

## Annex A – NATION’S COMPLETED MATRIX

ISSUE 01	PHASES in LIFE CYCLE							
Date 15 12 2004	1	2	3	4	5	6	7	8
NATO LCC Phases	Mission need evaluation phase	Pre-feasibility phase	Feasibility phase	Project definition phase	Design and Development phase	Production phase	In-service phase	Disposal phase
National LCC Phases Nation: Denmark	Acquisition phase Requirements statement (Basic Military Requirements, Operational User Requirements)				Acquisition (Market exploration, Invite tender, Tender evaluation, Type selection, Order)		Phase in + Service and maintenance phase	Phase out
Type of costing studies required					LCC-analysis to compare alternatives and establish budgets		Follow-up on LCC-analysis to validate budgets and validate and improve estimating techniques	
Description of the process or national guideline to be followed - how are we going to do this ?					Guideline/standard process is being developed			
What methods are used ?					Parametric			
What models are available ? Commercial models								
What models are available ? In house developed models					Standard generic Excel based model (Under development), Various purpose-made Excel models			
Requirements to apply national guideline	none	none	none	none	MOD requirement to develop and use guideline/standard process		none	none
Requirements to apply methods	none	none	none	none	none		none	none
Requirements to apply models	none	none	none	none	MOD requirement to develop and use generic framework model		none	none
Restrictions on applicable methods or models depending on the goal					Lack of expertise and experience. Low priority within MOD and Defence organisations.			
How can data be collected					DeMars SAP R/3 ERP system (Service data for similar systems)		DeMars SAP R/3 ERP system (Service data)	
How is risk and uncertainty considered ?	Expert opinion (very limited use)	Expert opinion (very limited use)	Expert opinion (very limited use)	Expert opinion (very limited use)	Expert opinion (very limited use), Sensitivity analysis		Expert opinion (very limited use)	Expert opinion (very limited use)
What models and tools are available to assess uncertainty ?					Simple Monte Carlo functionality implemented in generic model			
What models and tools are available for risk analysis?	none	none	none	none	none	none	none	none
Requirements to apply risk methodology	No	No	No	No	No	No	No	No

Abbreviations
CBA = Cost Benefit Analysis CBS = Cost Breakdown Structure COO = Cost of Ownership EVM = Earned Value Management IA = Investment Appraisal RFI = Request for Information RFQ = Request for Quotation SME = Subject Matter Expert LUPC= Unit Production Cost

Commercial Models	"In-House" model	Methodology
	Model Generic Excel framework model (under development)	High level CBS, Parametric

Figure A-1: Completed Matrix from Denmark.

## ANNEX A – NATION’S COMPLETED MATRIX

Issue	PHASES in LIFE CYCLE							
	1	2	3	4	5	6	7	8
Date								
NATO LCC Phases	Mission need evaluation phase	Pre-feasibility phase	Feasibility phase	Project definition phase	Design and Development phase	Production phase	In-service phase	Disposal phase
National LCC Phases Nation xxxxxxxx	préparation		conception		Réalisation		Utilisation	Démantèlement
Type of costing studies required	choice of operational solution Budget previsions		choice of technical solution definition of the full system, including ILS		Budget planning			
Description of the process to be followed - how are we going to do this ?	1st LCC estimation by end of phase		enhanced LCC estimation in end of phase file					
What tools are available ? Commercial Tools	FACET			PRICE, COST+				
What tools are available ? IN House Tools	MOPSOS (armored vehicle); SCOPE (ships) Excel based applications							
What methodologies are available ?	Analogy, CERs			Engineering				
Requirements to apply models/methodology	mandatory at end of phase		mandatory, whole along the phase		desirable		desirable	
Requirements to apply tools	none							
Requirements to apply methodology	none							
Restrictions on applicable methods depending on the goal								
How can data be collected	SIPROG : compiles all DGA contracts							
How is risk and uncertainty measured ?								
What models and tools are available to assess uncertainty ?								
What models and tools are available for risk analysis?								
Requirement to apply risk methodology								

Figure A-2: Completed Matrix from France.

ISSUE 01 Date 22 12 2004	PHASES in LIFE CYCLE							
	1	2	3	4	5	6	7	8
NATO LCC Phases	Mission need evaluation phase	Pre-feasibility phase	Feasibility phase	Project definition phase	Design and Development phase	Production phase	In-service phase	Disposal phase
National LCC Phases Nation Germany alternative *	Analysis Phase			Risk Reduction Phase		Introduction Phase	Service Use	
Type of costing studies required	LCC analysis to compare alternatives and options, CBA			LCC analysis to compare alternatives and options, CBA		LCC analysis to compare alternatives and options, CBA	CBA	
Description of the process to be followed - how are we going to do this ?	CPM: approval required to enter next phase			CPM: approval required to enter next phase		CPM: approval required to enter next phase		
What tools are available ? Commercial Tools	in process to start using FACET			ACES PRICE CostXpert (COCOMO II)		ACES PRICE CostXpert (COCOMO II)	ACES PRICE CostXpert (COCOMO II)	
What tools are available ? IN House Tools	SCOPE Excel-sheets			SCOPE Excel-sheets		SCOPE Excel-sheets	SCOPE Excel-sheets	
What methodologies are available ?	Expert opinion, Analogy, Parametric, Engineering			Expert opinion, Analogy, Parametric, Engineering		Expert opinion, Analogy, Parametric, Engineering	Expert opinion, Analogy, Parametric, Engineering, Simulation	
Requirements to apply models/methodology	mandatory			mandatory		mandatory	mandatory	
Requirements to apply tools	none			none		none	none	
Requirements to apply methodology	none			none		none	none	
Restrictions on applicable methods depending on the goal	Availability of data, personnel, time and budget			Availability of data, personnel, time and budget		Availability of data, personnel, time and budget	Availability of data, personnel, time and budget	
How can data be collected	Manually, Information systems (limited), Answers to questionnaires			Manually, Information systems (limited), Answers to questionnaires		Manually, Information systems (limited), Answers to questionnaires	Manually, Information systems (limited), Answers to questionnaires	
How is risk and uncertainty measured ?	Expert opinion (IAGFA)			Sensitivity Analysis		Sensitivity Analysis	Sensitivity Analysis	
What models and tools are available to assess uncertainty ?	none			Risk Analysis of parametric models		Risk Analysis of parametric models	Risk Analysis of parametric models	
What models and tools are available for risk analysis?	Cost Estimation, WU AZF-Plan / Milestones VOCON / Reviews			Demonstrators, Simulations; Cost Estimation, WU AZF-Plan / Milestones		Cost Estimation, WU AZF-Plan / Milestones VOCON / Reviews	Cost Estimation, WU AZF-Plan / Milestones VOCON / Reviews	
Requirements to apply risk methodology	mandatory as part of CPM			mandatory as part of CPM		mandatory as part of CPM	mandatory as part of CPM	

Abbreviations
AZF-Plan= Arbeits-/ Zeit-/Finanzplan (Work, Time, Financial Plan)
CBA= Cost Benefit Analysis
CBS= Cost Breakdown Structure
CPM= Customer Product Management
IAGFA= Integr. Arbeitsgr. Fähigkeitsanalysen (Integrated Working Team Ability Analysis)
VOCON= Vorhabens Controlling (Integrated Controlling System)
WU= Wirtschaftlichkeitsuntersuchung (Value Research)

Commercial Models	"In-House" model	Methodology
ACES = Advanced Cost Estimating Systems	SCOPE = Cost Estimating Tool for Ships	
COCOMO II = Software Estimating Tool		
CostXpert = Software Cost Estimating Tool		
PRICE = Parametric Review of Information for Costing and Evaluation		
FACET = Family of Advanced Cost Estimating Tools		

\* If you have products available that don't need any modifications it is possible to reduce the Life Cycle of three phases (s. above)

Figure A-3: Completed Matrix from Germany.

## ANNEX A – NATION’S COMPLETED MATRIX

ISSUE 01 Date 13 Dec 2004	PHASES in LIFE CYCLE							
	1	2	3	4	5	6	7	8
NATO LCC Phases	Mission need evaluation phase	Pre-feasibility phase	Feasibility phase	Project definition phase	Design and Development phase	Production phase	In-service phase	Disposal phase
National LCC Phases Nation GR/HAGS	Pre-Concept		Concept	Assessment	Demonstration	Manufacture	In-service	Disposal
Type of costing studies required	CBA ,CBS							
Description of the process to be followed - how are we going to do this ?	Operational Analysis Studies							
What tools are available ? Commercial Tools	RFI							
What tools are available ? IN House Tools	CBS Formulas							
What methodologies are available ?	Expert Analysis							
Requirements to apply models/methodology	IBD							
Requirements to apply tools	IBD							
Requirements to apply methodology	Expert Analysis							
Restrictions on applicable methods depending on the goal	User Requirements							
How can data be collected	Manually							
How is risk and uncertainty measured ?	Expert Analysis							
What models and tools are available to assess uncertainty ?	RFI							
What models and tools are available for risk analysis?	RFI							
Requirements to apply risk methodology								

Abbreviations
CBA = Cost Benefit Analysis CBS = Cost Breakdown Structure RFI = Request for Information IBD- IS TO BE DEFINED

Commercial Models	"In House" Models	
	Model	Methodology

Figure A-4: Completed Matrix from Greece.

Issue	PHASES in LIFE CYCLE							
	1	2	3	4	5	6	7	8
Date								
NATO LCC Phases	Mission need evaluation	Pre-feasibility phase	Feasibility phase	Project definition phase	Design and Development phase	Production phase	In-service phase	Disposal phase
National LCC Phases Nation ITALY	Italian Army uses the NATO Life Cycle phases							
Type of costing studies required	Overall constraints of costs and industrial capacity	Estimates of costs for prototypes and initial production, target unit production costs, life cycle costs, impact of inflation, budget changes, exchange rates		Update prior estimates as appropriate			Specific costing studies (according to the nature of systems concerned)	
Description of the process or national guideline to be followed - how are we going to do this ?	Not applicable	RFP or equivalent, as applicable						
What methods are used ?	Analogy or parametric methodologies							
What models are available ? Commercial models	No specific commercial model							
What models are available ? In house developed models	Excel-based models and/or proprietary algorithms							
Requirements to apply national guideline	Some cost formats are mandated by the Government							
Requirements to apply methods	Some cost formats are mandated by the Government							
Requirements to apply models	Some cost formats are mandated by the Government							
Restrictions on applicable methods or models depending on the goal	No particular restriction for methods/models							
How can data be collected	Data collection is usually not automated							
How is risk and uncertainty considered ?	No standard exists for risk and uncertainty evaluation							
What models and tools are available to assess uncertainty ?	None							
What models and tools are available for risk analysis?	None							
Requirement to apply risk methodology	None							

Figure A-5: Completed Matrix from Italy.

# ANNEX A – NATION'S COMPLETED MATRIX

Issue	PHASES in LIFE CYCLE							
Date 2006-09-10	1	2	3	4	5	6	7	8
NATO LCC Phases	Mission need evaluation	Pre-feasibility phase	Feasibility phase	Project definition phase	Design and Development phase	Production phase	In-service phase	Disposal phase
National LCC Phases Nation Norway	Concept		Definition		Development	Aquisition	In-service	Disposal
Type of costing studies required	CBA, WLC		CBA,WLC		CBA,WLC	CBA,WLC	CBA,WLC	CBA
Description of the process or national guideline to be followed - how are we going to do this ?	Operational Analysis Studies Mandatory		Feasibility studies Mandatory RFI		Feasibility studies Mandatory RFQ	Feasibility studies, follow-up Mandatory RFQ	Operational studies Mandatory	Feasibility studies Mandatory
What methods are used ?	Analogies, Parametric, Expert opinion		Activity Based Costing					
What models are available ? Commercial models	No model available or required				OPUS			
What models are available ? In house developed models	KOSTMOD, LCC-Analyzer, Xi-based LCC single purpose models		KOSTMOD, LCC-Analyzer, Xi-based LCC single purpose models, FLYT2				KOSTMOD, LCC-Analyzer	LCC-Analyzer,
Requirements to apply national guideline	National guideline exist for investments larger than 500 mill NOK (app 62 mill EUR)				Significant divagation from decision basis needs to be approved		No guideline on use of LCC	
Requirements to apply methods	Cost Benefit Analysis (incl LCC) on defined conceptual alternatives mandatory to all investments with LCC larger than 500 mill NOK (app 62 mill EUR)		Cost Benefit Analysis (incl LCC) on defined alternatives within the decided concept mandatory to all investments with LCC larger than 500 mill NOK (app 62 mill EUR)		Significant divagation from decision basis needs to be approved			
Requirements to apply models	No specific model requirements, but use of models are mandatory							Desirable
Restrictions on applicable methods or models depending on the goal	Data availability, knowledge, personnel, budget and time available							
How can data be collected	Manually	Manually		Manually	Manually	Manually and information systems		Manually
How is risk and uncertainty considered ?	Probability of project accomplishment. Sensitivity analysis, expert opinion and experience on cost drivers, evaluation of risk and reliability of input data based on alternative data sources and internal models i.e. related to logistics and availability rates. Risk should be evaluated both in terms of: input and modelling and, 2) risk in defined requirements for future capability (i.e. number of aircraft, new technology etc)				Continuous risk evaluation in project using tools such as easy risk manager or similar.			
What models and tools are available to assess uncertainty ?	Easy Risk Manager, Extend, win RAMA, Orbit RCM, OPUS, @RISK, Crystal Ball, CARA fault tree, Access based FMECA tool							
What models and tools are available for risk analysis?								
Requirement to apply risk methodology	Mandatory							

  

Abbreviations	Commercial Models	"In House" Models	Methodology
CBA = Cost Benefit Analysis CBS = Cost Breakdown Structure COO = Cost of Ownership EVM = Earned Value Management IA = Investment Appraisal RFI = Request for Information RFQ = Request for Quotation SME = Subject Matter Expert UPC= Unit Production Cost	@Risk = Risk analysis tool Crystal Ball = Risk analysis tool OPUS = Modelling and spares optimisation Extend winRAMA Orbit RCM CARA fault tree	Easy Risk Manager Access based FMECA tool LCC Analyzer ILSR data base KOSTMOD = Force Structure Cost I, FLYT2 = Air Force model, availability of aircraft and pilots	Parametric Activity based costing Weighted marking scheme Comparative/Parametric Risk based Parametric LCC Database

Figure A-6: Completed Matrix from Norway.

Issue	PHASES in LIFE CYCLE							
Date 2006-04-20	1	2	3	4	5	6	7	
NATO LCC Phases	Mission need evaluation phase	Pre-feasibility phase	Feasibility phase	Project definition phase	Design and Development phase	Production phase	In-service phase	Disposal phase
National LCC Phases	Concept development phase	Concept evaluation phase	Definition and demonstration phase	Procurement phase	In-service phase	In-service phase	Disposal phase	
Nation Sweden								
Type of costing studies required	Costing for long term force structure planning.		CBA	CBA	CBA			
Description of the process or national guideline to be followed - how are we going to do this ?	Operational Analysis Studies, not mandatory	RFI, not mandatory	RFI, RFP, not mandatory	The Act on Public Procurement is mandatory Gate: A number of different cost analyses has to be performed before a project is allowed to proceed to the Production phase, e.g. An estimate of Life Cycle Cost.	The Act on Public Procurement is mandatory Before a system is handed over to the Swedish Armed Forces from FMV an estimate of operating and maintenance costs shall be calculated by FMV. The estimate shall include scope, time plan for the outcome of costs divided on different resources and organisations and shall include cost for: operating and maintenance, consumption of maintenance resources, operating and maintenance management, technical support, etc	The Act on Public Procurement is mandatory	The Act on Public Procurement is mandatory	
What methods are used ?	CBS Parametric Analogy Expert opinion Rules of Thumb	CBS Parametric Analogy Expert opinion Sensitivity analysis to find cost drivers Normorganisation to define a baseline for the LCC-calculations Rules of Thumb Discrete Event Simulation	CBS Parametric Analogy Expert opinion Sensitivity analysis to find cost drivers Normorganisation to define a baseline for the LCC-calculations Rules of Thumb Discrete Event Simulation Optimisation	CBS Parametric Analogy Expert opinion Sensitivity analysis to find cost drivers Normorganisation to define a baseline for the LCC-calculations Rules of Thumb Discrete Event Simulation Optimisation	CBS Parametric Analogy Expert opinion Sensitivity analysis to find cost drivers Normorganisation to define a baseline for the LCC-calculations Rules of Thumb Discrete Event Simulation Optimisation			
What models are available ? Commercial models	CATLOC	CATLOC SIMLOX	CATLOC SIMLOX OPUS10					
What models are available ? In house developed models	CBS-model (including calculation formulas) Excelbased models	Various ILS systems, CBS-model (including calculation formulas) Excelbased models						
Requirements to apply national guideline	No national guidelines on the use of LCC for any phase The Act on Public Procurement is mandatory							
Requirements to apply methods	In larger projects the Armed Forces requires various maintenance analyses and CBS							
Requirements to apply models	Some models are recommended but none are required							
Restrictions on applicable methods or models depending on the goal	Data availability, knowledge, personnel, time, and budget							
How can data be collected	From Business Software Applications, ILS-systems, Industry, Manually, Interviews/Questionnaires, Expert opinion							
How is risk and uncertainty considered ?	Sensitivity analysis, Expert opinion	Risk management plan, FMV working processes are linked to PMBOK Guide (A Guide to the Project Management Body of Knowledge) PMI - Project Management Institute. Sensitivity analysis, Expert opinion, Earned value management						
What models and tools are available to assess uncertainty ?	Spreadsheet models, templates and calculation formulas	Spreadsheet models, templates and calculation formulas based on working process and methodology from (A guide to the Management Body of Knowledge) PMI - Project Management Institute and internal working processes. Earned value management is recommended.						
What models and tools are available for risk analysis?	Spreadsheet models, templates and calculation formulas	Spreadsheet models, templates and calculation formulas based on working process and methodology from (A guide to the Management Body of Knowledge) PMI - Project Management Institute and internal working processes. Earned value management is recommended.						
Requirement to apply risk methodology	The Swedish Armed Forces requires the Swedish Defence Material Administration to perform project risk analysis, no specific models are required except working processes. FMV Risk management is linked to FMV working processes for project management which are linked to PMBOK Guide (A Guide to the Project Management Body of Knowledge) PMI - Project Management Institute. FMV working processes for Risk management is also linked to ISO 15288:5.4.6 Risk Management Process. Earned value management is recommended.							

  

Abbreviations	Commercial Models	In House Models	Methodology
RFI = Request for information RFQ = Request for Quotation RFP = Request for proposal CBA = Cost benefit analysis CBS = Cost Breakdown structure ILS = Integrated Logistic Support	CATLOC - system model for Life Cycle Cost (LCC) calculation and analysis OPUS - system model for modeling and optimization SIMLOX - discrete event Monte Carlo simulation model	ASTOR - Air Force Simulation of Tactics and Operational Resources	<b>The Act on Public Procurement</b> - Since FMV is engaged in public sector procurement, there are rules and regulations that have to be followed. The principal regulations are contained in <b>The Act on Public Procurement</b> which applies to all public sector organisations. The fundamental principle is that procurement should be conducted in a businesslike, competitive and objective way. The regulations also contain rules governing procurement procedures, tender enquiries, the security of classified information, tender opening, assessment of tenderers, tender evaluation and other matters that must be followed by the procuring authority. FMV must also check that a new contractor is registered for VAT and does not have any tax payments outstanding.

**Figure A-7: Completed Matrix from Sweden.**



ISSUE 01 Date 13 Dec 2004	PHASES in LIFE CYCLE							
NATO LCC Phases	1	2	3	4	5	6	7	8
NATO LCC Phases	Mission need evaluation phase	Pre-feasibility phase	Feasibility phase	Project definition phase	Design and Development phase	Production phase	In-service phase	Disposal phase
National LCC Phases Nation The Netherlands	<b>Pre-Phase A</b>	<b>Phase A: Statement of requirement</b>			<b>Phase B/C/D: (preliminary) study &amp; preparation for procurement</b>	<b>Realisation</b>	<b>In-service</b>	<b>Disposal</b>
Type of costing studies required	High level studies to compare strategic alternatives	Determine costs of currently used equipment that need to be replaced (to be used as a benchmark) Preparing questionnaires			LCC analysis to compare alternatives and options CBA and Business Cases Preparing questionnaires	LCC analysis to compare alternatives and options CBA and Business Cases Preparing questionnaires	LCC analysis to compare alternatives and options CBA and Business Cases Preparing questionnaires	Replacement studies, CBA
Description of the process or national guideline to be followed - how are we going to do this ?		DMP /RFI: approval required to enter next phase, FEL-SALDO step-by step approach for LCC-analysis			DMP / RFQ & RFP approval required to enter next phase FEL-SALDO step-by step approach for LCC-analysis	FEL-SALDO step-by step approach for LCC-analysis	DMP Phase E: evaluation of process followed (only large projects)	-
What methods are used ?	Analogy	Analogy, Parametric			Analogy, Engineering, Parametric, Expert opinion, Rule of Thumb	Analogy, Engineering, Parametric, Expert opinion, Rule of Thumb	Engineering	Rule of Thumb
What models are available ? Commercial models	none	none			none	none	none	none
What models are available ? In house developed models	LCC tool and Excel spreadsheet tools	LCC tool and Excel spreadsheet tools			LCC tool and Excel spreadsheet tools	LCC tool and Excel spreadsheet tools	LCC tool and Excel spreadsheet tools	LCC tool and Excel spreadsheet tools
Requirements to apply national guideline	DMP process is obliged	DMP process is obliged, FELSALDO CBS is obliged in DMP			DMP process is obliged, FELSALDO CBS is obliged in DMP	DMP process is obliged, FELSALDO CBS is obliged in DMP	DMIP is under development	
Requirements to apply methods	none	none			none	none	none	none
Requirements to apply models	none	none			none	none	none	none
Restrictions on applicable methods or models depending on the goal	Availability of data, personnel, time and budget	Availability of data, personnel, time and budget			Availability of data, personnel, time and budget	Availability of data, personnel, time and budget	Availability of data, personnel, time and budget	Availability of data, personnel, time and budget
How can data be collected	Manually, Information systems (limited), Answers to questionnaires	Manually, Information systems (limited), Answers to questionnaires			Manually, Information systems (limited), Answers to questionnaires	Manually, Information systems (limited), Answers to questionnaires	Manually, Information systems (limited), Answers to questionnaires	Manually, Information systems (limited), Answers to questionnaires
How is risk and uncertainty considered ?	sensitivity analysis, expert opinion	sensitivity analysis, expert opinion			sensitivity analysis, expert opinion	sensitivity analysis, expert opinion	sensitivity analysis, expert opinion	sensitivity analysis, expert opinion
What models and tools are available to assess uncertainty ?	New (in house developed), LCC tool covers uncertainty, Crystal Ball is also available	New (in house developed) LCC tool covers uncertainty, Crystal Ball is also available			New (in house developed), LCC tool covers uncertainty, Crystal Ball is also available	New (in house developed), LCC tool covers uncertainty, Crystal Ball is also available	New (in house developed), LCC tool covers uncertainty, Crystal Ball is also available	New (in house developed), LCC tool covers uncertainty, Crystal Ball is also available
What models and tools are available for risk analysis?	-	-			-	-	-	-
Requirement to apply risk methodology	mandatory as part of DMP	mandatory as part of DMP			mandatory as part of DMP	-	-	-

  

Abbreviations	Commercial Models	"In House" Models	
		Model	Methodology
LCC = Life Cycle Costs CBS = Cost Breakdown Structure CBA = Cost Benefit Analysis FELSALDO = FEL Step by step Approach to Analyse Life cycle costs in the Defence Organisation DMP = Defence Materiel Process RFI = Request for Information RFQ = Request for Quotation RFP = Request for Proposal DMIP = Defence Materiel In-service Process	Crystal Ball	LCC tool	

**Figure A-9: Completed Matrix from The Netherlands.**

## ANNEX A – NATION’S COMPLETED MATRIX

ISSUE 02 Date 10 04 2006	PHASES in LIFE CYCLE							
	1	2	3	4	5	6	7	8
NATO LCC Phases	Mission need evaluation phase	Pre-feasibility phase	Feasibility phase	Project definition phase	Design and Development phase	Production phase	In-service phase	Disposal phase
National LCC Phases Nation TURKEY	Pre-concept		Concept	Project Definition Phase	Engineering & Product Development	Manufacture	Operation & Maintenance	Disposal
Type of costing studies required	CBA		CBA, UPC, WLC	UPC, WLC	UPC, WLC	UPC, WLC	WLC	WLC
Description of the process or national guideline to be followed - how are we going to do this ?	OR Studies, Construction of CBS		Elaboration of CBS, RFI, RFP	Tender Assessment, Scheduling	Verification of CBS, Tender Assessment	Verification of CBS, Scheduling	Verification of CBS, Deriving actual costs	
What methods are used ?	Analogy, Contingency Analysis, Pairwise Comparisons, Multi-objective Analyses		Parametric Comparisons, Regression Analysis	Parametric Analyses	Parametric Analyses, Discrete Event Simulation	Discrete Event Simulation	Activity Based Costing	Parametric comparisons
What models are available ? Commercial models	EXCEL, ExpertChoice, Theater Level Simulation Tools		EXCEL, MS Project Manager	EXCEL, MS Project Manager	EXCEL, ARENA	EXCEL, ARENA, MS Project Manager	EXCEL, ARENA	EXCEL, Expert Choice
What models are available ? In house developed models	BESTSEL, BAM		GVCAM, FMSCAM, ALCAM, BAM	ALCAM, P3M	CALS*	CALS*	CALS*, EDCAM, EXCAM	CALS*, BESTSEL
Requirements to apply national guideline	Desirable		Desirable	Mandated	Mandated	Mandated	Mandated	Desirable
Requirements to apply methods	Desirable		Desirable	Desirable	Desirable	Desirable	Some methods are mandated by the General Staff	Desirable
Requirements to apply models	Desirable		Desirable	Desirable	Desirable	Desirable	Some models are mandated by the General Staff	Desirable
Restrictions on applicable methods depending on the goal	Personnel, time, system and budget requirements		Personnel, time, system and budget requirements					
How can data be collected	Manual Records, General Information & Data Systems		Manual Records, General Information & Data Systems					
How is risk and uncertainty measured ?	Sensitivity Analysis		Sensitivity Analysis, Monte Carlo Simulation	Monte Carlo Simulation	Monte Carlo Simulation			
What models and tools are available to assess uncertainty ?								
What models and tools are available for risk analysis?	CALS*, RISKSIM, Statistical Software Packages		CALS*, RISKSIM, Statistical Software Packages	CALS*, RISKSIM, Statistical Software Packages	CALS*, RISKSIM, Statistical Software Packages			
Requirements to apply risk methodology	Access to SME							

Abbreviations
CBA = Cost Benefit Analysis
CBS = Cost Breakdown Structure
RFI = Request for Information
RFQ = Request for Quotation
SME = Subject Matter Expert
UPC= Unit Production Cost
WLC= Whole Life Cost

Commercial Models	"In-House" Models	Methodology
ARENA Standard Edition 8.0 (including OptQuest feature) Expert Choice (Advanced Decision Support Software) Theater Level Simulation Tools : NIMROD, TAMARI Statistical Software Packages : JMP, SPSS, Bestfit  Optimization Tools : Lingo 8.0 Extended Optimizasyon Paketi Extended What's Best 7.0 Extended Large-Scale LP Solver Engine V5.5E Premium Solver Platform for Excel V5.5	BESTSEL : Best Selection (Prioritization Tool Based on Optimization) BAM : Budget Allocation Model GVCAM : Ground Vehicle Cost Analysis Model ALCAM : Aircraft Life Cycle Cost Analysis Model FMSCAM : Foreign Military Students Cost Analysis Model P3M : Pre-payment for Projects Model EDCAM : Educational Cost Effectiveness Analysis Model EXCAM : Exercises Cost Effectiveness Analysis Model CALS - ILS : Continuous Acquisition Lifetime Support - Integrated Logistic Support Module  General Information & Data Systems : Air Forces Information System, Logistics Information System C2 Information System	Sensitivity Analysis Contingency Analysis Heuristics Scheduling Theory Regression Analysis Activity Based Costing

Figure A-10: Completed Matrix from Turkey.

ISSUE 02	PHASES in LIFE CYCLE							
Date 5 Apr 2006	1	2	3	4	5	6	7	8
NATO LCC Phases	Mission need evaluation phase	Pre-feasibility phase	Feasibility phase	Project definition phase	Design and Development phase	Production phase	In-service phase	Disposal phase
National LCC Phases Nation: U.S. Dept. of Defense DoD Instruction 5000.2, Issued May 2003	Pre System Acquisition				System Acquisition		Sustainment	
	Concept Refinement		Technology Development		System Develop. & Demonstration	Production & Deployment	Operations & Support	Included in O&S
	Milestone A ^		Milestone B ^		Milestone C ^	Possible additional milestones for major updates		
Type of costing studies required	"Rough cost assessment" as part of JCIDS analysis; AoAs		At milestone B and C: AF; APB; CARD for MDAPs & MAIS; cost assessment (for certain ACAT levels); LCCE; EA & CCA for MAIS; ICE for MDAPs; PBL EA		ICES for FRP DRs (in production phase); also, updates of prior cost estimates for new increments			
Description of the process or national guideline to be followed -	The U.S. DoD cost analysis community follows policies and procedures as promulgated in DoD Instruction 5000.2, "Operation of the Defense Acquisition System," and in all implementing guidance to this instruction.							
What methods are used ?	Rough analogies; high-level parametric cost estimating relationships (CERs)		Analogy & Parametric		Analogy, parametric & engineering build up	Parametric & engineering build up	Parametric	Analogy & Parametric
What models are available ? Commercial models	Literally hundreds of models are available. Each DoD component involved in cost estimating buys and develops tools and models appropriate to the types of systems relevant to that organization. MS Excel is the DoD standard spreadsheet. For MDAPs and MAIS, OSD and each Service typically develop a cost-estimating model unique to that system.							
What models are available ? In house developed models								
Requirements to apply national guideline	DoD and Service-level guidance specify, in detail, what cost-analysis products are required at various milestones in the acquisition process. However, considerable latitude is permitted in terms of <i>how</i> to actually produce the deliverables. The individual analyst has great intellectual freedom in generating a cost estimate.							
Requirements to apply methods								
Requirements to apply models								
Restrictions on applicable methods or models depending on the goal								
How can data be collected	Cost data are available through the DoD and Service budgeting and accounting systems; formal reports such as CCDRs, SRDRs, CPRs, SARs, DAES reports; internal contractor accounting data; and through numerous cost/technical database efforts throughout the cost community.						VAMOS	VAMOS
How is risk and uncertainty considered ?	Varies within and between cost-estimating organizations. A detailed study is available.							
What models and tools are available to assess uncertainty ?	Varies by cost-estimating organization. A detailed study is available.							
What models and tools are available for risk analysis?	Commercial tools such as Crystal Ball and @Risk are widely available in DoD but not used consistently.							
Requirement to apply risk methodology	Varies by cost-estimating organization. A detailed study is available.							

List of abbreviations	
ACAT	Acquisition Category
AF	Affordability Assessment
AoA	Analysis of Alternatives
APB	Acquisition Program Baseline (contains cost goals, in addition to performance and schedule goals)
CARD	Cost Analysis Requirements Description
CCA	Component Cost Analysis
CCDR	Contractor Cost Data Report
CER	Cost Estimating Relationship
CPR	Contract Performance Report
DAES	Defense Acquisition Executive Summary report
DoD	Department of Defense
EA	Economic Analysis
FRP DR	Full-rate Production Decision Review
ICE	Independent Cost Estimate
JCIDS	Joint Capabilities Integration and Development System (CJCSI 3170.01E; 11 May 2005)
LCCE	Life Cycle Cost Estimate
MAIS	Major Automated Information System
MDAP	Major Defense Acquisition Program
PBL	Performance Based Logistics
SAR	Selected Acquisition Report
SRDR	Software Resources Data Report
VAMOS	Visibility and Management of Operating and Support Costs

Figure A-11: Completed Matrix from the United States of America.

# ANNEX A – NATION'S COMPLETED MATRIX

ISSUE 03 Date 04 April 2006	PHASES in LIFE CYCLE							
	1	2	3	4	5	6	7	8
NATO LCC Phases	Mission need evaluation phase	Pre-feasibility phase	Feasibility phase	Project definition phase	Design and Development phase	Production phase	In-service phase	Disposal phase
National LCC Phases Nation UK MOD CADMID	Pre-Concept		Concept	Assessment	Demonstration	Manufacture	In-service	Disposal
Type of costing studies required	Bol, CBA	UPC, WLC, COO	UPC,IA, WLC, COO	UPC,IA, WLC, COO	UPC,WLC, COO	UPC, WLC, COO	IA, WLC, COO	WLC, COO
Description of the process or national guideline to be followed - how are we going to do this ?	Operational Analysis Studies	Bayesian, Parametric, Analogy	RFI, Independent estimate	RFQ, Independent estimate	Tender Assessment	Contract data	Actual Costs	Independent estimate
What methods are used ?	Saaty, Pair-Wise,	Bayesian, Parametric, CGT, Regression Analysis	CBS, CGT,Regression Analysis, COO	CBS, CGT,Regression Analysis, COO	CBS, CGT, MACE, COO	CBS, COO	CBS, COO	Analogy, COO
What models are available ? Commercial Models	Portfolio, Option Analyser	FACET, PRICE, SEER	FACET, PRICE, SEER, COCOMO	FACET, PRICE, SEER, COCOMO, OSCAM, ILS Tools	ILS Tools, OSCAM, COCOMO	Metify, OSCAM, OPUS	Metify, OSCAM, OPUS	Metify, OSCAM, Excel
What models are available ? In House Models	Operational Analysis Studies	EXCEL, SPRUCE, MELICCA, A-credit, OATS, SSCM	EXCEL, SPRUCE, MELICCA, A-credit, OATS & COO System, SSCM	EXCEL, SPRUCE, MELICCA, A-credit, OATS & COO System, SSCM	EXCEL, SPRUCE, MELICCA, A-credit, OATS & COO System, SSCM	Excel, OATS & COO System	Excel, OATS & COO System	Excel, OATS & COO System
Requirements to apply national guideline on LCC	Desirable	Desirable	Mandatory for major Projects / Desirable	Mandatory for major Projects / Desirable	Mandatory for major Projects / Desirable	Mandatory for major Projects / Desirable	Mandatory for major Projects / Desirable	Desirable
Requirements to apply methods	Desirable	Desirable	Desirable	Desirable	Desirable	Desirable	Desirable	Desirable
Requirements to apply models	Desirable	Desirable	Desirable	Desirable	Desirable	Desirable	Desirable	Desirable
Restrictions on applicable methods and/or models depending on the goal	Access to SME, User Requirements	Access to SME, User Requirement	Access to Data, System Requirement	Access to Data, Design Data	Access to Data, Design Data	Contract conditions restricting access to actuals, Design data	Contract conditions restricting access to actuals	Planning Assumptions
How can data be collected ?	Manually	Manually	Manually	Manually	Manually	Manually, EVM	Manually	Manually
How is risk and uncertainty measured ?	Sensitivity Analysis	Sensitivity Analysis	Detailed Modelling	Detailed Modelling	Risk Management & Analysis	Risk Management & Analysis	Risk Management & Analysis	Sensitivity Analysis
What models and tools are available to assess uncertainty ?	@RISK, Predict, Arrisca, Crystal Ball, Optimism Bias	@RISK, Predict, Arrisca, Crystal Ball, Optimism Bias	@RISK, Predict, Arrisca, Crystal Ball, Optimism Bias	@RISK, Predict, Arrisca, Crystal Ball	@RISK, Predict, Arrisca, Crystal Ball	@RISK, Predict, Arrisca, Crystal Ball	@RISK, Predict, Arrisca, Crystal Ball	@RISK, Predict, Arrisca, Crystal Ball
What models and tools are available for risk analysis ?	TDRM	TDRM	ARM, Arrisca, Predict Risk Controller, PERTMaster	ARM, Arrisca, Predict Risk Controller, PERTMaster	TDRM, PERTMaster			
Requirements to apply risk methodology		Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory	Mandatory

Abbreviations
CBA = Cost Benefit Analysis
CBS = Cost Breakdown Structure
COO = Cost of Ownership
BOI = Balance of Investment
EVM = Earned Value Management
IA = Investment Appraisal
RFI = Request for Information
RFQ = Request for Quotation
SME = Subject Matter Expert
UPC= Unit Production Cost

Commercial Models	"In House" Models	Methodology
@Risk = Risk analysis tool	CGT = Compensated Gross Tonnage (Ships)	Parametric
A-Credit = Automated cost resource evaluation and data integration tool	Force Structure Cost Model	Activity based costing
ARM = Active Risk Manager	MACE = 'Multi(ple) Attribute Choice Elucidation' (Cost is just one element)	Weighted marking scheme
Arrisca = Risk Management and analysis tool (Cost & Schedule)	MACRO (Method for Assessing Cost of exploiting Research Output)	Comparative/Parametric
COCOMO = Software estimating tool	MELICCA = Cost collection tool	Activity based costing
Crystal Ball = Risk analysis tool	SPRUCE= Ship Platform Risk based Unit Cost Estimates	Risk based Parametric
FACET = Family of Cost Estimating Tools	OATS & COO System = Options and Affordability Tools Set & Cost of Ownership System	Activity based costing
Metify = Activity based costing/management (ABC/M)		
OPUS = Modelling and spares optimisation		
PERT Master = Schedule risk management and analysis tool		
Predict Risk Controller = Schedule risk management and analysis tool		
PRICE = Parametric cost estimating models		
SEER Parametric cost estimating models		
SSCM = Software Support Cost model		
TDRM = Top Down Risk Model		

Figure A-12: Completed Matrix from the United Kingdom.