INCOSE International Symposium
Philadelphia, PA
June 24-27, 2013

Closing the loop for lifecycle product management in Norwegian subsea systems

Jan Ove Mjaanes
Cecilia Haskins
Luca Piciaccia

Agenda

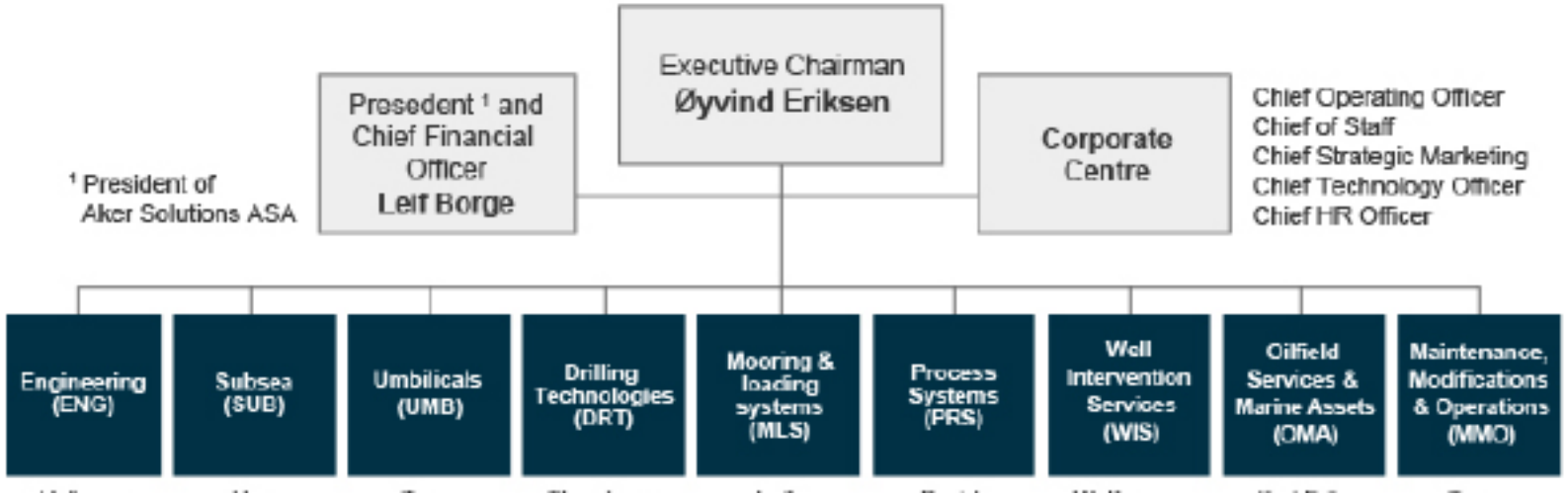
INCOSE International Symposium
Philadelphia, PA
June 24-27, 2013

- Background
- Case company – Aker Solutions
- Research question
- Methods
- Analysis
- Findings
- Conclusion

Background

- Systems in subsea natural environments face many of the same challenges as space-based systems.
- This means that they are complex and often embedded as systems of systems.
- Norwegian firms are increasingly applying systems engineering processes.

Aker Solutions



Vision: To be the preferred partner for solutions in the oil and gas industry…

Engineering and Maintenance

INCOSE International Symposium
Philadelphia, PA
June 24-27, 2013

Project success

- Communication across the multiple vendor supply chain is a critical project success factor.
- Communication is a symptom of a larger problem.
- Example:
  - Fire safety system in Gulfaks

What can ISO/IEC 15288:2008 contribute to making Aker Solutions projects successful?

RESEARCH QUESTION

Methods

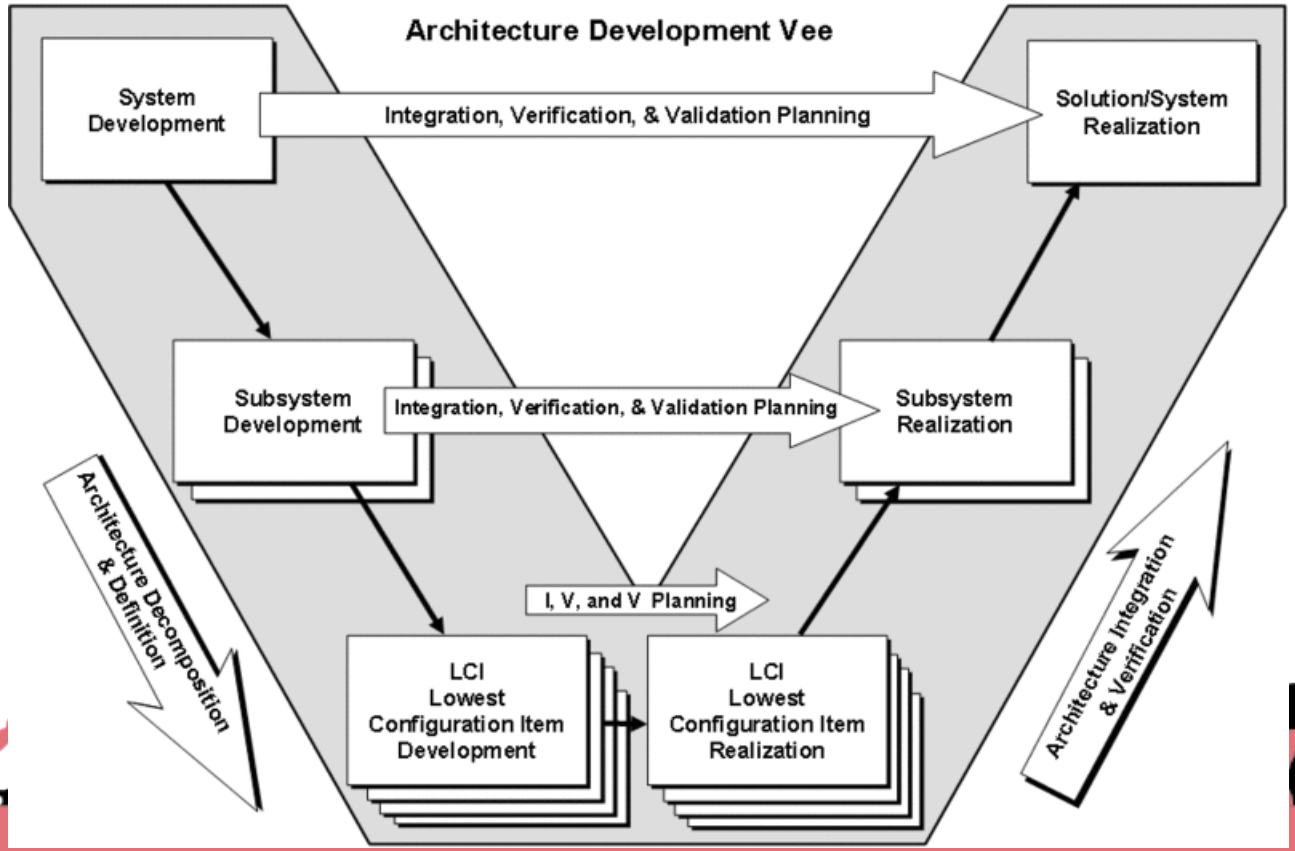
INCOSE International Symposium
Philadelphia, PA
June 24-27, 2013

- Aker uses a Project Execution Model (PEM)
- Gap analysis of the PEM and ISO/ IEC 15288:2008 to find differences and discrepancies between the models.

Methods

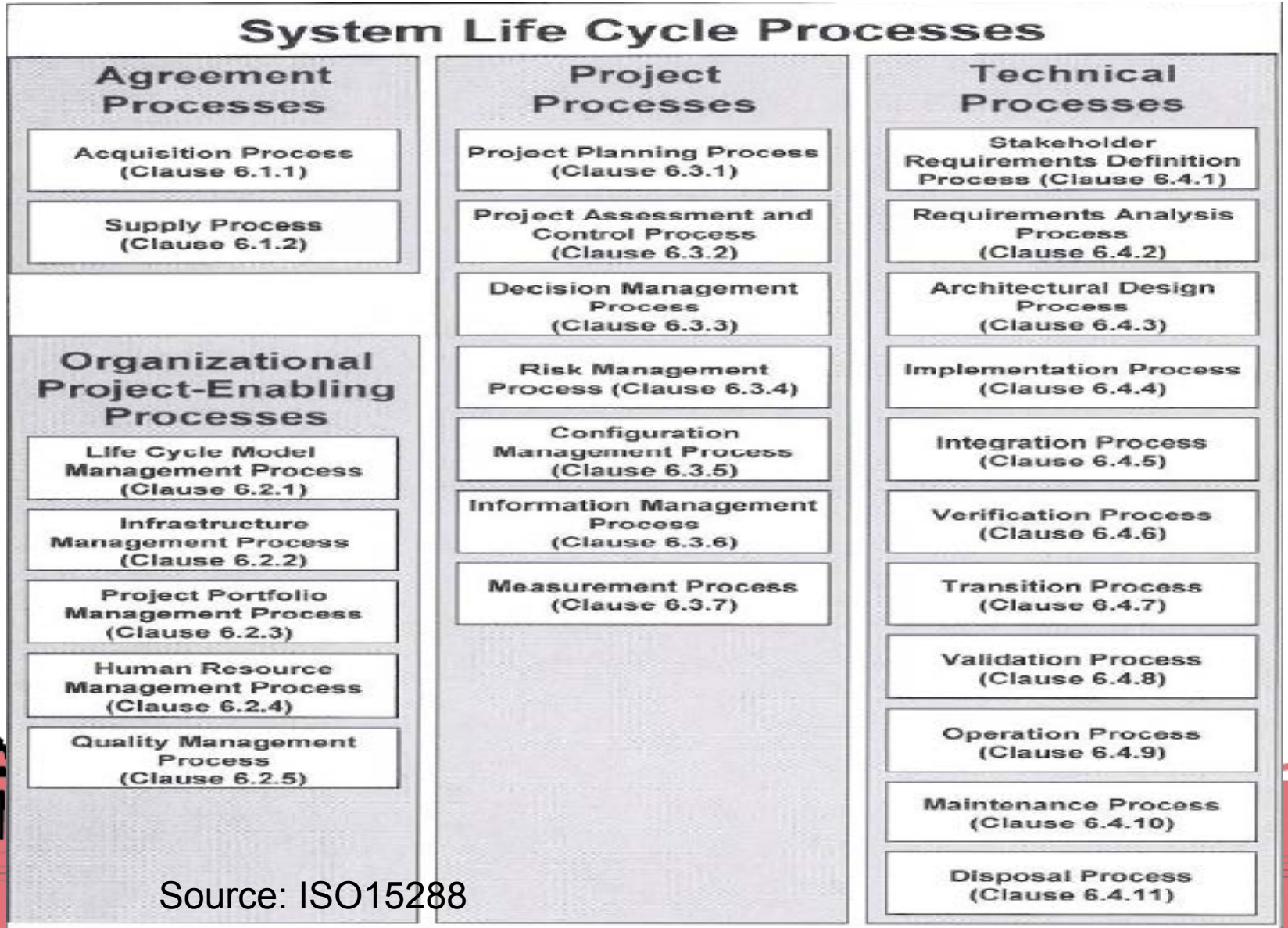
INCOSE International Symposium
Philadelphia, PA
June 24-27, 2013

- Map onto the Systems Engineering Vee model for comparison against a framework



Overview of ISO15288

INCOSE International Symposium
Philadelphia, PA
June 24-27, 2013



Source: ISO15288

PEM & PEM$_{m\&m}$

INCOSE International Symposium
Philadelphia, PA
June 24-27, 2013

PEM – New projects and product development

Feasibility & Concept	System Definition	Detailing & Fabrication	Assembly / Erection	System Completion
• OPPORTUNITY APPRAISAL • FEASIBILITY STUDIES • CONCEPT SELECTION • CONCEPT DEFINITION	• SYSTEM DEFINITIONS • SYS. DESIGN & LAYOUT DEV. • GLOBAL DESIGN	• DETAIL DESIGN & SUB-CONTRACTING • PRE-FAB. & MANUFACTURING • FABRICATION	• TRANSPORT & POSITIONING • ASSEMBLY • MECHANICAL COMPLETION	• COMMISSIONING • OFFSHORE INSTALLATION • START-UP • TAKE-OVER

PEM$_{m\&m}$ – Maintenance and Modification

Scope Definition	System Definition	Detailing & Fabrication	Assembly / Erection	System Completion
• CONCEPT CLARIFICATION • CONCEPT DEVELOPMENT • ESTIMATION & PLANNING	• SYSTEM DEFINITION • SYS. DESIGN & LAYOUT DEV. • GLOBAL DESIGN	• DETAIL DESIGN • WORK PREPARATION • PRE-FABRICATION • FABRICATION	• TRANSPORT & POSITIONING • INSTALLATION	• COMMISSIONING • CLOSE OUT

Top Level Observations

INCOSE International Symposium
Philadelphia, PA
June 24-27, 2013

Stakeholder requirements definition	Requirements Analysis	Architectural Design	Implementation Process	Integration	Verification	Transition	Validation	Operation	Maintenance	Disposal

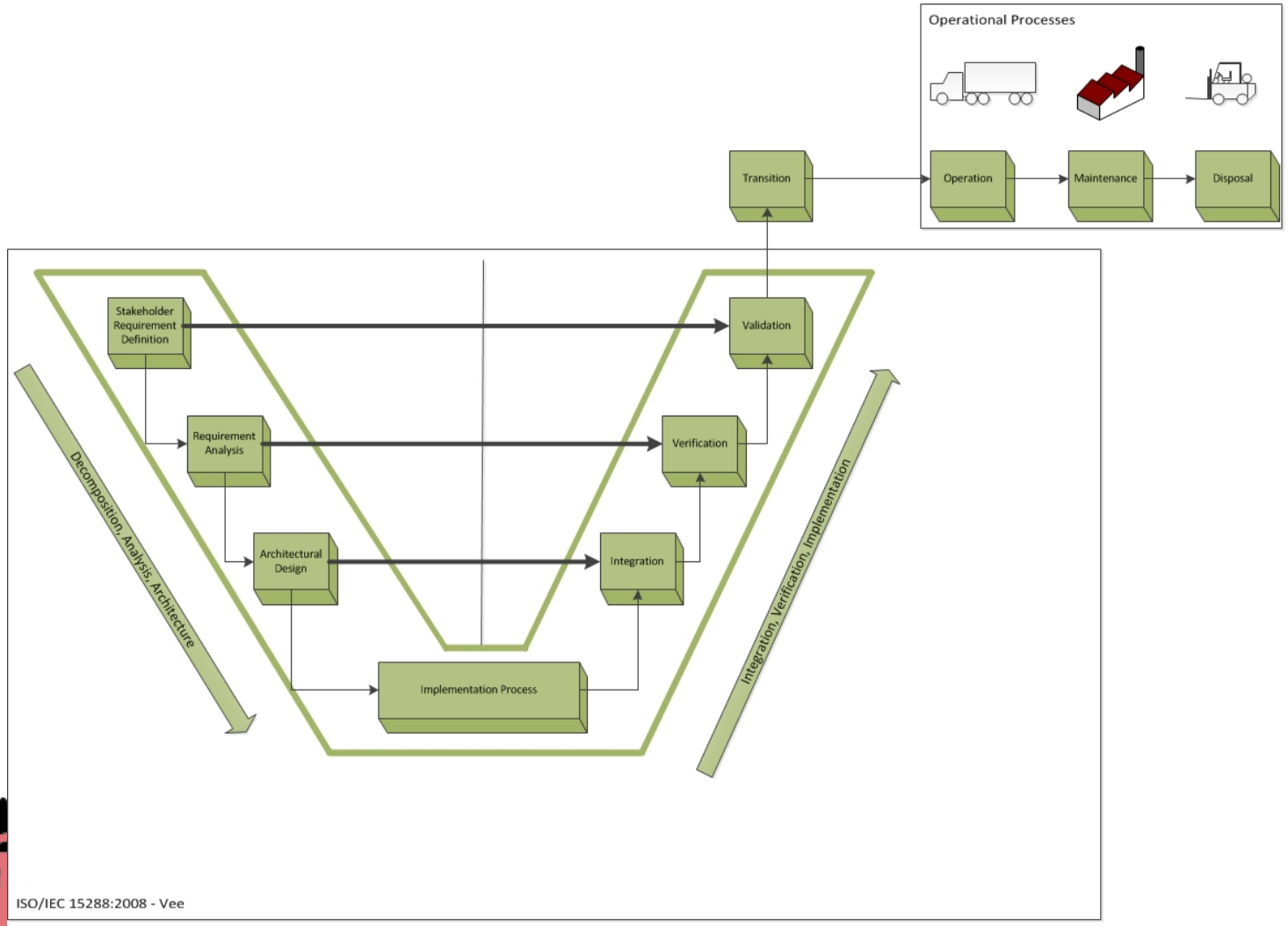
Top level ISO standard

Feasibility & Concept	System Definition	Detailing & Fabrication	Assembly / Erection	System Completion

Top level PEM

Vee over ISO standard

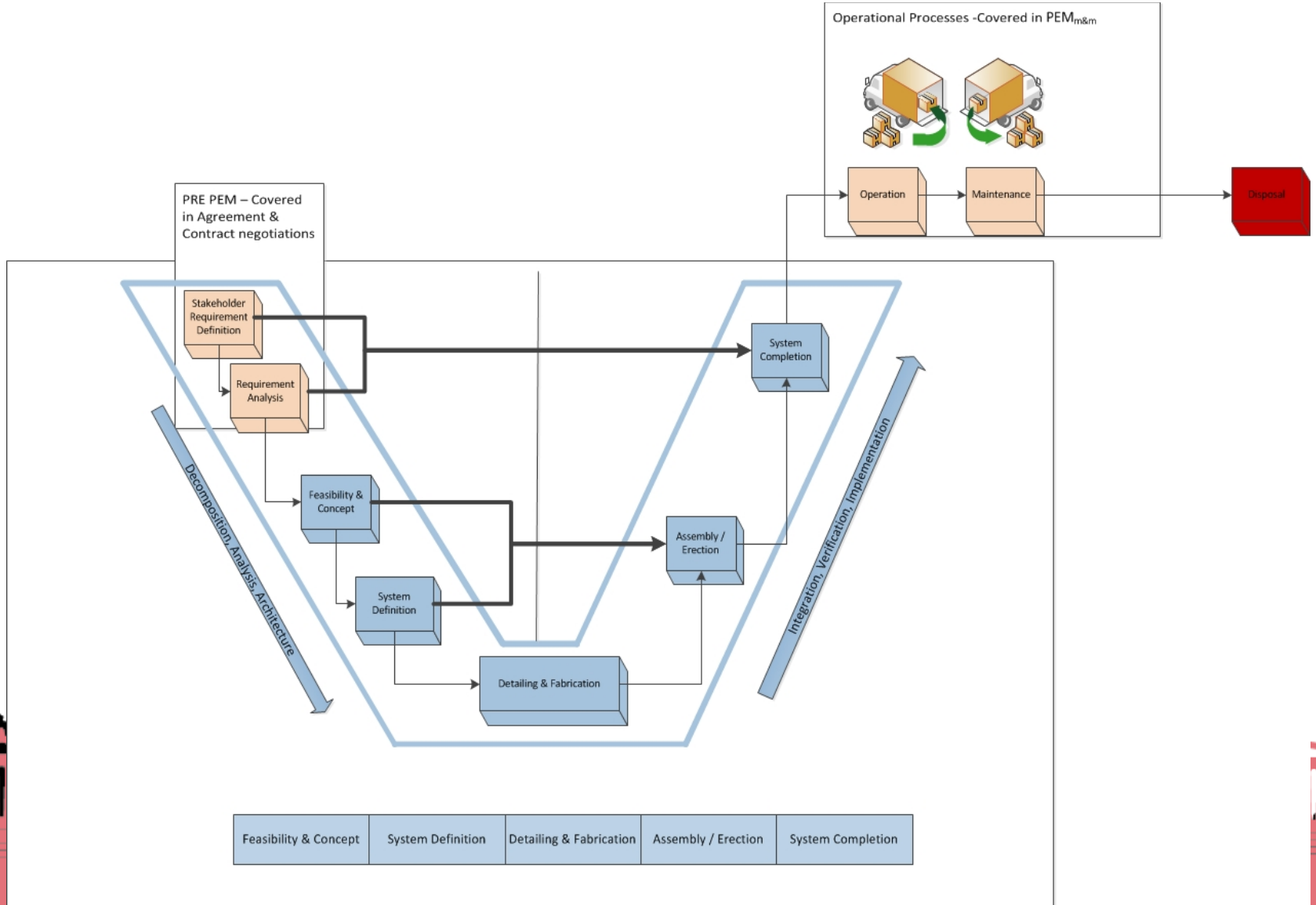
INCOSE International Symposium
Philadelphia, PA
June 24-27, 2013



Stakeholder requirements definition	Requirements Analysis	Architectural Design	Implementation Process	Integration	Verification	Transition	Validation	Operation	Maintenance	Disposal

Vee over PEM

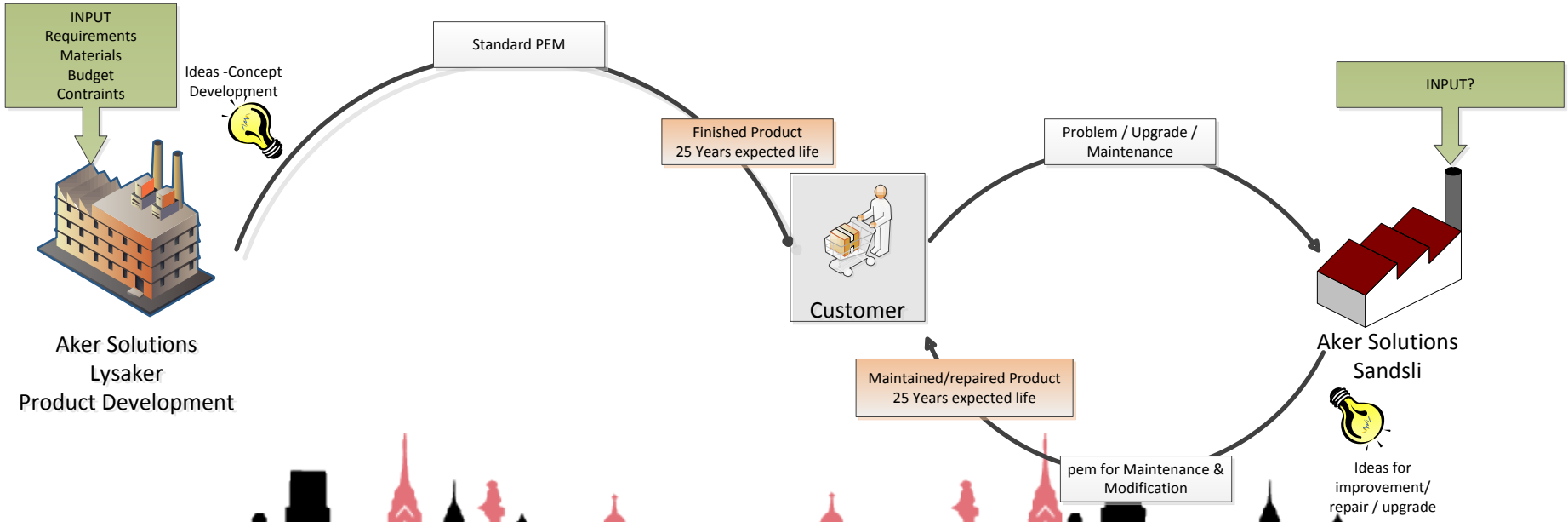
INCOSE International Symposium
Philadelphia, PA
June 24-27, 2013



Findings - 1

INCOSE International Symposium
Philadelphia, PA
June 24-27, 2013

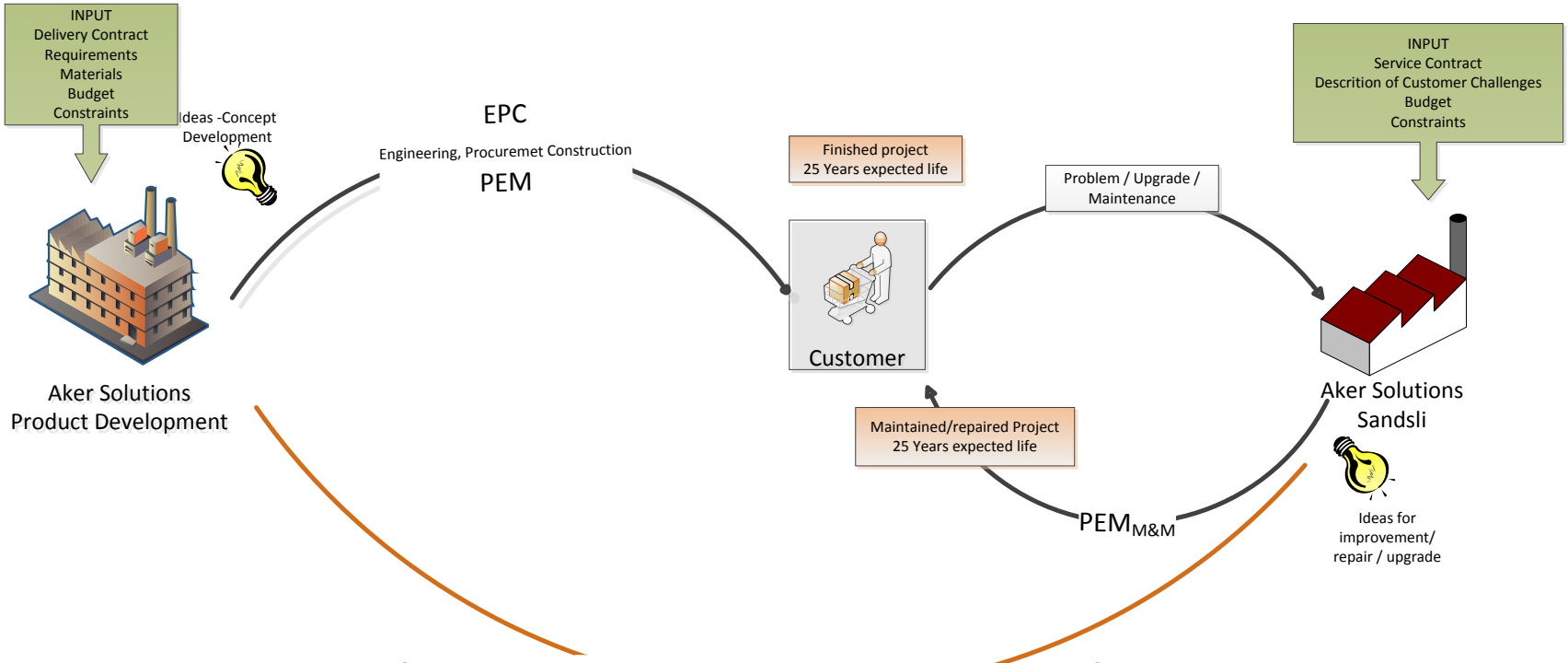
Todays situation – Outside View
PEM for Development & $PEM_{M\&M}$ for Maintenance and Modification



Findings - 2

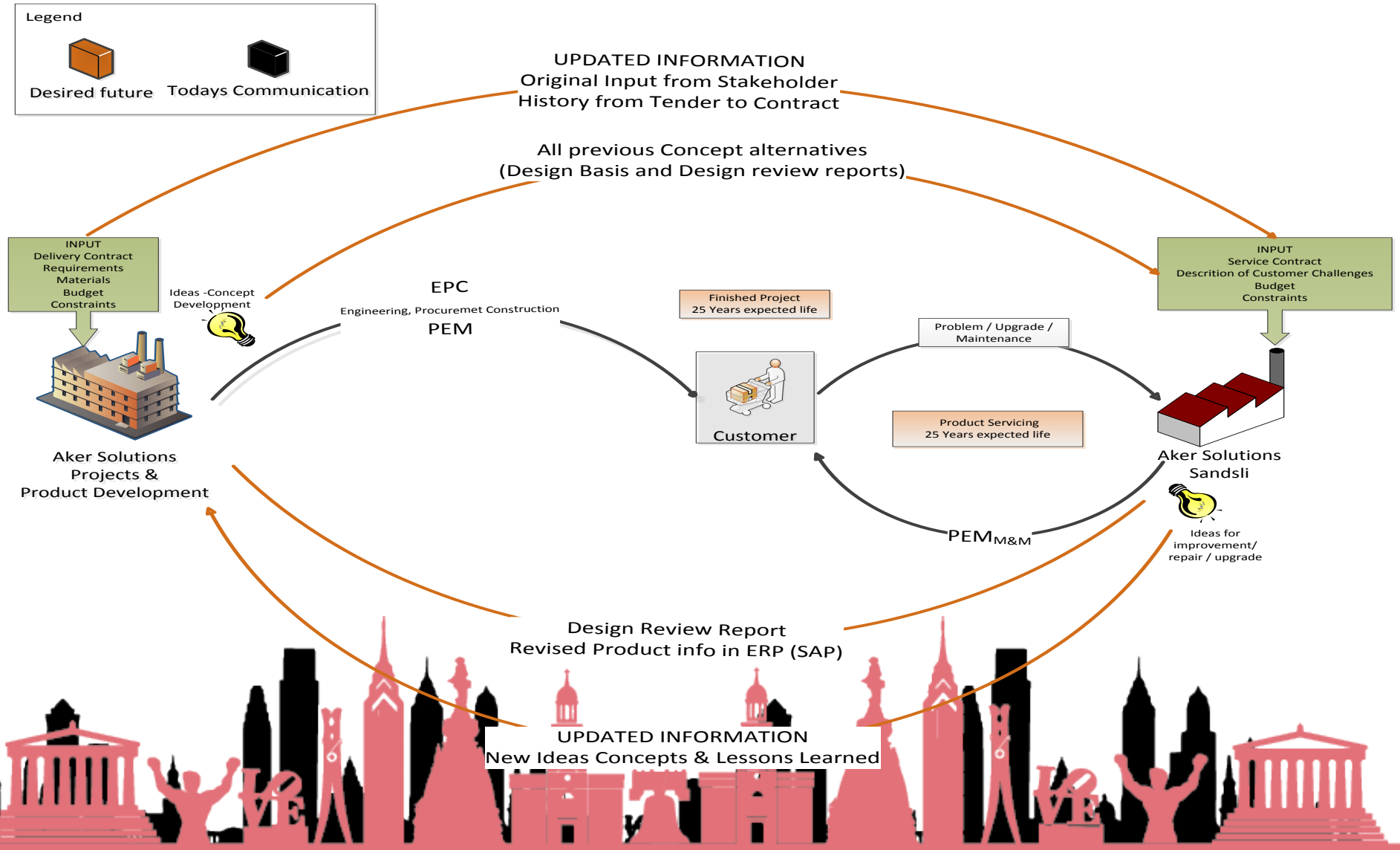
INCOSE International Symposium
Philadelphia, PA
June 24-27, 2013

Todays situation: With inside Information
PEM for Development & $PEM_{M\&M}$ for Maintenance and Modification



Closing the loop

INCOSE International Symposium
Philadelphia, PA
June 24-27, 2013



Discussion

- The research done and the deviations documented suggest that Aker would benefit from and increase their success of projects by introducing missing elements of the ISO/IEC 15288:2008 standard processes into their project execution strategy.

- PEM has a visible focus towards implementation elements of the lifecycle. This is evident where the boxes depicting PEM starts at the lower part of the left leg of the Vee and stop at the top of the right leg.

Discussion

- My findings suggests that requirements analysis should be a part of the early phase of system definition. The upper left part of the vee model is not covered by PEM.

Discussion

INCOSE International Symposium
Philadelphia, PA
June 24-27, 2013

- ***"The current industry standard for executing projects is dependent on requirements defined by governing documents."***

- ***"As the existing tendering regime restricts the flow of information between the contractors and the oil companies, it is not possible to perform an efficient analysis in this phase."***
  - Tranøy, Eldar; 2013: **"Reduction of Late Design Changes Through Early Phase Need Analysis "**

Conclusion

- It is clear that PEM in today's version is a development life cycle model and to become a full life cycle model PEM needs to be expanded to cover more of the ISO standard processes..

- It is my understanding that gathering all project execution activities into PEM and make it into a full life cycle model would make PEM a more important and more useful tool within the company.

Conclusion

INCOSE International Symposium
Philadelphia, PA
June 24-27, 2013

- Further reflection on the use of the standard (and the accompanying INCOSE Systems Engineering Handbook) suggests that these are well constructed and useful products that assist in the analysis of current situations, and the development of tailored approaches for future improvements.

Questions

THANK YOU