## Appendices

## Developing A Framework and An Instrument For Measuring System Openness

Tope Omitola, t.omitola@ecs.soton.ac.uk, Gary Wills, gbw@ecs.soton.ac.uk Electronics and Computer Science, University of Southampton, Southampton, UK 22-01-2020

## Abstract

This document shows the goals, questions and metrics (detailed in the tables below) that were developed as part of the framework and instrument for measuring the degree of openness of a system. It starts with the questions and metrics that can be applied to measuring the openness of an organisation's culture and that of its employees.

It goes on to describe the goals and metrics for ascertaining the openness of the components of the factors of Architecture, Design, Data, and Implementation.

## A Questionnaires

**Culture - Organisation** The **goal** of the factor of Culture of the Organisation is to assess the Openness of the culture of the organisation. Tables 1 and 2 describe the questions and metrics that can be used for this assessment.

mem no	Question				ale	
CO.1	Is the organisation	No	Specialist	Senior Mem-	The	All employees
	committed to		staff only	bers	Board	
	openness principles?					
Evidence	e: the answers to the question	ns ab	ove, give cros	ss reference to d	ocumentatio	n. Is it possible to
	n example, e.g. from Training					
Guidanc	e: e.g. references from Syste	m Des	sign Docume	ent; System Eng	ineering Plar	n, Employee
Training I	Materials.					
CO.2	Where possible are	No	Only	Normally	Normally	Always written and
	contracts and		where	written, but	writ-	enforced
	agreements with		customer	not enforced	ten, and	
	customers written		specifies		enforced	
	with the openness					
	principles in mind?					
	e: the answers to the question					n. Is it possible to
	n example, e.g. from Training					
	e: e.g. references from System	m Des	sign Docume	nt; System Eng	ineering Plar	n, Employee
Training I	Materials.					
CO.3	Where possible, do	No	Only	Only the	Only the	Design, Imple-
	the design,		where	design and	sustained	mentation and
	implementation and		customer	implemen-	operation	Sustained envi-
	sustained operation		specifies	tation en-	environ-	ronments provide
	environment of a			vironments	ments	these
	project provide			provide	provides	
	complete and			these	these	
	sufficient information					
	for the customer to					
	operate in an					
	openness principle					
	way?					
	e: the answers to the question	ns ab	ove, give cros	ss reference to d	locumentatio	n. Please provide
example(s						
Guidanc	e: Systems Engineering Plan	, Initi	ial Capabiliti	ies Document (I	(CDs)	

Scale

Table 1: Culture - Organisation

Item No

Question

Item No	Question			$\operatorname{Scale}$	Scale					
CO.4	At the start of a new	None exist	Only	Only middle	Only	All pay				
	project are staff re-		higher	level staff are	lower	scales are				
	minded of the open-		level	reminded	level	reminded				
	ness principles (includ-		staff are		staff are					
	ing procurement and		reminded		reminded					
	sales)?									
Evidence	e: the answers to the question	ns above, give	e cross refere	nce to documen	tation. Pleas	se provide				
some exai	some examples.									
Guidanc	e: e.g. references from Empl	oyee Inductio	n Materials.							
CO.5	Where possible, are	No	Only	Normally	Normally	Always				
	openness principles re-		when	written into	written	written				
	suined from the sumply		,			l • ,				
	quired from the supply		customer	contracts,	into con-	into con-				
	chain?		specifies	but not	into con- tracts,	tracts,				
				_ ′						
				but not	tracts,	tracts,				
			specifies e cross refere	but not enforced	tracts, and enforced	tracts,				

Table 2: Culture - Organisation (contd.)

Culture - Employees The goal of the factor of Employee Culture is to assess the Openness of the culture of existing with the employees. Tables 3 and 4 describe the questions and metrics that can be used for this assessment.

Item No	Question			Scale		
CE.1	Do all	No training received	Training	Open ar-	Open ar-	Open ar-
	engineering		in place	chitecture	chitecture	chitecture
	staff receive		but not	training	training	training
	training in		manda-	received by	received	received
	open		tory	50% or less	by more	by more
	architecture			of employees	than 50%	than 50%
	design?				employees	employ-
						ees, and
						monitored
Evidence	e: the answers to the	he questions above, give	e cross refere	nce to documen	tation. Is it p	ossible to
		m Training Manuals or				
		rom System Design Do	cument; Syst	em Engineering	Plan, Employ	ree
Training 1	Materials					
CE.2	Are all	No training received	Training	Open ar-	Open ar-	Open ar-
	engineering		in place	chitecture	chitecture	chitecture
	staff trained		but not	training	training	training
	to use open		manda-	received by	received	received
	standards,		tory	50% or less	by more	by more
	where			of employees	than 50%	than 50%
	possible?				employees	employ-
						ees, and
						monitored
		he questions above, give	e cross refere	ence to documen	tation, and m	aybe some
	system modules					
		rom System Design Do	cument; Syst	em Engineering	Plan, Employ	ree
Training	Materials					
CE.3	Are openness	None used	Some	Principles	Principles	Principles
	principles		princi-	used and	used and	used and
	used		ples used	enforced on	enforced	enforced
	${ m throughout}$		but not	less than	on more	on all
	the product		enforced	50% of	than 50%	of the
	or service			lifecycle	of lifecycle	lifecycle
	lifecycle?					
		he questions above, give	e cross refere	ence to documen	tation. Please	provide
example(s						
Guidanc	e: Systems Engine	ering Plan, Initial Capa	abilities Docu	iment (ICDs))		

Table 3: Culture - Employees

Item No	Question		Scale						
CE.4	At the start	None exist	Only	Only middle	Only	All pay			
	of a new		higher	level staff are	lower level	scales are			
	project are		level	reminded	staff are	reminded			
	staff		staff are		reminded				
	reminded of		reminded						
	the openness								
	principles								
	(including								
	procurement								
	1								
	and sales)?								
	and sales)? e: the answers to t	he questions a	above, give c	ross reference to	documentation	on. Please provide			
some exa	and sales)? e: the answers to temples.	•	, 0		documentation	on. Please provide			
some exa	and sales)? e: the answers to t	•	, 0		documentation	on. Please provide			
some exa <b>Guidanc</b>	and sales)? e: the answers to temples.	•	, 0		documentation	on. Please provide All pay			
some exa Guidanc	and sales)? e: the answers to t mples. e: e.g. references f	rom Employee	e Induction 1	Materials					
some exar <b>Guidanc</b>	and sales)? e: the answers to to estimate the end of th	rom Employee	e Induction I	Materials  Only middle	Only	All pay			
some exa	and sales)? e: the answers to t mples. e: e.g. references f  Are openness principles	rom Employee	e Induction Months of the Indu	Materials  Only middle level staff are	Only lower level	All pay scales are			
some exar <b>Guidanc</b>	and sales)? e: the answers to to to to the principles. Are openness principles part of the	rom Employee	e Induction I Only higher level	Materials  Only middle level staff are given this	Only lower level staff are	All pay scales are given this			
some exar <b>Guidanc</b>	and sales)? e: the answers to to e: e.g. references for the part of the induction	rom Employee	e Induction I Only higher level staff are	Materials  Only middle level staff are given this	Only lower level staff are given this	All pay scales are given this			

Table 4: Culture - Employees (contd.)

**Architecture:** The fundamental concepts or properties of a system in its environment embodied in its elements, relationships, and in the principles of its design and evolution [ISO/IEC/IEEE 42010].

In this appendix, we describe the relative importance of factors that contribute to the Openness of an Architecture in a System. These include: Configurability, Portability, Extensibility, and Vendor-agnosticity,

**Interfaces:** An interface can be defined as shared boundary across which information is passed. An interface can also be defined as a method of connecting two or more components for the purpose of passing information from one to the other. [IEEE 610.12-1990 - IEEE Standard Glossary of Software Engineering Terminology].

In this appendix, we describe the relative importance of factors that contribute to the Openness of System Interfaces.

**Design:** This can be defined as the process of developing, expressing, documenting, and communicating the realization of the architecture of the system through a complete set of design characteristics described in a form suitable for implementation [Guide to the Systems Engineering Body of Knowledge (SE-BoK)].

In this appendix, we describe the relative importance of factors that contribute to the Openness of System Design.

**Data:** A representation of facts, concepts, or instructions in a manner suitable for communication, interpretation, or processing by humans or by automatic means. [IEEE 610.12-1990 - IEEE Standard Glossary of Software Engineering Terminology]

In this appendix, we describe the relative importance of factors that contribute to the Openness of the Data of a System.

**Implementation:** The process of translating a design into hardware and/or software components [IEEE 610.12-1990 - IEEE Standard Glossary of Software Engineering Terminology].

In this appendix, we describe the relative importance of factors that contribute to the Openness of the Implementation of a System.

Configurability: the ease with which a system's configurations (or its subsystems) can be changed or modified after development or design, e.g., for different platforms and/or usages

Item No	Question	Scale				
C.1	How much of	Not addressed	Less than	50% of Ar-	More than	All of the
	the		50% of	chitecture	50% of Ar-	Archi-
	architecture		Archi-	address	chitecture	tecture
	addresses		tecture	obsolescence	address	address
	obsolescence?		address		obsoles-	obsoles-
			obsoles-		cence	cence
			cence			

Evidence: the answers to the questions above. Also, do give cross reference to documentation.

**Purpose of Question:** The difficulty in upgrading a system derives directly from how well the functional and infrastructure elements are modularised and grouped according to their system roles. If this is done clearly, then the ripple effects of changing it to a different platform or usage is minimised. Therefore, this question assesses the ease of the configuration of the architecture to address technology obsolescence.

Guidance: References from Systems Engineering Plan, Information Support Plan, MoD/Authority Architecture products and standards, etc.

C.2	How much of	Not addressed	Less than	50% of Ar-	More than	All of the
	the		50% of	chitecture	50% of Ar-	Archi-
	architecture		Archi-	address	chitecture	tecture
	addresses		tecture	technology	address	address
	technology		address	refresh	technology	technology
	refresh?		tech-		refresh	refresh
			nology			
			refresh			

Evidence: the answers to the questions above. Also, do give cross reference to documentation.

Purpose of Question: The difficulty in upgrading a system derives directly from how well the functional and infrastructure elements are modularised and grouped according to their system roles. If this is done clearly, then the ripple effects of changing it to a different platform or usage is minimised. Therefore, this question assesses the ease of the configuration of the architecture to address technology refresh.

**Guidance:** References from Systems Engineering Plan, Information Support Plan, Authority Architecture products and standards, etc.

C.3	How much of	Not addressed	Less than	50% of Ar-	More than	All of the
	the		50% of	chitecture	50% of Ar-	Archi-
	architecture		Archi-	address	chitecture	tecture
	addresses		tecture	unplanned	address	address
	unplanned		address	maintenance	unplanned	unplanned
	maintenance?		un-		mainte-	mainte-
			planned		nance	nance
			mainte-			
			nance			

Evidence: the answers to the questions above, give cross reference to documentation.

**Purpose of Question:** The difficulty in upgrading a system derives directly from how well the functional and infrastructure elements are modularised and grouped according to their system roles. If this is done clearly, then the ripple effects of changing it to a different platform or usage is minimised. Therefore, this question assesses the ease of the configuration of the architecture to address unplanned maintenance, e.g. to address zero-day exploits, etc.

Guidance: Systems Engineering Plan, Information Support Plan, Company/Authority Architecture products and standards, Change Management Plan.

Configurability: the ease w	rith which a system's configurations (or its subsystems) can be changed or
modified after development o	r design, e.g., for different platforms and/or usages
	a ,

Item No	Question			Scare		
C.4	How much of	Not addressed	Less than	50% of Ar-	More than	All of the
	the		50% of	chitecture	50% of Ar-	Archi-
	architecture		Archi-	address	chitecture	tecture
	addresses		tecture	planned	address	address
	planned		address	upgrades	planned	planned
	upgrades?		planned		upgrades	upgrades
			upgrades			

**Purpose of Question:** The difficulty in upgrading a system derives directly from how well the functional and infrastructure elements are modularised and grouped according to their system roles. If this is done clearly, then the ripple effects of an upgrade to a part of the system are minimized. This results in faster upgrades and lower costs. Therefore, this question assesses the ease of the configuration of the architecture to address planned upgrades.

Guidance: References from Systems Engineering Plan, Information Support Plan, Company/Authority Architecture products and standards, etc.

Table 6: Architecture - Configurability (contd.)

Portabil	Portability: architecture expressed in standardised models, such as XMI, UML, SysML, MoDAF									
Item No	Question			Scale						
P.1	To what	None used	Used, no	Used,	Used,	Used,				
	extent is the		syntax-	syntax-	syntax-	syntax-				
	system's		checking,	checked,	checked,	checked,				
	architecture		no model-	no model-	fair model-	and con-				
	based on		checking	checking	checking	sistent				
	related					model-				
	industry or					checking				
	other									
	standard									
	reference									
	models and									
	architectural									
	frameworks?									

**Purpose of Question:** To assess the degree to which the system's architecture matches or aligns with architectural patterns (e.g., ISO/IEC 10746 Reference Model - Open Distributed Processing) that are well established in industry.

Guidance: References from Systems Engineering Plan, Information Support Plan, MoD/Authority Architecture products and standards, etc.

P.2	To what	Not used	Less than	50% of mod-	More than	All system
	extent is an		50% of	ules defined	50% of	modules
	architectural		modules	using an	modules	defined
	description		defined	ADL	defined	using an
	language		using an		using an	ADL
	(ADL) used		ADL		ADL	
	to define					
	system					
	modules?					

Evidence: the answers to the questions above. Also, do give cross reference to documentation.

**Purpose of Question:** To assess the degree to which the system modules are well-defined and understandable.

Guidance: References from Systems Engineering Plan, Information Support Plan, MoD/Authority Architecture products and standards, etc.

P.3	To what	Not used	Less than	50% of	More than	All system
	extent is an		50% of	system inter-	50% of	modules
	architectural		system	faces defined	system	defined
	description		interfaces	using an	interfaces	using an
	language used		defined	ADL	defined	ADL
	to define		using an		using an	
	system		ADL		ADL	
	interfaces?					

Evidence: the answers to the questions above, and please do give cross reference to documentation.

**Purpose of Question:** To assess the degree to which the system interfaces are well-defined and understandable.

Guidance: References from Program documentation (e.g., System's architecture, Systems Engineering Plan, Information Support Plan, etc).

**Extensibility:** the ease with which the architecture can be modified to increase its functional capacity, e.g. facilitating new technology insertion

	0	00				
Item No	Question			Scale		
E.1	To what	Not capable	Less than	50% of archi-	More than	All of archi-
	extent is the	and/or may	50% of archi-	tecture easy	50% of archi-	tecture easy
	system's	inhibit	tecture easy	to extend	tecture easy	to extend
	architecture		to extend		to extend	
	capable of					
	adapting to					
	evolving					
	requirements?					

Evidence: the answers to the questions above, give cross reference to documentation.

**Purpose of Question:** To assess the degree to which the system's architecture enables ease of change, mitigates technological obsolescence, and provides long-life supportability.

**Guidance:** References from the system's architecture documentation, technical data package, contracts, etc.

E.2	To what	Does not fol-	Less than	50% of ar-	More than	All of ar-
	extent does	low and/or	50% of ar-	chitecture	50% of ar-	chitecture
	the	difficult	chitecture	easy to	chitecture	easy to
	architecture	to imple-	easy to	implement	easy to	implement
	development	ment change	implement	capability	implement	capability
	process follow	requests	capability	extension	capability	extension
	a well-defined		extension		extension	
	System					
	Engineering					
	process for					
	implementing					
	capability					
	extension?					

Evidence: the answers to the questions above, give cross reference to documentation.

Purpose of Question: Creating an extensible architecture requires careful coordination of concerns in design, architectural principles, work product specification and activities to make sure that decisions made throughout the process does not inadvertently create inhibitors to extensibility.

Guidance: References from Program documentation (e.g., System's architecture, Systems Engineering Plan, Information Support Plan, etc).

Table 8: Architecture - Extensibility

Vendor-a	Vendor-agnostic: the ease with which a system or component can be transferred and run from one								
hardware	hardware or software environment to another								
Item No	Question			Scale					
V.1	To what	Not free of	Less than	50% of	More than	All system			
	extent is the	proprietary	50% of	system com-	50% of	components			
	program free	interfaces	system com-	ponents	system com-	are free of			
	of system		ponents	are free of	ponents	proprietary			
	components		are free of	proprietary	are free of	interfaces			
	that have		proprietary	interfaces	proprietary				
	proprietary		interfaces		interfaces				
	characteris-								
1	tios?								

Purpose of Question: In an open systems approach, if proprietary elements are needed, their use cannot preclude their replacement with or interface to other, non-proprietary solutions or elements. The concern is that system elements will include proprietary or program unique features/requirements that preclude alternative solutions. This question evaluates how much freedom the Authority has to tender these components these components for competitive selection or re-assignment to other vendors.

Guidance: References from System Architecture Documents; System Engineering Plan, etc.

V.2	To what	Not free of	Less than	50% of sys-	More than	All system
	extent is the	restrictive li-	50% of	tem compo-	50% of	components
	program free	censing	system com-	nents are free	system com-	are free of
	of system		ponents	of restrictive	ponents	restrictive
	components		are free of	licensing	are free of	licensing
	that have		restrictive		restrictive	
	restrictive		licensing		licensing	
	licensing?					

Evidence: the answers to the questions above, give cross reference to documentation.

Purpose of Question: In an open systems approach, if proprietary elements are needed, their use cannot preclude their replacement with or interface to other, non-proprietary solutions or elements. The concern is that system elements will include proprietary or program unique features/requirements that preclude alternative solutions. This question allows the Authority to plan how much they may need to pay for continual access to the system components

Guidance: References from System Architecture Documents; System Engineering Plan, etc.

Table 9: Architecture - Vendor-agnostic

Vendor-agnostic: the ease with which a system or component can be transferred and run from one							
hardware or software environment to another							
Item No	Question			Scale			
V.3	To what	Not capable	Less than	50% of data	More than	All data sets	
	extent is the	of adapting	50% of data	sets can	50% of data	can adapt to	
	Program's		sets can	adapt to	sets can	new change	
	data sets		adapt to	new change	adapt to	requests	
	capable of		new change	requests	new change		
	adapting to		requests		requests		
	evolving						
	requirements?						
Evidence	e: the answers to the	he questions abo	ove, give cross re	eference to docu	mentation.		

**Purpose of Question:** To assess the degree to which the system's data sets enable ease of change, mitigates technological obsolescence, and provides long-life supportability.

Guidance: References from Data Design Documents, technical data package, contracts, etc.

V.4	To what	Not free of	Less than	50% of	More than	All system
	extent is the	prohibitive	50% of	system com-	50% of	components
	program free	costs	system com-	ponents	system com-	are free of
	of prohibitive		ponents	are free of	ponents	prohibitive
	cost that		are free of	prohibitive	are free of	cost
	could limit or		prohibitive	cost	prohibitive	
	preclude the		cost		cost	
	reuse of the					
	components					

Evidence: the answers to the questions above, and please do give cross reference to documentation.

**Purpose of Question:** This measures the ease (or lack) of competitive selection or re-assignment of these components to other suppliers and vendors, by the Authority.

**Guidance:** References from Systems Engineering Plan, Information Support Plan, Authority Architecture products and standards, etc.

Table 10: Architecture - Vendor-agnostic (contd.)

Item No	Question			Scale	Scale							
S.1	How much of	No traceabil-	Traceability	Traceability	Traceability	Traceability						
	the interface	ity	for less	for $50\%$ of	for more	for all Inter-						
	can be		than $50\%$ of	Interfaces	than $50\%$ of	faces						
	traceable to		Interfaces	'	Interfaces							
	the			'	'	[ ]						
	Program's			'	'	[ ]						
ļ	architecture			'	'	[ ]						
	and design			'	'	[ ]						
 	elements?	!		·								
<b>Evidence:</b> the answers to the questions above, give cross reference to documentation. Is it possible to												
_	provide an example, e.g. from Architecture to Interfaces?											
	of Question: To					ie Program.						
Guidanc	e: e.g. references fr	com System Des	sign Document;	System Enginee	ring Plan.							
S.2	How much of	No standard-	Standardisatic	nStandardisatic	nStandardisatic	nStandardisation						
	the interface	isation	for less than	for $50\%$ of	for more	for all Inter-						
	are		50% of	Interfaces	than $50\%$ of	faces						
	standardised		Interfaces	'	Interfaces							
	across			'	'							
	systems			'	'							
	modules?			'	'							
Evidence	e: the answers to the	ne questions abo	ove, give cross re	eference to docu	mentation, and	maybe some						
example s	system modules.											
Purpose	of Question: Thi	is evaluates the	degree of modu!	larisation or con	nponentisation ε	of the						
system T	this is useful for sw	stem understand	ling and ease of	change								
bysociii. i	entile is discruit for sy.	been anacibean	mig and case or	ciiaiige	system. This is useful for system understanding and ease of change							

Standardised: interfaces from this system, and across system modules are Standardised, according to

industry and/or community-of-practice norms, and easily transferred across systems

Table 11: Interfaces - Standardised

Guidance: e.g. references from System Design Document; System Engineering Plan.

industry and/or community-of-practice norms, and easily transferred across systems									
Item No	Question		Scale						
S.3	To what	No criteria	Established	Established	Established	Established			
	extent are		criteria exist	criteria exist	criteria exist	criteria exist			
	there		to designate	to designate	to designate	to designate			
	established		less than	50% of key	more than	all of key			
	criteria for		50% of key	interfaces	50% of key	interfaces			
	designating		interfaces		interfaces				

Standardised: interfaces from this system, and across system modules are Standardised, according to

**Evidence:** the answers to the questions above, give cross reference to documentation. Please provide example(s).

**Purpose of Question:** To assess the degree to which the program has established criteria (e.g., criticality of function, ease of integration, frequency of change, interoperability, commonality) as the basis for designating key interfaces.

Guidance: Systems Engineering Plan, Initial Capabilities Document (ICDs)), interface control and configuration management documentation, Information Support Plan, Architecture Framework products and standards.

S.4	To what	None exist	Open stan-	Open stan-	Open stan-	Open stan-
	extent are		dards are	dards are	dards are	dards are
	open		selected for	selected for	selected for	selected for
	standards		less than	50% of key	more than	all of key
	selected for		50% of key	interfaces	50% of key	interfaces
	key		interfaces		interfaces	
	interfaces?					

**Evidence:** the answers to the questions above, give cross reference to documentation. Please provide some examples.

**Purpose of Question:** To assess the degree to which the program has established standards selection criteria that give preference to open interface standards.

Guidance: e.g. references from Interface control and configuration management documentation, contractual documents.

Table 12: Interfaces - Standardised (contd.)

key

interfaces?

Non-pro	prietary published	d according to in	dustry and/or o	community-of-pr	ractice standard	S
Item No	Question			Scale		
N.1	To what	None exist	Definitions	Definitions	Definitions	Definitions
	extent are		exist for less	exist for	exist for	exist for all
	proprietary		than $50\%$ of	50% of pro-	more than	proprietary
	interfaces		proprietary	prietary	50% of pro-	interfaces
	well-defined		interfaces	interfaces	prietary	
	and limited in				interfaces	
	scope so that					
	others are not					
	precluded					
	from					
	interfacing					
	with these or					
	from					
	developing					
	and providing					
	interfaces					
	with					
	comparable					
	or improved					
	performance					
	and form, fit					
	and function?					

Purpose of Question: In most cases, the total replacement of "in-service interfaces" with new interfaces is not a fiscally sound option. Upgrading existing systems to modular open system designs for all or portions is, however, possible and desirable. To achieve this goal, upgrading existing systems to become modular and open must be planned for, as part of the technology refresh/insertion process and work plans must be structured to enable the process

Guidance: Please state percentage of COTS supply or provision in the Program. And, references from System Design Document; System Engineering Plan.

N.2	To what	No assess-	Feasibility	Feasibility	Feasibility	Feasibility
	extent has	ment	studies done	studies done	studies done	studies done
	the Program		for less than	for 50%	for more	for all pro-
	assessed the		50% of pro-	of propri-	than 50%	prietary key
	feasibility of		prietary key	etary key	of propri-	interfaces
	using open or		interfaces	interfaces	etary key	
	non-				interfaces	
	proprietary					
	standards for					
	key					
	interfaces?					

Evidence: the answers to the questions above, give cross reference to documentation.

Purpose of Question: To assess the degree to which the program uses feasibility studies (i.e., market, economic, operational, and technological) to evaluate the appropriateness of using open standards for key interfaces.

Guidance: Trade-studies, market research findings, Technology Readiness Assessment, Affordability Assessment.

Non-pro	<b>prietary</b> published	d according to in	ndustry and/or o	community-of-pr	ractice standard	S
Item No	Question			Scale		
N.3	To what	None used	Standards	Standards	Standards	Standards
	extent does		adoption	adoption and	adoption and	adoption
	the program		and usage	usage exist	usage exist	and usage
	use widely-		exist but no	but little	and fairly	exist and
	accepted and		enforcement	enforcement	enforced	consistently
	$\operatorname{supported}$					enforced
	standards to					
	define					
	interface					
	definitions or					
	key interfaces					
	that are					
	published and					
	maintained					
	by recognized					
	organiza-					
	tions?					

Purpose of Question: The key to Open Systems and modular designs and acquisition flexibility is the ability of third parties to participate in or compete for functional modules or components. Using disciplined partitioning and clearly defined, preferably widely-accepted Community-of-practice Interfaces, use widely-accepted and supported standards are a key attribute of the Open Systems process.

Guidance: e.g. references from Systems Engineering Plan, Initial Capabilities Document (ICDs)), interface control and configuration management documentation, Information Support Plan, Architecture Framework products and standards.

N.4	To what	None exist	Plai	n	ex-	Plan	and	Plan	and	Plan	and
	extent are		ist	but	no	timet	able	timet	able	timet	able
	there		$ an \epsilon$	${ m etable}$	)	exist	for	exist	for	exist	for all
	established		for	]	plan	less	than	more	$_{ m than}$	key	inter-
	mechanisms		enac	ctmen	$^{\mathrm{nt}}$	50%	of key	50%	of key	faces	
	to migrate					interf	aces	interf	aces		
	key interfaces										
	that are										
	proprietary										
	or closed to										
	key interfaces										
	that are										
	open?										

Evidence: the answers to the questions above, give cross reference to documentation.

Purpose of Question: To assess the degree to which the program has established a plan to migrate from proprietary to open interfaces.

Guidance: e.g. references from Interface control and configuration management documentation, Systems Engineering Plan

**User-base:** How large is the user base, the more eyes, the higher the probability many errors/bugs have been eliminated

Item No	Question			Scale		
U.1	To what	No control	Some control	Some control	Some control	Some con-
	extent does	policy exists	policies exist	policies exist	policies exist	trol policies
	the Program		but not en-	but lightly	but fairly en-	exist and
	have policies		forced	enforced	forced	consistently
	that control					enforced
	adding					
	specifications					
	that limit the					
	use of widely-					
	available					
	interface					
	standards?					

Evidence: the answers to the questions above, give cross reference to documentation.

Purpose of Question: In some cases, vendors have used widely-supported commercially available interface standards but modified or implemented them in such a way that the ability of third parties to provide alternative solutions is restricted or precluded. Therefore, this question measures the ease by which third parties can easily provide alternative solutions to the system's components.

**Guidance:** e.g. references from Interface control and configuration management documentation, Systems Engineering Plan.

U.2	To what	No	$\operatorname{control}$	Some control	Some	control	Some control	Some con-
	extent does	polic	y exists	policies exist	polici	es exist	policies exist	trol policies
	the Program			but not en-	but	lightly	but fairly en-	exist and
	have			forced	enfore	ced	forced	consistently
	processes that							enforced
	control							
	adding							
	options or							
	extensions							
	that limit the							
	use of openly							
	available							
	interface							
	standards?							

Evidence: the answers to the questions above, give cross reference to documentation.

**Purpose of Question:** In some cases, vendors have used widely-supported commercially available interface standards but modified or implemented them in such a way that the ability of third parties to provide alternative solutions is restricted or precluded. Therefore, this question measures the ease by which third parties can easily provide alternative solutions to the system's components.

**Guidance:** e.g. references from Interface control and configuration management documentation, Systems Engineering Plan.

Table 15: Interfaces - User base

User-bas	se: How large is th	e user base, the	more eyes, the l	nigher the proba	ability many erro	ors/bugs						
have been	have been eliminated											
Item No	Question Scale											
U.3	To what	No support	No support   Support ex-   Support ex-   Support ex-   Support ex-									
	extent does		ists for less   ists for 50%   ists for more   ists for all									
	the Program		than 50% of of interfaces than 50% of of the inter-									
	include		interfaces		interfaces	faces						
	Lifecycle											
	Support for											
	the											
	interfaces?											

**Purpose of Question:** To evaluate the Program's commitment, and the system's support, to adapt to evolving requirements, mitigating technological obsolescence and provisioning for long-life supportability.

Guidance: e.g. references from Systems Engineering Plan, Initial Capabilities Document (ICDs)), interface control and configuration management documentation, Information Support Plan, Architecture Framework products and standards.

U.4	Are the	None open	Less than	50% of the	More than	All IDEs
	development		50% of IDE	IDE open	50% of IDE	open
	environment		open		open	
	tools for					
	interface					
	definition					
	openly					
	available?					

**Evidence:** the answers to the questions above, give cross reference to documentation. Please state some example tools used in the program.

**Purpose of Question:** Evaluates ease of adapting to evolving requirements and mitigating technology obsolescence.

Guidance: e.g. references from Systems Engineering Plan, Initial Capabilities Document (ICDs)), interface control and configuration management documentation, Information Support Plan, Company/Architecture Framework products and standards.

Table 16: Interfaces - User base (contd.)

Extensib	oility: How easy can t	he interface be e	extended to acco	ommodate ch	anges or augme	ntation				
Item No	Question			Scale						
E.1	To what extent	Proprietary	Less than	50% of	More than	All pro-				
	have the	interfaces	50% of pro-	propri-	50% of pro-	prietary				
	proprietary or	scope not	prietary	etary	prietary	interfaces				
	unique	well defined	ell defined interfaces interfaces ha							
	non-commercial		have well	have well	have well	defined				
	interfaces been		defined	defined   defined		scope				
	limited or well		scope	scope	scope					
	defined such									
	that they do not									
	hinder others									
	from interfacing									
	or developing									
	any part of the									
D 11	system?		• •	, 1						

Purpose of Question: Since using proprietary or vendor unique solutions on occasion at a component or module level and within contracts cannot be uniformly prohibited, and since few functions, components or modules are truly mission unique, the use of proprietary or unique non-commercial interfaces should be minimised in order to maximise re use, transportability, and extensibility

Guidance: e.g. references from System Engineering Plan.

E.2	To what extent	No mi-	Migration	Migration	Migration	Migration	
	are there	gration	mechanisms	mecha-	mechanisms	mechanisms	
	established	mechanism	in place	nisms in	in place	in place	
	mechanisms to	exists	for less	place for	for more	for all key	
	migrate key		than 50%	50% of	than 50%	interfaces	
	interfaces that		of all key	all key	of all key		
	are proprietary		interfaces	interfaces	interfaces		
	or closed to key						
	interfaces that						
	are open?						

Evidence: the answers to the questions above, give cross reference to documentation.

**Purpose of Question:** To assess the degree to which the Program has established a plan to migrate from proprietary to open interfaces.

Guidance: e.g. references from System Design Document; System Engineering Plan.

Table 17: Interfaces - Extensibility

Extensib	Extensibility: How easy can the interface be extended to accommodate changes or augmentation											
Item No	Question		Scale									
E.3	To what	No capabil-	No capabil- Less than 50% of in- More than All int									
	extent is the	ity to extend	50% of	terfaces are	50% of	are easy to						
	Program's		interfaces easy to ex- interfaces									
	interfaces		are easy to	tend	are easy to							
	capable of		extend		extend							
	adapting to											
	evolving											
	requirements?											

Purpose of Question: To assess the degree to which the system's interfaces enables ease of change, mitigates technological obsolescence, and provides long-life supportability.

Guidance: e.g. references from System Design Document; System Engineering Plan.

E.4	Does the	None	exist	Standa	ards	Stand	dards	Stand	ards	Standa	rds
	Program use	nor use	$_{\mathrm{ed}}$	exist	but	exist.	, used	exist,	used	exist,	used
	widely-			used	spar-	for	50% of	for	more	for all	inter-
	accepted and			ingly		inter	faces	than .	50% of	faces	
	$\operatorname{supported}$							interfa	ices		
	standards to										
	define										
	interface										
	definitions or										
	key interfaces										
	that are										
	published and										
	maintained										
	by recognized										
	organiza-										
	tions?										

Evidence: the answers to the questions above, give cross reference to documentation.

Purpose of Question: To assess the degree to which the system's interfaces enables ease of change, mitigates technological obsolescence, and provides long-life supportability.

Guidance: e.g. references from the system's architecture, technical data package, contracts, etc.

Table 18: Interfaces - Extensibility (contd.)

Accessib	Accessibility: Ability to access interfaces' functions and data. Is the accessibility mechanism										
proprietary or based on industry or community-of-practice standards?											
Item No	Question					S	Scale				
A.1	To what	All	access	More	than	50%	of ac-	Less	than	None is pro-	
	extent is the	propr	rietary	50%	of	cess	propri-	50%	ac-	prietary	
	accessibility			access	pro-	etary	,	cess	are		
	mechanism			prietary	y			propri	etary		
	proprietary										
	or based on										
	industry or										
	community-										
	of-practice										
	standards?										

**Purpose of Question:** A proprietary accessibility mechanism may add to ongoing costs of data access and its maintenance during the lifecycle support of the Program. An industry-based access mechanism reduces costs of on-going maintenance. If the access mechanism is proprietary, is there a migration path from this proprietary mechanism to one based on industry standard?

**Guidance:** e.g. references from Interface control and configuration management documentation, Systems Engineering Plan.

A.2	To what	No version	Less than	50% are	More than	All are
	extent does	control	50% version	version	50% version	version
	the		controlled	controlled	controlled	controlled
	configuration					
	management					
	process					
	encompass					
	changes to					
	key interfaces					
	and					
	corresponding					
	standards?					

Evidence: the answers to the questions above, give cross reference to documentation.

Purpose of Question: To assess the degree to which the program has incorporated key interface designations, selected standards and related design modifications in the change management process Guidance: e.g. references from Interface control and configuration management documentation, etc.

Table 19: Interfaces - Accessibility

**Module coupling:** degree of dependency on other modules to achieve purpose. Is the module loosely-coupled, i.e. has, or makes use of, little or no knowledge of other modules? or a tightly-coupled module, i.e. it has knowledge, or makes use, of many other modules

Item No	Question		Scale									
MP.Q1	How much of	No loose cou-	Less	than	50%	of	More	than	All	modules		
	the design is	pling	50%	50% of		ıles	50%	of	are	loosely-		
	loosely-		modu	les	are	loosely-	modul	es	coup	oled		
	coupled?		are loosely-		coupled		are 1	oosely-				
			couple	$_{\mathrm{ed}}$			couple	d				

**Evidence:** the answers to the questions above, give cross reference to documentation, and if possible, do provide an example.

**Purpose of Question:** To assess the degree to which the system can ensure that changes to one module will not necessarily require extensive changes to other modules, so that evolving requirements can be easily accommodated by changing a minimum number of modules.

Guidance: e.g. reference from System Engineering Plan; System Design Documents.

MP.Q2	How much of	No tight cou-	Less	$_{ m than}$	50%	of	Mor	e than	All	modules
	the design is	pling	50%	of	mod	ules	50%	of	are	tightly-
	tightly-		modu	les	are	tightly-	mod	ules	cou	pled
	coupled?		are	tightly-	coup	oled	are	tightly-		
			couple	$_{\mathrm{ed}}$			coup	oled		

**Evidence:** the answers to the questions above, give cross reference to documentation. If possible, do provide an example from your designs.

**Purpose of Question:** To assess the degree to which the system can ensure that changes to one module will not necessarily require extensive changes to other modules, so that evolving requirements can be easily accommodated by changing a minimum number of modules.

Guidance: e.g. reference from System Engineering Plan; System Design Documents.

Table 20: Design - Module coupling

Module	Module cohesion: degree of Discrete and identifiable functionalities with well-defined responsibilities										
Item No	Question		Scale								
MH.Q1	To what	None used	Used for less	Used for 50%	Used	for	Used for	all			
	extent has the		than 50% of	of modules	more tl	nan	modules				
	Program used		modules		50%	of					
	incentives to				modules						
	promote										
	modular										
	designs?										

**Purpose of Question:** This measures effectiveness of incentives used by the Program to promote modular designs on all major aspects of the Program

Guidance: e.g. reference from System Engineering Plan; Program Design Documents.

MH.Q2	To what	None used	Used for less	Used for 50%	Used f	or	Used for	all
	extent has the		than 50% of	of modules	more that	an	modules	
	Program used		modules		50%	of		
	incentives to				modules			
	promote							
	modular							
	commonality							

Evidence: the answers to the questions above, providing reference to pertinent documentation.

**Purpose of Question:** This measures effectiveness of incentives used by the Program to promote modular commonality on all major aspects of the Program

Guidance: e.g. reference from System Engineering Plan; Program Design Documents

MH.Q3	To what	None used	Used for less	Used for 50%	Used for	Used for all
	extent has the		than 50% of	of modules	more than	modules
	Program used		modules		50% of	
	incentives to				modules	
	promote					
	modular					
	designs,					
	commonality					
	and					
	component					
	reuse?					

Evidence: the answers to the questions above, give cross reference to documentation.

Purpose of Question: Program incentives are tools used to motivate and incentivise (sub) contractors and/or their team to meet performance standards of the contract. This question measures effectiveness of incentives used by the Program to promote modular designs, commonality and component reuse on all major aspects of the Program. Combining these three characteristics provides fiscal incentive for the prime system integrator to support the Open Systems Business Model.

Guidance: e.g. reference from System Engineering Plan; Program Design Documents.

Item No	Question			Scale		
DR.Q1	To what extent	None	Adoption	Adoption	Adoption	Adoption
	does the design	used	present but	present,	present,	present,
	process stress the		not widely	consistently	consistently	consistently
	use of		used on	used on $50\%$	used on more	used on all
	widely-accepted		Program	of modules	than 50% of	modules
	and supported				modules	
	standards, such					
	as those					
	maintained by					
	${f recognized}$					
	${f organizations}$					
	(e.g. IEEE) and					
	domain					
	community, to					
	define both					
	internal and					
	external					
	modules?					
Evidence	e: the answers to the q	uestions abo	ove, give cross re	eference to docu	mentation.	
Purpose	of Question: The key	y to Open S	ystems and mod	dular designs an	d acquisition fle	xibility is
the ability	of third parties to parties	rticipate in d	or compete for f	unctional modu	les or componen	ts. Using
	d partitioning and clear	-	-		_	
-	Reference models and					-
Guidanc	e: e.g. reference from l	Program Des	sign Documents	, etc.		-
DR.Q2	To what extent is	None in	In place and	In place and	In place and	In place and
	a Design Reuse	place	used on less	used on 50%	used on more	used on all
	strategy in		than $50\%$ of	of modules	than 50% of	modules
	place?		modules		modules	
Evidence	e: the answers to the q	uestions abo	ove, give cross re	eference to docu	mentation.	
Purpose	of Question: To asse	ss the degre	e to which the s	ystem enables e	ease of change, a	nd mitigates
technologi	ical obsolescence.					-

Design - Re-use: Community-of-practice understanding of Design Patterns, Reference models and

 ${\it architectures}$ 

Table 22: Design - Re-use

Guidance: e.g. reference from System Engineering Plan; Program Design Documents

	<b>Design - Re-use:</b> Community-of-practice understanding of Design Patterns, Reference models and architectures										
Item No	No Question Scale										
DR.Q3	To what extent	nat extent No Life- Lifecycle Lifecycle Lifecycle Lifecycle									
	does the design	cycle	Support in	Support in	Support	Support in					
	process include	Support   place for less   place 50% of   in   place   place for									
	Lifecycle Support	in place	than $50\%$ of	modules	for more	modules					
	for the designed		modules		than 50% of						
	modules?				modules						
Evidence	Evidence the answers to the questions above, give cross reference to documentation.										
Purpose	of Question: To asse	ss the degre	e to which the s	system enables e	ease of change, n	nitigates					

technological obsolescence, and provisioning for long-life supportability.

Guidance: e.g. reference from System Engineering Plan; Program Design Documents

DR.Q4	To what extent	None ex-	Funding ex-	Funding ex-	Funding ex-	Funding ex-
	does the design	ists	ists for less	ists for 50%	ists for more	ists for all
	process include		than $50\%$ of	of modules	than $50\%$ of	modules
	Funding for the		modules		modules	
	designed					
	modules?					

Evidence: the answers to the questions above, give cross reference to documentation.

Purpose of Question: Successful implementation of Open Systems requires Programs to include support and funding to enable an ongoing commitment to maintain and even improve that Program's level of openness. If Open Systems were addressed only during initial implementation, the Program's designs would likely grow more closed over time as they become more complex and technical insertions were performed.

Guidance: One way to assess the degree to which Open Systems has been included as a critical element of the lifecycle is to consider if the system is open enough to incorporate regular upgrades and whether or not the program plan includes funding for these upgrades throughout the lifecycle. Please do provide an example of how the design process supports/includes funding for the designed modules.

Table 23: Design - Re-use (contd.)

Design - Re-use:	Community-of-practice understanding of Design Patterns, Reference models and
architectures	

Item No	Question				Scale				
DR.Q5	To what extent	No	re-	Priority	Priority	Priority	7	Priority	
	does the design	quire-		given to less	given to 50%	given	to	given to	all
	process criteria	ment		than 50% of	of modules	more	than	modules	
	require that,			modules		50%	of		
	other things					module	S		
	being equal,								
	priority be given								
	to software								
	modules that								
	have the least								
	restrictive rights								
	associated with								
	them?								

**Purpose of Question:** This evaluates the degree to which the program uses selection criteria that generally favour maximizing the Authority's rights. These rights are typically ranked in descending order from least to most restrictive. The primary goal is to maximise the Authority's flexibility and minimise costs by reusing available designs that satisfy the operational needs of the Authority.

**Guidance:** e.g. reference from System Engineering Plan; System Integration Plan; Program Design Documents

DR.Q6	To what extent	Not sup-	Supply avail-	Supply avail-	Supply avail-	Supply
	are non-mission	plied	able to less	able to 50%	able to more	available to
	unique (NMU)		than 50%	of (NMU)	than 50%	all (NMU)
	capabilities		of (NMU)	capabilities	of (NMU)	capabilities
	supplied using		capabilities		capabilities	
	either					
	components					
	reused from					
	other programs					
	or available from					
	the commercial					
	market?					

Evidence: the answers to the questions above, give cross reference to documentation.

Purpose of Question: Since using proprietary or vendor unique design solutions on occasion at a component or module level and within contracts cannot be uniformly prohibited, and since few functions, components or modules are truly mission unique, the use of proprietary or unique non-commercial designs should be minimised in order to maximise re use, transportability, and extensibility of the program's design evolution

Guidance: e.g. reference from System Engineering Plan; Program Design Documents

Table 24: Design Re-use (contd.)

Design - Layering:	Good separation	of concerns of	applications an	d infrastructure, e.g.	hardware,
operating system, etc.					

Item No	Question			Scale				
DL.Q1	To what extent	Not well-	Well-defined	Well-define	ed	Well-d	lefined	Well-defined
	have the	defined	for less than	for 50	1%	for	more	for all UNC
	proprietary or		50% of UNC	of UN	IC	than	50%	elements
	unique		elements	elements		of	UNC	
	non-commercial					elemer	nts	
	(UNC) elements							
	been limited or							
	well defined such							
	that they do not							
	hinder other							
	developers from							
	interfacing or							
	developing any							
	part of the							
	system?							

**Evidence:** the answers to the questions above, give cross reference to documentation. Please provide examples and/or numbers to justify your answer.

Purpose of Question: In most cases, the total replacement of "in-service designs" with new designs is not a fiscally sound option. Upgrading existing systems to modular open system designs for all or portions is, however, possible and desirable. To achieve this goal, upgrading existing systems to become modular and open must be planned for as part of the technology refresh/insertion process and work plans must be structured to enable the process

Guidance: Percentage of COTS supply or provision in the Program. Program Design Documents

DL.Q2	To what extent	No third-	Third parties	Third par-	Third parties	Third parties
	are multiple	party	are invited	ties supply	supply half	supply all of
	third parties	contrac-	to apply but	less than half	of system	system com-
	directly	tors	not many	of system	components	ponents
	contracted to		get through	components		
	develop					
	components of					
	the system,					
	giving the					
	Authority the					
	flexibility to					
	compete or					
	reassign module					
	development?					

Evidence: the answers to the questions above, give cross reference to documentation.

Purpose of Question: This assesses the degree of openness of system components.

Guidance: e.g. reference from System Engineering Plan; System Design Documents.

Table 25: Design - Layering

operating	operating system, etc.										
Item No	Question		Scale								
DL.Q3	To what	Design evo-	Design evo-	Design evo-	Design	Design evo-					
	extent is the	lution plan	lution plan	lution plan	evolution	lution plan					
	system's	does not	exists but	exists for less	plan exists	exists for					
	$\operatorname{design}$	exist	not enforced.	than $50\%$	for $50\%$ of	all designed					
	capable of			of designed	designed	modules					
	adapting to			modules	modules						
	evolving										
	requirements?										
	e: the answers to the		ove, give cross re	eference to docu	mentation, if po	ssible,					
	designed module e										
-	of Question: To	9		v	ease of change, n	nitigates					
_	ical obsolescence, a	-	-	- "							
Guidanc	e: e.g. reference from	om System Desi	gn Document; S	ystem Engineer	ing Plan.						
DL.Q4	To what	No capabil-	Design capa-	Design capa-	Design capa-	Design capa-					
	extent is the	ity exists	bility exten-	bility exten-	bility exten-	bility exten-					
	system's		sion plan ex-	sion plan ex-	sion plan ex-	sion plan ex-					
	$\operatorname{design}$		ists but not	ists for less	ists for 50%	ists for all					
	capable of		enforced	than $50\%$ of	of modules	modules					
	leveraging			modules							
	new										
	technologies?										
	e: the answers to the	-			mentation, if po	ssible,					
	n example from one		~								
	of Question: To				ease of change, n	nitigates					
	ical obsolescence, a										
Guidanc	Guidance: e.g. references from System Design Document; System Engineering Plan.										

Design - Layering: Good separation of concerns of applications and infrastructure, e.g. hardware,

Table 26: Design - Layering (contd.)

**Data Management Strategy** [**DMS**]: DMS reflects an assessment of the long-term technical data needs of the system, including the data required to design, manufacture and sustain the system

Item No	Question			Sca	le	
D.1	To what extent does	Program	Program	Program	Program	Program
	the Program include	has no	has DMS	has DMS	has DMS	has DMS
	a data management	DMS	in place	in place	in place	in place
	strategy ensuring		for less	for 50%	for more	for 100%
	that when the		than	of its	than	of its Data
	Authority exercises		50% of	Data	50% of	Sets
	its intellectual		its Data	Sets	its Data	
	property rights to		Sets		Sets	
	obtain any					
	developmental					
	artefacts for					
	anything it paid to					
	develop with either					
	complete or partial					
	funding, the					
	Contractor can at					
	most charge a					
	nominal fee covering					
	the marginal cost of					
	the effort to provide					
	that documentation?					

Evidence: the answers to the questions above, and please do give cross reference to documentation.

**Purpose of Question:** It enables the Contractor or the Prime System Integrator to know if the Authority has a DMS in place. If these is a DMS in place, it allows both parties, the Authority and the Contractor, to be aware of their contractual obligations during the lifetime of the project, maintenance and support.

Guidance: e.g. from Design Disclosure Documents, etc.

D.2	To what extent is	Takes no	Strategy	50% of	More	100% of
	the DMS a part of	part in	only	DMS is	than	DMS fully
	the Authority's	Strategy	mentions	part of	50% of	incorpo-
	Acquisition		DMS	Strategy	DMS is	rated in
	Strategy?				part of	Strategy
					Strategy	

Evidence: the answers to the questions above, give cross reference to documentation.

**Purpose of Question:** To assess the degree to which DMS is integrated into the acquisition strategy as a means to achieving program objectives and benefits such as affordable and sustainable system development; system adaptability and flexibility; ease of integration; vendor and technology independence; insertion of new commercial technologies; reuse and commonality of components; interoperability.

Guidance: e.g. references from DMS in Acquisition Strategy, Technology Development Strategy, Systems Engineering Plan

Item No	Question			Sca	le	
D.3	To what extent does	Not	DMS has	DMS	DMS	DMS in-
	the DMS include the	included	less than	has 50%	has more	cludes all
	data required to		50% of	of data	than	the data
	design the system?		data	included	50% of	required
			included		data	
					included	
Evidence	e: the answers to the quest	ions above,	and please p	provide refer	ence to doc	umentation.
Purpose	of Question: To evaluate	the comple	eteness and f	fitness of the	e DMS.	
Guidanc	e: e.g. references from DM	S Design De	ocument; D	MS Docume	nt; System	Engineering Plan,
etc.						
D.4	To what extent does	Not	DMS has	DMS	DMS	DMS in-
	the DMS include the	included	less than	has 50%	has more	cludes all
	data required to		50% of	of data	than	the data
	develop the system?		data	included	50% of	required
			included		data	
					included	
Evidence	e: the answers to the quest	ions above,	give cross re	eference to d	locumentation	on.
Purpose	of Question: To evaluate	the comple	eteness and i	fitness of the	e DMS.	
Guidanc	e: e.g. references from DM	S Design De	ocument; D	MS Docume	nt; System 1	Engineering Plan.

Data Management Strategy [DMS]: DMS reflects an assessment of the long-term technical data needs of the system, including the data required to design, manufacture and sustain the system

Table 28: Data - Data Management Strategy (contd.)

Data Ma	Data Management Strategy [DMS]: DMS reflects an assessment of the long-term technical data										
needs of the system, including the data required to design, manufacture and sustain the system											
Item No	Question		Scale								
D.5	To what	Not included	Not included DMS has DMS has DMS in-								
	extent does		less	than	50% of	data	more	than	cludes	all	
	the DMS		50% of	f data	included	d	50% o	f data	the	data	
	include the		include	ed			include	$_{\mathrm{ed}}$	required	i	
	data required										
	to sustain the										
	system?										
Evidence	. the answers to the	ho questions abo	ovo civo	cross ro	foronco t	o docu	mentatio	nn -			

**Purpose of Question:** Evaluates the DMS' ability to adapt to evolving requirements and provisioning for long-life supportability.

**Guidance:** e.g. references from DMS Design Document; DMS Document; System Engineering Plan, etc.

D.6	To what	Not included	DMS	has	DMS	has	DMS	has	DMS	in-
	extent does		less	than	50% of	data	more	than	cludes	all
	the DMS		50% of	f data	include	d	50% o	f data	the	data
	include the		include	$^{\mathrm{d}}$			include	$_{\mathrm{ed}}$	require	f
	data to									
	support re-									
	competition									
	for									
	production,									
	sustainment									
	or upgrade of									
	the system?									

Evidence: the answers to the questions above, and please do provide reference to documentation.

**Purpose of Question:** Evaluates DMS' ability to adapt to evolving requirements, ease of leveraging new technologies, and ease of mitigating technological obsolescence, and provisioning for long-life supportability.

**Guidance:** e.g. references from DMS Design Document; DMS Document; System Engineering Plan, etc.

Table 29: Data - Data Management Strategy (contd.)

Standard	Standardised Data Schema: Established community-of-practice understanding of data semantics											
Item No	Question		Scale									
SD.1	To what	None	None Less than 50% of data More than All data sets									
	extent are the		50% of data sets de- 50% of data described in									
	data		sets de-	scribed in	sets de-	open format						
	described in		scribed in	open format	scribed in							
	open data		open format open format									
	description											
	format?											

Purpose of Question: To evaluate the ability of the design and architecture of the data to adapt to evolving requirements, ease of mitigating technological obsolescence, and provisioning for long-life supportability. There may already be present existing interfaces that the data sets need to be in conformance with (e.g. data at interface boundaries intra-platform is governed by the pre-existing intra-platform interface control protocols (ICPs); at an inter-platform level by the supported data links; and at the user-interface by the required/accepted operator terminologies). In such cases, please do state.

Guidance: e.g. references from DMS Design Document; DMS Document; System Engineering Plan, etc.

SD.2	To what	None	Less	than	50% of	data	More	than	All data sets
	extent are the		50% of	data	sets	de-	50% of	data	described in
	data		sets	de-	scribed	in	sets	de-	COP format
	described in		scribed	$_{ m in}$	COP for	$\operatorname{mat}$	scribed	in	
	community-		COP for	rmat			COP for	mat	
	of-practice								
	(COP) data								
	description								
	format?								

Evidence: All data sets described in COP format

Purpose of Question: To evaluate the ability of the design and architecture of the data to adapt to evolving requirements, ease of mitigating technological obsolescence, and provisioning for long-life supportability. There may already be present existing interfaces that the data sets need to be in conformance with (e.g. data at interface boundaries intra-platform is governed by the pre-existing intra-platform interface control protocols (ICPs); at an inter-platform level by the supported data links; and at the user-interface by the required/accepted operator terminologies). In such cases, please do state.

Guidance: e.g. references from DMS Design Document; DMS Document; System Engineering Plan.

Table 30: Data - Standardised Data Schema

Standard	Standardised Data Schema: Established community-of-practice understanding of data semantics										
Item No	Question					Scale	е				
SD.3	To what	100%	of	Less	than	50%	de-	More	than	No	data
	extent are the	data	sets	50%	de-	scribed	$_{ m in}$	50%	de-	or	dataset
	data	describe	ed in	scribed	$_{ m in}$	PDDF		scribed	$_{ m in}$	desc	ribed in
	described in	PDDF		PDDF				PDDF		PDI	ΟF
	proprietary										
	data										
	description										
	format										
	(PDDF)?										

**Purpose of Question:** To evaluate the ability of the design and architecture of the data to adapt to evolving requirements, ease of mitigating technological obsolescence, and provisioning for long-life supportability.

Guidance: e.g. reference from DMS Design Document; DMS Document; System Engineering Plan.

SD.4	To what	None exist	Migration	Migration	Migration	Migration
	extent does	or Migration	mechanisms	mecha-	mecha-	mechanisms
	the Program	mechanisms	and en-	nisms and	nisms and	and en-
	enable	exist but no	actment	enactment	enactment	actment
	orderly	timetable for	timetable	timetable ex-	timetable ex-	timetable
	migration of	enactment	exist, for less	ist, for 50%	ist, for more	exist, for all
	proprietary		than $50\%$ of	of datasets	than $50\%$ of	datasets
	data formats		datasets		datasets	
	to open or					
	non-					
	proprietary					
	data schema					
	alternatives?					

Evidence: the answers to the questions above, give cross reference to documentation.

**Purpose of Question:** To assess the degree to which the Program has established a plan to migrate from proprietary to open data formats.

Guidance: e.g. reference from DMS Design Document; DMS Document; System Engineering Plan.

Table 31: Data - Standardised Data Schema (contd.)

standardis	sed formats		1	v	v	
Item No	Question			Scale		
SP.1	To what	None exist	Demonstrable	Demonstrable	Demonstrable	Demonstrable
	extent is		traceability	traceability	traceability	traceability
	there		for less	for $50\%$ of	for more	for all
	${f demonstrable}$		than $50\%$ of	datasets	than $50\%$ of	datasets
	traceability		datasets		datasets	
	from the					
	architecture					
	and design to					
	the published					
	data sets?					
	e: the answers to the			eference to docu	mentation. Is it	possible to
	n example, e.g. from					
Purpose	of Question: To	evaluate the deg	gree of system re	equirements acco	ountability of th	e Program.
Guidanc	e: e.g. reference fro	om DMS Design	Document; DM	IS Document; S	ystem Engineeri	ng Plan.
SP.2	To what	No data	Less than	50% de-	More than	100% of
	extent are the	or dataset	50% de-	scribed in	50% de-	data sets
	data	described in	scribed in	COPF	scribed in	described in
	published in	COPF	COPF		COPF	COPF
	openly-					
	available or					
	community-					
	of-practice					
	standardised					
	formats					
	(COPF)?					
Evidence	e: the answers to the	he questions abo	ove, give cross re	eference to docu	mentation, if po	ssible, do
provide a	n example.					
provide ar	of Question: To	evaluate the Pro	ogram's commit	ment to the max	xim of Open Sys	stems.
provide an <b>Purpose</b>						

Standardised published formats: data is published in industry and/or community-of-practice

Table 32: Data - Standardised published formats

Standard	Standardised published formats: data is published in industry and/or community-of-practice									
standardised formats										
Item No	Question			Scale						
SP.3	To what	No Lifecycle	Lifecycle	Lifecycle	Lifecycle	Lifecycle				
	extent does	Support in-	Support	Support	Support	Support				
	the Program	cluded	included for	included	included	included for				
	include		less than	for $50\%$ of	for more	all of the				
	Lifecycle		50% of	datasets	than 50% of	datasets				
	Support for		datasets		datasets					
	the published									
	data?									
Evidence	e: the answers to t	he questions abo	ove, give cross re	eference to docu	mentation.					

Purpose of Question: To evaluate the Program's commitment, and the system's support, to adapt to evolving requirements, mitigating technological obsolescence and provisioning for long-life supportability.

Guidance: e.g. reference from DMS Design Document; DMS Document; System Engineering Plan.

SP.4	To what	Program	Program in-	Program in-	Program in-	Program in-
	extent does	includes No	cludes Fund-	cludes Fund-	cludes Fund-	cludes Fund-
	the Program	Funding	ing for less	ing for $50\%$	ing for more	ing for all of
	include		than $50\%$ of	of datasets	than 50% of	the datasets
	Funding for		datasets		datasets	
	the published					
	data?					

Evidence the answers to the questions above, give cross reference to documentation.

Purpose of Question: Successful implementation of Open Systems, including the Program's Data, requires the Program to include support and funding to enable an ongoing commitment to maintain and even improve the level of openness for the published data.

Guidance: e.g. reference from Data Design Document. System Engineering Plan. System Implementation Plan. System Lifecycle Development Plan

Table 33: Data - Standardised published formats (contd.)

Data Ex	Data Extensibility: ease of extending data across modules and/or platforms									
Item No	Question		Scale							
D.1	To what	No propri-	Less than	50% of pro-	More than	All propri-				
	extent have	etary or	50% of pro-	prietary or	50	etary or				
	the	unique non-	prietary or	unique non-		unique non-				
	proprietary	commercial	unique non-	commercial		commercial				
	or unique	data set is	commercial	data sets are		data sets are				
	non-	well-defined	data sets are	well-defined		well-defined				
	commercial		well-defined							
	data sets									
	been limited									
	or well									
	defined?									

Purpose of Question: Since using proprietary or vendor unique solutions on occasion at a component or module level and within contracts cannot be uniformly prohibited, and since few functions, components or modules are truly mission unique, the use of proprietary or unique non-commercial datasets should be minimised in order to maximise re use, transportability, and extensibility of the program's datasets

Guidance: e.g. reference from System Engineering Plan; Data Design Documents

D.2	To what	No mecha-	Migration	Migration	Migration	Migration
	extent are	nism exists	mechanisms	mechanisms	mechanisms	mechanisms
	there		exist for less	exist for $50\%$	exist for	exist for
	established		than 50%	of propri-	more than	100% of pro-
	mechanisms		of propri-	etary key	50% of pro-	prietary key
	to migrate		etary key	interfaces	prietary key	interfaces
	key interfaces		interfaces		interfaces	
	that are					
	proprietary					
	or closed to					
	key interfaces					
	that are					
	open?					

Evidence: the answers to the questions above, give cross reference to documentation.

**Purpose of Question:** To assess the degree to which the Program has established a plan to migrate from proprietary to open interfaces.

Guidance: e.g. reference from DMS Design Document; DMS Document; System Engineering Plan.

Table 34: Data - Extensibility

	· ·	9			, -					
Item No	Question				Scale	!				
D.3	To what	No dataset is	Less t	than	50%	of	More	than	100%	of
	extent is the	capable	50%	of	datasets	are	50%	of	datasets	are
	Program's		datasets	are	capable		dataset	ts are	capable	
	data sets		capable				capable	е		
	capable of						_			
	adapting to									
	evolving									
	requirements?									
Evidence	e: the answers to the	he questions abo	ove, give cr	oss re	eference to	docu	mentatio	on, and	if possible,	,
do provid	e an example.	_								
Purpose	of Question: To	assess the degre	e to which	the s	ystem ena	bles e	ease of ch	nange, n	nitigates	
technolog	ical obsolescence, a	nd provisioning	for long-lif	fe sup	portability	7		0 ,	Ü	
	e: e.g. reference fro						vstem E	ngineeri	ing Plan.	
			T =		TT 10					
D.4	Does the	None exist	Processes	s ex-	Uniform	pro-	Uniform	m	Uniform	
	program		ist but	not	cesses ex	ist	process	ses	processes	;
	follow a		uniform				exist a	nd are	exist, are	fol-
	well-defined						followe	d	lowed,	and
	System								consisten	tly
	Engineering								applied	
	process for									
	implementing									
	data									
	I	I	1				l		l	

Table 35: Data - Extensibility (contd.)

processes (e.g. ISSO 15288, IEEE 1220, IEEE 1016) in its data engineering

Evidence: the answers to the questions above, give cross reference to documentation.

Purpose of Question: To assess the degree to which the program employs systems engineering

Guidance: e.g. reference from Systems Engineering Plan, Data Design Plan, Data Engineering Plan.

capability extension?

Data Extensibility: ease of extending data across modules and/or platforms

**Accessibility:** Ability to access the data. Is the accessibility mechanism proprietary or based on industry or community-of-practice standards?

·	v 1									
Item No	Question					S	cale			
A.1	To what	All	propri-	Less	than	50%	propri-	More	than	None is pro-
	extent is the	etary		50%	propri-	etary	•	50%	propri-	prietary
	accessibility			etary				etary		
	mechanism									
	proprietary									
	or based on									
	industry or									
	community-									
	of-practice									
	standards?									

**Evidence:** the answers to the questions above, give cross reference to documentation, and if possible provide an example data accessibility procedure (e.g. a data query, etc.)..

**Purpose of Question:** A proprietary accessibility mechanism may add to ongoing costs of data access and its maintenance during the lifecycle support of the Program. An industry-based access mechanism reduces costs of on-going maintenance. If the data access mechanism is proprietary, is there a migration path from this proprietary mechanism to one based on industry standard.

Guidance: e.g. reference from Data Design Document; System Engineering Plan

A.2	To what	No configu-	Configuration	Configuration	Configuration	Configuration
	extent does	ration man-	management	management	management	management
	the	agement pro-	process ex-	process ex-	process ex-	process
	configuration	cess exists	ists and	ists and	ists and	exists and
	management		covers less	covers $50\%$	covers more	covers all key
	process		than 50% of	of key inter-	than $50\%$ of	interfaces
	encompass		key inter-	faces	key inter-	
	changes to		faces		faces	
	key interfaces					
	and					
	corresponding					
	standards?					

Evidence: the answers to the questions above, give cross reference to documentation.

Purpose of Question: To assess the degree to which the program has incorporated key interface designations, selected standards and related design modifications in the change management process Guidance: e.g. reference from Interface control and configuration management documentation.

Table 36: Data - Accessibility

Accessibility: Ability to access the data. Is the accessibility mechanism proprietary or based on									
industry or community-of-practice standards?									
Item No	Question			Scale					
A.3	To what	No data (or	Data (or	Data (or	Data (or	Data (or			
	extent are	licensing)	licensing)	licensing)	licensing)	licensing)			
	data (or	right exists	rights exist	rights exist	rights exist	rights exist			
	licensing)		for less than	for 50% of	for more	for all data			
	rights		50% of data	data sets	than 50% of	sets			
	well-specified		sets		data sets				
	in a standard								
	and open								
	manner?								
Evidona	o. the engineers to the	ha amagtiang aha	orro mirro anogg na	formando to door	montation if no	agible de			

**Evidence:** the answers to the questions above, give cross reference to documentation, if possible, do provide an example.

**Purpose of Question:** Data or Licensing rights regarding the use of that data need to be explicitly specified, so that the parties consuming the data know what rights are associated with the data to be consumed. If these rights are not specified in standard or open manner, it will be difficult for all parties involved to know the kind of rights associated with the date being supplied and consumed.

Guidance: e.g. reference from Data Design Documents; Published Data Licensing Format.

Table 37: Data - Accessibility (contd.)

Program	nming Language	Portability: in	nplementation is	s not programm	ing language spe	ecific					
Item No	Question		Scale								
PL.Q1	To what	Proprietary	Less than	50% of pro-	More than	All pro-					
	extent have	elements	50% of pro-	prietary	50% of pro-	prietary					
	the	scope not	prietary	elements	prietary	elements					
	proprietary	well defined	elements	have well	elements	have well					
	or unique		have well	defined	have well	defined					
	non-		defined	scope	defined	scope					
	commercial		scope		scope						
	elements been										
	limited or										
	well defined										
	such that										
	they do not										
	hinder other										
	developers										
	from										
	interfacing or										
	developing										
	any part of										
	the system?										

**Evidence:** the answers to the questions above, give cross reference to documentation. And, if possible, please provide an implementation example

Purpose of Question: Since using proprietary or vendor unique solutions on occasion at a component or module level and within contracts cannot be uniformly prohibited, and since few functions, components or modules are truly mission unique, the use of proprietary or unique non-commercial implementations should be minimised in order to maximise re use, transportability, and extensibility of the program's code base

Guidance: e.g. references from System Engineering Plan; Code Design Documents

PL.Q2	What	None	ad-	The	Inter-	The	In-	The	Inter-	All	layers
	programming	dresses		face	to the	terface	e to	face	to the	addre	ess
	language	obsolesc	ence	Netw	ork-	the	Oper-	HCI	Layer	obsol	lescence
	characteris-			ing	Layer	ating	Sys-	addr	esses		
	tics address			addre	esses	tem/P	latform	obsol	escence		
	obsolescence?			obsol	escence	Layer	ad-				
						dresses	3				
						obsole	scence				

Evidence: the answers to the questions above, give cross reference to documentation.

**Purpose of Question:** The difficulty in upgrading a system derives directly from how well the functional elements are modularised and grouped according to their fundamental system roles (a.k.a. separation of concerns). If this is done clearly, and dependencies between modules and across roles are minimal, then the ripple effects of an upgrade to a part of the system are minimised. When it comes to the programming languages used on the program, what characteristics are used to mitigate or prevent obsolescence?

Guidance: e.g. references from System Engineering Plan; System Implementation Plan.

Table 38: Implementation - Pragramming Language Portability

Program	Programming Language Portability: implementation is not programming language specific												
Item No	Question		Scale										
PL.Q3	Are the	None open	Less than	50% of the	More than	All	IDEs						
	development		50% of IDE	IDE open	50% of IDE	open							
	environment		open		open								
	tools												
	industry-												
	standard or												
	community-												
	of-practice,												
	and openly												
	available?												

**Evidence:** the answers to the questions above, give cross reference to documentation. Please give some examples of some in-house development environment tools.

**Purpose of Question:** This measures the scope of unique development within the program, and the program's flexibility in its ability to change from one development tool to another based on program need.

Guidance: e.g. references from System Engineering Plan; System Implementation Plan.

PL.Q4	To what	No traceabil-	Traceability	Traceability	Traceability	Traceability
	extent is their	ity	for less	for 50% of	for more	for all Imple-
	demonstrable		than 50% of	Implementa-	than 50% of	mentation
	traceability		Implementa-	tion	Implementa-	
	from the		tion		tion	
	Program's					
	Architecture,					
	Interfaces and					
	Design					
	elements to					
	Implementa-					
	tion?					

**Evidence:** the answers to the questions above, give cross reference to documentation. Is it possible to provide an example, e.g. from Architecture to Implementation?

Purpose of Question: To evaluate the degree of system requirements accountability of the Program

Guidance: e.g. references from System Design Document; System Engineering Plan.

Table 39: Implementation - Programming Language Portability (contd.)

Implementation Infrastructure Portability: the degree of specificity of implementation to a particular operating system, middleware, or hardware

1	1 0 0		,								
Item No	Question					Scale	е				
IP.Q1	To what	All	are	Less	than	50%	of	More	than	None	is
	extent is the	design-		50%	are	impleme	n-	50%	are	design-	
	implementa-	specific		design-		tation	are	design-		specific	
	tion			specific		design-		specific			
	infrastructure					specific					
	design-										
	specific?										

Evidence: the answers to the questions above, give cross reference to documentation.

**Purpose of Question:** To assess the degree to which design-specific solutions are imposed in the implementation. Such solutions may impede the implementation or emergence of Open Systems if they require vendor-specific software or hardware

Guidance: e.g. references from Capabilities Development Document, Systems Engineering Plan, Implementation Infrastructure Plan

IP.Q2	To what	None	Less	$_{ m than}$	50%	of	More	$_{ m than}$	All	imple-
	extent is the		50%		implement	a-	50%		ment	ation
	implementa-				tion infr	as-			infra	struc-
	tion				tructure				ture	in their
	infrastructure								susta	ined
	(Operating								envir	conment
	System,								are o	pen
	Databases,									
	Communica-									
	tions,									
	Interfaces,									
	Tools, etc.) in									
	its sustained									
	operation									
	environment									
	open?									

**Purpose of Question:** This evaluates the degree to which the program's implementation infrastructure can be easily swapped and/or evolved.

Guidance: e.g. references from System Engineering Plan; System Infrastructure Plan.

IP.Q3	Are the	None open	Less than	50% of the	More than	All	IDEs
	development		50% of IDE	IDE open	50% of IDE	open	
	environment		open		open		
	tools						
	industry-						
	standard or						
	community-						
	of-practice,						
	and openly						
	available?						

Evidence: the answers to the questions above, give cross reference to documentation.

Purpose of Question: This measures the scope of unique development within the program, and the program's flexibility in its ability to change from one infrastructure development tool to another based on program need.

Guidance: e.g. references from System Engineering Plan; System Implementation Plan; System Infrastructure Plan.

Implementation Infrastructure Portability: the degree of specificity of implementation to a particular operating system, middleware, or hardware

particalar	articular operating system, initiatioware, or haraware											
Item No	Question				S	cale						
IP.Q4	To what	None	Less	than	50%	of	All	imple-				
	extent does		50%		imple	menta-	50%		ment	ation		
	the imple-				tion infras-				infras	struc-		
	mentation		tructure							in their		
	infrastructure									ined		
	in its								envir	onment		
	sustained								addre	ess		
	operation								obsol	escence		
	environment											
	$\operatorname{address}$											
	obsolescence?											

**Evidence:** the answers to the questions above, give cross reference to documentation, if possible, provide an example.

**Purpose of Question:** The difficulty in upgrading a system derives directly from how well the infrastructure elements are modularised and grouped according to their fundamental system roles (a.k.a. separation of concerns). If this is done clearly, and dependencies between modules and across roles are minimal, then the ripple effects of an upgrade to a part of the system are minimised. When it comes to the system infrastructure used on the program, what characteristics are used to mitigate or prevent obsolescence?

**Guidance:** e.g. references from System Engineering Plan; System Implementation Plan; System Infrastructure Plan.

IP.Q5	To what	None	Less	$_{ m than}$	50%	of	More	$_{ m than}$	All	
	extent does		50%		implem	nenta-	50%		implen	nent-
	the imple-				tion	infras-			ation	in-
	mentation				tructur	re			frastru	cture
	infrastructure								in	their
	address								sustain	ed
	planned								enviror	$_{ m iment}$
	maintenance?								address	5
									planne	d
									mainte	nance
T . 1	.1		•		c	, 1		· c	•1 1	

**Evidence:** the answers to the questions above, give cross reference to documentation, if possible, provide an example.

**Purpose of Question:** This evaluates the existence of an open and credible maintenance process for the implementation infrastructure. By open, it is meant that the maintenance process is carried out (i.e. provided) from more than one single source or provider.

Guidance: e.g. references from System Integration Plan; System Infrastructure Plan.

IP.Q6	To what	None	Less	than	50%	of	More	than	All	imple-
	extent does		50%		imple	ementa-	50%		ment	ation
	the imple-				tion	infras-			infra	struc-
	mentation				truct	ure			ture	in their
	infrastructure								susta	ained
	address								envir	conment
	unplanned	47							addr	ess
	patches?	41							unpl	anned
									patcl	nes

Evidence: the answers to the questions above, give cross reference to documentation.

**Purpose of Question:** This evaluates the existence and evidence of a credible continual maintenance procedure, such as continual backup procedures, for the implementation infrastructure.

Guidance: e.g. references from System Engineering Plan; System Infrastructure Plan.

Platform	Platform agnosticity of development toolchains, such as compilers, IDEs, etc.											
Item No	Question			Scale								
PA.Q1	How much of	All of the	More than	50% of	Less than	All of the						
	the imple-	implementa-	50% of	the imple-	50% of	implementa-						
	mentation	tion infras-	n infras- the imple- mentation the imple- tion									
	infrastructure	tructure are	mentation	infrastruc-	mentation	tructure are						
	are platform	platform-	infrastruc-	ture are	infrastruc-	platform-						
	agnostic?	specific	ture are	platform-	ture are	agnostic						
			platform- specific platform-									
			specific specific									

**Purpose of Question:** This measures the openness of the Contractor's development environment toolchains, e.g. is the C compiler used by the Contractor a Unix C compiler (e.g. gcc) or Visual C compiler for Windows or compatible with both?

Guidance: e.g. references from System Engineering Plan; Change Management Plan.

PA.Q2	To what	No capacity	Less	than	50%	of	More	than	All	of	the
	extent will	to accommo-	50%	of	impleme	en-	50%	of	imp	leme	n-
	the imple-	date change	imple	men-	tation	can	implem	nen-	tatio	on	can
	mentation		tation	can	accomm	10-	tation	can	acco	mm	0-
	accommodate		accom	imo-	date cha	ange	accomn	no-	date	cha	nge
	change in		date	change			date ch	ange			
	infrastructure		in	infras-							
	elements?		tructu	ıre							
			eleme	$\operatorname{nts}$							

**Evidence:** the answers to the questions above, give cross reference to documentation, providing examples.

**Purpose of Question:** This measures if the program has an effective and open change management in place. Without an effective change management process downstream, changes to the infrastructure elements can lead to less-than-open results.

Guidance: e.g. references from Change Management Plan.

PA.Q3	To what	Program	Program	Program	Program	Program
	extent does	includes No	includes	includes	includes	includes
	the Imple-	Lifecycle	Lifecycle	Lifecycle	Lifecycle	Lifecycle
	mentation	Support	Support for	Support	Support	Support
	process		less than	for 50% of	for more	for all of
	include		50% of	Implementa-	than 50% of	the Imple-
	Lifecycle		Implementa-	tion	Implementa-	mentation
	Support for		tion		tion	modules
	the					
	implemented					
	modules?					

Evidence: the answers to the questions above, give cross reference to documentation.

Purpose of Question: Successful implementation of Open Systems requires Programs to include support and funding to enable an ongoing commitment to maintain and even improve that Program's level of openness. If Open Systems were addressed only during initial implementation, the Program's designs would likely grow more closed over time as they become more complex and technical insertions were performed.

Guidance: One way to assess the degree to which Open Systems has been included as a critical element of the lifecycle is to consider if the system is open enough to incorporate regular upgrades and whether or not the program plan includes funding for these upgrades throughout the lifecycle.

Platform agnosticity of development toolchains, such as compilers, IDEs, etc.											
Item No	Question	Scale									
PA.Q4	To what	Program	Program	Program in-	Program	Program					
	extent does	includes No	includes	cludes Fund-	includes	includes					
	the Imple-	Funding	Funding for	ing for $50\%$	Funding	Funding					
	mentation		less than	of Implemen-	for more	for all of					
	process		50% of	tation	than 50% of	the Imple-					
	include		Implementa-		Implementa-	mentation					
	Funding for		tion		tion	modules					
	the										
	implemented										
	modules?										

**Purpose of Question:** Successful implementation of Open Systems requires Programs to include support and funding to enable an ongoing commitment to maintain and even improve that Program's level of openness. If Open Systems were addressed only during initial implementation, the Program's designs would likely grow more closed over time as they become more complex and technical insertions were performed.

Guidance: One way to assess the degree to which Open Systems has been included as a critical element of the lifecycle is to consider if the system is open enough to incorporate regular upgrades and whether or not the program plan includes funding for these upgrades throughout the lifecycle.

PA.Q5	To what	No	migra-	Migration		Migration		Migration		Migration	
	extent does	tion	plan	plan	exists	plan	exists	plan	exists	plan	exists
	the Program	exists		but	not	and	enforced	and e	nforced	and e	nforced
	enable			enforc	ed	for	50%	for	more	for a	ll pro-
	orderly					or	less of	than	50% of	prieta	ry
	migration of					prop	rietary	propri	ietary	modu	les
	proprietary					mod	ules	modu	les		
	or platform										
	unique										
	implemented										
	modules to										
	open system										
	alternatives?										

Evidence: the answers to the questions above, give cross reference to documentation.

Purpose of Question: In most cases, the total replacement of "in-service systems" with new code is not a fiscally sound option. Upgrading existing systems to modular open system designs for all or portions is, however, possible and desirable. To achieve this goal, upgrading existing systems to become modular and open must be planned for as part of the technology refresh/insertion process and work plans must be structured to enable the process

**Guidance:** e.g. state percentage of COTS supply or provision in the Program; Code Implementation Process

Table 43: Implementation - Platform agnosticity (contd.)

**Inter-operability:** ease of which this system's implemented modules can operate with other system's implemented modules, compatibility with underlying supporting infrastructure, such as virtualisation

Item No	Question			$\operatorname{Scale}$		
IO.Q1	What is the	No defined	Scope of	Scope of	Scope of	Scope of
	scope of in-	scope of	interop-	interop-	interop-	interop-
	teroperability	interoper-	erability	erability	erability	erability
	of the imple-	ability	defined but	defined and	defined and	defined and
	mentation?		not enforced	enforced	enforced on	enforced on
	i.e. is it			on $50\%$ or	more than	all of the
	method/function,			less of the	50% of the	Program
	or class, or			Program	Program	modules
	module, or			modules	modules	
	component?					

Evidence: the answers to the questions above, give cross reference to documentation.

Purpose of Question: The "scope of interoperability" is the level at which a module, within a system, can or will interoperate with other modules. At the extremes: standalone reflects a module that does not interoperate with another module; it shares no data or capabilities; and has no need of either from other units. This measures the ease of compositionality of the implementation; the more granular the scope, the easier it is to compose with other (sub) systems

Guidance: e.g. from references System Engineering Plan; System Implementation Plan.

IO.Q2	To what	No	ability	Abi	lity to ac-	.	Ability to ac-	Abilit	y to ac-	Ability to ac-	
	extent will	to	accom-	com	commodate		commodate	commodate		commodate	
	the imple-	modate		extensibil-			extensibility	extensibility		extensibility	
	mentation	exte	nsibility	ity	on less	3	on 50% of	on	more	on all of the	
	infrastructure		v	thai	n 50% of	f	Implementa-	than	50% of	Implementa-	
	accommodate			Imp	lementa-		tion	Imple	menta-	tion	
	extensibility			tion	l			tion			
	of the Imple-										
	mentation										
	scope of inter-										
	operability?										

Evidence: the answers to the questions above, give cross reference to documentation.

**Purpose of Question:** The extensibility may be downward, i.e. from coarse to more granular, or upwards, i.e. from granular to coarse (or less granular); how much effort need to be expended on the infrastructure to cope with this?

Guidance: e.g. references from Change Management Plan; System Engineering Plan.

IO.Q3	To what	Unable	to	Less	than	50%	Imple-	More	than	Scope	
	extent is the	adapt		50%	Imple-	menta	ation	50%	Imple-	of	inter-
	scope of inter-			mentation		can a	dapt	mentation		operability	
	operability			can a	dapt			can a	dapt	of all	Imple-
	capable of									menta	tion
	adapting to									modul	es can
	evolving									adapt	
	requirements?										

Evidence: the answers to the questions above, give cross reference to documentation.

Purpose of Question: This measures how much effort the Authority need to expend on the scope of inter-operability extensibility if requirements (e.g. architecture, etc.) change.

Guidance: e.g. references from System Engineering Plan; Change Management Plan.

**Inter-operability:** ease of which this system's implemented modules can operate with other system's implemented modules, compatibility with underlying supporting infrastructure, such as virtualisation

Item No	Question		Scale										
IO.Q4	To what	Unable to	Less than	50% Imple-	More than	Scope							
	extent is the	leverage new	50% Imple-	mentation	50% Imple-	of inter-							
	established	technologies	mentation	can leverage	mentation	operability							
	scope of inter-		can leverage		can leverage	of all Imple-							
	operability					mentation							
	mechanism					modules can							
	capable of					leverage new							
	leveraging					technologies							
	new												
	technologies?												

Evidence: the answers to the questions above, give cross reference to documentation.

**Purpose of Question:** In an open systems approach, the more modular the implementation, the easier it will be to take advantage of new technology insertions.

Guidance: e.g. references from System Engineering Plan; Change Management Plan.

IO.Q5	To what	Unable to be	Less than	50% of the	More than	All of the
	extent are the	deployed as	50% of the	components	50% of the	components
	components	packages	components	can be de-	components	can be de-
	of the scope		can be de-	ployed as	can be de-	ployed as
	of inter-		ployed as	packages	ployed as	packages
	operability		packages		packages	
	implemented					
	and					
	independently					
	deployable as					

Evidence: the answers to the questions above, give cross reference to documentation.

**Purpose of Question:** This measures the modular decomposition of the implementation to well partitioned packages. The key to Open Systems and acquisition flexibility for the Authority is the ability of third parties, or other COTS (Commercial Off The Shelf) or GOTS (Government Off The Shelf) products, to participate in or compete for packages' implementation.

**Guidance:** e.g. references from System Engineering Plan; System Implementation Plan; System Design Documents.

Table 45: Implementation - Inter-operability (contd.)

packages?