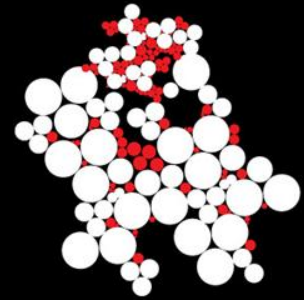


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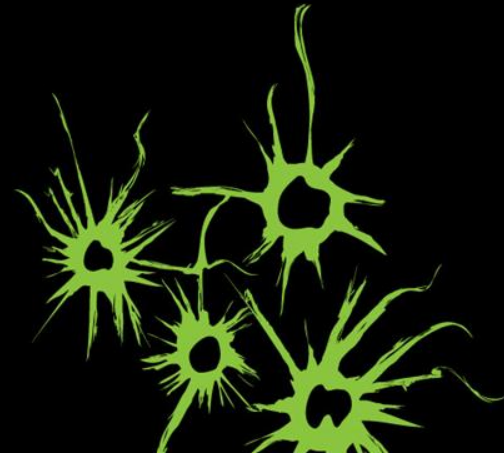


WCM SUMMER SCHOOL 2014

ASSET LIFE CYCLE MANAGEMENT

RICHARD RUITENBURG, MSC

THE 20TH OF AUGUST, 2014



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- Current:** Ph.D. candidate in Asset Life Cycle Management (ALCM), sponsored by Liander (network operator)
- Background:** Research Master in Management, Economics and Consumer Behaviour (Wageningen University)
- Interests:** ALCM, strategic asset management, multidisciplinary approach, sustainability, qualitative methods, the human factor in maintenance, continuous improvement
- Characteristics:** interested, analytical, creative, flexible, empathic, goal oriented

ASSET LIFE CYCLE MANAGEMENT

OUTLINE

- personal introduction
- short introduction of my Ph.D. research project
- introduction Asset Life Cycle Management (ALCM)
- developing a new approach to ALCM
- ALCM plans
- conclusions
- time for questions/discussion

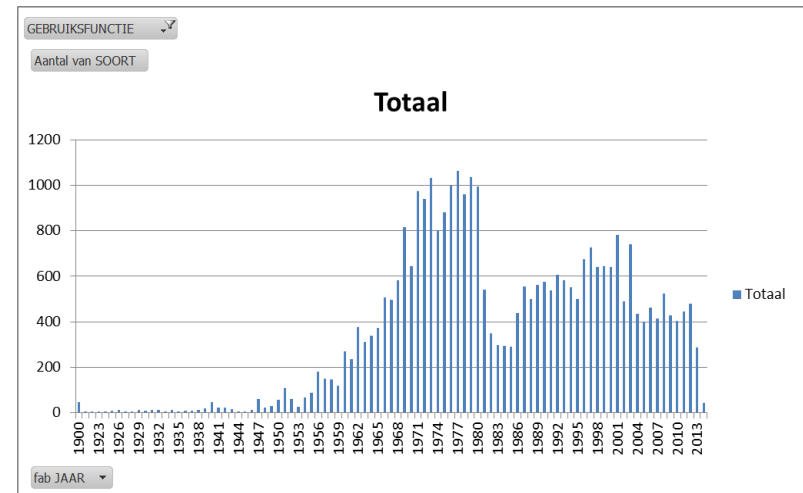
THE ALCM RESEARCH PROJECT

INTRODUCTION

- Start in January 2013
- Pilot project on ALCM
- Ph.D. project started last December

Liander faced a number of challenges:

- reliability and safety
- ageing assets
- changing demands
- deeper understanding of the consequences of policy decisions
- data availability and quality
- information and experience distributed throughout the organization



THE ALCM RESEARCH PROJECT

INTRODUCTION

Objective

- to assist a company in its strategic Asset Life Cycle Management
- by using the knowledge and information available to the company
- to gain a deep and thorough understanding of its assets
- in order to create maximum business value with these assets
- over their complete lifetime.

ASSET LIFE CYCLE MANAGEMENT

INTRODUCTION

To recapitulate: 5 characteristics of Asset Life Cycle Management:

1. a multidisciplinary practice;
2. the whole life cycle of a physical asset;
3. to achieve certain objectives;
4. limited by risk and relevant regimes; and
5. allocation of resources.

ASSET LIFE CYCLE MANAGEMENT

INTRODUCTION

In literature a number of problems has been recognized:

- focus on technical and economical perspectives
- focus on quantitative approaches
 - while data quality and availability often is a problem
- focus on the short and medium term
- lack of alignment with the corporate objectives

To conclude: there is theoretical and practical need for a multidisciplinary and strategic ALCM approach.

ASSET MANAGEMENT AND ICEBERGS

DISCUSSION

>>> DISCUSSION <<<

ASSET MANAGEMENT AND ICEBERGS

DISCUSSION

- Do you recognize the analogy of the asset manager and the iceberg?
- Are icebergs recognized in time in your organization?
- What time horizon do you normally use to look ahead?
- What kind of icebergs do you have to deal with?
- How are icebergs discovered in your organization?

ASSET LIFE CYCLE MANAGEMENT

OBJECTIVE OF THE PROJECT

The aim is a proactive and strategic Asset Life Cycle Management

- which has a deep **insight** in its assets,
- recognizes opportunities and threats in time
- and actively **manages** these by the timely preparation and implementation of (policy) measures.

In this way, the asset manager is '**in control**' with its assets.

ASSET LIFE CYCLE MANAGEMENT

PROPOSED IMPROVEMENTS

The **ALCM approach** we propose is distinct in the following aspects:

- close relation with the corporate objectives (alignment)
- long term strategic focus on the complete life cycle of the asset
- multidisciplinary approach
- focus on lifetime impacts
- use of qualitative and quantitative information using expert sessions

ALCM APPROACH

STRATEGIC ALIGNMENT

Strategic alignment (also known as 'line of sight'):

- a core concept in e.g. PAS 55 and ISO 55000
- goals and actions at strategic, tactical and operational level should be related/aligned
- maintenance as a contributor to the corporate objectives
- knowing the (possible) consequences of decisions

ALCM APPROACH

STRATEGIC FOCUS ON THE COMPLETE LIFE CYCLE

We take a long term **strategic** focus on the asset's **complete life cycle**:

- long term: whole life cycle
 - functional vs. physical life cycle
- strategic focus on corporate objectives and (budget) planning
 - but related to maintenance activities (strategic alignment)
- distinction between medium and long term
 - medium term: trends
 - long term: scenarios
 - short term: maintenance concepts, evaluation important
- the complete life cycle of the asset
 - from specifications and design
 - to refurbishment, end-of-life and disposal/recycling

ALCM APPROACH

MULTIDISCIPLINARY APPROACH

Central to a full understanding of your assets is a **multidisciplinary approach**:

- not only the asset (population) itself
- but also external factors
- ageing as a multidisciplinary concept
- for how long will the asset be useful?
- report of Rob van Dongen (2011) (VITALE)
 - life extension of physical assets
 - in close collaboration with industry

ASSET LIFE CYCLE MANAGEMENT

EXPERT SESSIONS

To allow such a multidisciplinary approach, both **qualitative and quantitative information** will be used:

- not all information available in quantitative data
 - some information hard to quantify
 - information dispersed over different departments
 - expertise and knowledge in the heads of people (tacit knowledge)
- hard to combine information from different perspectives
- information brought together by means of expert sessions
 - expert sessions are well known in e.g. FMEA
 - quantitative information and analyses as input
 - allows the estimation of reliability of information

ALCM APPROACH

MULTIDISCIPLINARY APPROACH

Five **perspectives** on the asset:

- **Technical:** the asset measures up to the original/current specifications
 - *e.g. failure modes, degradation mechanisms, wear, rust, condition monitoring, availability of spare parts, bathtub curves*

ALCM APPROACH

MULTIDISCIPLINARY APPROACH

Five **perspectives** on the asset:

- **Technical:** the asset measures up to the original/current specifications
 - *e.g. failure modes, degradation mechanisms, wear, rust, condition monitoring, availability of spare parts*
- **Economical:** the asset delivers financial benefits to the owner
 - *e.g. maintenance costs, costs of failures, OPEX, costs of spare parts, LCC, TCO*

ALCM APPROACH

MULTIDISCIPLINARY APPROACH

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- these two perspectives are in general taken into account

ALCM APPROACH

MULTIDISCIPLINARY APPROACH

Three additional **perspectives** on the asset:

- **Commercial:** the asset fulfills the demands of the market/customer
 - *e.g. fashion, novelty, performance, innovations*

ALCM APPROACH

MULTIDISCIPLINARY APPROACH

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ALCM APPROACH

MULTIDISCIPLINARY APPROACH

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- **Compliance:** the asset complies with norms, rules and regulations
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- **Organization:** the organization is able to operate the asset
 - *e.g. knowledge, expertise, data, availability of employees, standardization*

ALCM APPROACH

LIFETIME IMPACTS

Key in our ALCM approach is the identification of **lifetime impacts**:

- not a focus on the estimation of the remaining useful life
 - often predominantly technical, data availability problems
- but on impacts on the asset's remaining life
 - *positive impacts: opportunities, innovations, savings*
 - *negative impacts: risks, threats, degradation, ageing*
- **lifetime impacts**: trends or events that may have a positive or negative influence on the remaining lifetime of the asset
- needed to prepare timely measures

ALCM APPROACH

A BIT OF THEORY ON MANAGEMENT

There are 5 necessary requirements for effective management ('control') (*de Leeuw, 2002*):

1. a clear **goal**

e.g. a number of failures per year at a certain cost level

2. a **model** of the system to be managed

e.g. the influence of preventive maintenance

3. **information** over the state and environment of the system

e.g. the current condition and demand prognosis

4. sufficient amount of **control measures**

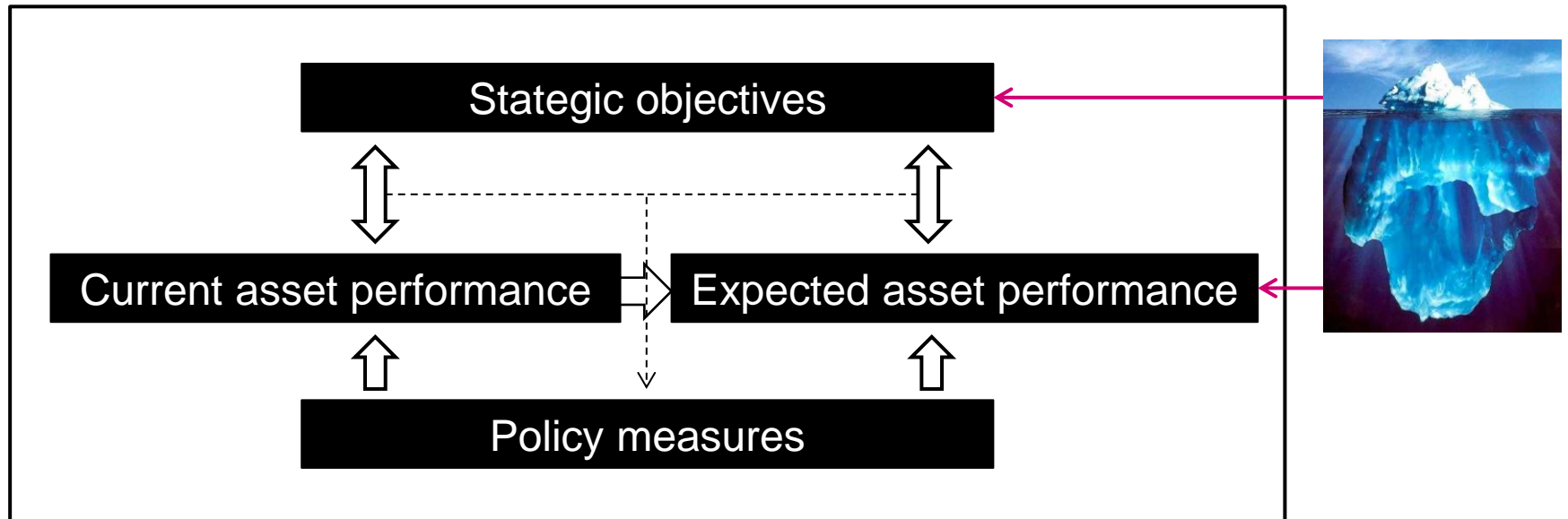
e.g. inspection interval, refurbishment

5. capacity to **process information**

e.g. sensory data, working orders, feedback measures

ALCM APPROACH

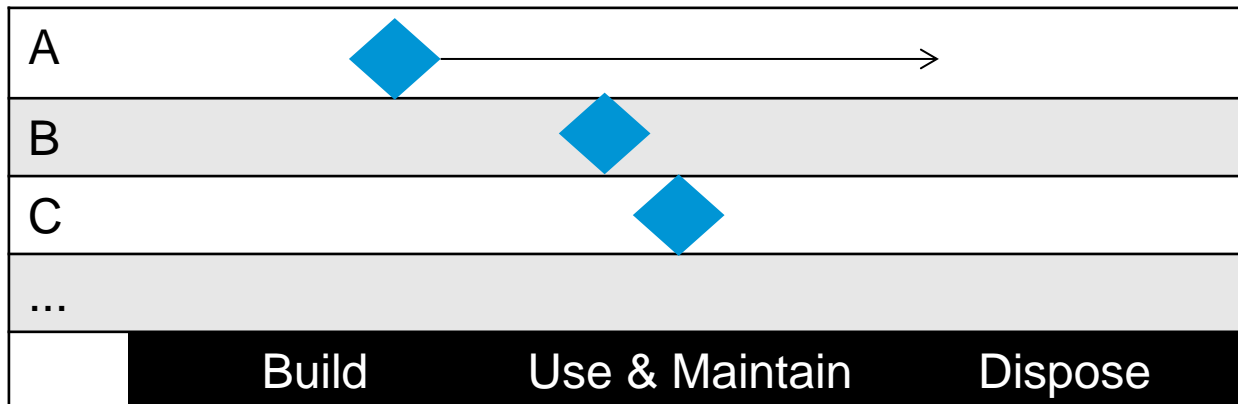
BASIC MODEL



ALCM APPROACH

STEERING BY CLASSIFICATION IN LIFE CYCLE PHASES

	Target	A	B	C	...
# of failures per year	25	31	23	19	
Costs of maintenance (per year per asset)	€2,-	€3,-	€1,50	€1,75	
Remote control (additional functionality)	None	Yes	No	refurbishment	



LIFE CYCLE PLAN

Chapter 1
ASSET STRATEGY

strategic objectives

asset information

Chapter 2
ASSET PERFORMANCE

asset performance

Chapter 3
ASSET EVALUATION

asset performance

TECK-ageing

residual life time

Chapter 4
SCENARIOS

asset performance

scenarios

residual life time

Chapter 5
POTENTIAL MEASURES

potential measures

asset performance

residual life time

information

outside LCP

estimation

inside LCP

→

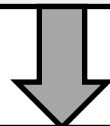
causal relation

- - - - ->

evaluation

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Decision Making



CONCLUSION

TAKE HOME MESSAGES

- focus on the long term is key to optimize value creation in AM
- make use of all available information
- bringing people together may yield new insights
- a full understanding requires a multidisciplinary approach
- by knowing lifetime impacts timely measures can be prepared
- focus on the control measures and their consequences

TECK METHOD - ILLUSTRATION

ESTIMATION OF THE REMAINING USEFUL LIFETIME – BICYCLE EXAMPLE

