

Software and Computing CoDR 2.5 Risks and Management of Risks 2012 Feb 16 D. Hall, SPDO



Introduction

- Assessed risk exposures
- Comparison with SEI risk taxonomy
- High level analysis
- Plans to manage risks and issues

Risk exposure thresholds define exposure levels for CoDR



Likelihood:

- Low : less than estimated 30% likelihood of occurrence, [7] Risk Categories 0-2
- Medium : at least 30% but less than 50% likelihood of occurrence, [7] Risk Categories 3-5
- High : at least 50% likelihood of occurrence, [7] Risk Categories 6-10

Impact:

Impact	Cost	Schedule	Performance
Low	Less than 10% impact, [1] Impact levels 1-3	Very minor or no slip in milestone, i.e. order one month	Very minor or no impact
Medium	Order 10% to 20% impact, [1] Impact level 4	Moderate slip in milestone, i.e. up to 6 months	Moderate functional impact or reduction in performance, performance almost acceptable but would require redesign
High	Greater than 20% impact, [1] Impact level 5	Critical slip in milestone, i.e. more than 6 months	Critical functional impact or reduction in performance, performance not acceptable and requires new design

Table 1 Risk Impact Definitions

Resulting risk exposure assessments: from 'very low' to 'very high'



High **Assessed Likelihood** Medium

High	Medium	High	Very High
Medium	Low	Medium	High
Low	Very Low	Low	Medium
	Low	Medium	High

Assessed Impact

Risks Related to Software Engineering Note: levelling across all risks yet to be done



No.	Risks	Short Description	Risks Becoming Issues Results in:	Proposed Plans to Manage Risks & Issues <u>Current Status</u>	Risk Owner	Impact: SKA1 <i>SKA2</i>	Likelihood: SKA1 <i>SKA2</i>	Exposure: SKA1 <i>SKA2</i>
1.1	Disassociation between Monitoring and Control and other software- intensive elements of the system	 Insufficient interface definition between – and integration with – other software implementations 	 Unnecessary re-work Under-estimates of cost, time and the resources required to meet the requirements of software and computing Severe and negative impact on the project as a whole 	 Establish and maintain mechanisms to capture and assess early signs of negative scope risk <u>Current Status</u>: Risks documented Issues not yet manifest 	TPM, WPC	High High SKA1	High High	Very High Very High
1.2	A wide variety of "antipattern" behaviours	[5] "In software engineering, an antipattern is a pattern that may be commonly used but is ineffective and/or counterproductive in practice."	Under-estimates of cost, time and the resources required to meet the requirements of software and computing. Negative impact on the project as a whole due to inappropriate requirements analysis.	 Adherence to the [1] SEMP Continual monitoring and management of potentially dysfunctional behaviours Apply internationally recognised standards and good practices for software development appropriate to the SKA software development effort Learn from Precursor and Pathfinder experiences <u>Current Status</u>: Risks documented Issues not yet manifest 	TPM, WPC	Medium Tigh	Medium Medium	High
1.3	Misinterpretation and erroneous analysis of requirements	The flow down of requirements is open to misinterpretation particularly when this is solely via document handover	Delivered designs may not meet the original intention of the requirement	 Use agreed common processes and tools to share information related to requirements Close collaboration between the parties involved in generating requirements including regular reviews of requirements Learn from Precursor and Pathfinder experiences 	TPM, WPC	SKA2	Medium Medium	High



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1: SKA₁ risks related to Software Engineering



High **Assessed Likelihood** Medium Lov



1.4: Lack of HPC skills

1.5: Lack of cross-domain skills

Low

Medium

High

1.1: S&C – M&C WBS decomposition

1.3: Misinterpretation of

requirements

Assessed Impact

2: SKA₁ risks related to Software Architecture





3: SKA₁ risks related to HPC Hardware





Low

Medium

High

Assessed Impact

4: Unable to achieve visibility processing goals for SKA₁



Assessed Likelihood



Assessed Impact

5: Unable to achieve non-visibility processing goals for SKA₁



Assessed Likelihood

High		5.1: Non-imaging algorithms not well specified 5.2: Bottlenecks in processing non- visibility data	
Medium		5.3: Too many pulsar candidates 5.4: Wide fields of view required for to detect transients	
Low			
	Low	Medium	High

Assessed Impact

6: SKA₁ risks related to data products, storage and distribution





Low

Medium

High

Assessed Impact

7: SKA₁ risks related to interfaces for users and operators





Assessed Impact

Summary of SKA₁ risks presented in Software and Computing CoDR Risk Register



Assessed Likelihood

High

Medium

Lov

Low	Medium	High
	 1.2: Antipatterns 2.1: Lack of attention to performance requirements 2.2: Overlooking interfaces 2.3: Hardware-specific architectures 2.4: Challenges to scaling up parallelisation 3.1: Insufficient HPC performance 3.2: Planned HPC roadmaps not delivered 5.3: Too many pulsar candidates 5.4: Wide fields of view required for to detect transients 7.1: Human factors overlooked 	1.3: Misinterpretation of requirements
	 1.5: Lack of cross-domain skills 3.3: Technology obsolescence or shifts 4.1: Inability to develop algorithms 4.2: New algorithms not sufficient 4.3: Various visibility processing challenges are unresolved 5.1: Non-imaging algorithms not well specified 5.2: Bottlenecks in processing non-visibility data 6.1: Late definition of required data and metadata 	1.1: S&C – M&C WBS decomposition

Assessed SKA₂ overall risk impact & exposure is greater than for SKA₁, primarily due to scale







Introduction

Assessed risk exposures

Comparison with SEI risk taxonomy

High level analysis

Plans to manage risks and issues

SEI taxonomy of risks for HPC application development – example decomposition



SQUARE KILOMETRE ARRAY

S&C Risk Register – links to SEI taxonomy of HPC development cycle risks



			WP2-050.020.010-RE-001			1.0				2	2.0			3.0			4.0			5	5.0		6.0	7.0
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CN	1U-SEI_2006-TN	1-039		Disassociation between Monitoring and Control and other software-intensive elements of the system	A wide variety of "antipattern" behaviours	Misinterpretation and erroneous analysis of requirements	Limited availability of software engineering resources for exascale	Limited availability of cross-domain experts	Lack of attention to non-functional performance requirements	Overlooking interfaces	Hardware- specific software architectures	chailenges in continuing to scale up the parallelisation of codes by many orders of magnitude	scaing: surriciently powerrul computers in appropriate price range to deliver science results are not available when needed	MPublished HPC development road maps are not delivered	Obsolescence and technology paradigm shifts	Algorithm and implementation development; coupled with limited availability of developers	An enhanced path of continued algorithm development does not deliver performance expectations sufficient to deliver SKA2	Various imaging-related considerations not yet demonstrated as having been solved	Implementations are not well specified with large potential impact on processing systems.	Non visibility data processing	Too high a level of candidate pulsar detections	Wide fields of view are required to detect transients	Definitions of required data products and associated metadata products are late	Human factors are overlooked in developing interfaces
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			b Evolvability																					
			c Completeness																					
			d Clarity																	<u> </u>				
		1 Requirements	e Accuracy									1			1				<u> </u>					
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		3 Implementation	b Project Plan																					
			c Scale of Effort												1	1	İ — —							
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			d Validation																					

S&C Risk Register – links to SEI taxonomy of HPC development environment risks



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		a Repeatability																						
	Development	b Suitability	<u> </u>																			ļ		
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	3 Process	c Management Experience																						
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		e Reward Systems																						ļ
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S&C Risk Register – links to SEI taxonomy of HPC programmatic risks



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			1.1	1.2	1.3	1.4	1.5	2.1	2.2	2.3	2.4	3.1	3.2	3.3	4.1	4.2	4.3	5.1	5.2	5.3	5.4	6.1	7.1
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		aSchedule																					
		h Staff								-	-	-	-	-	-								
	1 Resources	c Budget																+					
		d Facilities												-									
		e Management Commitment																					
		a Contract Type																					
	2 Contract	b Restrictions																					
		c Dependencies																		1			
CProgrammatic		a Customer Communication																					
		b User Commitment																					
		c Sponsor Alignment																					
	Programme	d Subcontractor Alignment																					
	Interface	e Prime Contractor																					
		f Corporate Communication						1			1							1				1	1
		g Vendor Performance						1										1					
		h Political																					1



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Returning to SKA₁ risks presented in Software and Computing CoDR Risk Register:



Assessed Likelihood

High

Medium

Lov

	Accord Import	
Low	Medium	High
	 1.2: Antipatterns 2.1: Lack of attention to performance requirements 2.2: Overlooking interfaces 2.3: Hardware-specific architectures 2.4: Challenges to scaling up parallelisation 3.1: Insufficient HPC performance 3.2: Planned HPC roadmaps not delivered 5.3: Too many pulsar candidates 5.4: Wide fields of view required for to detect transients 7.1: Human factors overlooked 	1.3: Misinterpretation of requirements
	 1.4: Lack of HPC skills 1.5: Lack of cross-domain skills 3.3: Technology obsolescence or shifts 4.1: Inability to develop algorithms 4.2: New algorithms not sufficient 4.3: Various visibility processing challenges are unresolved 5.1: Non-imaging algorithms not well specified 5.2: Bottlenecks in processing non-visibility data 6.1: Late definition of required data and metadata 	1.1: S&C – M&C WBS decomposition

Assessed Impact

'People' related risks are important to manage:



Assessed Likelihood



Assessed Impact

Key 'technology' related risks must also be managed:



Assessed Likelihood

Medium

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Assessed Impact

Many 'programmatic' risks have been escalated to System level:



3: Distributed development – task

10: Unmanaged scope creep 11: Aggressive schedule

5: Distributed development – geographical

12: Scope of work greater than expected

4: Distributed development – knowledge

distribution

distribution

management

poo	High	9: Perceived bureaucracy	2: Organisational characteristics antipatterns 7: Over-reliance on processes applicable for 'small' scale
essed Likelih	Medium		1: Project management antipatterns 6: Distributed development – collaboration infrastructure
Asse	Low	13: Scope of work much less than expected	8: Over-reliance on 'high-ceremony' processes

Low

Medium

High

Assessed Impact

S&C programmatic risks – links to System level risks



					Softwa M	re and Co anageme	mputing nt and O	Risks Re rganisati	lated to on		
			1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9
			A wide variety of "antipattern" project management behaviours	A wide variety of "antipattern" organisational characteristics	Distributed Development: Task Distribution	Distributed Development: Knowledge Management	Distributed Development: Geographical Distribution	Distributed Development: Collaboration Infrastructure	Over-reliance on processes that are generally appropriate only for developing software in the small	Over-reliance on processes that are generally appropriate only for developing software in the large; coupled with 'perceived bureaucracy' risk	Perceived bureaucracy
Syste	Sys_Rsk_1210	Project management systems and controls are ineffective for the SKA project									
m Level Ris an	Sys_Rsk_1220	SPDO Contributing Organisations unable to carry out work packages to the point of actual promised delivery.									
iks Rela d Orga	Sys_Rsk_1230	Lack of SPDO staff resources to complete the design and policy work needed for PrepSKA.									
atec	Sys_Rsk_1240	SKA project structure deficient									
d to Mana ation	Sys_Rsk_1250	Loss of valuable experience, relationships and knowledge during project execution and post project.									
gement	Sys_Rsk_1260	The SKA project fails to understand external project environment									
	Sys_Rsk_1270	Handover between SPDO and SPO									



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Plans to manage risks and issues

Proposed plans to manage risks and issues



- Identify, document and communicate risks:
 - Continuous monitoring, e.g. learning from Pathfinders, Precursors and other projects
 - Health checks more than just at design reviews
 - Appropriate escalation
- Address issues and high exposure risks:
 - WPCs and SPO must have the skills and processes required to progress work
 - WPCs to actively participate with and learn from industry partners, HPC institutions and collaborations
 - Encourage SPO and WPCs to address cross-cutting concerns via 'Integrated Design Teams'



END