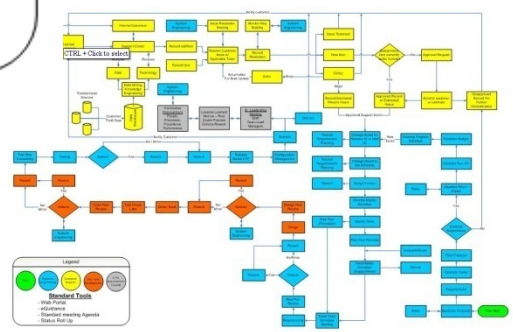
- **Provides the stakeholders with complete color coded work flow of both <u>new</u> products and sustainment of <u>existing</u> products**
- **Visually enhances ability of the stakeholders to better understand dynamics of how to improve systems engineering execution and business discipline knowledge management**



Work Flow Visualization (cont)

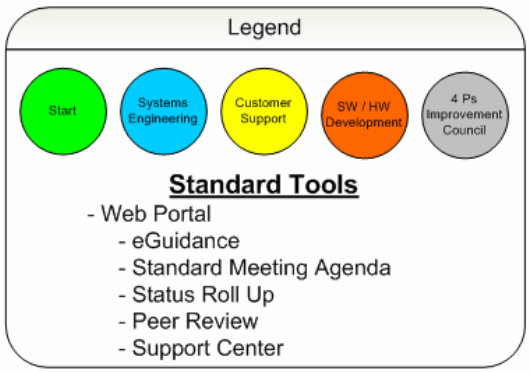
- **Legend provides color coded element identifiers**
- **Standard tools - lists web-based methods for maintaining same information gathering throughout the organization**

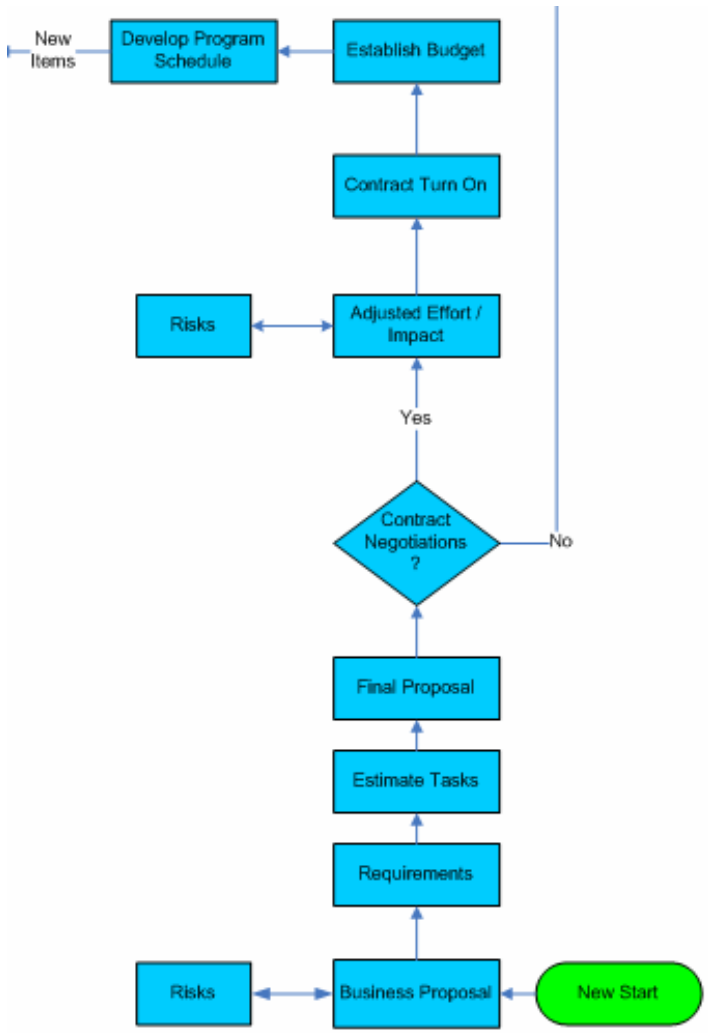




Work Flow Visualization (cont)

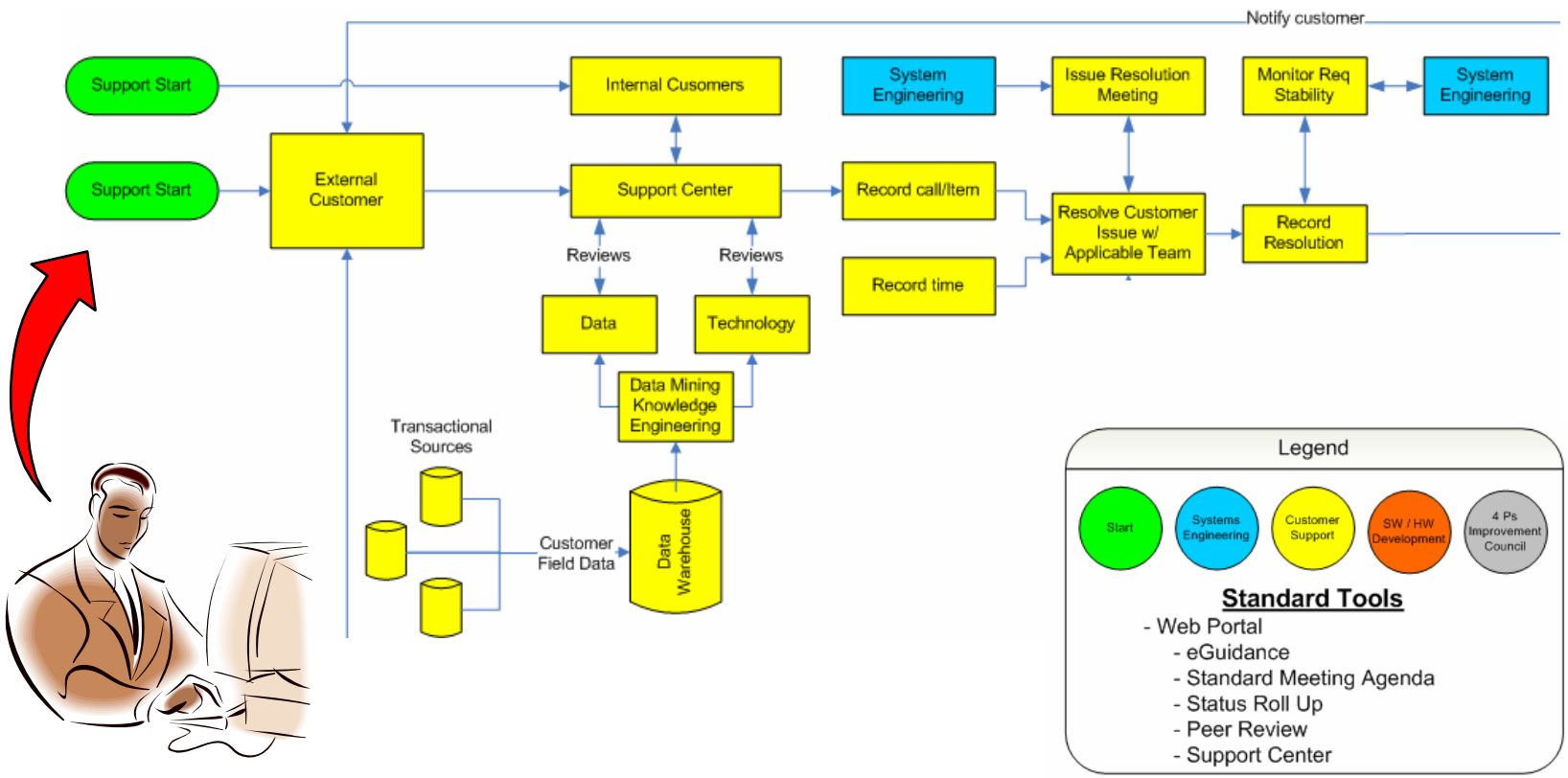
- **Start for new development Section**
  - Entry point for new business





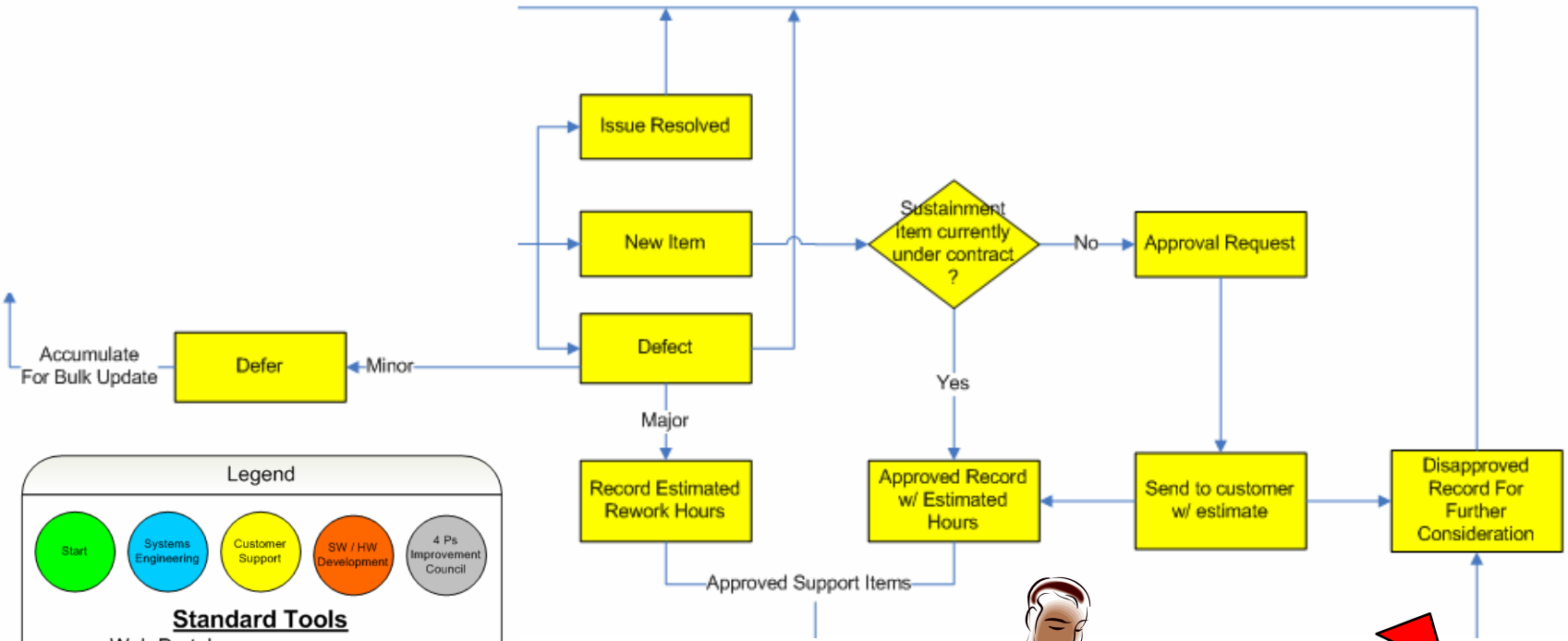
Work Flow Visualization (cont)

- **Sustainment support and capturing product upgrades**
  - Represents methodology for acquiring follow-on business



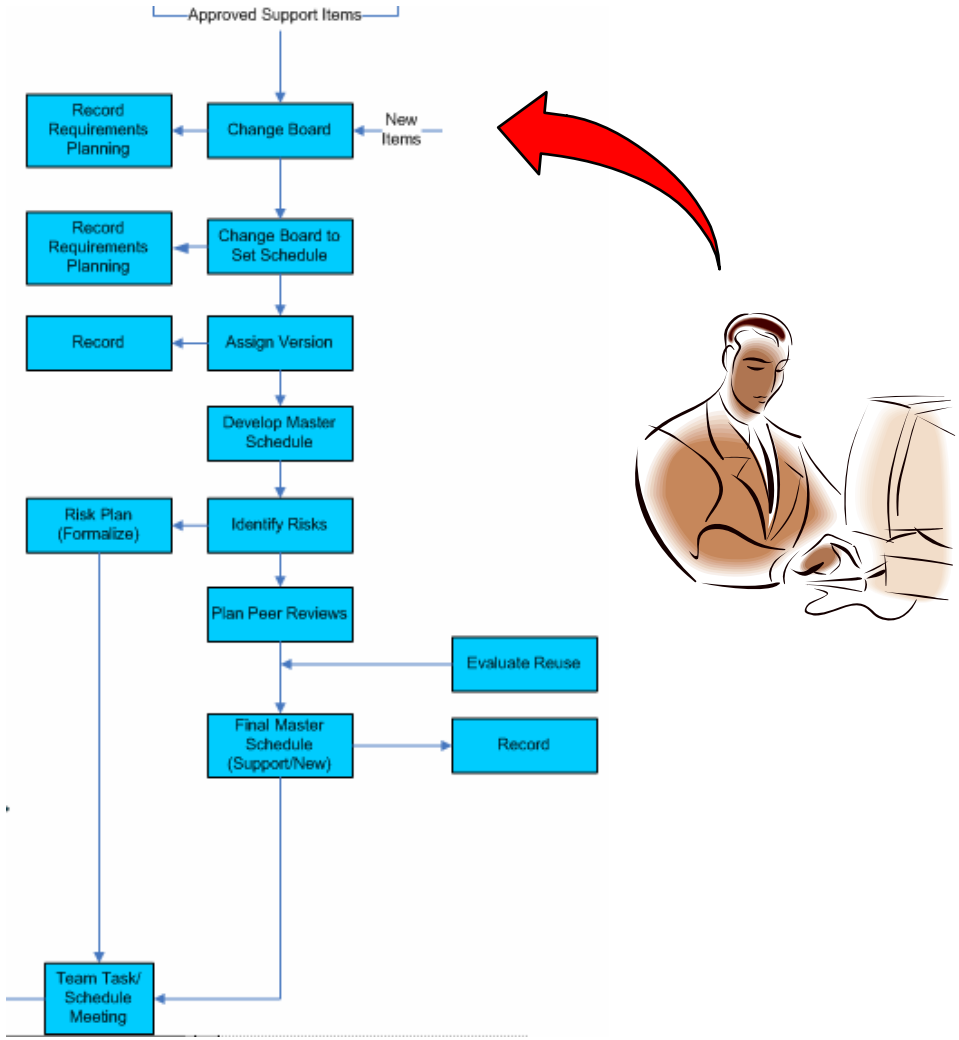
Work Flow Visualization (cont)

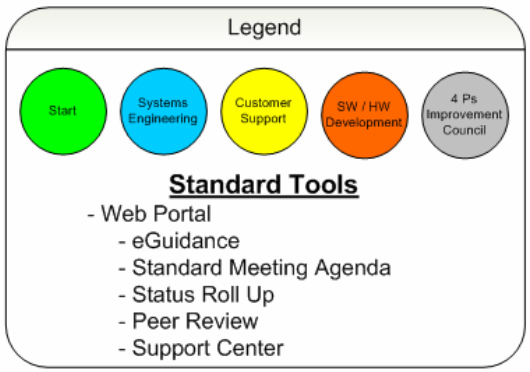
- **Section addresses support center, problem disposition and upgrade funding**



Work Flow Visualization (cont)

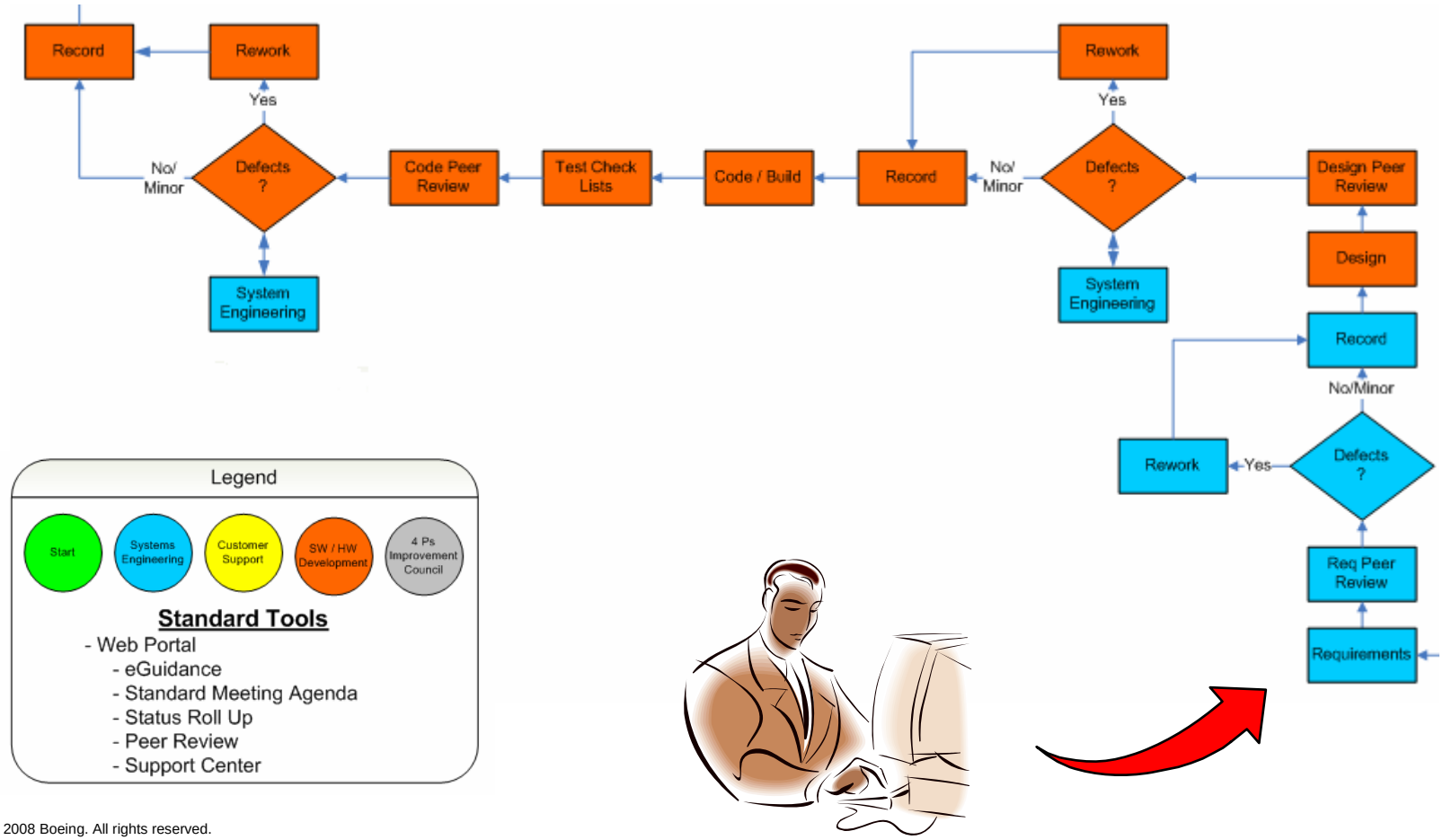
- **Section for Change Board activity**





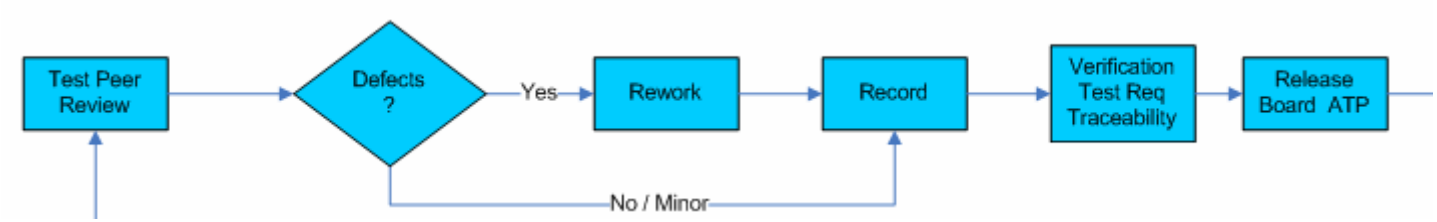
Work Flow Visualization (cont)

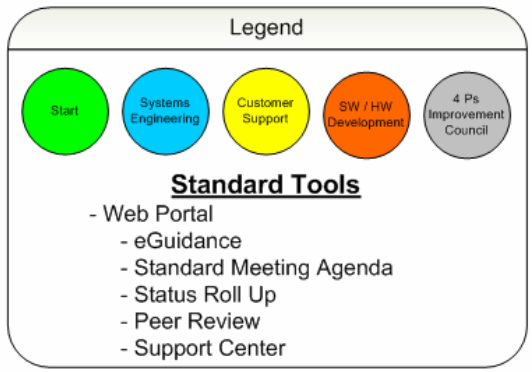
- **Design Synthesis - code/build oversight**



Work Flow Visualization (cont)

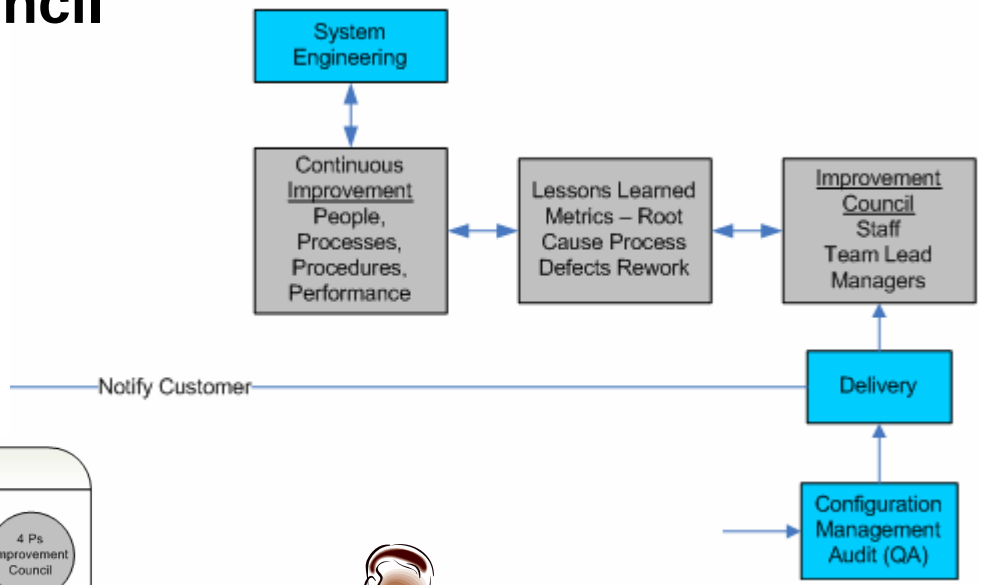
- **Testing, verification and release**

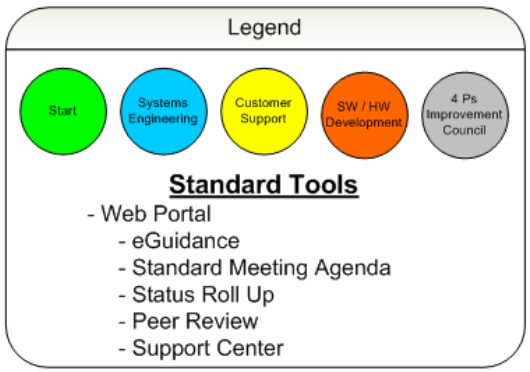




Work Flow Visualization (cont)

- **Configuration Management, delivery and continuous improvement**
- **Improvement Council**





Work Flow Visualization Benefits

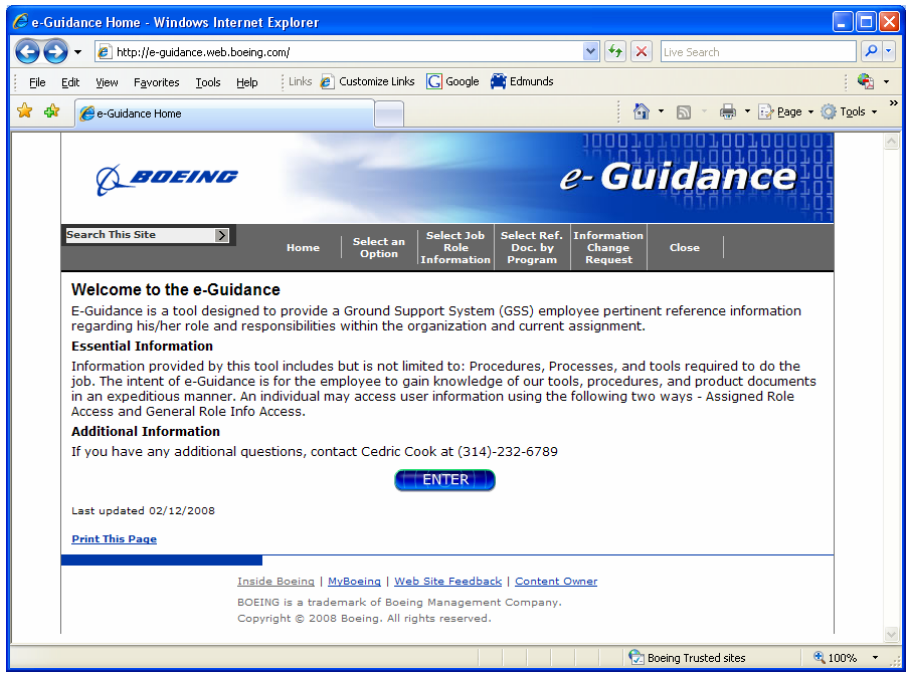
- **Identifies major steps in development that will remain during organizational process change activity**
  - Engineer better informed as to what his or her role is for product development
  - Influence to product delivery
- **Associated processes may change, but work flow stays consistent**
  - Minor adjustments made for that role for that task
- **Communication across specialties improved**
  - Work flow task
- **Importance of work flow task provides increased importance on work product artifact, at that stage**
  - Improve peer review effectiveness
  - Decreases chance of out of phase defects
  - Increases chance of in phase defects found

Knowledge Management

- **Linking and sharing of related information between business disciplines**
  - Improves systems engineering influence and maturity
  - Improves oversight of quality
  - Increases timeliness of applicable decision making processes
  - Directs engineer to key “need to know” information
  - Protects engineer from overwhelming sensation of “nice to know” information
  - Reduces bottleneck

Knowledge Management (cont)

- **Electronic guidance or eGuidance**
- **Key "need to know" information provided by a web based tool**
  - Procedures, Processes, and tools required to do the job
  - E-Guidance is a tool designed to provide an employee relevant reference information regarding his/her role and responsibilities within the organization and current assignment
  - Intent of e-Guidance is for the employee focus learning of necessary tools, procedures, and product documents in an expeditious manner



Standard Tools to Consider

- **Common Web Portal**
  - Meeting Agenda
  - Meeting Minutes
  - Status with applicable roll up to various levels of leadership
  - eGuidance
  - Peer Review
  - Support Center

Summary

- **Challenge**
  - Implement an effective method of improving systems engineering execution and knowledge management across specialties
  - Maintain control of chaotic situations that impact base lined work flow
  - Insure communication of activities are readily available up and down the organizational chain
- **Solution**
  - Build on past studies and lessons learned for continuous improvement
  - Develop visualizations of major business work flow elements
  - Map the employee role to the documentation that is needed
  - Develop standard meeting agendas that represent full process compliance
  - Utilize the latest technology to lessen the bottle neck affect of key domain technical documentation of the team and specific roles
- **Future Benefits**
  - More robust program managers
  - Knowledge builds upon knowledge