



Overview

- Risk and Requirements
- Winning Product vs Risk
- Scope Risks
- Requirement Risks
- Requirement Management Risk
- Parting Thoughts

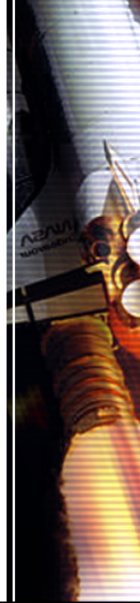


What's Coming Next

Risk and Requirements



3



NASA OIG

- NASA must be vigilant in its process of establishing and validating project requirements.
- Program risks increase when NASA awards contracts before developing a sound business case and clearly defining requirements;
 - Placing the project at risk of significant cost overruns, schedule delays, and performance shortfalls.
- Effective risk management, safety, and mission assurance controls are key to supporting robust and reliable operations in the context of very challenging launch and mission schedules.



NASA's Most Serious Management and Performance Challenges – Nov 2008

4



Risk and Requirements Presentation to TGCC 091709

GAO

- The start of product development represents the point at which program managers make a commitment to provide a product that will perform as required and be delivered on time and within estimated costs.
- Programs are more likely to succeed if program managers are able to achieve a match between user needs, which eventually become requirements, and resources (technology, design and production knowledge, money, and time) at the start of product development.
- Conversely, if they do not match requirements with resources, cost overruns and schedule delays are likely to occur, reducing the organization's buying power in other areas.



GAO-03-598

5

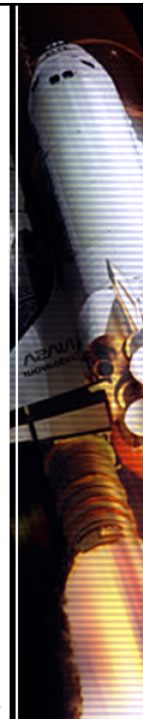


“Losing sight of requirements is often the first step on the road to projects that come in over budget, are late, do not meet specifications or are canceled.”

**Standish Group CHAOS Chronicles
2003 report**



6



Risk and Requirements Presentation to TGCC 091709

“According to new research, success in 68% of technology projects is “improbable.” Poor requirements analysis causes many of these failures, meaning projects are doomed right from the start. The solution lies in recognizing that requirements definition is critical.”

Michael Krigsman of ZDNet.

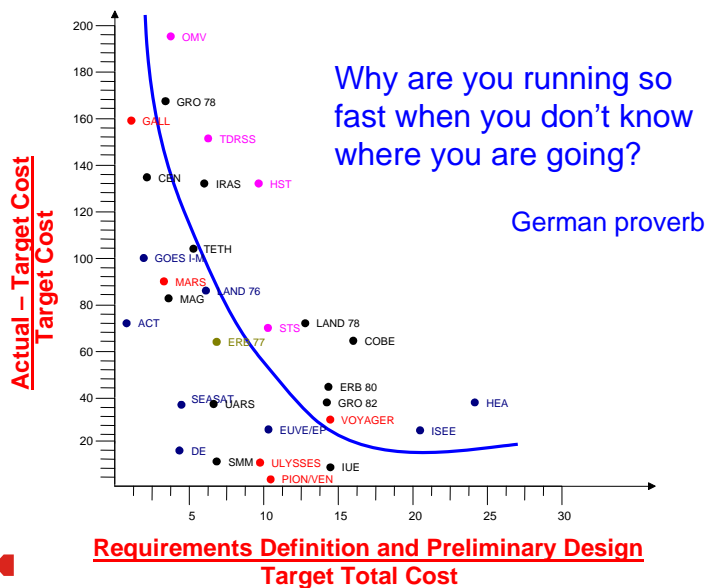
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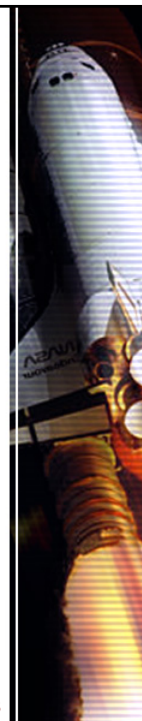
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Effect Of Requirements Definition Investment On Program Costs

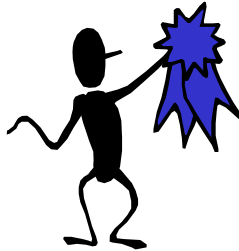


8



What's Coming Next

Winning Product vs Risk

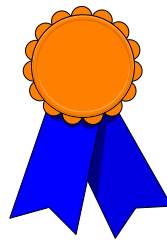


10



A Winning Product

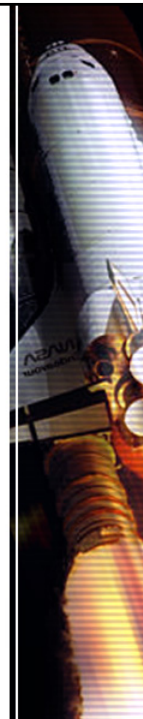
- Delivers what's needed
- Within budget
- Within schedule
- With desired quality



Risk: Anything that can prevent you from delivering a winning product!



11



Risk and Requirements Presentation to TGCC 091709

What are risks?

- Risks are something that could have an impact on your product or subsystem (hazard or threat)
- Two major components
 - Likelihood
 - Impact/Consequence

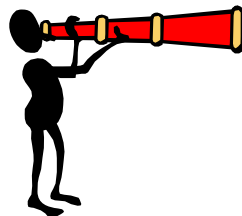


12



What's Coming Next

Scope Risk



13



Scope Risk Factors

- Failure to define Scope
 - Product purpose/use not well understood
 - Stakeholder's expectations not met
 - Vague or undefined desired outcomes
 - Lack of direction/Lack of vision
 - Conflict
 - Constant Change
 - Insufficient knowledge to write requirements
- Failure to involve relevant stakeholders
 - Missing requirements
 - Incorrect information
 - To many assumptions



14

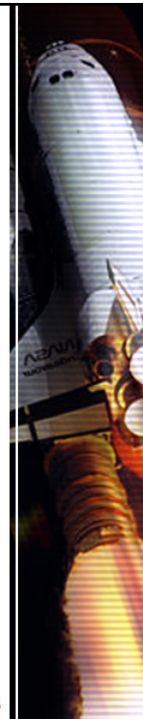


Scope Risk Factors (2)

- Failure to identify drivers and constraints
 - Missing requirements
 - Non compliance
 - Rework
 - Won't work with existing systems
- Failure to define a feasible concept to meet the stakeholder needs
 - Stakeholder expectations not met
 - Lifecycle stage requirements missing
 - Lack of robustness handle off-nominal cases
 - Cost & schedule impacts
 - Scope creep



15



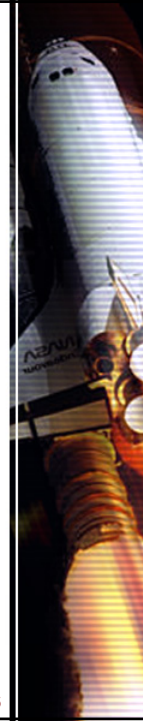
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Scope Risk Factors (3)

- Failure to define product boundaries and external interfaces
 - Do work you don't need to do
 - Leave out work you should have done
 - Fail to work when interacting with other systems
- Failure to baseline scope before writing requirements
 - Uncontrolled change
 - Scope creep
 - Conflict
 - Inconsistent, incorrect, and incomplete requirements
 - Cost & schedule impacts



16



Identify Scope Risks

- Do we have product boundary questions?
- Have we missed a key stakeholder?
- Have we missed a product life-cycle phase?
- Are there areas of strong disagreement?
- Are there technical issues?
- Are there schedule issues?
- Are there cost issues?
- Are there any resource availability issues?
- Are there too many uncertainties?



Yes = High risk

No = Low risk

17



Mitigating Scope Risk

- Develop a clear vision
 - Identify the Need
 - Define clear goals and objectives
- Identify and involve relevant stakeholders
- Identify and manage drives and constraints
- Develop operational concepts
- Identify and manage external interfaces
- Identify and manage scope risk
- Baseline Scope following MCR guidelines



MCR: Mission Concept Review

18



What's Coming Next

Requirement Risk



19



Requirement Risk Factors

- Requirement not necessary
 - Increase requirement management cost
 - Increase project cost
 - Less resources for needed requirements
- Requirement not verifiable
 - Wrong implementation
 - Stakeholder expectations not met
 - Incorrect verification (verify wrong thing)
- Requirement not attainable
 - Cost
 - Schedule
 - Technology



20



Something to Think About

**A quick and inexpensive way
to improve testing**

***Bell Labs and IBM
studies have determined***

***80% of all defects
are inserted
in the
requirements phase***

**— Testing Techniques
Newsletter**



21

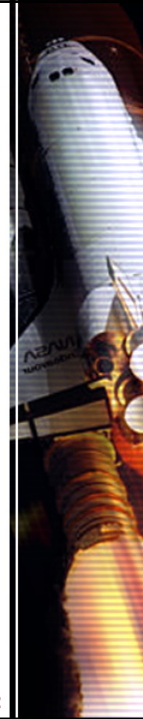


Requirement Risk Factors (2)

- Requirement can be understood more than one way (ambiguous)
 - Wrong implementation
 - Stakeholder expectations not met
 - Incorrect verification (verify wrong thing)
- Requirement(s) incomplete
 - Requirement can not be implemented
 - Stakeholder expectations not met
 - Non-compliance with drivers and constraints
 - Won't interface correctly with other systems



22



Requirement Risk Factors (3)

- Requirement reflects implementation
 - Real requirement not addressed
 - Could be a wrong level
 - Restricts solution space
- Requirement(s) subject to change
 - Rework (impact on cost & schedule)
 - Non-compliance
 - Conflict
 - Wrong requirement implemented
 - May not interface correctly with other systems

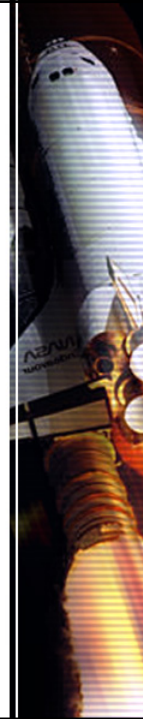


23

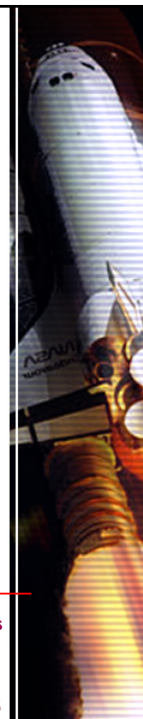
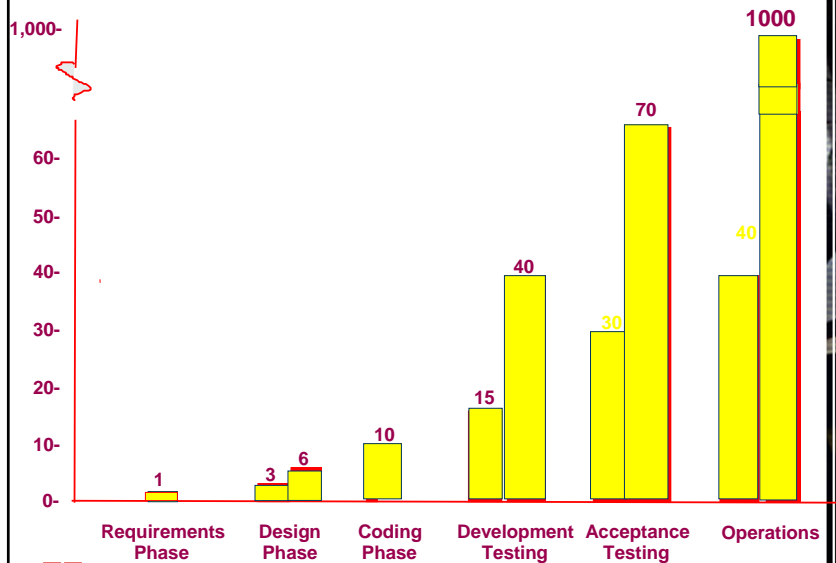


Requirement Risk Factors (4)

- Requirements not allocated (flowed down)
 - Requirements not implemented
 - Gold plating – requirement not needed
 - Could miss an internal interface
 - Incomplete change assessment
- Requirements not traceable to a parent
 - Gold plating – requirement not needed
 - Incomplete change assessment
 - Parent requirement not properly implemented



Cost to fix requirement defects



Mitigating Requirement Risk

- Define and enforce a requirement development process
- Follow the Writing Good Requirements Checklist
- Include key attributes: rationale, traceability, verification method, allocation, priority, risk
- Train your requirement development team, management, developers, testers, reviewers
- Practice continuous requirement validation
- Identify and manage requirement risk
- Baseline Requirements per the SRR guidelines



SRR: System Requirement Review

26

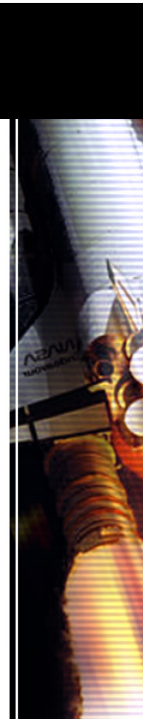


What's Coming Next

Requirement Management Risk



27



Requirement Management Risk Factors

- Not enough time and resources allocated to define and baseline scope
 - Scope risk factors
 - Lack of feasible concept to meet expectations
 - Scope creep
- Not enough time and resources allocated to develop and baseline requirements
 - Requirement risk factors
 - Lack of direction to developers
 - Requirement creep



28



Requirement Management Risk Factors (2)

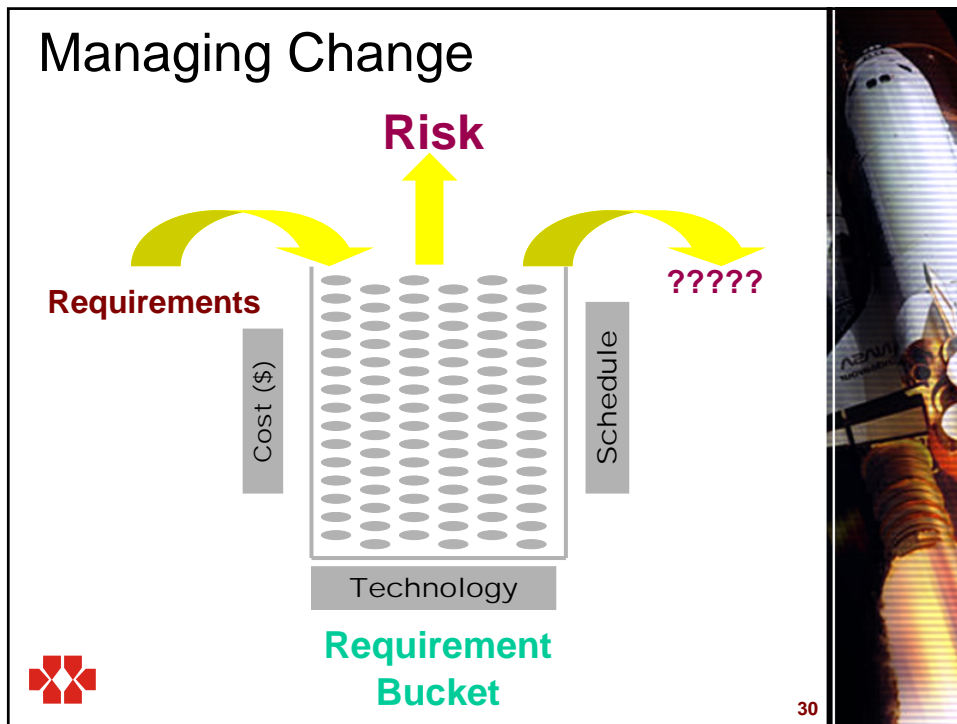
- No official process/process not followed
 - Wasted resources
 - Scope risk factors
 - Requirement risk factors
- Poor change management
 - Uncontrolled change
 - Unnecessary rework
 - Scope creep
 - Requirements creep
 - Budget and Schedule impacts



29



Risk and Requirements Presentation to TGCC 091709



- ### Mitigating Requirement Management Risk
- Allocate sufficient time and resources to define and baseline Scope
 - Allocate sufficient time and resources to develop and baseline requirements
 - Develop and enforce a formal requirement development and management process
 - Use allocation and traceability to manage requirements
 - Train team in the process
 - Manage change
- A red logo is in the bottom left corner, and the number '31' is in the bottom right corner.

Mitigating Change Risk

- Do the best job you can the first time
 - Define and baseline your scope before writing requirements
 - Do not baseline a bad document
 - Put as much rigor in the baseline as in the changes that will follow
- “Design for change”
- Establish criteria for change

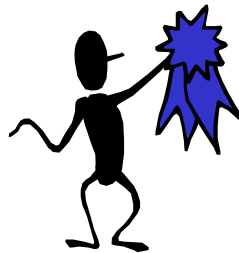


32



What's Coming Next

Wrap up



33



Putting Requirement Risk in the Proper Perspective

Not to put too much pressure on you....

- The Requirements Document is probably the single most influential piece of paper that we have control over in the entire Constellation Program.
- This is our chance to make sure that we are asking for what we really want. Let's get it right.
- This is a big, fat, hairy deal. If we don't get this right, folks 20 years from now will be shaking their heads and saying, "What were those yahoos thinking?"
 - I'll be around and don't want to go to that meeting.



CxP EVA Suit PGS Team Requirement Kickoff Mtg 5/2007

34

No Surprises

**People who write bad requirements
should not be surprised
when they get bad products**



**But they
always are.**

Ivy Hooks



35



Parting Thought

"Putting forth the same effort, or using the same approach, then expecting different results is...insanity"
- Charles Bolden,
NASA Administrator, July 2009



36

