



M&S Credibility Questions

6/2/09



Core Questions



- Is the M&S Verified?**
- Is the M&S Validated?**
- Is the M&S Appropriate (Accredited) for the Intended Use?**
- How Reliable are the Inputs to the M&S?**
- How Confident are the Analysts in the Results?**
- Has the M&S been used before?**
- Under what controls were the M&S developed?**
- How Qualified are the Analysts?**



Ideal Answers - *Risk of use is low.*



- Is the M&S Verified? *NPR-7150.2 Documentation Suite, S/W Independent Verification and Validation*
- Is the M&S Validated? *M&S Verification and Validation Report*
- Is the M&S Appropriate (Accredited) for the Intended Use? *M&S Conceptual Model approved (or accredited) by decision authority prior to use.*
- How Reliable are the Inputs to the M&S? *Input data certified to represent the system by the project office and technical authority.*
- How Confident are the Analysts in the Results? *NASA-STD-7009 Credibility Assessment Scale Factors for Results Uncertainty and Robustness*
- Has the M&S been used before? *The M&S has extensive use history with NASA and industry.*
- Under what controls was the M&S developed? *The M&S were developed by a CMMI level X organization.*
- How Qualified are the Analysts? *Analysts are qualified in the field and experience or trained on the specific M&S*



Other Answers - *Risk of use is medium*



- Is the M&S Verified? *Show S/W test documentation (Plans, procedures, results reports).*
- Is the M&S Validated? *Show Validation Report including referents (analyses, test data, similarity comparisons).*
- Is the M&S Appropriate (Accredited) for the Intended Use? *Approval (Accreditation) by management to use the model.*
- How Reliable are the Inputs to the M&S? *Show data sources and references.*
- How Confident are the Analysts in the Results? *No assessment has been performed.*
- Has the M&S been used before? *The M&S has been used by the project on previous analyses.*
- Under what controls was the M&S developed? *The M&S were developed by an organization not rated against industry M&S development standards .*
- How Qualified are the Analysts? *Developers were the analysts, analysts were trained on the M&S, analysts have extensive experience using the M&S, results were peer reviewed.*



Bad Answers - *Risk of use is high*



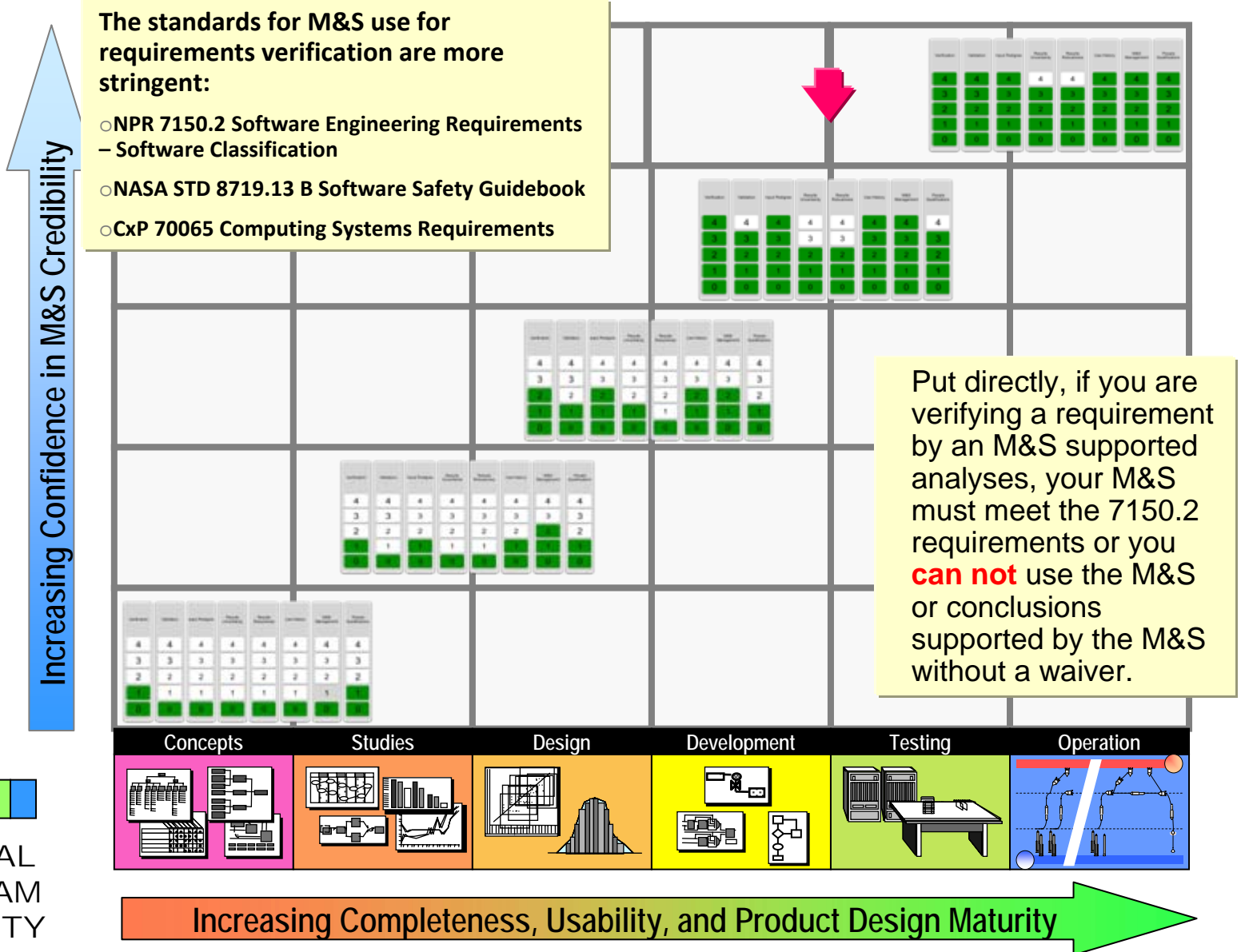
- Is the M&S Verified? *The M&S were tested informally. There are no records of the testing.*
- Is the M&S Validated? *The M&S has never been compared to real world referents or examples.*
- Is the M&S Appropriate for the Intended Use? *The M&S were chosen by default as “the only tool available”.*
- How Reliable are the Inputs to the M&S? *Input data taken from undocumented or uncontrolled source.*
- How Confident are the Analysts in the Results? *No assessment has been performed.*
- Has the M&S been used before? *The M&S has never been used by the project or anyone else.*
- Under what controls was the M&S developed? *The M&S were developed informally by an engineering organization with no formal M&S controls or processes.*
- How Qualified are the Analysts? *Analysts were using the tools for the first time.*



Credibility Requirements Increase as the Program Matures



Software SIG - SAVIO



NOMINAL PROGRAM MATURITY

Increasing Completeness, Usability, and Product Design Maturity



Documentation Required as a Function of Use



Software SIG - SAVIO

Most Stringent Requirements	Intended Use	Developmental Documentation Required															ESMD M&S IMDD VV&A Docs Req'd					
		Dev/Mgt Plan	CM Plan	Test Plan	Maint Plan	Assur Plan	Req Spec	Data Dict	Dgn Desc	I/F Dgn Desc	CR/PR	Test Proc	Users Man	Ver Desc Doc	Metrics Rpt	Test Rpt	Insp/Peer Rvw	Accreditation Criteria	Accreditation Plan	V&V Plan	V&V Report	Accreditation Report
<p style="text-align: center;">CXP 70073-01 CxP PMR - Vol 1 CM Requirements</p> <p style="text-align: center;">CXP 70076 M&S Requirements</p> <p style="text-align: center;">NASA-STD-7009</p> <p style="text-align: center;">NPR 7150.2</p>	Class A: Human Rated Software Systems	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
	Class B: Non-Human Rated Software Systems	X	C	X	C	X	X	C	X	X	X	X	X	X	X	X	C	X	X	X	X	X
	Class C: Mission Support Software Systems	C	C	C			C		C	C	C	C		C	C	C		X	X	X	X	X
	M&S Used for Critical Decisions		X	X								X		X		X		X	X	X	X	X
	M&S Used for Non-Critical Decisions													X								
Least Stringent Requirements	M&S Used for Ad-Hoc Analysis																					

Legend	
Required to meet	X
Required per Center defined process	C