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The United States Marine Corps Logistics Requirements Funding Summary Cost Estimating Tool (USMC LRFS CET) Development (Phases I, II, & III)

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EXECUTIVE SUMMARY

The Study Report documents the approach, methodology and results of the Logistics Requirements Funding Summary (LRFS) Cost Estimating Tool (CET) development task for the United States Marine Corps (USMC). It provides users of the tool, decision makers and stakeholders with a comprehensive understanding of the LRFS CET development process that includes market research, use case analysis, framework development, data collection, methodology development and testing. Currently, there is limited capability within the Marine Corps to develop an LRFS and logisticians may not have the necessary skills or background to perform cost estimation of logistics requirements. The purpose of this task is to develop an Excel-based, user-friendly tool that allows program managers, product support managers and logisticians to quickly generate or review LRFSs for all types of Marine Corps programs.

The LRFS CET development effort includes two phases followed by a third phase, which focuses primarily on the tool's operations & maintenance. This Study Report details the Phase I, Phase II, and Phase III development efforts. During Phase I, the LRFS CET Development Team reviewed relevant policy and guidance as well as conducted a market survey and review of the logistics cost estimating tools within Department of Defense (DoD). The team developed a library containing Federal, DoD, Navy and Marine Corps policy and guidance related to integrated product support (IPS) and costing estimating best practices for weapons systems. The establishment the library ensured that the LRFS CET is compliant with up-to-date logistics and cost estimating policy. The market survey of logistics cost estimating tools served to highlight the features and methodologies that provided the greatest value to the logisticians. It also revealed deficiencies and strengths of various tools that enabled the team to avoid pitfalls and incorporate the "must have" features of past development efforts. The market survey and review found the existing tools to be disparate and limited in scope. Furthermore, none of the tools demonstrated a comprehensive cost estimating structure that captures all the logistics funding requirements.

To identify types of Marine Corps Programs that would use the LRFS CET, the LRFS CET Development Team analyzed the data from a data call that was conducted in July 2009, which identified 133 Marine Corps programs that will require the development of an LRFS by December 2011. The analysis of the data indicated that the majority of the programs are small in terms of funding (i.e., ACAT III, ACAT IV, and AAP Programs) and are relatively mature (i.e., Milestone C and Full Rate Production Decision Reviews). The data call also identified the types of commodities each program supported. This information helped to direct the team's development effort for the LRFS CET.

A review of the existing LRFS Cost Element Structure (CES) revealed that the CES did not comprehensively represent the logistic requirements and tasks to be estimated. As a result, a critical step to developing the LRFS CET required redefining the existing LRFS CES to include all logistic requirements for each logistic discipline. This made the CES development process increasingly challenging and required a disciplined CES and model development cycle. To redefine the CES for each module, the LRFS CET Development Team relied on three authoritative documents as the basis of the CES development. The MARCORSYSCOM LRFS Template, which contains lower level subtasks for each logistics discipline, was the basis for establishing the CES. The Independent Logistics Assessment (ILA) Checklist and the Life Cycle Logistics (LCL) Roadmap were also consulted to formulate the CES. Additionally, a decision was made to develop the CESs of each logistics discipline using the LCL Roadmap framework to increase the user-friendliness of the tool because logisticians understand these phases well.

The LRFS CET Development Team initiated a series of Integrated Product Team (IPT) meetings in order to better understand the logistics requirements associated with an LRFS. These meetings

also provided the opportunity to identify all of the activities needed for each Logistics discipline and achieved a consensus among the IPT members with respect to the disciplines' CESs and the commodities the CESs represent. From these meetings, we established the framework of the user interface and identified the relevant questions to ask for each Logistics discipline in order to better define the program and finalize the CESs. Interacting with the logisticians also enabled the LRFS CET Development Team to understand how programs are managed in each logistic roadmap phase.

Using case analyses, the LRFS CET Development Team developed a conceptual architecture for the tool with a goal to facilitate the development of defensible program LRFSs at all stages of the acquisition life cycle. A set of LRFS purposes was developed, referred to as "Use Case Applications," and are nested with the overarching LRFS CET goal. The conclusions resulted in defining limited requirements for LRFS Estimate generation, and including additional optional features for advanced refinement of data and cost models (impacts to user-inputs, calculation methods, data collection requirements), as well as general and specific outputs that support a wide range of LRFS purposes (impacts to required tool outputs).

Based on the conceptual tool architecture framework, the LRFS CET Development Team first developed a prototype module for the Supply Support logistics discipline as it was determined to be the most representative of model functions to be employed across all modules. The LRFS CET Development Team and the government worked together to prioritize the development of all subsequent modules based on need and complexity of the modules. The determination of the first discipline to be addressed in the prototype and the succeeding draft module was also driven by the desire to demonstrate the interrelationships of the modules. After the initial prototype demonstration period, two key lessons learned were identified:

1. Each CES requires the LRFS Development Team and the IPT Team coordinated planning well before technical development of the CES or modules were scheduled to begin.
2. CES development requires a careful balance of both cost elements and event/activity items (from the Logistics Core Processes) to provide enough depth to help users complete a comprehensive estimate without overwhelming them.

Leveraging these lessons learned, the LRFS CET Development Team successfully developed nine LRFS modules in Phase I as planned.

During Phase II, the LRFS CET Development Team completed the remaining seven LRFS modules; provided tool enhancement and refinement to the previously developed modules; conducted various test and evaluation activities to ensure the preservation of functionality as the tool became fully integrated with all modules; and continued collaboration with the IPT Team

One of the accomplishments of the Phase II was the Development Team's support of Beta Test events that included the development of Joint Mine Resistance Ambush Protected (MRAP) Vehicle Program - Cougar Variant LRFS and a three-day Usability and Performance Test (U&PT). Valuable users' feedback and revision requests were collected and vetted through the IPT for prioritization and/or de-confliction as necessary. The LRFS CET Development Team leveraged the beta tests' results and the prioritized updates while the integrated tool was being finalized.

One common activity in both Phase I and Phase II was the data collection and cost analysis effort. The LRFS CET Development Team collected data from various sources and developed cost estimating methodologies for each CES within a given module. Analysis performed by the team resulted in the development of over 6,300 cost models for the entire tool. Each cost model was fully documented and is accessible from a cost methodology library within the tool. These models were categorized by ACAT Level, MIL-STD 881 category, Commodity, Support

Strategy, and Program Status (i.e. legacy vs. new system) which provided the foundation for the model selection process logic. Based on the user's input for a specific program, the model process selection logic will match the user input to each cost model and score for each cost model based on the matches. The model that receives the highest score based on this matching process is then selected for each cost element.

During Phase III, the LRFS CET Development Team provided even more tool enhancement to both the interface and the underlying algorithms resulting in a refined tool near software quality. Adjustments previously developed modules, additional test and evaluation activities to ensure the preservation of functionality, and on call support was also provided as the tool achieved widespread deployment for the first time.

Similar to that done in Phase II, Beta Test events were conducted that included the development of a Joint Mine Resistance Ambush Protected (MRAP) Vehicle Program - Buffalo Variant LRFS and M-ATV LRFS. Detailed training was also initiated during Phase III in support of all USMC Product Groups (PGs). This training was developed specifically for logisticians to attend in a hands-on atmosphere with personal laptops and provided exercises to build skills easily transferrable to ongoing real world tasks.

In addition to the Study Report, the LRFS CET Development Team generated the User's Help File, User's Manual, and System Manual as part of the Phase I and Phase II LRFS CET Development effort. The User's Help file is integrated into the LRFS CET as an HTML-based, interactive execution support guide. The User's Manual, a printed version of the User's Help file, outlines how to use the LRFS CET for individual end-users. These manuals are periodically updated as new versions of the tool are released. The System Manual includes an executive summary of LRFS CET system functionality, and provides tool "super-users" and/or tool administrators the ability to update and/or modify particular attributes or internal system data.

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1. INTRODUCTION

The Study Report documents the approach, methodology and results of the Logistics Requirements Funding Summary (LRFS) Cost Estimating Tool (CET) development task for the United States Marine Corps (USMC). It provides users of the tool, decision makers, as well as stakeholders with a comprehensive understanding of the LRFS CET development process that includes market research, use case analysis, development of the framework, data collection, methodology development and testing. The LRFS CET development effort includes two phases followed by a third phase, which focuses primarily on the tool's operations & maintenance. This Study Report details Phase I, Phase II, and Phase III development efforts. Accompanied by a System Manual and a User's Manual, the Study Report serves as the ultimate guide and documentation on "how the LRFS CET was developed."

1.1 BACKGROUND

Marine Corps Systems Command (MARCORSYSCOM), Assistant Commander, Acquisition Logistics Product Support (AC ALPS) serves as the focal point and competency manager for all life cycle logistics issues and activities related to the Command's equipment support process. A key life cycle logistics management support initiative includes LRFS process improvement, and the pursuit of tools to enhance the quality and ease in the development of the LRFS. The LRFS is the consolidated requirements document that should be used by Program Managers (PMs), Product Support Managers (PSMs) and Logisticians to identify the Integrated Product Support (IPS) related costs for the system, its support system and the acquisition program initiated to design, produce, field, and deploy the system throughout its operational service life. These cost estimates (i.e., requirements) are then compared with the associated funding to highlight significant funding issues. The LRFS provides logistics requirements visibility when required for Program Objectives Memorandum (POM) and budget submissions. The LRFS is a means for the acquisition PM, PSM and Logistician to identify a program's supportability requirements by relevant appropriation and phasing, in one document, across the current Future Years Defense Program (FYDP).

Although logisticians who currently support Marine Corps programs understand the logistics requirements of the program, they may not have the necessary skills or background to perform cost estimation of these requirements. As a result, cost estimates produced for these Marine programs may not provide sufficient funding needed for support. AC ALPS in collaboration with Assistant Commander, Programs, (AC PROG) initiated the task to provide an LRFS CET that incorporates relevant cost estimating data and methodologies available. Booz Allen Hamilton was selected as the prime contractor to support the task. In addition, an integrated product team (IPT) was established to provide subject matter expertise as well as guidance to the LRFS CET Development Team. The IPT consists of a diverse team of acquisition professionals encompassing the Logistics, Engineering, Program Management, Operations Research, and Financial competencies.

1.2 PURPOSE

The purpose of this task was to develop an LRFS CET that incorporates cost estimating data and methodologies available into a user friendly automated environment to enable logisticians and decision makers to determine their program's funding requirements. The LRFS CET will assist the development of Planning Programming Budget Execution (PPBE) process, Life Cycle Sustainment Plan (LCSP), the LCCE, and other programmatic documentation developed in support of acquisition milestones and programmatic execution.

1.3 SCOPE

The objectives of this task were to develop a tool that enabled LRFS development by implementing a data collection and synthesis framework, developing cost estimating models, providing analyses of findings (e.g., quantifiable Course of Action (COA) recommendations). The LRFS CET should provide the Government stakeholders with a basis for developing and defending the identification of the logistics requirements funding decisions as well as documenting findings in a report. The tool is intended to assist the LCLs in each Product Group (PG), independent PM, and Program Executive Office (PEO) for their program's logistics requirements. Each IPS Element is represented in one or more of the tailored cost estimating tool modules integrated into the overall LRFS development tool.

AC ALPS Staff, in corroboration with AC PROG Staff, divided the LRFS CET task into three phases as follows:

Phase I- Tool and Module Development

- Supply Support
- Maintenance Planning
- Support Equipment
- Facilities
- Design Interface
- Automated Information Technology (AIT- IUID - RFID)
- ILS Management
- Tech Data and Tech Publications
- Manpower, Personnel & Training (MPT)

Phase II- Tool and Module Development

- Computer Resources Support (CRS)
- Human Systems Integration (HSI)
- Performance Based Logistics (PBL)
- Environmental, Safety and Occupational Health (ESOH)
- Packaging, Handling, Storage and Transportation (PHS&T)
- Configuration Management (CM)
- Disposal

Phase III- Tool Operations &Maintenance and Enhancements

- CES and Cost Methodology Refinement
- Rates and Factors Update
- Configuration Management
- Operations and Maintenance Support
- Ad Hoc Tool Enhancements
- Joint MRAP Vehicle Program LRFS Support
- User Training
- SharePoint site maintenance

Highlights of the statement of work (SOW) include the following:

- Establish ground rules and assumptions; gather and validate data from the logistics subject matter experts (SMEs); and ensure all applicable Functional Area (FA) and Commodities (equipment types) are analyzed.

- Develop Cost Estimating Relationships (CERs) and Work Breakdown Structures (WBS); and populate the cost methodologies into the applicable cost estimating tool module for each IPS Element. Individual logistic elements cost estimating tool modules will roll up and integrate into a single program-level LRFS development tool. Provide cost modeling methodologies using available technologies and proven processes.
- The LRFS CET and associated individual modules will be functional in Microsoft Office components in an NMCI environment. The LRFS development tool will be compatible with (but not limited to) legacy systems and other software applications not supported through local Automated Information Systems (AIS) and inputs of data from various existing data sources
- The LRFS CET will support differentiation of logistics requirements funding based on such factors as the variations of Acquisition Category (ACAT), maturity of the capability documentation and the associated acquisition phase, the technology and manufacturing readiness levels of the system and the associated inherent support infrastructure, the nature of the system.

2. POLICY AND GUIDANCE

Established logistics and cost estimating policy and guidance were referenced during the LRFS CET development effort to ensure compliance. Overarching policies and guidelines used include the following documents:

Table 2-1: Overarching Policy and Guidance

Date	Title
1976	OMB, *Major Systems Acquisitions*, Circular A-109 (Washington, D.C.: Apr. 5, 1976).
2003	Total Life Cycle Systems Management (TLCSM) Plan of Action and Milestones
2003	Designing and Assessing Supportability in Department of Defense (DoD) Weapon Systems: A Guide to Increased Reliability and Reduced Logistics Footprint
2004	Focused Logistics Campaign Plan 2004 Edition
1993	Government Performance and Results Act
2004	Defense Acquisition Guidebook
2009	GAO-09-3SP GAO Cost Estimating and Assessment Guide DTD Mar 2009
1992	OMB, *Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs*, Circular No. A-94 Revised (Washington, D.C.: Oct. 29, 1992).
1997	MIL-HDBK-260 Reference Data for Logistics Metrics DTD 2 Mar 1997
1997	MIL-HDBK-502 Acquisition Logistics DTD 30 May 1997
2005	MCO 4000.57
2007	Operating and Support Cost Estimating Guide DTD Oct 2007
1987	MCO 4105.2 – Marine Corps Warranty Program
1997	MIL-HDBK-470A Designing and Developing Maintainable Products and Systems DTD Aug 4, 1997
2005	OMB, *Improving Information Technology (IT) Project Planning and Execution*, Memorandum for Chief Information Officers No. M-05-23 (Washington, D.C.: Aug. 4, 2005).
2008	USD AT&L Memo Dated 31 July 2008 – Implementing a Life Cycle Management Framework
2008	Naval PoPS Guidebook
2006	OMB, *Capital Programming Guide:Supplement to Circular A-11, Part 7, Preparation, Submission, and Execution of the Budget* (Washington, D.C.: Executive Office of the President, June 2006).
2008	USMC PBL Guide_Sig Rev_ 28 Mar 08
2005	GAO-05-739SP Performance Measurement and Evaluation: Definitions and Relationships
2007	DoDI 4151.21, Public-Private Partnerships for Depot-Level Maintenance
2003	USD AT&L TLCSM-PBL Memo 2003
2009	GAO-09-150 Defense Logistics: Lack of Key Information May Impede DoD's Ability to Improve SCM
2008	DoD SecNAVINST 5000 02 Dec 2008
2008	DoD Announces Major Revision to Acquisition Policy v5
2003	DODR 4140.1-R – DoD Supply Chain Materiel Management Regulation – May 2003
	DUSDLMR Memo re PBL MID 917 PBL Interim Summary
2008	DAPWG Change Summary
2007	USMC PBL Guide v 1 04 20071206
2005	Program Manager's Planning Roadmap For Implementing Item Unique Identification (IUID) DTD Jun 2005
2007	MCO-4081.2 – Marine Corps PBL DTD Jan 2007
2007	USD AT&L Memo Dated 10 March 2007 --Life Cycle Sustainment Metrics Outcomes
2004	DoD Supportability Guide; Designing and Assessing Supportability in DoD Weapon Systems; Oct 2004
2007	Official DoN PBL BCA GUIDE signed 6 Nov 07
2005	DoD 7000.14-R Depot Maintenance Reporting
2001	DoD 4790.19 Depot Maintenance Policy
2005	DoD 4790.21 Depot Level Source of Repair (DLSOR) Policy

A complete list of all relevant documents used is in Appendix A: LRFS CET Policy and Guidance.

3. SURVEY OF SPECIALIZED LOGISTICS COST ESTIMATING TOOLS

Several tools that aid in the development of logistics cost estimates are available to both logisticians and cost analysts. Table 3-1 below presents a list of software tools available that the LRFS CET Development Team reviewed. Through the reviewing process, the benefits and deficiencies of the each were identified. This review also served to highlight the features and methodologies that provided the greatest value to the logistician. The tool set review was also conducted to ensure that data collection and methodology development efforts were comprehensive. It served to expedite the LRFS CET development process, as some features captured in the tool are analogous to those found in other tools. A review of deficiencies and strengths of the various tools available enabled the team to avoid pitfalls and incorporate "must have" features of past development efforts. Features deemed "must have" were not always in Excel format, and so the function had to be replicated in Excel (i.e., code was pulled directly from existing DoD tools), Examples of "must have" features include:

- Adding in known costs;
- Adjusting the applicable elements by whether the system is new or existing;
- Automatically phased fielding schedules.

Table 3-1: Evaluation of Existing Tools

Tool	Service	Synopsis	Developer	Applicable Discipline(s)
Automated Cost Estimating Integrated Tools (ACEIT)	DoD Wide	ACEIT is a family of applications that support program managers and cost analysts during all phases of a program's life cycle in analyzing, developing, sharing, and reporting risk adjusted cost estimates, providing a framework to automate key analysis tasks and simplify the cost estimating process.	TECOLOTE	All
COMPASS	Army	A PC-based computer model designed to assist in conducting a Level of Repair Analysis (LORA) study. A LORA is an analytical methodology used to determine the maintenance level where the removal and replacement, repair, or the discard of an item should be performed. COMPASS is the Army approved system level LORA model.	Ft. Monmouth	5.0: Maintenance Planning
Cost Analysis Strategy Assessment Model (CASA)	Army	Presents the total cost of ownership depending on user selections: including cost of RDT&E, acquisition/production, operating/support, and disposal. CASA covers the entire life of the system, from its initial research costs to those associated with yearly maintenance, as well as spares, training costs, and other expenses.		All
LCET	Army	Estimates the logistics costs for a weapon system. The logistics costs are broken into 25 cost categories.	Ft. Monmouth	All
Marine Corps Ground Training Systems Aid	USMC	Assists in estimating the scope of Marine Corps Ground training for early budget submissions. Focus is placed on identifying costs that will be added due to the training and that are relevant to the budget submission.	Government	9: Manpower and Training
Munitions Design Trade/Operation & Support Cost Model (MUNMOD 3.11)	DoD Wide	Estimates the cost of Operations and Support (O&S) of munitions and missiles.		7.0: Supply Support

Tool	Service	Synopsis	Developer	Applicable Discipline(s)
NAUTILUS	DoD	A logistics requirements and cost forecasting simulation model – developed in support of the AEGIS Program Office Fleet Logistics, Naval Aviation Logistics Command (NALC), Naval Surface Warfare Center (NSWC) Crane, North Atlantic Treaty Organization (NATO) SeaSparrow and SMART-T. The NAUTILUS modeling tool has an innovative approach for accurately estimating system supply support requirements using historical data readily available at most inventory control points. NAUTILUS has been used extensively to develop spares and maintenance budgets, perform trade-off studies of emerging technologies, support engineering alterations, and evaluate hardware obsolescence. NAUTILUS is specifically tailored to meet the sustainability needs of all types of weapon systems from the beginning of their development through the remainder of their life cycle. NAUTILUS is used to perform AEGIS Commercial-Off-The-Shelf (COTS) cost/benefits analysis and Performance Based Logistic (PBL) studies to define optimum investment/asset management strategies.	TSC	7.0: Supply Support
System Evaluation and Estimation of Resources - Hardware Estimation (SEER-H)	DoD Wide	Aids in the estimation of hardware development, production, operations & support, and system level cost analysis.	Air Force (AFMC)	All
System Evaluation and Estimation of Resources - Software Estimation Model (SEER-SEM)	DoD Wide	Aids the estimation of software development and maintenance cost, effort, schedule, staffing, reliability and risk. It includes a knowledge base of algorithms to aid the analyst in producing concept level estimates.	Air Force (AFMC)	All

Our review found the existing set of tools to be disparate and specific to certain disciplines. The tools do not follow a comprehensive structure that captures all the logistics funding requirements. The program must also be beyond Milestone A to properly use many of the tools. Additionally, most tools lack an online help feature and contextual-based help search functionality. As a result, a user may often face a greater learning curve before meaningful estimates can be generated.

4. SURVEY OF MARCORSYSCOM PROGRAMS AND LRFS DEVELOPMENT

To focus the cost model development and data collection processes by identifying the types of programs and commodities that will require support from the LRFS CET, a data call was conducted in July 2009. The data call identified 133 Marine Corps programs that will require the development of an LRFS by December 2011. An analysis of the data indicated that the majority of the programs are small in terms of funding (i.e., ACAT III, ACAT IV, and AAP Programs) and are relatively mature (i.e., Milestone C and Full Rate Production Decision Reviews). Categorizing these programs also helped the LRFS CET Development Team focus the data collection effort on the following specific commodities:

- C4ISR
- M&S Trainer
- Ground Vehicle
- Infantry Weapon Systems
- Satellite Communication

In addition to the data collected through the data call, the team also compiled data from LRFSs conducted by Booz Allen Hamilton that are currently in development. Table 4-1: Examples of Recent USMC LRFSs includes the LRFSs that either have been completed or are in the process of being completed. Data collected from these LRFSs was used to identify common methodologies and data sources that could be included in the LRFS CET to estimate specific cost elements. A review of the Cost Element Structures (CESs) of each program's LRFS provided guidance in the development of a standard LRFS CES for each logistics discipline.

Table 4-1: Examples of Recent USMC LRFSs

LRFS Task Name	Commodities	PG/PEO/Ind. PM	Milestone	ACAT Designation	Lead Agency
JLTV LRFS	Ground Vehicles	PEO Land Systems	Milestone A	ID	Army
CAC2S	C4ISR	PEO Land Systems	Milestone C	IAC	USMC
MRAP	Ground Vehicles	PM MRAP	Post Milestone C	ID	USMC
ETMS (NGCF)	Calibration Facilities	PG16 (CESS)	Post Milestone C	IV	USMC
GCSS	ERP System	PM (GCSS)	Milestone B	IAM	USMC
COC	C4ISR	PG11 (MC2I)	Milestone C	II	USMC
ONLS	Optics/Night Vision	PG13 (IWS)	Post Milestone C	IV	USMC
AAV Upgrades	Amphibious Vehicles	PG-14 (AFSS)	Milestone B	III - SCE/ IV - I-UGWS	USMC
DCGS	Intel/C4ISR	PG12	Milestone C	IA (IAM or IAC is TBD)	USMC
TFSMS	IT System	PG10	Milestone B	III	USMC
MCEITS	Enterprise Capability	PG-10 (ISI)	Milestone C	III	USMC
EPLS	Vehicle Logistics	PM (AL)	Post Milestone C	IVM	USMC
EMSS	Servers	PM (AL)	Post Milestone C	III	USMC
MPM	Non Lethal Payload	PG13 (IWS)	Milestone B	IV	USMC

Based on the information from MARCORSYSCOM and LRFS on-going efforts, the model development team focused its data collection efforts towards the five commodity types of programs identified as well as collecting programmatic data for small but mature programs. This approach enabled our team to develop cost models for each logistics discipline using data from programs of similar size and scope.

5. LRFS COST ELEMENTS AND DEFINITIONS

To develop the LRFS cost element and lower level cost element structure, the LRFS CET Development Team initiated a series of Integrated Product Team (IPT) meetings in order to better understand the logistics requirements associated with managing a program. These meetings also provided the opportunity to identify all of the activities needed for each logistics discipline and achieved a consensus among the IPT members with respect to the disciplines' CESs and the commodity the CESs represent. From these meetings, the team established the framework of the user interface and identified the relevant questions to for each logistics discipline in order to better define the program and finalize the CESs. Interacting with the logisticians also enabled the LRFS CET Development Team to learn that the programs are managed through a series of logistic roadmap phases. Cost elements included in the LRFS CET are divided into 16 LRFS modules:

- ILS Management
- Performance Based Logistics (PBL)
- Design Interface
- Maintenance Planning
- Support Equipment
- Supply Support
- Human Systems Integration (HSI)
- Manpower, Personnel, and Training (MPT)
- Packaging Handling Storage & Transportation (PHS&T)
- Configuration Management (CM)
- Tech Data and Tech Publications
- Environmental, Safety and Occupational Health (ESOH)
- Facilities
- Computer Resources Support (CRS)
- Automated Information Technology (IUID-RFID)
- Disposal

The MARCORSYSCOM LRFS Template, which contains lower level subtasks for each discipline, was used as the basis to establish the CES. The Independent Logistics Assessment (ILA) Checklist and the Life Cycle Logistics (LCL) Roadmap were also consulted to formulate the CES. Using these three documents and input from logistics SMEs and other stakeholders on the IPT, lower cost element indentures were added to the CES for each discipline.

Figure 5-1: Five-Step LRFS Cost Element Definition Process below illustrates the following method used to formulate the cost element structure for each module:

Step 1. The DoD SECNAVINST 5000 Series and Defense Acquisition Guidebook policies were referenced during the identification of activities and requirements from the ILA Checklist, the AC LCL Logistics Roadmap, and the existing LRFS Template for each logistic element.

Step 2. Appropriate methodologies and questions for each activity identified in Step 1 were researched, formulated and selected for the CES.

Step 3. All activities and requirements, as well as their corresponding methodologies and questions were consolidated into a hierarchal CES for the module.

Step 4. The LRFS CET Development Team conducted an internal review of the draft CES to identify any missing elements or incomplete methodologies, and questions prior to IPT review.

Step 5. The resulting CES for the module was presented to the IPT for review and approval of the structure for insertion into the tool.

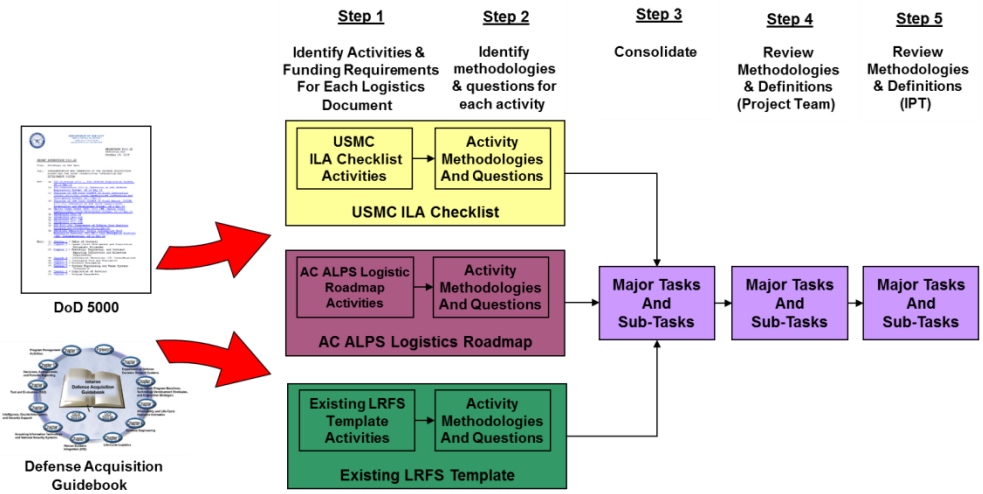

Figure 5-1: Five-Step LRFS Cost Element Definition Process

Additionally, lower-level cost elements in the CET were associated with the AC ALPS Logistics Roadmap Phase from which they originated. This helped increase the user-friendliness of the tool because logisticians understand these phases well.

This association allows the user to sort the elements by phase within the tool for visual clarity. Figure 5-2: AC ALPS Logistics Roadmap Phases below contains the AC ALPS Logistics Roadmap Phases and their corresponding color schemes used in the LRFS CET.

Figure 5-2: AC ALPS Logistics Roadmap Phases

Lower level cost elements will be reviewed periodically to determine if an update is required. Subsequently, detailed tracking and sources of component changes will be provided.

The LRFS CET Task was divided into three distinct phases to increase the efficiency of tool development, updates, and enhancements. Phase I focused on the development of the overall tool environment, user interface and the first nine LRFS modules. Phase II focused on completion of the remaining seven LRFS modules, expansion & improvement of the tool, test and evaluation. Phase III focused on the CESs and cost models updates operations, maintenance of the tool, training, expansion of specialized tool capabilities, and configuration management. Detailed explanations of the Phase I, Phase II, and Phase III LRFS modules are listed in the section below.

5.1 LRFS CET PHASE I LRFS MODULES

5.1.1 ILS Management

Integrated Logistics Support (ILS) is the unified management of the technical logistic disciplines that plan and develop Logistics Support Requirements for military forces and which will ensure system product quality in terms of reliability, availability, maintainability and testability (RAMT). The process facilitates specification, design, development, acquisition, testing, fielding, and the support of systems.

During the course of the LRFS CET development, MARCORSYSCOM was in the midst of adopting the DoD's twelve Integrated Product Support (IPS) elements. The ILS Management module was finalized prior to its name change to Product Support Management.

5.1.2 Design Interface

Design Interface details the relationship between logistics related design parameters and readiness and support resource requirements. These logistics-related design parameters are expressed in operational terms rather than as inherent values and specifically relate to system readiness objectives and support costs of the system.

While developing the CES for Design Interface, the IPT elected to include all Diminishing Manufacturing Sources and Material Shortages (DMSMS) in this module.

5.1.3 Maintenance Planning

Maintenance Planning details the process of identifying and arranging all required elements of the maintenance/repair support capability to ensure weapons systems, subsystems, and equipment are capable of performing their operational missions throughout their life cycle.

5.1.4 Support Equipment

Support Equipment details all equipment (mobile and fixed) required to support the operation and maintenance of the system. This includes associated multi-use end items, ground handling and maintenance equipment, tools, metrology and calibration equipment, test equipment, and automatic test equipment.

5.1.5 Supply Support

Supply Support details all management actions, procedures, and techniques necessary to acquire, receive, catalog, store, transfer, issue and dispose of secondary items. This includes provisioning for initial support, acquiring, distributing, replenishing inventory spares and parts, and planning for direct and competitive spares procurement. In an attempt to avoid cost element complications throughout the task, the IPT elected to include all Demilitarization (DEMIL) and Disposal costs in the supply support module with the option of reorganizing it throughout the CET at a later date.

5.1.6 Manpower, Personnel & Training

Manpower and Personnel involves identification and acquisition of personnel with skills and grades required to operate and maintain a system over its lifetime. Manpower requirements are developed and personnel assignments are made to meet support demands throughout the life cycle of the system. Manpower requirements are predicated on accomplishing the logistics support mission in the most efficient and economical way. This element includes requirements during the planning and decision process to optimize numbers, skills, and positions.

Training and training systems support encompasses the planning, processes, procedures, techniques, training devices and equipment used to train personnel to operate and support a system. This element defines qualitative and quantitative requirements for the training of operations and support personnel throughout the life cycle of the system.

5.1.7 Tech Data and Tech Publications

Product and Technical Data consist of scientific or technical information necessary to translate system requirements into discrete engineering and logistic support documentation. Product and Technical Data is used in the development of repair manuals, maintenance manuals, user manuals, and other documents that are used to operate or support the system.

5.1.8 Facilities

Facilities detail the permanent, semi-permanent, or temporary real property assets required to support the system. This includes conducting studies to define facilities or facility improvements, locations, space needs, utilities, environmental requirements, real estate requirements and equipment.

5.1.9 Automated Information Technology (AIT - IUID –RFID)

Automated Information Technology (AIT) details the of technologies (barcodes, contact memory buttons, radio frequency identification (RFID), etc.) that facilitate the timely, accurate and efficient collection and transmission of source data that is essential in DoD's effort to provide visibility of all assets in-transit, in-process or in-storage.

Item Unique Identification (IUID) is an asset identification system instituted to uniquely identify a discrete tangible item or asset. Tangible items are distinguished from one another by the assignment of a unique identifier in the form of a unique data string and encoded in a bar code placed on the item. An item unique identifier is only assigned to a single item and is never reused. Once assigned to an item, the IUID is never changed even if the item is modified or re-engineered.

5.2 LRFS CET PHASE II LRFS MODULES

5.2.1 Performance Based Logistics (PBL)

Performance Based Logistics (PBL) is a support strategy that places primary emphasis on optimizing weapon system support to meet the needs of the warfighter. Its primary tenets are documentation of warfighter performance requirements as measurable metrics in Performance Based Agreements (PBAs), designation of single point accountability for performance with a Product Support Integrator (PSI), and development of support metrics and accompanying incentives to ensure that the performance objectives are met. In short, PBL is buying Performance, not transactional goods and services. PBL delineates outcome performance goals of weapon systems, ensures that responsibilities are assigned, provides incentives for attaining these goals, and facilitates the overall life-cycle management of system reliability, supportability, and total ownership costs. It is an integrated acquisition and logistics process for buying weapon system capability.

5.2.2 Human Systems Integration (HSI)

Human Systems Integration (HSI) is the comprehensive management and technical program applied early and throughout the acquisition process to optimize total system performance, minimize total ownership costs, and ensure that the system is built to accommodate the characteristics of the user population that will operate, maintain, and support the system. HSI addresses manpower, personnel, training, human factors engineering, habitability, personnel survivability, environment, safety and occupational health. In simple terms, HSI focuses on the human and their interaction with everything in the environment associated with DoD systems.

5.2.3 Packaging, Handling, Storage, and Transportation (PHS&T)

Packaging, Handling, Storage, and Transportation is the combination of resources, processes, procedures, design, considerations, and methods to ensure that all system, equipment, and support items are preserved, packaged, and handled, and transported properly. These costs include environmental considerations, equipment preservation for the short and long storage.

5.2.4 Configuration Management (CM)

Configuration Management is a discipline that organizes and implements, in a systematic fashion, the process of documenting and controlling configuration. Its antitheses are chaos, confusion, crisis, and adverse cost impacts.

5.2.5 Environmental, Safety, and Occupational Health (ESOH)

This element includes interrelated resource requirements that encompass Environmental, Safety, and Occupational Health (ESOH). The System Safety process requirement is used across the ESOH disciplines to identify hazards and mitigate risks through the systems engineering process.

5.2.6 Computer Resources Support (CRS)

Computer Resources Support encompasses the facilities, hardware, software, documentation, manpower, and personnel needed to operate and support mission critical computer hardware/software systems.

5.2.7 Disposal

Disposal includes demilitarizing and disposing of a system at the end of its useful life in accordance with all legal and regulatory requirements and policy relating to safety (including explosives safety), security, and the environment. Specifically, disposal includes getting rid of excess, surplus, scrap, or salvage property under proper authority. Disposal may be accomplished by, but not limited to, transfer, donation, sale, declaration, abandonment, or destruction. Note: As of Phase II, Demilitarization and Disposal elements were no longer captured in Supply Support.

The CES of each Logistics discipline is included in Appendix B: LRFS CET Cost Element Structure.

6. GROUND RULES AND ASSUMPTIONS (GR&AS)

The GR&As outlined below were developed to guide each phase of the tool's development. The GR&As are divided into the following three sub-categories.

6.1 OVERARCHING GR&AS

The LRFS CET assumed that the experience level of the end user might vary significantly from users who have little or no logistics experience to users with 30+ years of experience. Along these lines, the LRFS CET also assumed that the end user has little or no experience with cost modeling for an LRFS estimate. Based on these two assumptions, the LRFS CET Development Team developed the LRFS CET with the experience level of the user in mind. The tool is designed to request the most basic programmatic information from the user and apply that information to select the appropriate models for the user's program and generate costs for each cost element.

Given the varying degrees of programmatic knowledge among the different end users of the LRFS CET, the tool assumed that the user would have information specific to the program that will improve the accuracy of the LRFS that is being generated. The accuracy of the LRFS is directly dependent upon the amount of programmatic information the user provides. For example, the user can generate an LRFS by providing minimal programmatic information (i.e., the program ACAT level, commodity type, number of systems being procured, system unit cost, etc.). As the user provides additional information, the LRFS CET estimate is refined to better represent the requirements of the program. In short, the LRFS CET is designed to produce estimates with minimal programmatic information, but will allow the user to provide more programmatic information to refine the estimate.

6.2 DATA COLLECTION GR&AS

The LRFS CET assumed that programs of similar size and similar system types will have similar costs or cost relationships. In addition, programs with similar support strategies and program status are assumed to have similar costs. The LRFS CET includes a library of cost models, which automatically generate cost estimates for each LRFS cost element. These cost models were developed based on historical cost data from various USMC and DoD programs of different ACAT levels and commodities. To account for these differences, the cost models, which reside in the LRFS CET library, are individually organized based on the following program categories:

1) ACAT Level
2) MIL-STD 881 Category
3) Commodity
4) Program Status (new versus upgrade/modification of program)
5) Joint Program Status
6) Program Support Strategy

With this framework, the data collection effort included capturing the relevant programmatic details above for all cost-data points collected. By assigning these criteria to the data (and associated cost models developed), the LRFS CET Development Team created a method to determine the relevancy of available cost models to the user's inputs for a given estimate. This method included assigning "weights" for each of these criteria to support the cost model selection process. Additional details on the Data Collection processes and methodologies are included in section 8.

6.3 TOOL DEVELOPMENT GR&AS

Given the varying degrees of experience the end user is assumed to have with respect to logistics and cost estimating experience, the LRFS CET was designed to require minimal active manipulation of the models by the user outside of certain functions such as:

- The addition of travel, labor, facilities and miscellaneous costs
- The addition program specific labor rates and FTE requirements to override default values
- The inclusion and exclusion of models for a cost element
- The assignment of appropriations for cost elements

The tool design was not intended to require extensive training. An initial draft LRFS can be developed with little or no training by providing answers to a limited number of Programmatic, System, and Module Specific questions. To achieve this, the tool is designed with many features that include instructions, definitions and tool tips to guide the user. Additional information on Tool Development is included in Section 7.

7. TOOL DEVELOPMENT

The tool development process, captured below in Figure 7-1, employed includes identifying user requirements (via Use Case Analysis), developing the conceptual model architecture, building a Prototype Module for a single logistics discipline, developing and integrating all subsequent modules into one LRFS CET, testing and delivering subsequent/integrated models and making revisions as a part of the continuous development cycle. At each development milestone, the process was reviewed, validated and approved by the Study Director and AC LCL Lead to ensure that each module conforms to established performance and quality criteria. The Prototype Tool incorporated the capabilities of the final integrated tool (e.g., program level inputs and summary tables). The prototype development helped to solidify the model architecture and functionality before subsequent modules were built.

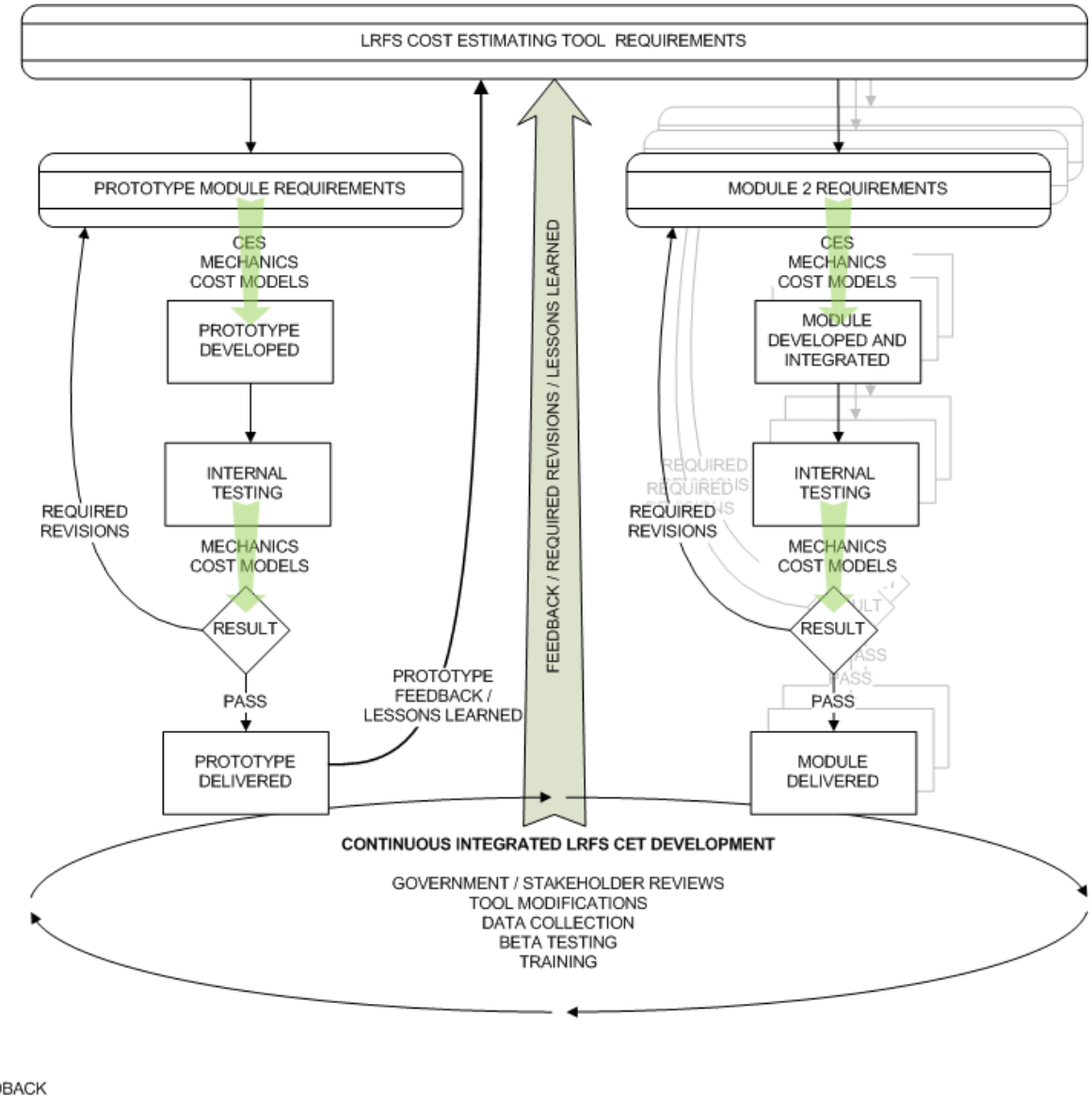

Figure 7-1: LRFS CET Development Process

7.1 USER REQUIREMENTS

The LRFS CET Development Team leveraged Use Case Analyses to identify user requirements. A Use Case described how a type of user (called an actor) uses a system to achieve a goal. A "Fully-Dressed" Use Case clearly defined particular actors, and their specific interactions with a system, but based on the broad range of potential users' level of functional logistics knowledge, program-specific knowledge, and cost-estimating knowledge, a "Casual" Use Case (summarized) was developed in order to provide the appropriate mix of defined requirements and flexibility in development. Use Cases are highly useful techniques for describing required interactions within the context of defined tasks (Use Case Applications), and various user-dependent Use Case parameters. The key objective of the Use Case Analysis was to define:

- Who will be using the system?
- What will they be using the system to do?

By answering these questions, the LRFS CET Development Team was able to tailor the tool to support a broad range of requirements; determining the appropriate mix of required and optional inputs, the appropriate advanced estimate refinement capabilities and the various required outputs of the LRFS CET.

7.1.1 Use Case Approach

A set of LRFS purposes was developed, referred to as "Use Case Applications," and are nested with the overarching LRFS CET goal: to facilitate the development of defensible program LRFSs at all stages of the acquisition life cycle. These purposes were derived from the review of MARCORSYSCOM initiatives, interviews conducted with AC ALPS personnel and dialogue during IPT sessions. Additionally, a set of user-dependent parameters, referred to as "Use Case Parameters" was developed to represent a collective description of potential users. These parameters were developed based on a review of AC ALPS positions, roles and responsibilities; consideration of various existing programs' maturity; and dialogue with the AC PROG Study Director and IPT members regarding cost analysis proficiencies within AC ALPS and MARCORSYSCOM. Each Use Case Parameter represents a generalized range of measure, from "low" to "high." All potential users and primary stakeholders fall somewhere within the generalized range of measure for each parameter, regardless of their particular title. Although specific titles and expected levels of proficiency were reviewed when analyzing the "Typical" Use Case (captured in section 7.1.2), Figure 7-2 depicts the LRFS CET Development Team's approach to the Use Case Analysis, and the user-based considerations applied to tool development requirements.

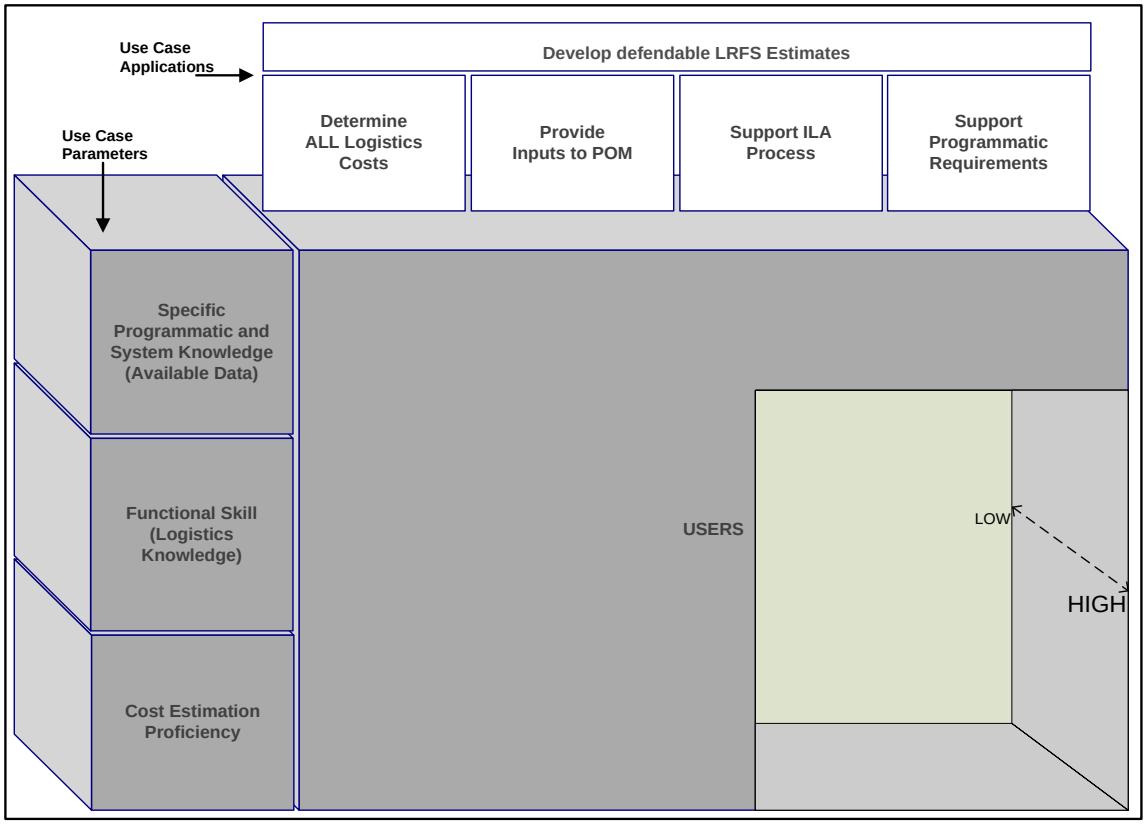

Figure 7-2: LRFS CET Use Case Analysis Approach

As shown in Figure 7-2, users of the LRFS CET will have varying levels of available program-specific data, logistics functional knowledge and cost estimating proficiency. As such, the tool had to be developed to account for the wide range of possibilities. The development considerations included:

- User Interface Features
- Inputs and Indicators
- LRFS CET Outputs

The conclusions resulted in: defining limited requirements for LRFS Estimate generation, including additional optional features for advanced refinement of data and cost models(impacts to user-inputs, calculation methods, data collection requirements), as well as general and specific outputs that support a wide range of LRFS purposes (impacts to required tool outputs). By tailoring the outputs to support a wide range of purposes, users have the ability to extract what they need for their specific requirements – from capturing all logistics related costs, to supporting the decision-making process for Program Managers. While the Use Case approach helped outline general user-based tool development considerations, a Typical Use Case was developed to better answer the primary questions posed.

7.1.2 Typical Use Case

To further capture user requirements, the LRFS CET Development Team constructed a Typical Use Case, outlined in Figure 7-3.

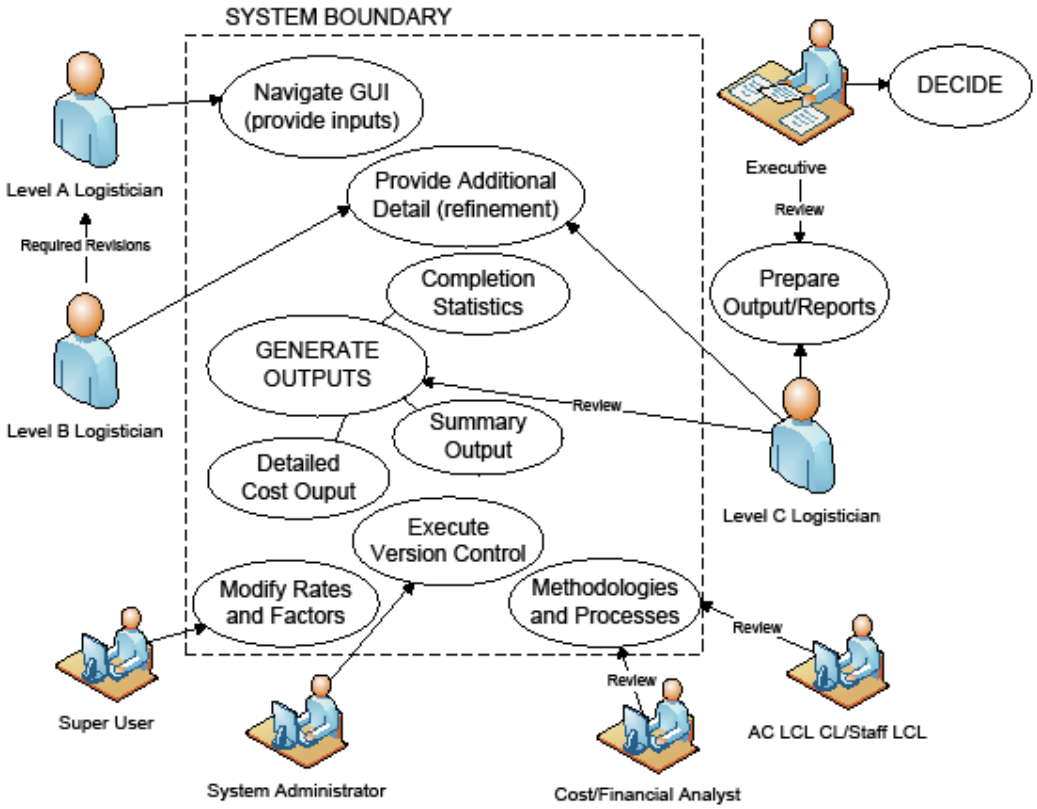

Figure 7-3: Typical LRFS CET Use Case

In the Typical Use Case, various Logisticians (represented by the "Level 'x' Logistician" actors within the Typical Use Case diagram) supporting the Program Management Team (PMT) will leverage the LRFS CET to generate an LRFS Estimate. The Logistician level designations correspond with the Certification Levels outlined in the ALPS Professional Development Handbook (4th Edition, September 2008). Each level will have a specified level of logistics proficiency, and higher levels (Level C is the highest) will likely be more familiar with specific program considerations, based on their functional logistics proficiency. The Level A, B and C Logisticians in this Typical Use Case represent Logisticians supporting the PMO directly, and would generally fall into the PMT ALPS and PM Lead ALPS positions outlined within the ALPS Professional Development Handbook. As depicted, the higher level of certification maturity, the more detailed their interaction with the LRFS CET becomes. Ultimately, the Level C Logistician, likely a lead logistician for a PMO or PEO, will leverage the various outputs of the LRFS CET to prepare specific decision-support documentation for a Program Manager (the "Executive" actor within Figure 7-3). In addition to using the LRFS CET to generate an estimate, other users within MARCORSYSCOM will likely use the LRFS CET for alternate purposes. Other users, as depicted in the Typical Use Case diagram, include:

- "Super User," who has the appropriate level of training and authority to modify rates, factors, and other internal data within the LRFS CET
- "System Administrator," who will execute version control and distribute updates within MARCORSYSCOM
- "Cost/Financial Analyst," who will use the LRFS CET to review cost methodologies employed within the tool; likely individuals assigned to AC PROG EBAB

- "AC ALPS CL/Staff ALPS ," who will use the LRFS CET to review CESs associated with specific logistics disciplines against evolving ILS processes and procedures; likely individuals assigned as ALPS Competency Leads or Staff Logisticians within AC ALPS

7.2 TOOL ARCHITECTURE

The tool architecture was summarized as a six-step process as shown in Figure 7-4 below; a tiered input step, three additional steps for calculation and review, and two final steps for reporting. Each subsequent step of the process provides the tool the information it needs to develop an estimate and represents a more detailed look at the logistics requirements for the program. These steps are:

- Step 1) User Data Input
- Step 2) Application of Cost Models
- Step 3) User Estimate Review
- Step 4) Application of Uncertainty Analysis
- Step 5) Output of Estimate Results
- Step 6) Utilization of Estimate Results in Reporting

The tool was also designed to accept estimates, actual costs and other input data from external sources during the data input process or during the estimate review. This information can be entered by the user at any time. Based on the input values and completeness of the information, the tool estimates and populates the costs associated with each applicable Logistics Cost Element. In the remaining steps, the user has the opportunity to revise and recalculate, or export the results.

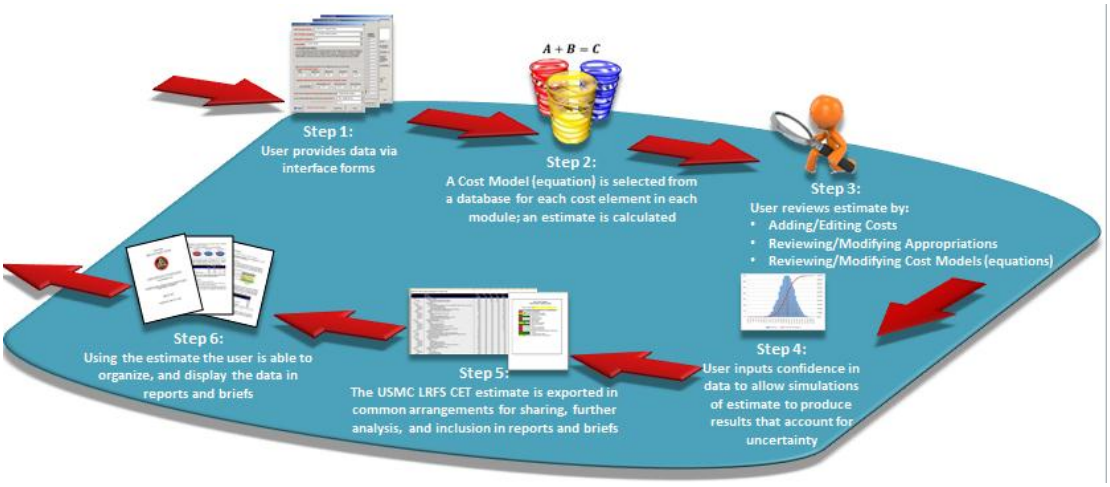

Figure 7-4: Tool Architecture Overview

Because much of the process is user-driven, the estimate fidelity relies on the programmatic information provided. The tool is designed to accommodate instances where certain inputs are undetermined. If the user cannot provide certain metrics, the tool may opt for an alternate methodology to calculate a cost. To support tool users, the tool includes a wizard to guide users through the three-tiered input process

7.3 PROTOTYPE DEVELOPMENT

The CET Development Team first developed a prototype module for the Supply Support as it was determined to be the most representative of cost model functions to be employed across all modules. The LRFS CET Development Team and the government worked together to prioritize the

development of all subsequent modules based on need and complexity of the modules. The determination of the first discipline to be addressed in the prototype and the succeeding draft module was also driven by the desire to demonstrate the interrelationships of the modules.

To this end, the prototype module was designed to summarize the logistics requirements and funding necessary to conduct Supply Support activities with the next module being focused on Maintenance Planning. The rationale for developing the Maintenance Planning module immediately after the Supply Support module was that user inputs used to populate the Maintenance Planning module were expected to influence some lower level elements in the Supply Support module.

The prototype module was demonstrated to AC ALPS staff and all key stakeholders to determine if the tool is functioning as required. After initial prototype demonstration period, two key lessons learned were identified:

3. Each CES requires LRFS Team/IPT Team coordinated planning well before technical development of the CES or modules were scheduled to begin. This planning must account for multiple sources including the ILA Checklist, the AC ALPS Logistics Roadmap, and the previously developed LRFS Template.
4. CES development requires a careful balance of both cost elements and event/activity items (from the Logistics Core Processes) to provide enough depth to help the user complete a comprehensive estimate without overwhelming them.

7.4 SUBSEQUENT MODULES DEVELOPMENT

Leveraging these lessons learned, the LRFS CET Development Team developed nine modules in Phase I and seven modules in Phase II and conducted tests periodically to determine that functionality was preserved as the tool became fully integrated with all modules. It was not anticipated that more than one meeting would be required to develop the CES for any given module since data existed on these elements. However, early on it became apparent that the CES in existence was not comprehensive enough for the tool or arguably the LRFS process. This made the CES development process much more challenging and required a disciplined CES and cost model development cycle (as discussed in Section 5).

The approach quickly morphed into a “cycle of development” for each module. Each process of this cycle began with the development of the initial CES for that module. Once the initial CES was developed, it was presented to the IPT Committee responsible for oversight on that module with an opportunity for revisions to be made. If the IPT Committee elected to revise the CES, it was returned to the LRFS CET Development Team to revise and then presented again. This cycle continued until the IPT Committee for that module was satisfied that the module would accommodate all costs, activities and interview questions that both the CET and LRFS process would demand. Once the structure was finalized, it was returned to the LRFS CET Development Team, model data was prepared for the CES and the module was then incorporated into the tool. This cycle accommodated the task schedule, while allowing for all necessary meetings on CES development and tool changes to take place without interruption. Figure 7-5 below illustrates the development cycle used for each module:

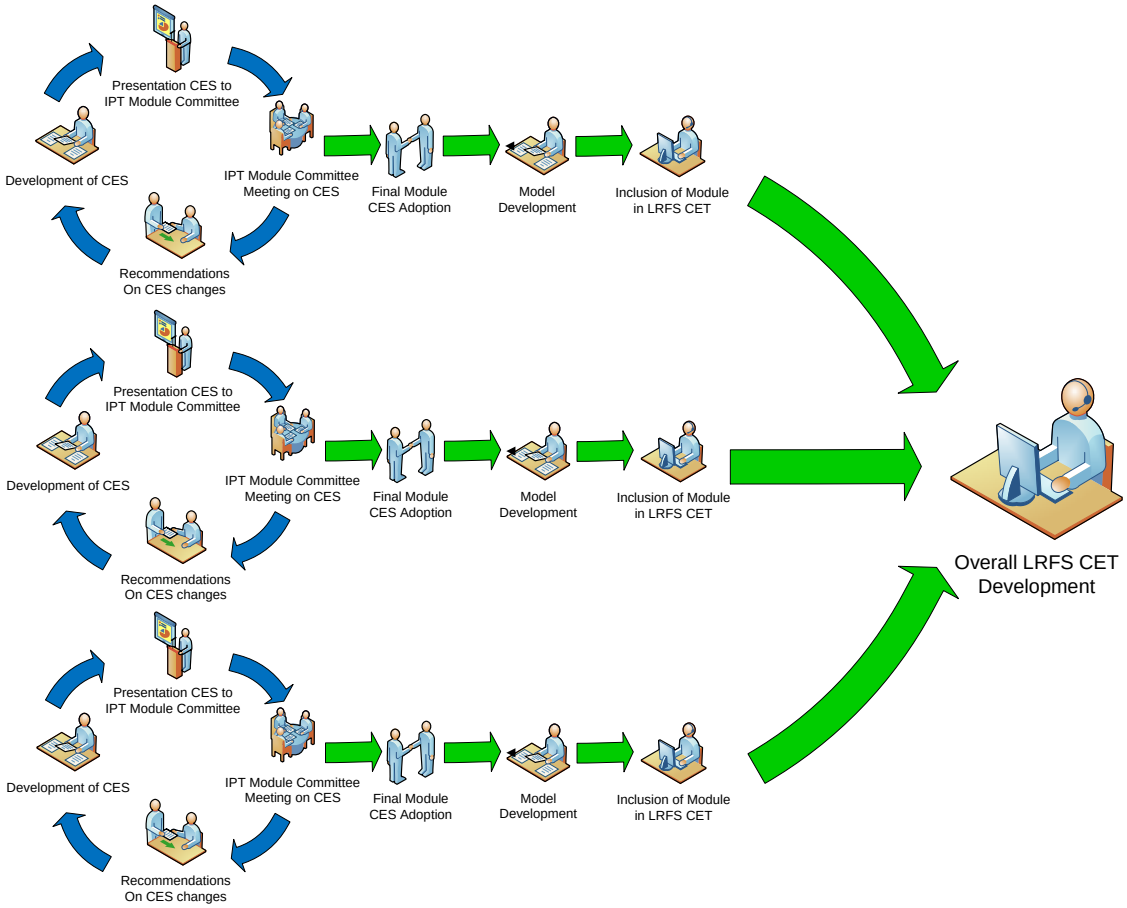

Figure 7-5: LRFS CET Module Development Cycle

7.5 TESTING AND MODULE INSTALLATION

Prior to each module installation, functionality (modeling mechanics) and cost methodologies (cost models) were tested internally for the newly developed module and the integrated CET. Testing on individual modules emphasized the applicability of costing methodologies and GR&A as they pertain to specific logistics disciplines. As such, testing of the individual modules relied on the input from team logisticians and SMEs. The testing process of these individual modules included the costing out of discipline-specific requirements associated with particular program characteristics. Modules were tested separately by the LRFS CET Team. Testing placed particular emphasis on the tool as a whole, to ensure that an LRFS can be completed by not only using the linear wizard process, but by populating elements as information becomes available. Any issues regarding mechanics, and/or cost methodologies were documented and reviewed.

7.6 REVISION OF MODULES AND INTEGRATED TOOL

Issues regarding mechanics and methodologies were reviewed, prioritized and added to a list of required revisions. These requirements were then addressed by both the modeling and data collection teams to revise the individual module and/or tool as a whole. Internal testing was again performed on the revised module and integrated, and the approved draft module was then delivered to the government (within an updated integrated CET product delivery). The testing/revision process repeated with the government stakeholders offering their input regarding model mechanics and cost methodologies. As feedback and revision requests were received, many were vetted through the IPT for prioritization and/or de-confliction as necessary. As each module was formally accepted, it

entered into the Continuous Integrated LRFS CET Development cycle, whereby additional module deliveries, subsequent government/stakeholder reviews, requested tool modifications and continued data collection all provided additional feedback and revisions to the LRFS CET requirements.

7.7 BETA TESTS

During Phase II, an LRFS CET Test Plan was developed to serve as the primary methodology for the tool's beta testing. Two beta test events were conducted in Phase II: Joint MRAP Vehicle Program - Cougar Variant LRFS development and the Usability and Performance Test. Two additional beta test events were conducted in Phase III: Joint MRAP Vehicle Program – Buffalo Variant LRFS development and Joint MRAP Vehicle Program – M-ATV Variant LRFS development.

7.7.1 LRFS CET Test Plan

The LRFS CET Test Plan described the scope, approach, and resources for testing activities of the LRFS CET Development Team. It identified the tool and functions being tested, testing tasks to be performed, and the personnel responsible for each task. The plan outlined the testing approach for the LRFS CET version with the most up to date functionality and features as dictated by the LRFS CET IPT at the time of testing. In addition, the testing approach utilized in the Test Plan was intended to measure the operation, user interaction, and other "beta" testing parameters of the LRFS CET and was not intended for the execution of detailed "alpha" testing.

7.7.2 Joint MRAP Vehicle Program – Cougar, Buffalo, and M-ATV Variant Tests

The Joint MRAP Vehicle Program – Cougar, Buffalo, and M-ATV Variants were chosen as part of the effort to test the validity of LRFS CET. The objectives of the test were to create a Marine Corps LRFS for the variants, and to validate and document the LRFS CET as dictated by the LRFS CET Test Plan. This test had a unique execution, specific objectives, and scheduling, which served to accomplish the main objective of testing the LRFS CET for deployment suitability. Full documentation of the these test events is contained in the Joint MRAP Vehicle Program – Cougar, Buffalo, and M-ATV Variant Test Reports, which provide the results from executing testing practices and procedures into the LRFS CET development project.

7.7.3 Usability and Performance Test

This test focused on the tool's usability and performance to ensure that the LRFS CET accommodates users of varying computer, logistics, technical, and cost estimating expertise and provides them with the functionality to develop cost estimates. Based on the results of this test, a tool modification list was generated to include future action items and necessary modifications for tool improvement. A full documentation of this test event is contained in the Usability and Performance Test Report, which details the process, execution and results of the test as well as recommended actions based on the testing results.

7.8 LESSONS LEARNED

As the LRFS CET prototype development ended and subsequent module development began, the LRFS CET Development Team implemented the following lessons learned to make the development process more efficient and focused:

1. Compressing the IPT meeting schedule for each module closer to subsequent modules allowed meetings to take place while other IPTs waited for data and reviews.
2. Prioritization of user, client and team needs is essential to staying on schedule for complete module development.

The MRAP Cougar Variant Test conducted during Phase II, the MRAP Buffalo Variant Test conducted during Phase III, and the MRAP M-ATV Variant Test conducted during Phase III, provided the LRFS CET Development Team with additional lessons learned:

1. The LRFS CET's standardized cost element structure enabled it to identify a number of MRAP Cougar, Buffalo, and M-ATV logistics elements as either being not funded at all or not sufficiently documented.
2. Due to the flexibility to define additional assumptions, override tool generated results, and customize inputs to cost estimating methodologies, the LRFS CET was able to capture the continuously evolving and unique mission requirements of the MRAP Cougar, Buffalo, and M-ATV Variants Programs.

The Usability and Performance Test, conducted during Phase II, further proved that the tool provided the functionality and the capability of developing a comprehensive LRFS cost estimate. Upon receiving an initial overview of the tool, users felt comfortable navigating the tool and developing cost estimates. The tool provided cost estimates with minimal tool issues. Based on the feedback received from the test event, a number of tool enhancements were proposed as follows:

1. Incorporate more training in the tool to allow users to easily navigate the various cost elements and find the data elements they need to complete.
2. Develop a detailed training program for users so they understand the entire process of developing cost estimates.
3. Complete the User's Manual and ensures that each module and tool functionality has sufficient instructions.
4. Further refine and modify the layout of the cost estimate interface to make the process more transparent and user friendly.
5. Modify performance errors received while utilizing the tool and ensure that users can navigate the tool without receiving any tool programming issues.
6. Determine a strategy for deploying the tool across the USMC for testing and ensure that the tool can be utilized by every user across the USMC command.

8. DATA COLLECTION AND COST ANALYSIS

The LRFS CET includes individual CERs, rates and factors for each LRFS cost element. Each of these cost estimating methodologies is fully documented and supported by data collected from programs that are analogous with respect to the cost element being estimated. The data collection and cost analysis process implemented to collect appropriate data to support the cost analysis needed to build the LRFS CET library is described below.

8.1 DATA COLLECTION AND COST ANALYSIS METHODOLOGY

The data collection methodology establishes the foundation and scope of the data collection effort, ensuring that the process is sound and reflects the needs of all key stakeholders. It is divided into six distinct steps, detailed below.

8.1.1 Step 1. Review of the LRFS Cost Estimating Methodologies

The LRFS CET Development Team conducted various meetings with Booz Allen logistics SMEs to review the current LRFS Cost Element Framework. This review identified all of the industry-approved cost estimating methodologies for each LRFS cost element and sub-element. From these cost estimating methodologies, the team identified the cost drivers needed to build the estimate and the types of data to target in the data collection process.

Next, the team reviewed the methodologies with the AC ALPS Study Director and logistician SMEs to receive additional input regarding the cost drivers identified. Feedback and recommendations received from AC ALPS ensured that the cost estimating methodologies identified properly represent the costs associated with how each element is being managed. Conducting these reviews with the logistician SMEs from both Booz Allen and the IPT allowed each major stakeholder to evaluate the process to ensure that all LRFS requirements are properly reflected in the tool.

8.1.2 Step 2. Identify Data Sources for Each LRFS Cost Element

Upon identifying the different types of cost data to collect for each LRFS cost element, the LRFS CET Development Team worked with Booz Allen logistician SMEs to identify programs that have already developed LRFS estimates. Identifying these programs provided data and estimating methodologies for a wide variety of sub-elements, which was subsequently used to support the development of cost models for the LRFS CET. Primary sources of data collected includes program office data, cost estimate data (e.g., Life Cycle Cost Estimates [LCCEs], Program Office Estimates [POEs]) and contractor data and reports containing cost data.

8.1.3 Step 3. Collecting and Mapping the Data/Methodologies

In Step 3, the collected cost data was mapped to the appropriate Logistics discipline and cost element as well as the different program categories listed in Section 6.2. This data mapping provided the foundation for LRFS CET model selection process, which scores the cost models developed against programmatic information provided by the end user.

8.1.4 Step 4. Developing Costing Methodologies

Using the data collected, the team developed CERs, rates and factors for the different LRFS cost elements and documented each model developed by detailing the cost estimating methodologies, data sources and supporting data to enable users to fully understand the cost model development process.

8.1.4.1 Developing Default Values for Each Cost Model

Each cost model developed includes default values that were used to produce the estimate. These default values provide the LRFS CET with the flexibility to generate estimates in the absence of user-

provided data. If the user is unable to provide programmatic information because it is not available, the use of default values from analogous programs will produce an estimate for the LRFS. As the user provides more programmatic information, the cost estimates becomes inherently more accurate because the models selected are supported by programmatic data that are more comparable to the program being estimated.

8.1.4.2 CER Development

CERs have been incorporated into the LRFS CET cost model library. Prior to including each CER into the library, the CER's statistics were reviewed for goodness of fit, degrees of freedom and statistical significance. This review provides the foundation for scoring the overall confidence level of the CER, which is evaluated during the model selection process of the LRFS CET.

CERs may incorporate several variables that have been identified as statistically significant cost drivers needed to estimate the cost of the cost element. Each variable has a calculated coefficient that is derived in the analysis of the data that is used to calculate the cost. The following example provides the general formula for a CER:

*Replenishment Spares Cost Per Year =$2.70 * Gross Vehicle Weight (tons) * OPTEMPO (in miles) * Vehicles Fielded*

In this example, if we know that a vehicle has a Gross Vehicle Weight of 25 tons, an OPTEMPO of 1,000 miles and a vehicle fleet of 500 vehicles, we can calculate the cost as follows:

*Replenishment Spares Cost Per Year =$2.70 * 25 tons * 1,000 miles * 500 vehicles = $33,750,000*

Given that each variable may change on a yearly basis, this calculation will be calculated for each year that the vehicle is fielded. The CERs can be found in Appendix C.

8.1.4.3 Rates and Factor Development

For cost elements that use specific metrics to estimate cost, the LRFS CET Development Team captured applicable rates to build cost models and statistically analyzed the data collected to develop factors for the cost elements.

The gathering of rate information was completed through government approved and accepted websites and data sources. Factors, on the other hand, were developed by calculating the relationship of a program's cost for that specific cost element to other programmatic costs. For example, the team can calculate the factor for Initial Spares costs by comparing the initial spares costs for a program to the total cost of the equipment for the program as shown below:

Initial Spares Cost = $3,000,000

Program Equipment Cost = $200,000,000

By dividing the Initial Spares Cost by the Program Equipment Cost, the team can calculate the Initial Spares Cost Factor as follows:

Initial Spares Cost Factor = Initial Spares Cost/Program Equipment Cost =

= $3,000,000/$200,000,000

= 1.5%

The Initial Spares Cost can then be calculated as follows:

Initial Spares Cost = 1.5% * Program Equipment Cost

These factors were reviewed with the logistician SMEs to ensure that they reflect relationships that are expected and that they are applied properly to develop the cost estimate.

8.1.4.4 Complexity Factor Development

Data from various USMC programs differ significantly in terms of the program's cost due to key differences in the size and scope of the program, level of maturity of the program and the commodities that are being managed by the program. To properly reflect these differences in the cost estimates produced, complexity factors were developed to account for these differences. Application of the complexity factors will enable the LRFS CET system to adjust estimates to reflect the cost differences of programs of different ACAT levels, Milestone Decisions and Product Groups. As a result, the process to develop costing methodologies is streamlined with the use of complexity factors because complexity factors will allow the LRFS CET to apply a single cost model to several different types of programs. For example, the following cost model which represents the cost of a program supported under a predominantly Organic support strategy can be used for programs that are predominantly 3rd Party/OEM supported by apply the appropriate complexity factor below:

*Replenishment Spares Cost Per Year =$2.70 * Gross Vehicle Weight (tons) * OPTEMPO (in miles) * Vehicles Fielded*

3rd Party/OEM: Organic Support Strategy Complexity Factor = 2.0

A cost of $2.7 million dollars per year will be calculated for Replenishment Spares for a program if the following values were provided for the program:

- Gross Vehicle Weight (tons) = 10 tons
- OPTEMPO = 1,000 miles
- Vehicles Fielded = 100 vehicles

This cost is an Organic support strategy cost. If the user indicates that the program support strategy is predominantly 3rd Party/OEM, the LRFS CET will apply the 3rd Party/OEM: Organic Support Strategy Complexity Factor to adjust the cost appropriately. This would increase the estimated cost to $5.4 million per year in the LRFS.

8.1.5 Step 5. Delphi Approach to Developing Cost Factors/Costing Methodologies

For cost elements where sufficient data was not available to develop CERs or factors, a Delphi approach was applied to develop costing methodologies. This Delphi approach involved collecting data from logistician SMEs, reviewing the data and generating a consensus in the methodologies developed.

8.1.6 Step 6. Reviewing the Costing Methodologies Developed and Building the Data Repository

The LRFS CET Development Team conducted several meetings with key stakeholders to review the costing methodologies developed and receive input to understand how the methodologies should be applied. Developing this understanding helped to refine the logic that was applied in developing the individual cost models and the LRFS CET model selection process. Cost estimating methodologies which have been thoroughly reviewed, evaluated and approved are retained in the LRFS CET cost model library in the form of individual cost models, each with a cost calculation methodology, default data, assigned relevancy and applicability criteria and confidence factor. Individual cost models are unique to a single cost element within the LRFS CET.

To apply the best-fit costing methodology to a given estimate, the LRFS CET Development Team developed a cost model selection process designed to apply appropriate models based on user input. The cost model selection process was developed by considering various relevancy and applicability criteria, and confidence parameters for the cost methodologies and the collected data, all within the

context of the CES. The process is based on an understanding that some methodologies are preferred over others (i.e., Build-Up is preferred to an application of rates and factors), that specific collected data may be more relevant to some programs than to others, that some methodologies (or cost elements) may not be applicable in all cases and that the nature of statistical relationships garners varying degrees of confidence between various cost models. The selection process must compare the assigned relevancy and applicability criteria for the individual CES and/or cost models against provided user inputs and calculate a total relevancy value. The relevancy value, coupled with the specified confidence factor for the cost model, ensures that the best-fit model is selected for use. Figure 8-1 below depicts the LRFS CET Model Selection Framework.

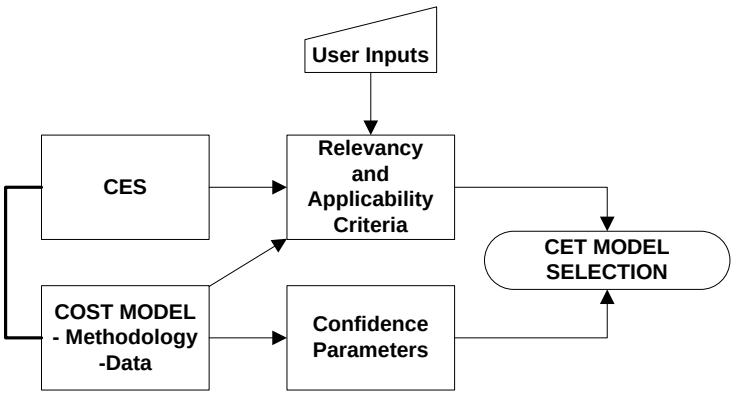

Figure 8-1: CET Model Selection Framework

8.1.6.1 Model Selection Process

Although the calculation details of the model selection process are outlined in the LRFS CET System Manual, it is important to provide a brief overview for context. The model selection process scores and ranks every cost model within the LRFS CET cost model repository, based on the established relevancy and applicability criteria against provided user inputs, coupled with the established confidence factor. This score is generated by calculating the weighted score for all relevancy criteria, multiplying that number by the various applicability multipliers and then multiplying again by the confidence factor to generate a total score for each model. The applicability multipliers take into consideration the level of information provided by the user. As the user provides more information to describe the program being estimated, LRFS CET applies different multipliers to reflect an increased level of confidence in the estimate being developed. The equation for generating a total score for each cost model is as follows:

Cost Model Total Score = Weighted Score * Applicability Multipliers * Confidence Factor

8.1.6.2 Relevancy and Applicability Criteria

Relevancy and applicability criteria were established for each cost element and cost model. The relevancy and applicability criteria were established around cost methodologies, programmatic details and in some cases, cost elements. The relevancy and applicability criteria may be grouped into two categories: general criteria and specific criteria. General criteria is employed across the entire LRFS CET, regardless of cost element or cost model, whereas specific criteria are unique to certain cost elements or cost models. General and specific criteria affect the weighted score, and/or the multiplier elements within the model selection process.

General criteria can be categorized as follows:

- Cost Calculation Methodology
- Programmatic Details

Specific criteria cannot easily be categorized, as it is unique to individual cost elements and/or individual cost models. Specific criteria include those programmatic and/or system-specific details that may render certain cost elements not applicable, or render certain cost models not applicable. For example, a cost model for facilities construction may include a unique facility that is only relevant to a single commodity, so if the user were to select a different commodity for their estimate, that particular model would be rendered not-applicable by the specific criteria established.

8.1.6.2.1 General Criteria

As previously stated, general criteria can be grouped into two categories: Cost Calculation Methodology, and Programmatic Details. General criteria are evaluated against user-provided inputs for all models, and the results are calculated in the form of a total relevancy score for each model. The relevancy score was based on specific weights applied to each of the general criteria for a matching user-provided answer and/or given condition. Although the criteria is general and applies across all models, the specific weighting of each criteria is unique to specific cost elements, or in some cases cost models. The relevancy scoring starts with an evaluation of the Cost Calculation Methodology against user-generated conditions.

Each model includes a specific Cost Calculation Methodology that can be categorized as follows:

- User-Provided Build-Up
- CER (parametric)
- Application of Rates and/or Factors
- Application of SME Input
- Combination

As the User-Provided Build-Up methodology is the most preferred cost estimation method, there are unique cost models within the LRFS CET that do not include any default data, and may only be employed if the user provides all required variables. Additionally, cost models may employ a cost calculation with SME-provided default data variables that are replaceable by user-input. In these cases, cost model relevancy scores are based explicitly on the extent to which users provide the required data values. The specific data values required are unique to each cost element and/or cost model. The relevancy scoring for these user-generated conditions is captured in the form of a weight assigned to the model type, coupled with a multiplier that is adjusted by the number of default data variables replaced by user inputs for the given model. This process is employed to ensure that User-Provided Build-Up models are utilized whenever possible, and to ensure that combination models for which users have provided some data are scored as the secondary selection only to User-Provided Build-Ups.

For the Cost Calculation Methodology categories other than User-Provided Build-Up, other general criteria are assessed to determine the total relevancy score. As stated, Programmatic Details provide the remaining general relevancy criteria. Programmatic Details included as general relevancy and applicability criteria include:

- Acquisition Category (ACAT) Level
- MIL-STD 881 System Type
- Commodity
- Program Status
- PICA Status
- Program Support Strategy

As discussed in Section 6.2, these Programmatic Details represent defining characteristics of different acquisition programs, and represent a clear ability to differentiate between cost requirements and drivers. These particular criteria were selected based on an evaluation of best practices and standards

within the DoD cost estimating community. Additionally, dialogue through IPT sessions and interviews with logisticians confirmed that these particular Programmatic Details represent significant drivers of logistics requirements and cost. For example, ACAT levels can be linked to various analyses required versus not required, MIL-STD System Type and Commodity can be linked to various materiel requirements and analogies, Program Status (new program vs. upgraded program) can be linked to various analyses required versus not required, PICA status can be linked to various support costs required versus not required, and Program Support Strategy drive some operations and support costs. These criteria represent identifiable biographical information for the collected data; as a result, relevancy is assigned to each criteria in the form of a weight, given an applicable value.

8.1.6.2.2 Specific Criteria

Specific relevancy and applicability criteria are unique to specific cost elements or modules. The specific criteria affecting cost element and model relevance are described below.

8.1.6.3 Confidence Parameters

A confidence factor was established for every cost model. To account for the variation in statistical significance between various parametric CERs, the relevancy of supporting data in terms of age, and the additional prioritization of various data sources and cost methodologies, a confidence factor was developed by the LRFS CET Development Team. The parameters for the confidence factor were outlined as follows:

- Cost methodology
- Data time relevancy (age)
- Statistical significance
- Data points (number of observations) available to develop cost model

The cost methodology drives the confidence factor assignment. Some methodologies require an additional consideration of data time relevancy and statistical significance (specifically rates and factors, and CERs). Table 8.1 below outlines the metrics for the confidence parameters for each of the cost methodologies. It is important to note that "combination" is missing, as combination models are merely non User-Provided Build-Up models that employ some user inputs (if provided); they default to the established confidence level of the utilized model.

Table 8.1: Confidence Factor Calculations by Methodology

Methodology	Confidence	Calculation
User Provided Build Up	100%	N/A
CER (Parametric)	Calculated	R^2 Adjusted * Data Age Confidence
Rates and/or Factors	Calculated	Data Age Confidence * Data Obs Confidence
Application of SME Input	70%	N/A

The data-specific statistics utilized in the calculations include factors to account for age of supporting data (Data Age Confidence) and total number of observations (Data Obs Confidence). Table 8.2 below outlines the calculations for these data stats.

Table 8.2: Data Stats Calculations (used in Confidence Calculations)

Data Age		Data Obs	
Date of Supporting Data	Assigned Confidence	Number of Observations	Assigned Confidence
2001-2010	100%	5 or more	100% - std dev/mean
1991-2000	90%	4	90% - std dev/mean
1981-1990	80%	3	80% - std dev/mean
1971-1980	70%	2	70% - std dev/mean
1970 and prior	50%	1	50%

For the Data Observations confidence, the calculated confidence takes into consideration the standard deviation and the mean of the data points used to calculate the factor. This method for calculating the confidence allows the confidence calculated to reflect the variation that is seen in the data used to determine the cost model factors. As a result, the confidence calculated will increase as more data points are used and the variation among the data points is minimal.

The confidence calculated for Data Age and Data Obs will have a minimum value of 50%. This allows the LRFS CET to place some value on data that is used even when there is only one data point that is not recent.

9. ORGANIZATIONAL RESPONSIBILITIES

Figure 9-1 outlines the organizational structure of the LRFS CET project team.

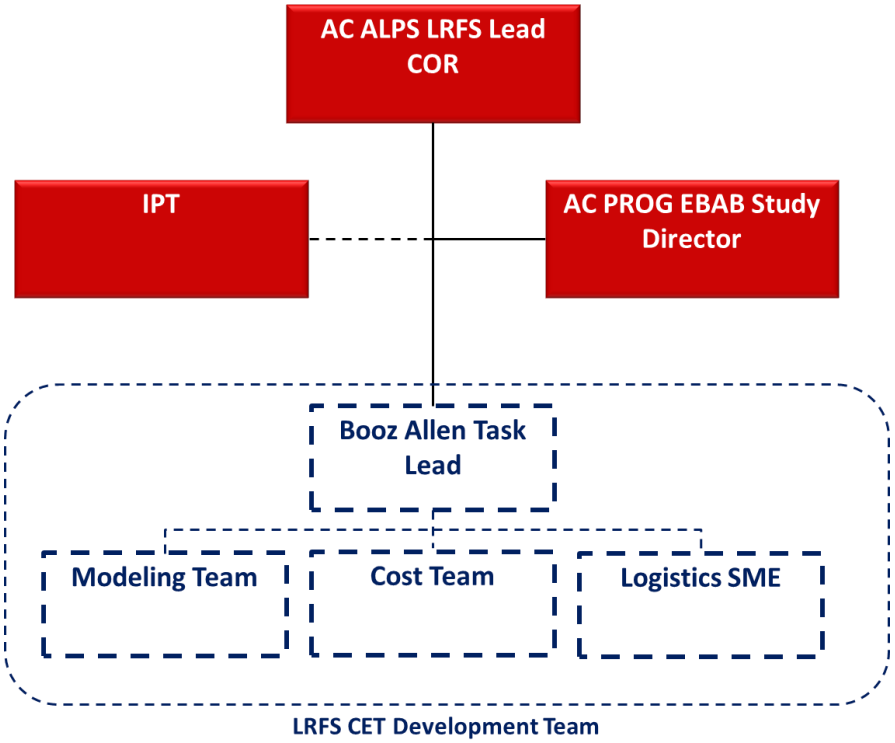

Figure 9-1: LRFS CET Project Organizational Diagram

9.1 LRFS CET DEVELOPMENT TEAM

The Booz Allen LRFS CET Development Team was responsible for supporting this effort by implementing a data collection and synthesis framework; developing cost estimating tools; providing analysis of findings (e.g., quantifiable Course of Action [COA] recommendations) that serve the Government stakeholders with a basis for developing and defending the identification of the logistics requirements funding decision; and documenting findings in a report. The team was responsible for all actions necessary to effectively support program technical activities including business planning and coordinating actions among the Logistics IPTs.

9.2 AC ALPS LRFS LEAD – COR

The AC ALPS LRFS Lead, serving as Contracting Offer's Representative (COR), was responsible for inspection and acceptance of all contract deliverables associated with this task order. Additionally, the AC ALPS LRFS Lead, in a supporting role to the Contracting Officer, provided advice and expertise on technical issues. Moreover, the AC ALPS LRFS Lead shared the responsibilities with the Study Director in overseeing the overall LRFS development process as described in the Section 9.3 below.

9.3 AC PROG EBAB - STUDY DIRECTOR

The Study Director, assigned from AC PROG Economic Business Analysis Branch (EBAB), collaborated with the AC ALPS LRFS Lead to ensure that the cost analysis effort supports the AC ALPS LRFS development process. Furthermore, the Study Director collaborated with the AC ALPS LRFS Lead to ensure that the cost estimating tool developed will improve the value of the applicable

portions of the LRFS to the execution of the acquisition program and the life cycle support of the system. The AC PROG Study Director and AC ALPS LRFS Lead were responsible for establishing the analytical framework, overseeing the selection and use of models, the approval of cost estimating tools and validating the findings of the process.

9.4 INTEGRATED PRODUCT TEAM (IPT)

The Integrated Product Team brought together all the key stakeholders in a collaborative team environment to address the critical decision points throughout the development of the LRFS CET life cycle. The IPT provided subject matter expertise as well as guidance to the LRFS CET Development Team. The IPT consists of a diverse team of acquisition professionals encompassing the Logistics, Engineering, Program Management, Operations Research, and Financial competencies.

10. DOCUMENTATION

In addition to the Study Report, the following documentation is provided as part of the Phase I and Phase II LRFS Development effort:

- User's Manual / User's Help File
- System Manual

10.1 USER'S MANUAL / USER'S HELP FILE

The User's Help File is a "how-to" guide to the tool and it allows any end user with basic knowledge of the tool to get function-specific help with formats, calculations, detailed definitions, advanced operations and instructions. As shown in Figure 10-1: Embedded User's Help File, this manual is incorporated into the tool in the format of a dynamic interactive HTML help file. This help file is designed for use as an immediate reference while using the tool and an on-demand aid to the end user. This file has been constructed concurrently with the development of each new module in the tool.

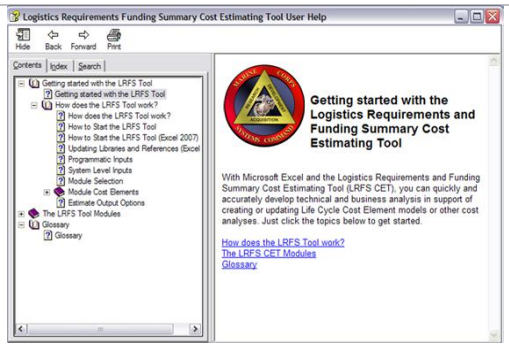

Figure 10-1: Embedded User's Help File

The User's Manual is a printer-friendly version of the User's Help File. It is designed for use as a desktop reference with or without the tool running. This manual will be periodically updated as new versions of the tool are released.

10.2 SYSTEM MANUAL

The System Manual includes an executive summary of LRFS CET system functionality, and provides tool "super-users" and/or tool administrators the ability to update and/or modify particular attributes or internal system data. The System Manual provides detailed information on the LRFS CET processes, functions and architecture, and provides the reader and end-to-end understanding of how the tool leverages inputs, selections and calculations against an internal repository of cost models and data values to generate a relevant LRFS Cost Estimate. The System Manual includes detailed descriptions of calculation methods, formulas and source locations within the tool. Additionally, System Manual appendices document the system's internal repository of rates and factors (e.g., inflation indices, labor rates, etc.), cost model equations and cost model data values. Simply put, the System Manual serves as the ultimate documentation on "how the LRFS CET works."

APPENDIX A. LRFS CET POLICY AND GUIDANCE

Date	Title	Applicable To	Relevance
1997	Department of Defense Handbook Acquisition Logistics (MIL-HDBK-502) - Y	DoD	
2005	DoD Guide For Achieving Reliability, Availability, and Maintainability - Aug 05	DoD	
1995	DoD, *Economic Analysis for Decision making*, Instruction No. 7041.3, (Washington, D.C.: USD, Nov. 7, 1995).	DoD	
2003	DoD, *The Defense Acquisition System*, Directive No. 5000.1 (Washington, D.C.: USD, May 12, 2003).	DoD	States that every Program Manager must establish program goals for the minimum number of cost, schedule and performance parameters that describe the program over its life cycle and identify any deviations
2003	Designing and Assessing Supportability in DoD Weapon Systems: A Guide to Increased Reliability and Reduced Logistics Footprint DTD 24 Oct 2003	DoD	
2005	DoD Guide For Achieving Reliability, Availability and Maintainability DTD 3 Aug 2005	DoD	
2003	DoD, *Operation of the Defense Acquisition System*, Instruction No. 5000.2 (Washington, D.C.: USD, May 12, 2003).	DoD	Describes the standard framework for defense acquisition systems: defining the concept, analyzing alternatives, developing technology, developing the system and demonstrating that it works, producing and deploying the system, and operating and supporting it throughout its useful life
2008	DoDI 5000.02 Operation of the Defense Acquisition System	DoD	Establishes a simplified and flexible management framework for translating capability needs and technology opportunities, based on approved capability needs, into stable, affordable, and well-managed acquisition programs that include weapon systems, services and automated information systems (AISs)
2008	Defense Acquisition University (DAU) Program Manager's Tool Kit	DoD	The Fourteenth Edition (Ver 2.0) of the *DAU Program Managers Tool Kit* contains a graphic summary of acquisition policies and managerial skills frequently required by DoD Program Managers
2008	SECNAVINST 5000.2D IMPLEMENTATION AND OPERATION OF THE DEFENSE ACQUISITION SYSTEM AND THE JOINT CAPABILITIES INTEGRATION AND DEVELOPMENT SYSTEM	DON	To issue mandatory procedures for Department of the Navy (DON) implementation of references (a) DOD Directive 5000.1, The Defense Acquisition System, of 12 May 03 (b) DOD Instruction 5000.2, Operation of the Defense Acquisition System, of 12 May 03 (c) Chairman of the Joint Chiefs of Staff Instruction (CJCSI) 3170.01F, Joint Capabilities Integration and Development System, of 1 May 07 and (d) Chairman of the Joint Chiefs of Staff Manual (CJCSM) 3170.01C,

Date	Title	Applicable To	Relevance
			Operation of the Joint Capabilities Integration and Development System, of 1 May 07, for major and non-major defense acquisition programs and major and non-major Information Technology (IT) acquisition programs
2003	Naval Aviation Systems Command (NAVAIRSYSCOM) Acquisition Guide	NAVAIRSYSCOM	Provide a consolidated overview of the major internal NAVAIR acquisition processes (*Used as recommended guidance for MARCORSYSCOM, but is not mandatory for all DON activities)*
2007	NAVAIR Logistics Handbook		
2003	Dept of the Navy PBL Guidance Document		
2006	NAVSO P-3692 Independent Logistics Assessment (ILA) Handbook DTD Sep 2006		
2004	SECNAVINST 5000.2C Implementation and Operation of the Defense Acquisition System and the Joint Capabilities Integration and Development System DTD 19 Nov 04		
2003	OPNAVINST 3000.12A Operational Availability Handbook DTD June 2003		
2000	NAVAIRINST 4081.2 Policy Guidance For Alternative Logistics Support Candidates DTD 18 Sept 2000		
2007	DUSD (LM&R) Memo: Life Cycle Sustainment Outcome Metrics DTD 10 Mar 2007		
2006	NAVSO P-3692, Independent Logistics Assessment Handbook	DON	Provides detailed guidance to facilitate a comprehensive evaluation of the adequacy of ILS planning, management, control, execution and resources. It also defines assessment criteria to be used at Initial Operational Capability (IOC) and Full Operational Capability (FOC) reviews
2007	Marine Corps Systems Command Acquisition Policy Letter 3-07 In-Service Management Planning and Execution	MARCORSYSCOM	Promulgate MARCORSYSCOM policy for In-Service Management Planning and Execution in support of the Operational Support Phase of the Command's equipping process
1998	United States Marine Corps Cost Analysis Handbook	MARCORSYSCOM	
	MARCORSYSCOM Logistics Element Cost Estimating Guide	MARCORSYSCOM	Cost estimation packages consist of the cost estimate, the purpose of the estimate (e.g. planning, feasibility, contract negotiation, tradeoff study, etc.,) the definition of that estimate (scope), the schedule for that estimate (task schedule & dependencies), and the basis of the cost estimate (assumptions, method(s) & source data).
	Logistics Requirements & Funding Summary (LRFS) Guide	MARCORSYSCOM	The LRFS is the consolidated requirements document

Date	Title	Applicable To	Relevance
			that should be used by Program Managers and Logisticians to identify the ILS-related costs and associated funding. The LRFS is a life cycle document that should be maintained, justified, defended and updated for as long as SYSCOM or their designated activities are responsible for any element of the system or equipment. The LRFS helps plan & quantify requirements, and identify and defend funding, and serves as the ILS input to the Program Life Cycle Cost Estimate (LCCE). The LRFS must be based on the program's configuration baseline, delivery schedule, and the site activation & fielding (deployment) schedule
2008	Operational Support Core Process	MARCORSYSCOM	Provides the planning process to assure all ILS, financial and other operational support requirements have been met
2009	Marine Corps Systems Command Acquisition Policy Letter 1-09 Funding Limited Low Rate Initial Production (LRIP) Assets	MARCORSYSCOM	Provide guidance to MARCORSYSCOM and Program Executive Officer, Land Systems (PEO, LS) personnel on the appropriate funding appropriation for the acquisition of LRIP assets
2009	Marine Corps Systems Command Acquisition Policy Letter 2-09 Travel Funding in Support of Total Life Cycle Systems Management (TLCSM)	MARCORSYSCOM	Provide guidance to MARCORSYSCOM and PEO, LS personnel on the appropriate funding appropriation to use for travel in support of TLCSM activities
2007	Marine Corps Single Acquisition Management Plan (MC-SAMP)	MARCORSYSCOM	The MARCORSYSCOM Single Acquisition Management Plan (MC-SAMP) Template is a tool used to develop a Program MC-SAMP
2006	DoD, *Cost Analysis Improvement Group (CAIG)*, Directive No. 5000.04 (Washington, D.C.: Aug 16, 2006).	DoD	
2007	CAIG, *Operating and Support Cost- Estimating Guide* (Washington, D.C.: Department of Defense, Office of the Secretary, May 2007).	DoD	
1992	DoD, *Cost Analysis Guidance and Procedures*, DoD Directive 5000.4-M (Washington, D.C.: OSD, Dec 11, 1992).	DoD	
2003	DoD, *The Program Manager's Guide to the Integrated Baseline Review Process* (Washington, D.C.: OSD, Apr 2003).	DoD	
2006	Defense Contract Management Agency, *Department of Defense Earned Value Management Implementation Guide* (Alexandria, Va.: Oct 2006).	DoD, FAA, NASA	

APPENDIX B. LRFS CET COST ELEMENT STRUCTURES

LRFS CET CES_2011.xlsx

APPENDIX C. COST ESTIMATING RELATIONSHIPS

Cost Estimating Relationships.xlsx