Making cost effective decisions in early program phases despite lack of data – an analytical approach

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Introduction

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Background:
- Swedish Defence Materiel Administration (FMV)
  - Chief Engineer, Integrated Logistic Support
  - Head of Aircraft Logistics Division
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Agenda
1. Balancing Cost and Capability
2. Early phases
3. Applying an analytical approach
4. Two methods to address the “lack of data”-issue
5. Summary
Life Cycle Cost

- **Conceptual phase**
- **Acquisition phase**
- **Development phase**
- **Operational Phase**
- **Production Phase**
- **Disposal phase**

**Budget (LCC)**

- 100% Committed part of LCC
- 50% Possibility to influence
- Accumulated cost

Always make decisions with LCC in mind

Decisions without LCC in mind often lead to cost increases
Optimal Balance between Operational Performance and Overall Cost

SUPPORT SOLUTION

WORKSHOP  WORKSHOP  WORKSHOP

STORE

DEPOT  DEPOT

OP-BASE  OP-BASE  OP-BASE

TECHNICAL SYSTEM

COST

EFFICIENCY

OPERATION

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Statement

• If you want to influence your future cost and operational performance you must start early

• You will need to balance between your
  – operational concept
  – your technical system
  – your support solution.
Examples of tasks in the early phases
Optimal allocation of budget to achieve maximum Operational Performance

Operational performance

Technical system

Logistic support resources

Budget constraint

Technical System

Logistic Support Resources

Support Concept

Buildings and facilities

Personnel

Maintenance and test equipment and tools

LRU’s and SRU’s

Spares

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Analysing Availability Performance Requirements

What are the economical consequences of the requirements and can we afford them?

What shall the requirements on the contractor be to fulfill the users requirements?

Are the requirements balanced between the technical system and the logistic system?

What are the economical consequences of the requirements and can we afford them?
Design to cost (DTC)

Acquisition management technique to:

• Increase Operational Performance
• Control Life Cycle Cost
More things you want to know early

- Concept
- Definition
- Acquisition
- Operations

- Most cost/effective system design?
- Most cost/effective support solution?
- Fleet size vs. usage profile?
- Life cycle cost budget?
- Availability performance requirements?
Applying an analytical approach to LCM

- **Operational Scenarios**
- **Technical Design**
- **Support Solution**

**LCC/TOC**

- **Operational Performance**
  - Capability
  - Readiness
  - Flexibility

- **Influenceable parameters**
  - Drivers of cost and efficiency

- **Establish Correlations**
  - Calculate impact

**DECISION SUPPORT MODELS**
- Preliminary models
- Simulate and Analyze
- Consequence, Sensitivity and What-if analyses

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Can we get good enough data?

Building blocks for modelling

**Support solution**
- Supportability
- Organization
- Turn-around-times
- Transportation times
- Resources
- etc.

**Technical system**
- Reliability and Maintainability.
- Item prices.
- Maintenance tasks

**Usage**
- Usage profiles
- Usage environment
The data issue

Created data

- High level estimates - top-down approach.
- Engineering estimates using logarithmic grouping - bottom-up.

Reference system

- Information gathered from existing systems not necessarily of the same type with best engineering judgement.

Predictions

- Standards and theoretical calculations are used to determine failure rates and life length.

Operational data (inherited)

- Supplier's reference users of the same system.
- Reference users (user's club)

Operational data (own system)

- Monitoring of the system's performance in own operational environment
Method 1: Top-down - generated data

- Generate a random system based on high level estimates (or goals) on:
  - Total failure rate of the system
  - Total price of the system
  - No of primary items in the system
A real system

- 989 Items, (355 repairables)
- Price = 17,9 M
- MTBF = 11,6 h
Cost/efficiency curve for that system
Comparison with four randomly generated systems
Method 2: Bottom-up – best engineering judgement

- Estimate the total no of items
- Let the engineers place each items in a price/failure rate intervall using a log/log-scale
- Create a system consisting av items using the geometrical mean values of each intervall

Note. The tighter log/log-intervall the better accuracy
Example log/log-matrix

![Log/log-matrix diagram](image-url)
Comparison of the real system with two fictive systems using different log/log scales
Summarizing the two methods

- These two methods will provide you with a starting point for your analyses.
- The first method is extremely fast.
- The second method provides better accuracy but requires more effort to perform.
- With a baseline model in place, it is easy to perform “what if”-analyses to evaluate different operational scenarios, changes in the logistic prerequisites, etc. and improve data quality where needed most.
- The two methods can be combined and also be complemented with actual data on sub-systems already known or other reference system data.
The methods have proven good enough to support decisions such as:

- Which system alternative is most cost-effective?
- Which logistic support concept will be most cost effective?
- Which requirements on availability performance and life cycle cost for the technical system are feasible?
- What key performance parameters should be used in a performance based support agreement?
- What should my budget be from a Total Ownership Cost perspective?
Summary

• Successful Life Cycle Management requires a capability to understand and influence the parameters that have impact on operational performance and Life Cycle Cost.
• This can be accomplished through an analytical approach based on Modeling and Simulation
• It is in the early phases that you have the most to gain, but at that time you lack real world data about your system
• We have shown two different methods that will provide you with good enough data to start your analytical process.
“Lack of data” is a poor excuse for not doing analyses

Without analyses it is hard to make the right decisions
IN SEARCH FOR THE OPTIMUM

We find the optimal balance between system performance and cost efficiency.

Thank you for listening!

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