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Acquisition Decision Framework:
embedding measurement in decision guidance

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Problem Addressed

- Fostering use of measurement in acquisition (mainly UK MoD, industry)
- Focus on Engineering Management

"Emerging Software and Systems Trends – What Are the Impacts on Measurement"

- Changing acquisition environment
- Evolving role of measurement

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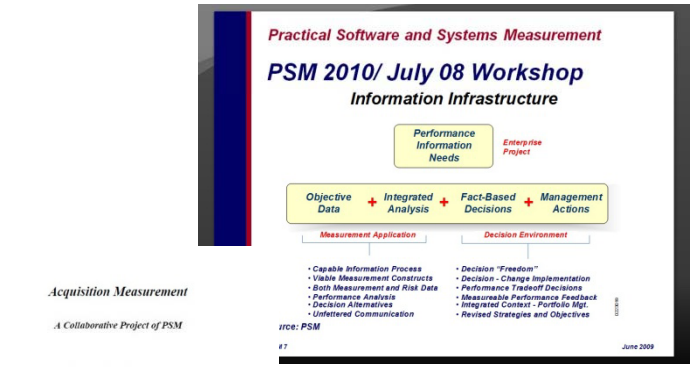
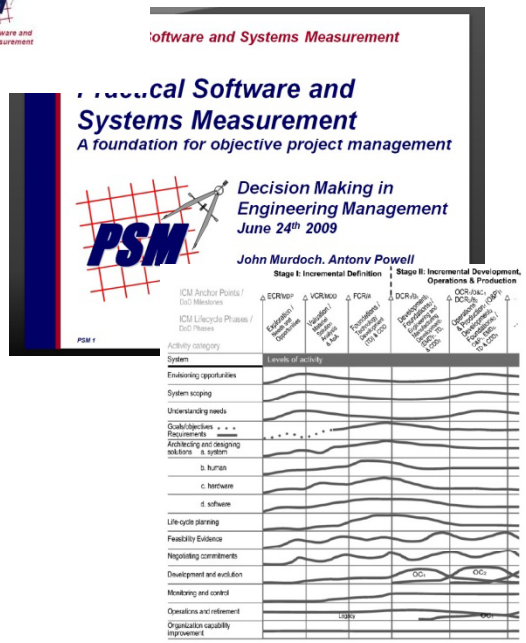
Inputs

- Issues in Measurement Programs (McGarry et al)
- Acquisition Measurement (PSM White Paper)
- PSM Workshop on Decision Making in EM (Orlando 2009)
- Incremental Commitment Model (USC)





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Challenges for Acquisition

- Changing, uncertain military requirements
- Increasing need to combine capabilities
- Information security, cyberspace
- Flexibility and speed in acquisition
- Diminishing resources, post credit crunch
- Low investment in acquirer capability
- Upholding the public interest

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Acquirer Responses

- Renewed emphasis on Value for Money
- Organisational relationships to enable flexibility, adaptability in acquisition
- Use of Open Systems, COTS
- Renewed emphasis on Re-use
- ‘Systems of Systems’ approach – coordination between quasi-autonomous projects
- Engineering Management strategy

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Implications for Measurement

- Measurement programs can support:
  - The ‘engineering communication’ needed for complex systems development – trading over multiple specialties, properties, across organizational boundaries
  - The ‘engineering management communication’ needed for resource allocation, risk management
  - The communication needed to provide governance - visibility, assurance, building of trust
  - flexibility and speed in acquisition
- But measurement has to be applied carefully – so as not to cause damage, but to provide value at minimum cost

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Challenges in implementing efficient measurement programs

- Knowing what information to ask for, and to provide
- Avoiding bureaucratisation - too much data
- Enabling the building of trust in provided information
- Adapting the incentives and disincentives to provide information
- Understanding the cost and value of obtaining information
- Integrating measurement information to support decision making: getting the measurement information used

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Proposed Strategy for MoD

- Set up an ‘Acquisition Decision Framework’
- Associate measurement with planned decisions points (gates, reviews)
- Locate and integrate measurements at decision points across the dimensions:
  - Lifecycles - Acquisition Life Cycle Model, system, software, component development cycles
  - Product breakdown structure
  - engineering specialties
  - supply chains
- Embed measurement guidance with process, method guidance

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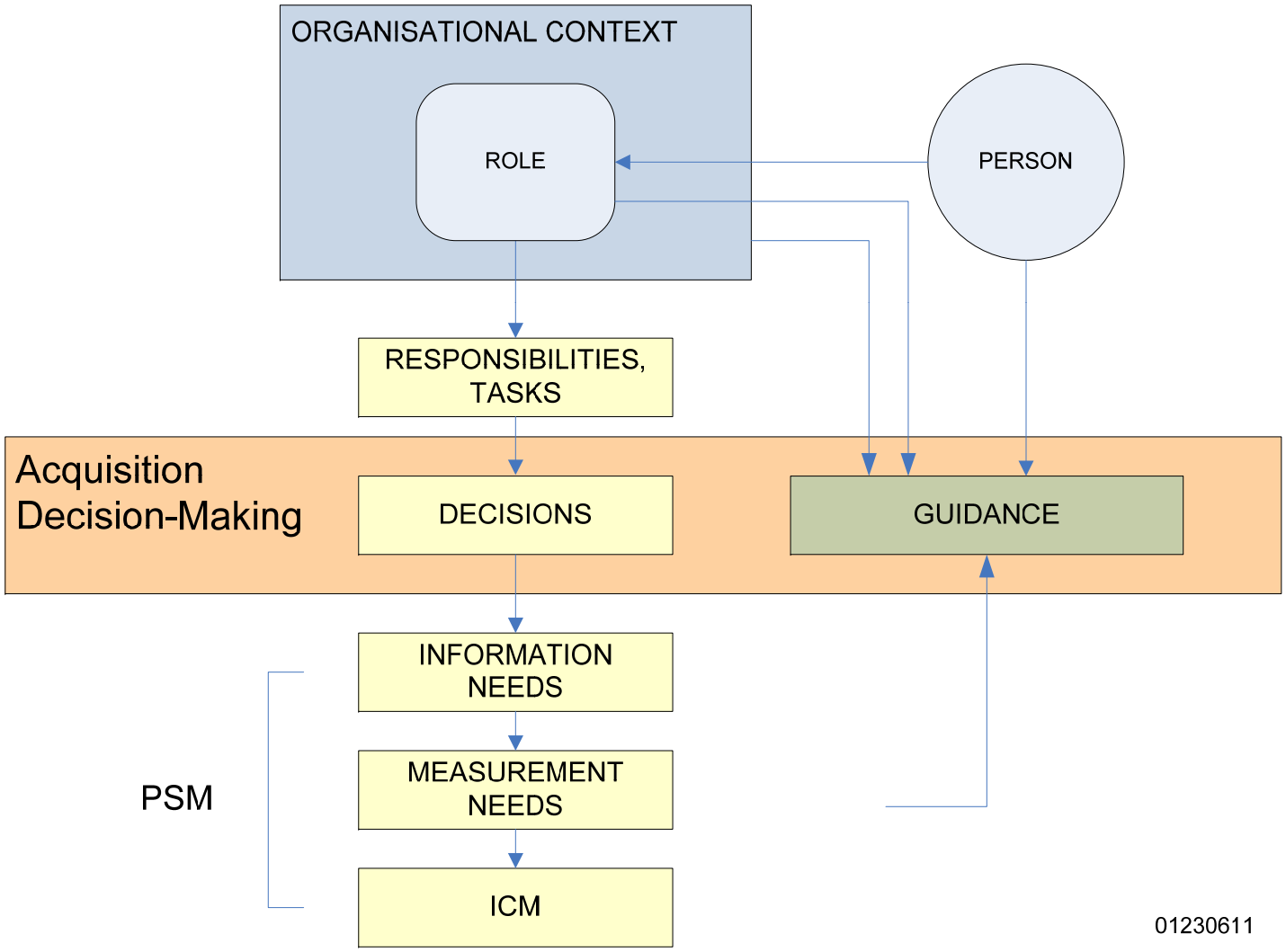
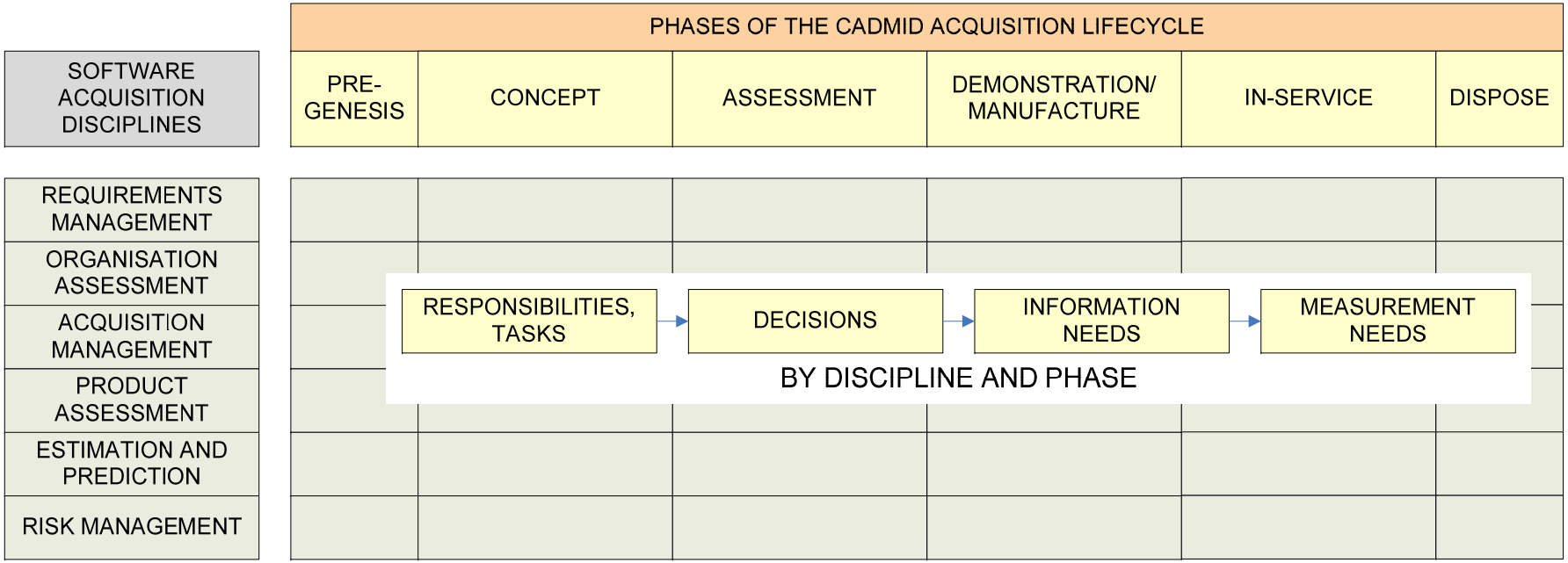
Acquisition Decision Framework



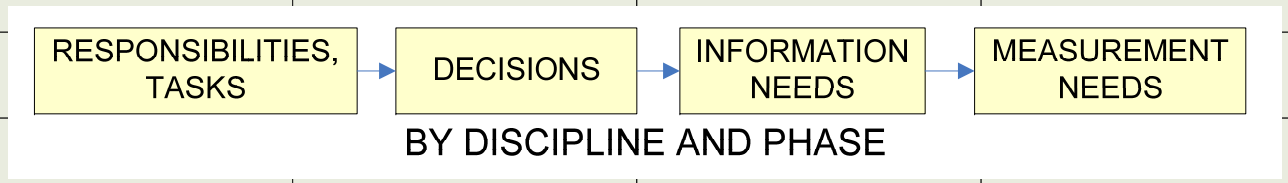
Software Acquisition

- Planning and monitoring engineering progress: locating measurements, targets and decision points



Software Development

SOFTWARE DEVELOPMENT DISCIPLINES	PHASES OF THE UNIFIED PROCESS PROJECT LIFECYCLE			
	INCEPTION	ELABORATION	CONSTRUCTION	TRANSITION
MANAGEMENT				
SOFTWARE REQUIREMENTS				
ARCHITECTURAL DESIGN				
DETAILED DESIGN				
IMPLEMENTATION (CODE AND TEST)				
INTEGRATION AND TEST				
SPECIALIST PROPERTIES				
DEPLOYMENT				
ENVIRONMENT				



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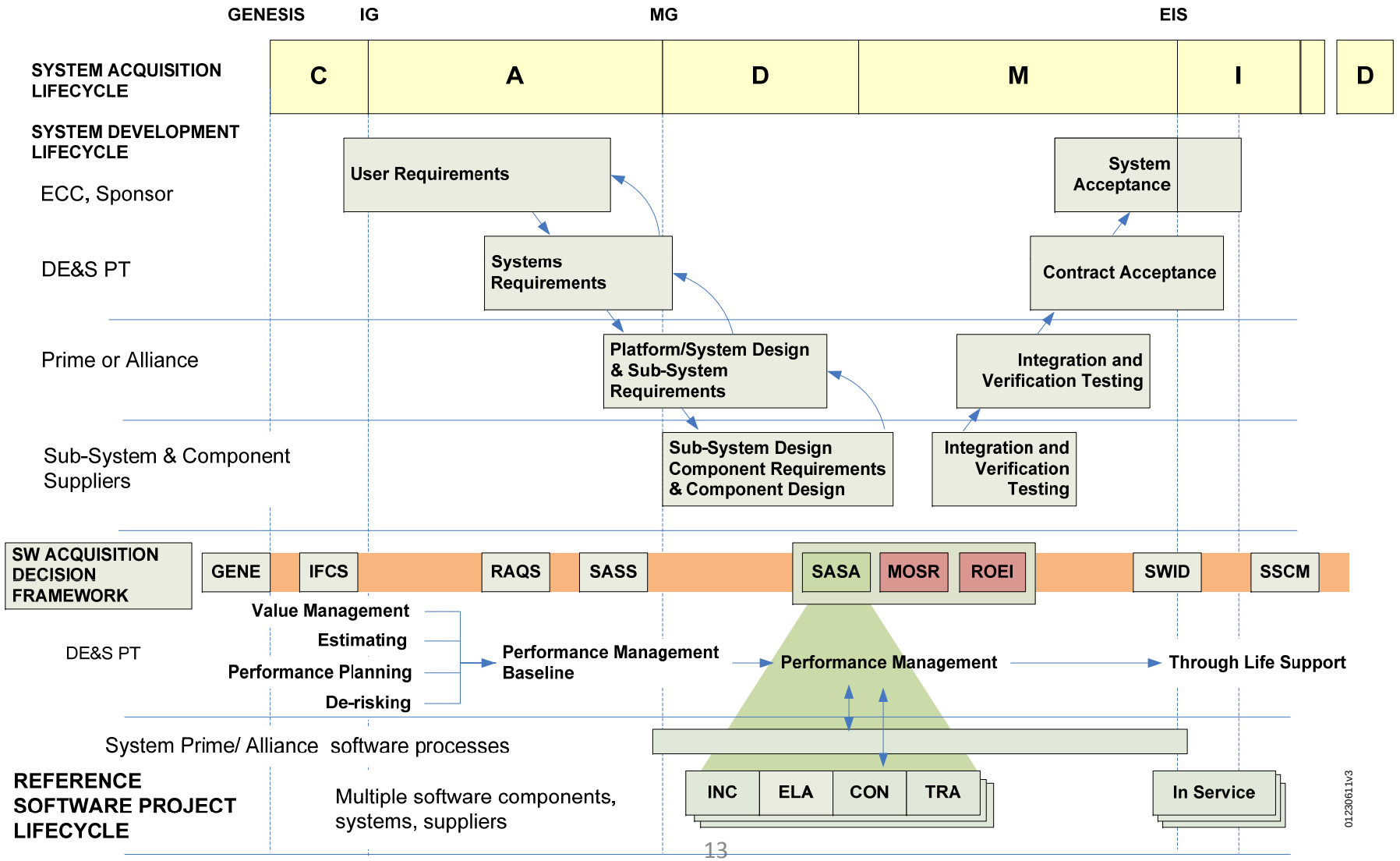
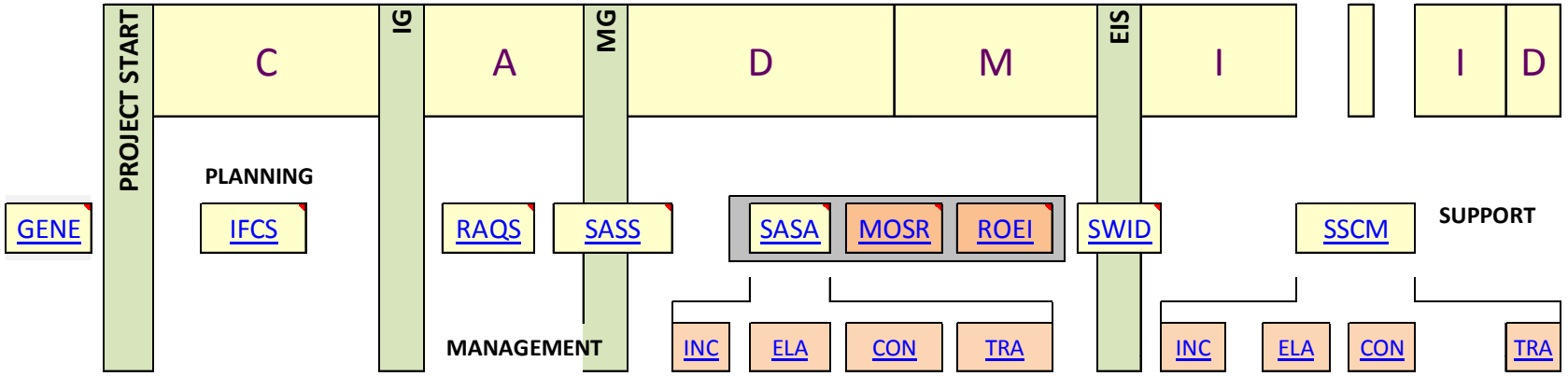
Linking Acquirer and Supplier



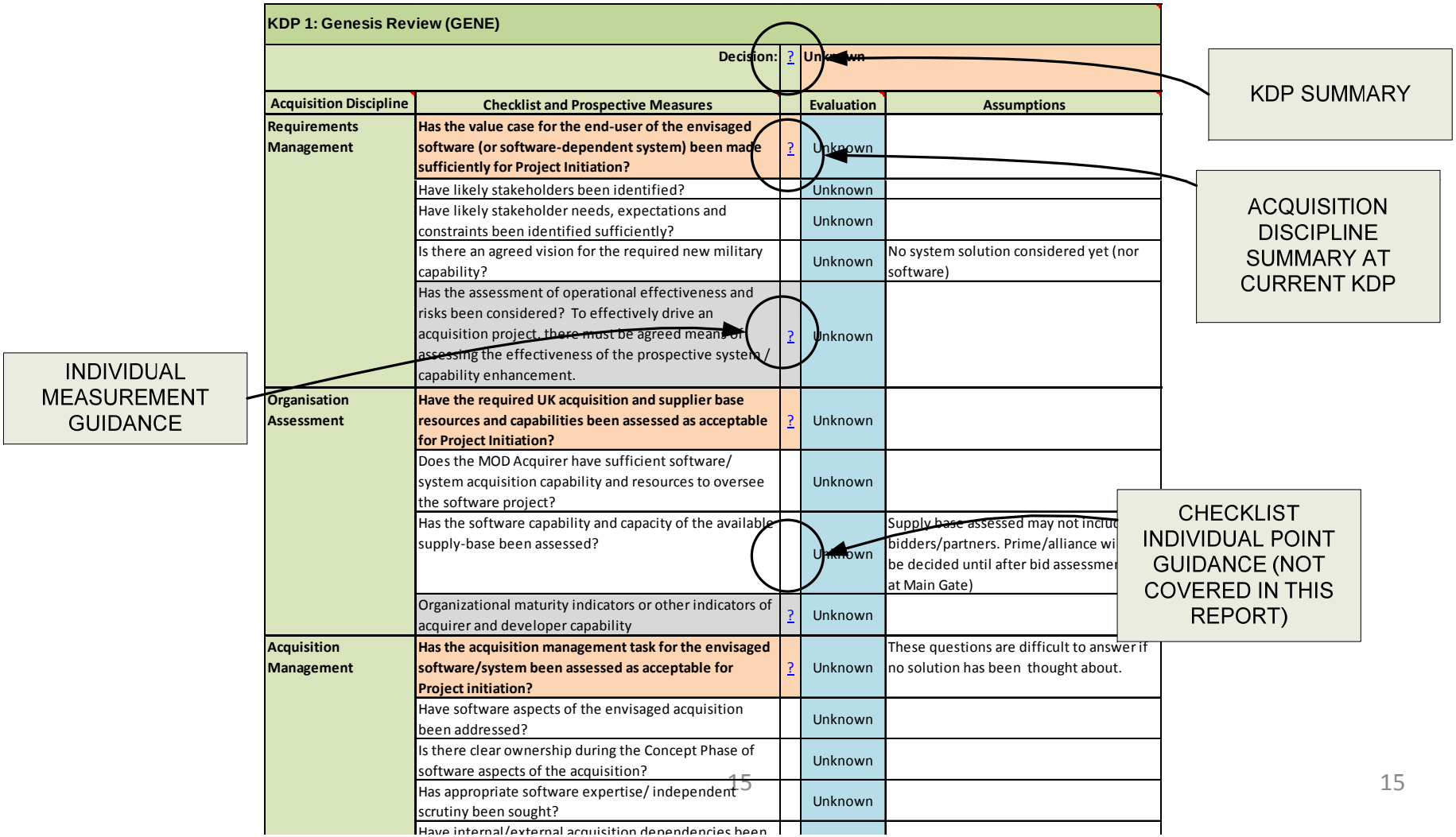
Software Acquisition Decision Framework

Version: 1.1



		Abbreviation	Decision	Normal Frequency
1	SOFTWARE ACQUISITON PLANNING	GENE	Genesis Review	Taken once pre-Concept Phase
2		IFCS	Initial Concept Feasibility, Cost & Schedule	Taken once in Concept Phase
3		RAQS	Software Requirements and Acquisition Strategy	Taken once in Assessment Phase
4		SASS	Software Architecture and Supplier Strategy	Taken once in Assessment Phase
5		SASA	Software Acquisition Status Assessment	Repeated during D/M Phases
5A	SOFTWARE ACQUISITION MANAGEMENT	SASA-INC	Inception of Software Development	per acquired software product
5B		SASA-ELA	Elaboration of Software Design	per acquired software product
5C		SASA-CON	Construction of Software	per acquired software product
5D		SASA-TRA	Transition to System Level	per acquired software product
5E	RISK MNGT	MOSR	Mitigation of Specific Risks	As Required
5F		ROEI	Resolution of Escalated Issues	As Required
6	SW SUPPORT	SWID	Software as Integrated and Delivered to MOD	Repeated during Integration & Test
7		SSCM	Systems Support - Capability Management	Repeated through-life

Integrating Measurement and Process Guidance



Acquisition Discipline	Checklist and Prospective Measures		Evaluation	Assumptions
Requirements Management	**Has the value case for the end-user of the envisaged software (or software-dependent system) been made sufficiently for Project Initiation?**	?	Unknown	
	Have likely stakeholders been identified?		Unknown	
	Have likely stakeholder needs, expectations and constraints been identified sufficiently?		Unknown	
	Is there an agreed vision for the required new military capability?		Unknown	No system solution considered yet (nor software)
	Has the assessment of operational effectiveness and risks been considered? To effectively drive an acquisition project, there must be agreed means of assessing the effectiveness of the prospective system / capability enhancement.	?	Unknown	
Organisation Assessment	**Have the required UK acquisition and supplier base resources and capabilities been assessed as acceptable for Project Initiation?**	?	Unknown	
	Does the MOD Acquirer have sufficient software/ system acquisition capability and resources to oversee the software project?		Unknown	
	Has the software capability and capacity of the available supply-base been assessed?		Unknown	Supply base assessed may not includ bidders/partners. Prime/alliance wi be decided until after bid assessmer at Main Gate)
	Organizational maturity indicators or other indicators of acquirer and developer capability	?	Unknown	
Acquisition Management	**Has the acquisition management task for the envisaged software/system been assessed as acceptable for Project initiation?**	?	Unknown	These questions are difficult to answer if no solution has been thought about.
	Have software aspects of the envisaged acquisition been addressed?		Unknown	
	Is there clear ownership during the Concept Phase of software aspects of the acquisition?		Unknown	
	Has appropriate software expertise/ independent scrutiny been sought?		Unknown	
	Have internal/external acquisition dependencies been			

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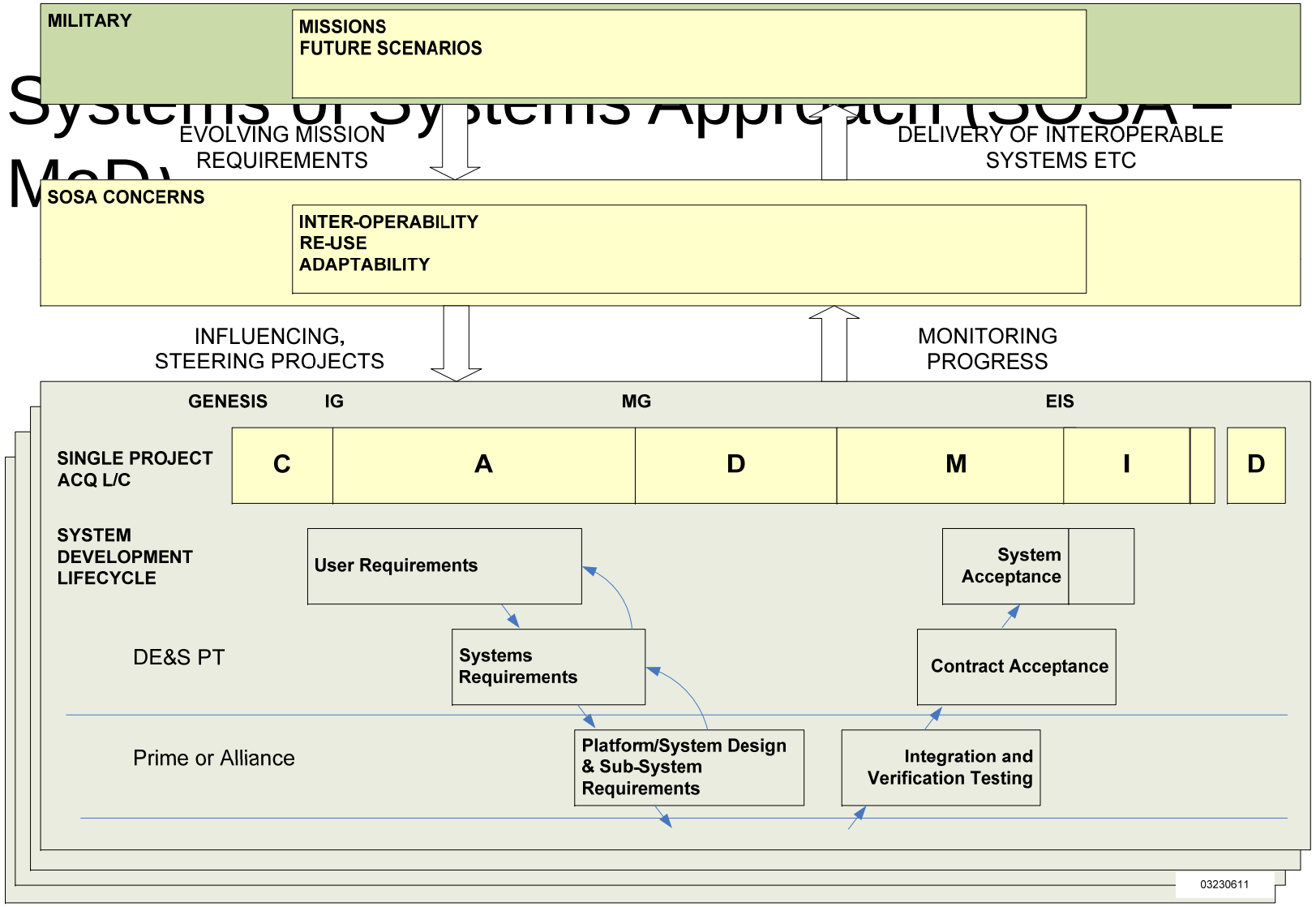
Estimation/Prediction	**Has the predicted performance of the acquisition effort, in terms of delivering the planned product, been assessed as generally acceptable to justify further development?**	?	Unknown	
	Given the requirements allocated to software, has software size been assessed to within an acceptable uncertainty range?		Unknown	
	Accurate estimates for completion available?		Unknown	
	Will it be done on time?		Unknown	
	Given the requirements allocated to software, have achievable software quality attributes been assessed to		Unknown	
	Given the requirements allocated to software, has software development schedule been assessed to within an acceptable uncertainty range?		Unknown	
	Given the requirements allocated to software, has software cost been assessed to within an acceptable uncertainty range?		Unknown	
	Have software cost, schedule, scope and quality properties been improved sufficiently (from the previous KDP)?		Unknown	
	Software system scope / size			
	Software system scope / size range			
	Software/system cost estimate		+/- 20%	< +/- 100% compared with similar systems
	Software/system cost estimate uncertainty range		0.5X - 2X	< 0.1X - 10X
	Software/ system development schedule		Unknown	
	Software/ system development schedule uncertainty range			
	Software / system performance targets			
	Software / system performance target ranges		0.5X - 2X	< 0.1X - 10X

Multiple Quasi-Autonomous Projects



Integrated Measurement: Engineering Maturity

- Needs are expressed for indicators of progress of engineering work at aggregated, system levels
- To support decision-making in areas of:
  - Trade-off
  - Risk management
  - Emergent properties
  - Coordination
  - Investment, resource allocation
  - Monitoring overall progress and VfM
- ‘product engineering maturity’ is a measurable concept for the substantive engineering progress on a project

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Defining Pragmatic Measures

- Many ways to define maturity – it is a ‘pragmatic measure’ – not purely representational
- To be useful, definition has to be clear, well-documented, so users understand it
- The ADF provides a context for measure definition
- Establishes how a measure is intended to be used; by whom, at what decision points
- Engineering maturity – counterpart to EVM: provide the engineering community with evidence to support assessments
- Related concepts: SRLs (UK MoD); PBEV

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Developing Maturity Targets

- Defining measurements; how they are to be used – in context of decisions in lifecycle models
- Identifying target values at decision points
- Acceptable uncertainty ranges
- Where information (base measures) comes from – who provides, aggregates and analyses the information
- How measurement information is presented

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Decision Readiness Assessment

Supplement to the PSM Measurement Process, to embed measurement guidance

- Identify planned decision points (gates, reviews etc) in the lifecycles
- Assess the skills, knowledge required in the decision-making roles to make good decisions
- Assess skills, experience and competencies of those assigned to the roles
- Assess information available to decision makers at the times decisions will be made
- Assess guidance and training needs and adapt the ADF and support appropriately

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Conclusion

"Emerging Software and Systems Trends – What Are the Impacts on Measurement"

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- Vital role of measurement in meeting current challenges in defence acquisition
- ADF concept – on-line support guidance, integrating measurement guidance with process and decision guidance
- Measurement at SoS level
- Engineering maturity: measurable concept to support decision making at integrated system levels
- Decision Readiness Assessment

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Future Work

- Measurement applied to strengthening Engineering Management
- ‘Decision support’ approach to measurement system design and guidance
- Measurement of Engineering Maturity
- Flexibility/ adaptability in measurement systems

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