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A case study in oil and gas

How can simplified requirements affect project efficiency

Fallrø & Falk

Authors

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- The University of South-Eastern Norway
- Enhanced Drilling
- Aker Solutions
- ABB

Background

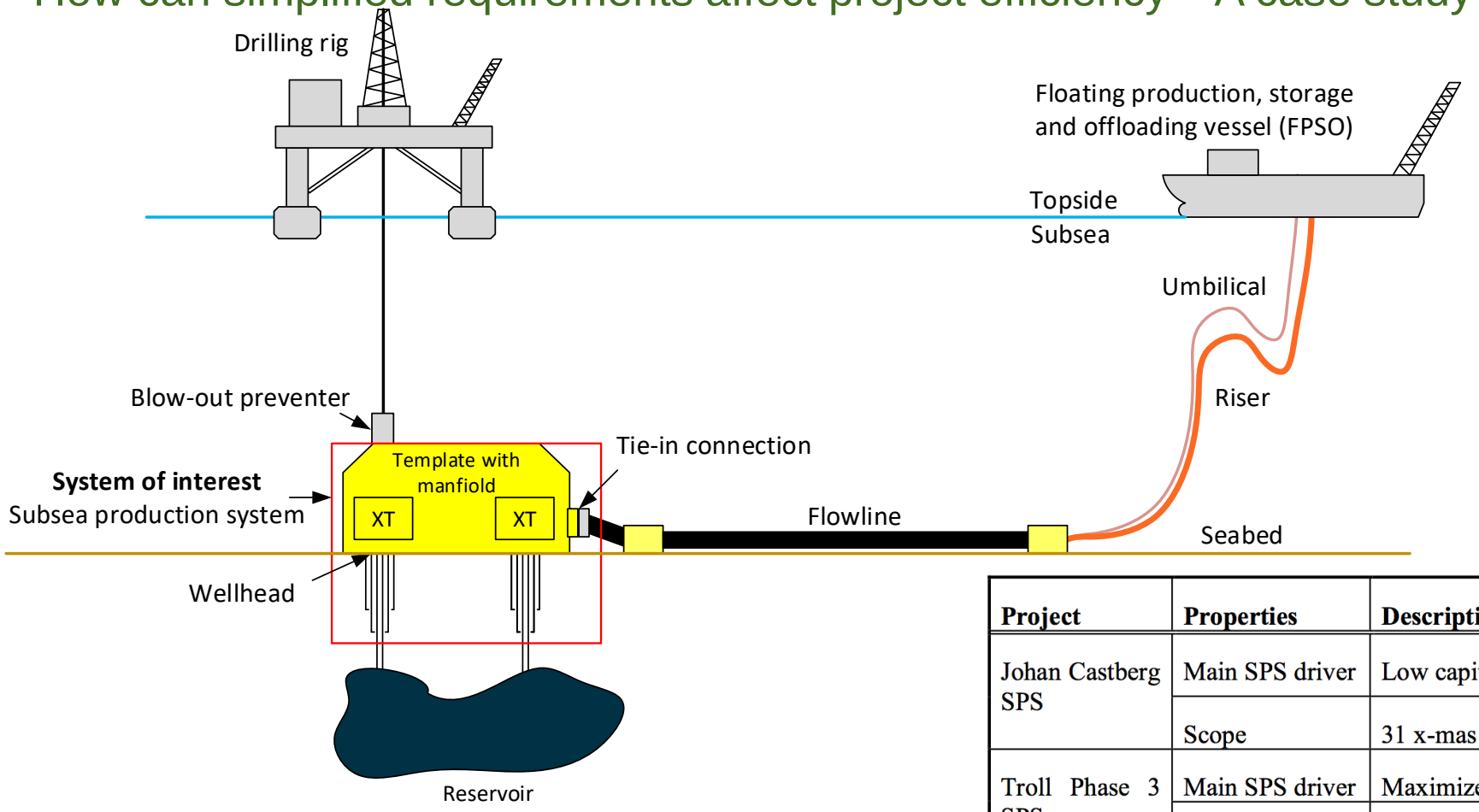
Research question

Research Method

Results & Discussion

Conclusions

How can simplified requirements affect project efficiency – A case study in oil and gas

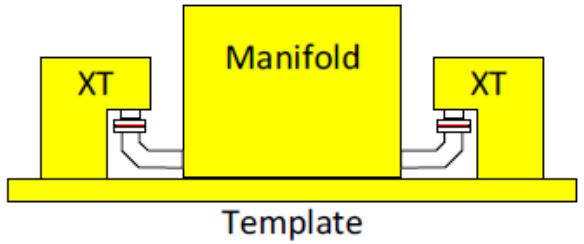


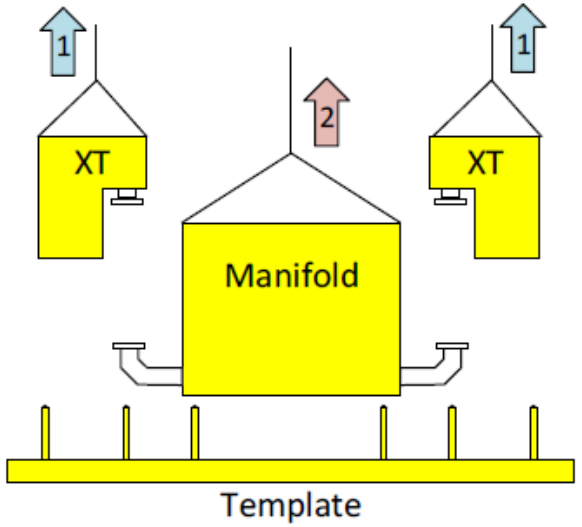
Project	Properties	Description
Johan Castberg SPS	Main SPS driver	Low capital expenditure and life of field costs
	Scope	31 x-mas trees, 10 templates with manifolds, 2 satellites
Troll Phase 3 SPS	Main SPS driver	Maximize gas production through reduced pressure loss
	Scope	9 x-mas trees, 2 templates with manifolds
Askeladd SPS	Main SPS driver	Reliable gas supply to onshore Melkøya LNG plant
	Scope	3 x-mas trees, 2 templates with manifolds

System of Interest

~ 400 m water depth

Vertical XT





XT: safety barriers

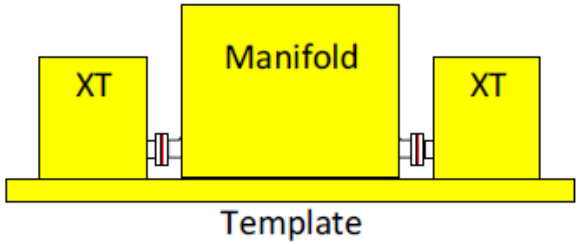
Manifold: distribution

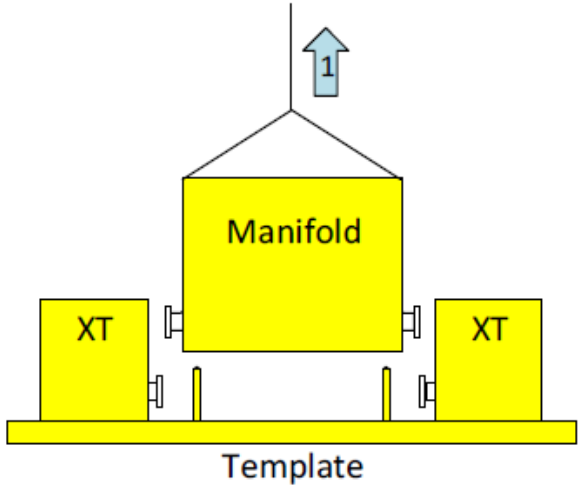
XT: ~10 tons

Manifold: ~100 tons

Must retrieve & reinstall

Horrizontal XT





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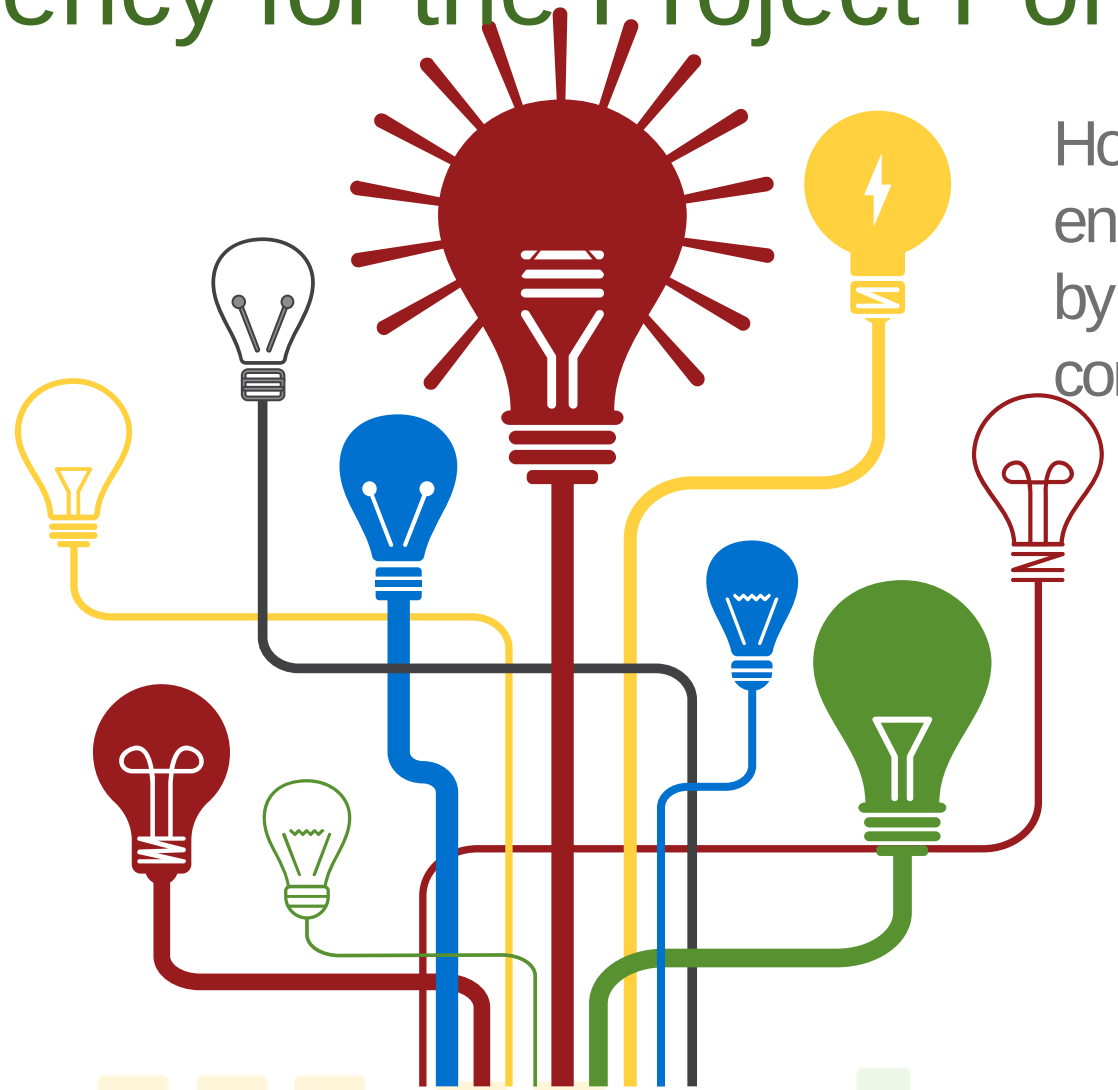
How have simplified requirements affected project efficiency for the Project Portfolio?

How did systems engineers in Equinor and AKSO define simplified requirements for the portfolio of frame agreement projects?

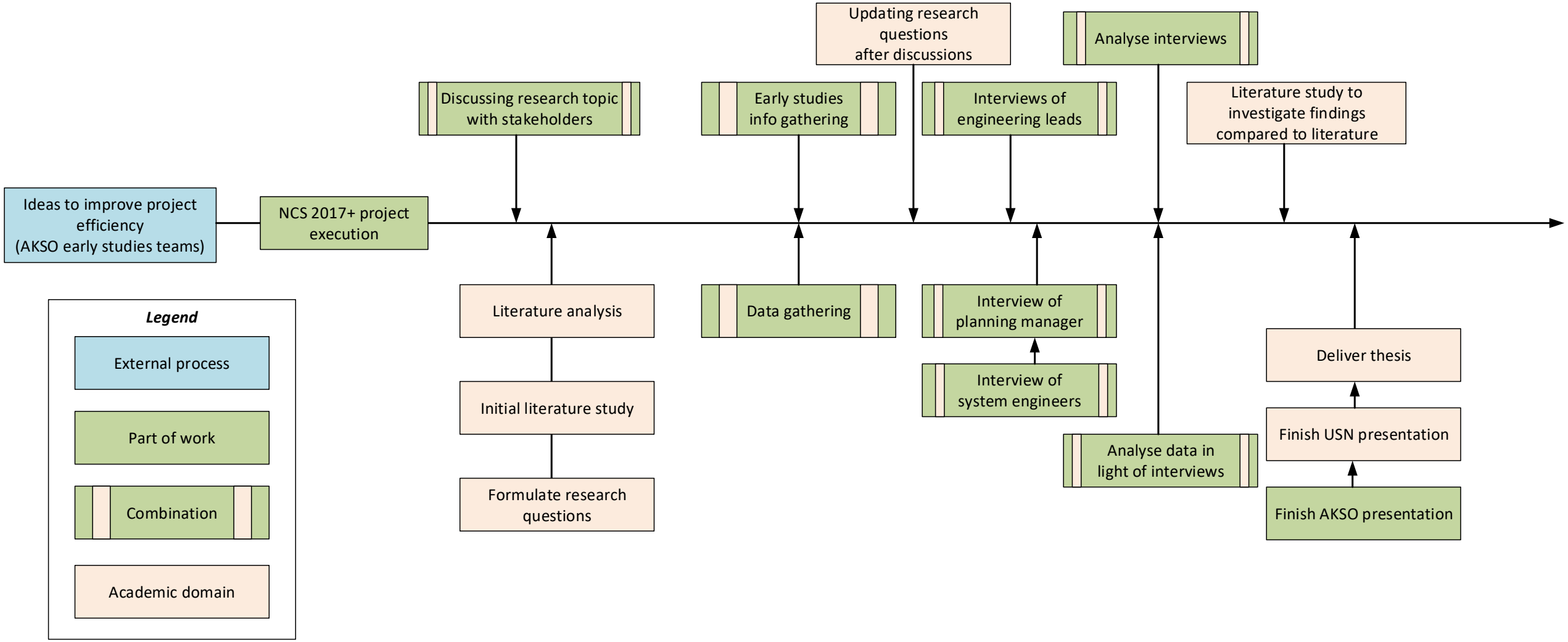


How much of the engineering work conducted by AKSO occurred pre-EPC contract award?

Which factors affect SPS project efficiency in AKSO?

Background | Research question | Research Method | Results & Discussion | Conclusions

Method


Ideas to improve project efficiency (AKSO early studies teams)
NCS 2017+ project execution
Discussing research topic with stakeholders
Updating research questions after discussions
Early studies info gathering
Interviews of engineering leads
Analyse interviews
Literature study to investigate findings compared to literature
Literature analysis
Initial literature study
Formulate research questions
Data gathering
Interview of planning manager
Interview of system engineers
Analyse data in light of interviews
Deliver thesis
Finish USN presentation
Finish AKSO presentation
Legend
External process
Part of work
Combination
Academic domain

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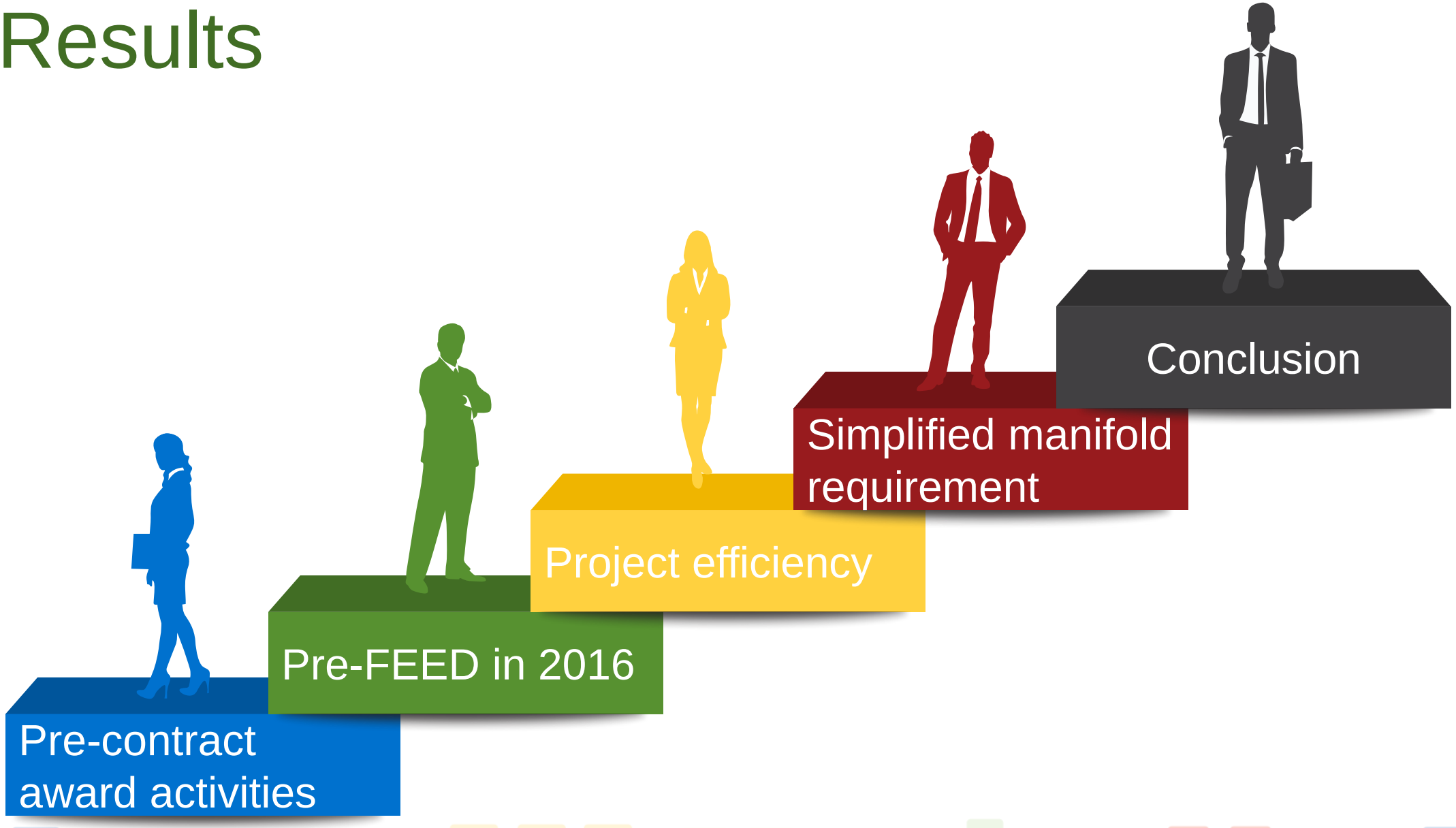
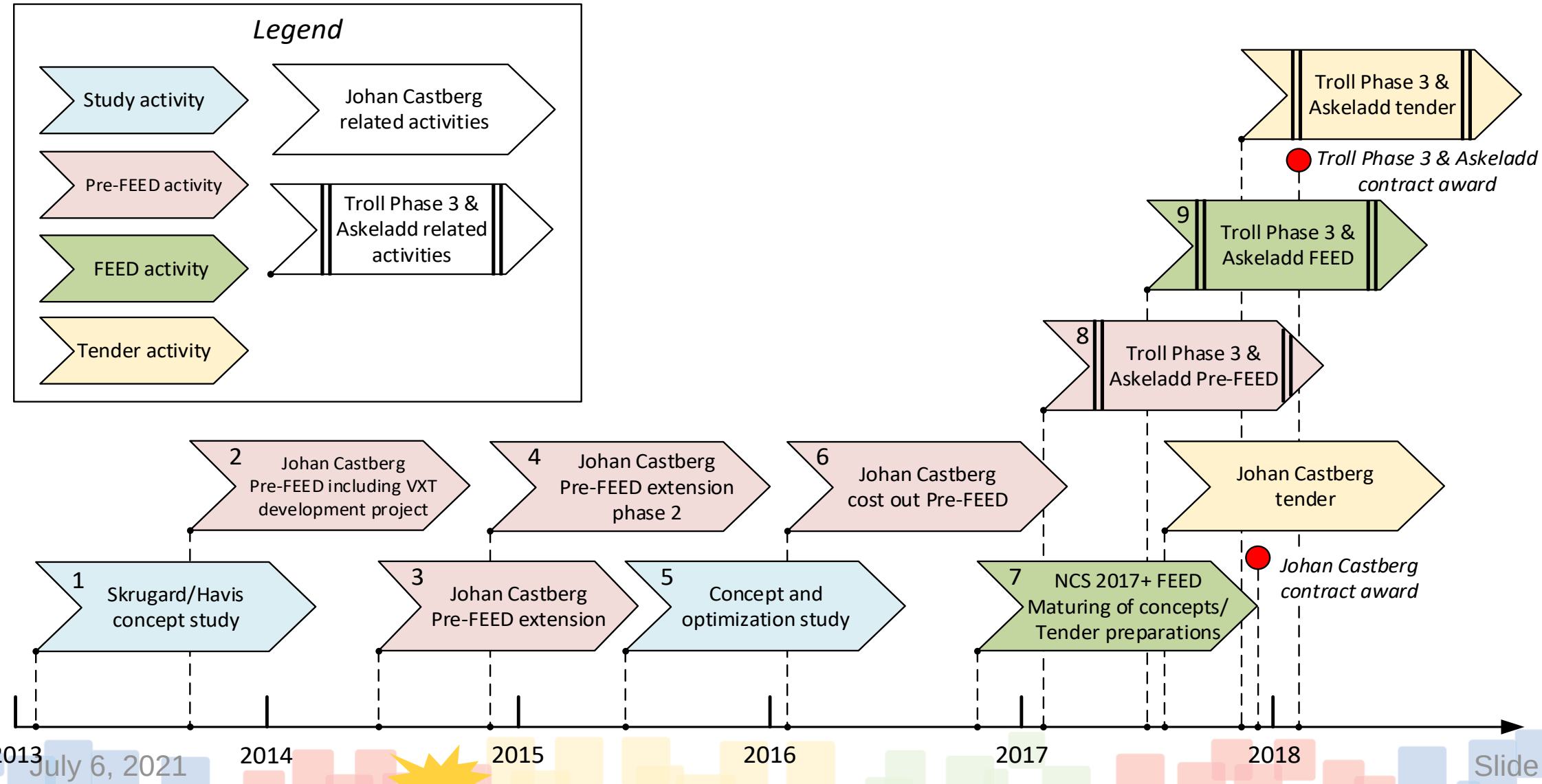
Results


Pre-contract award activities
Pre-FEED in 2016
Project efficiency
Simplified manifold requirement
Conclusion

Pre-contract award activities

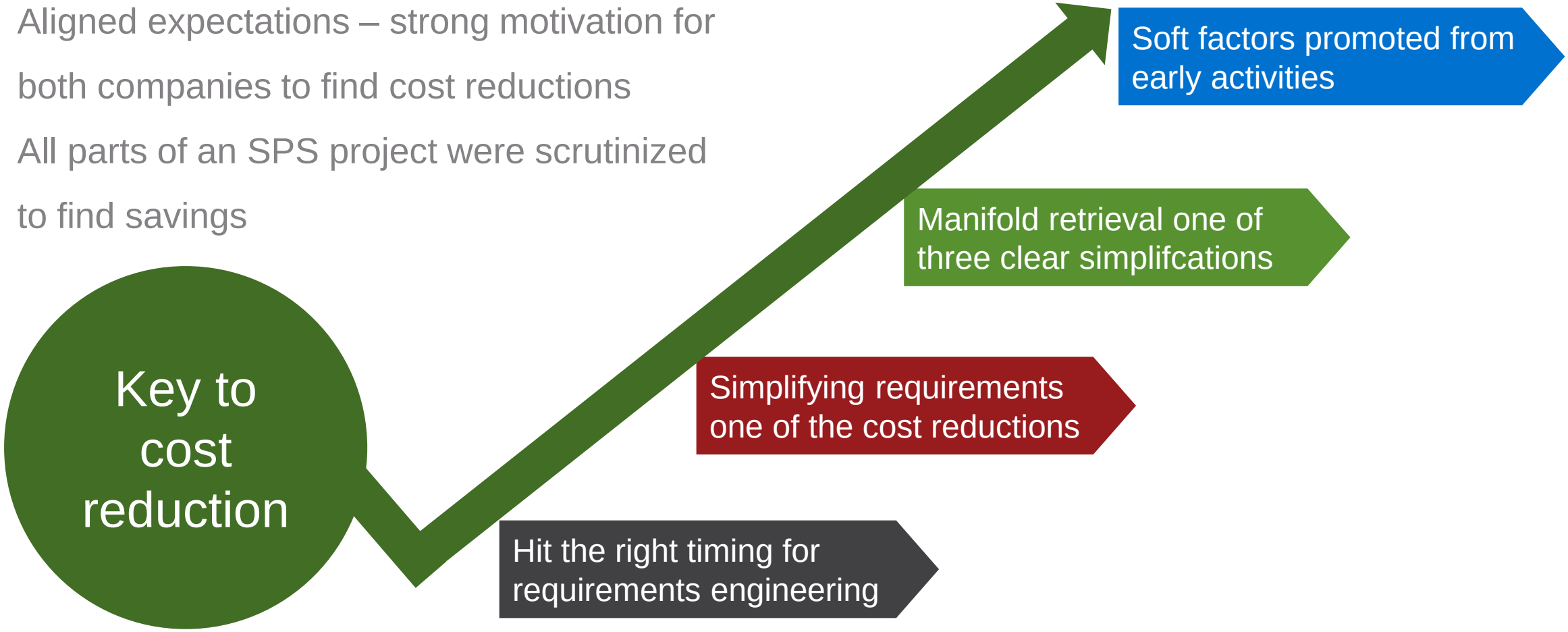


Oil price downturn

Pre-Feed 2016

Aligned expectations – strong motivation for both companies to find cost reductions

All parts of an SPS project were scrutinized to find savings



Requirements clarification

- ***Need*** *to have* requirements
  - System requirements with a clear link to stakeholder needs for current project
- ***Nice*** *to have* requirements
  - OPEX vs CAPEX
  - Redundancy in lines
  - Redundancy in valves
  - Multiple functions available for lines and valves
- ***Used*** *to have* requirements
  - Aligned with legacy equipment functions for easier maintenance
  - Adhrence to internal specifications (manifold retrieval example)

Project efficiency (1/2)

Frame agreement projects were regarded as efficient projects in AKSO

Supported by data and comparison

Project hours reduction not having a negative impact on quality

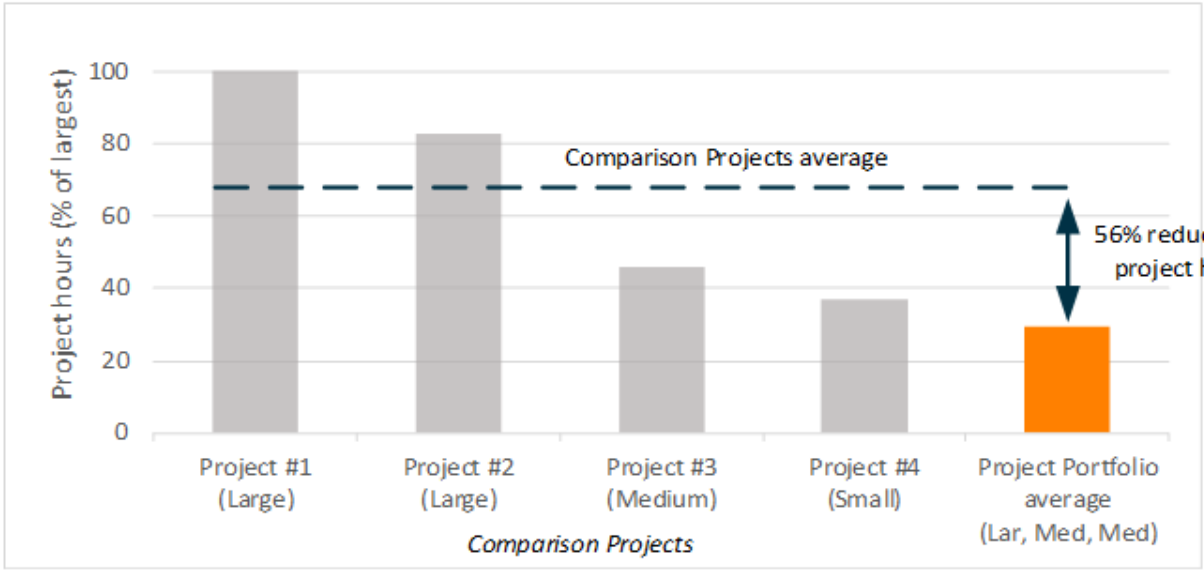


Figure 6. Internal project hours per project. Project Portfolio average is based on forecasted hours

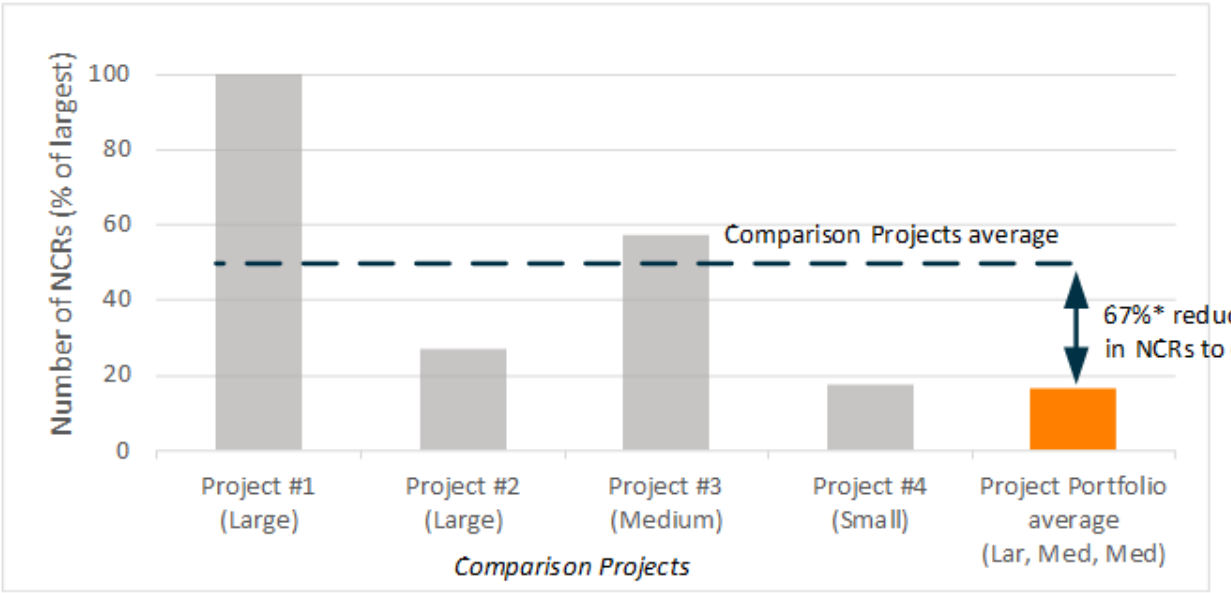


Figure 7. NCRs labeled as medium or high priority per project. *Current number of NCRs as portfolio projects are still ongoing.

Project efficiency (2/2)

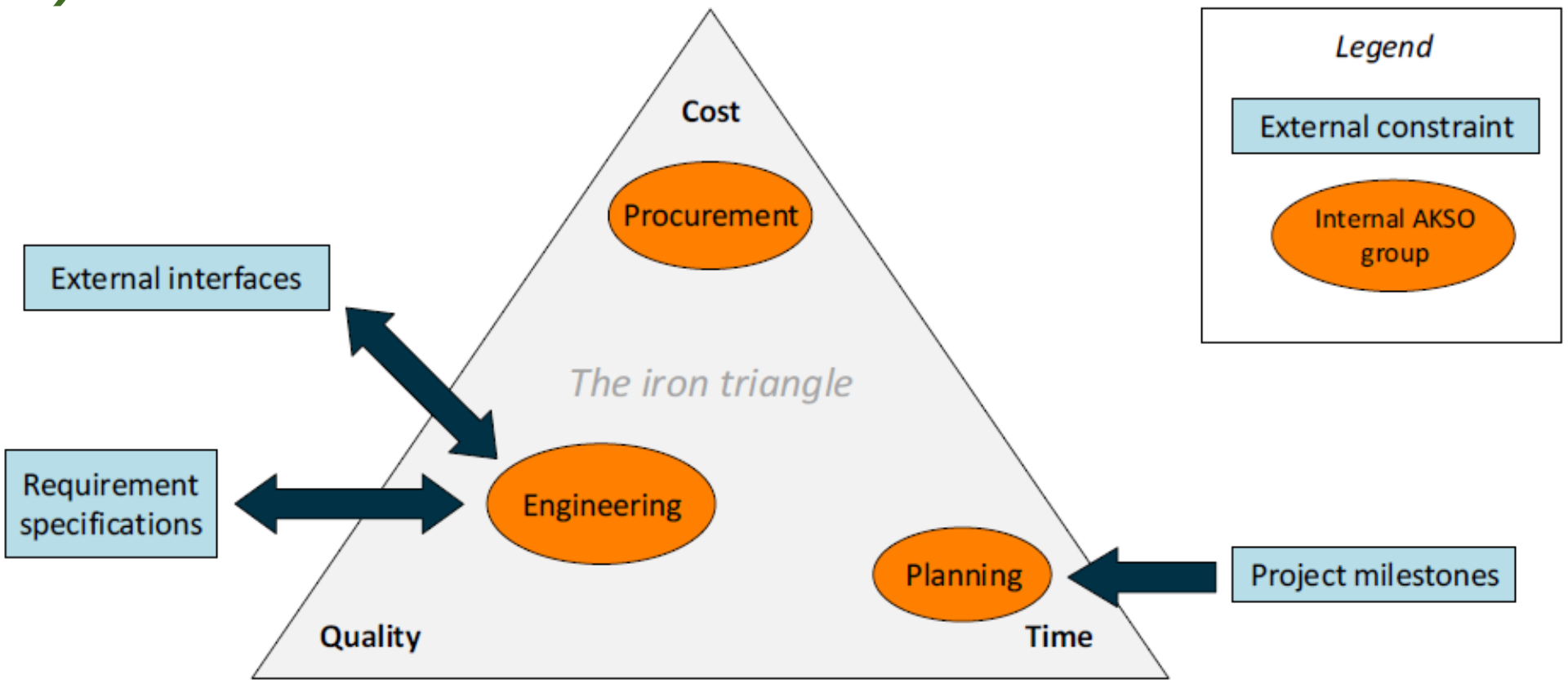
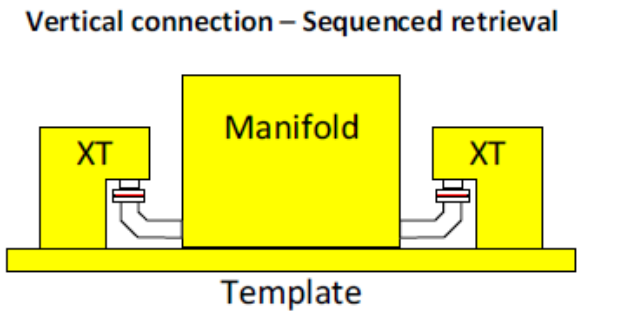
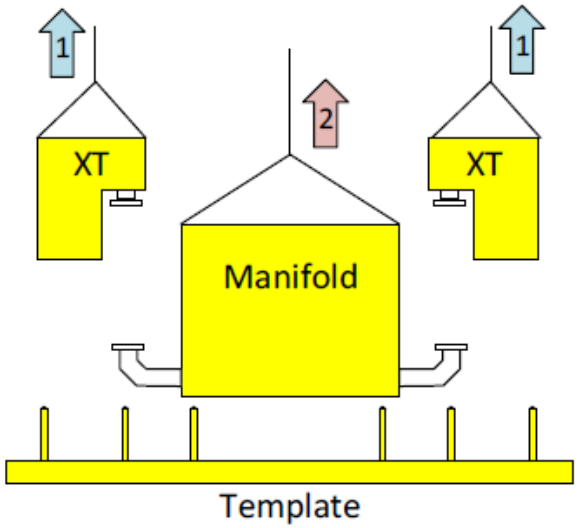


Figure 8. The iron triangle based on (Atkinson 1999) with an overlay of AKSO project groups and selected external inputs.

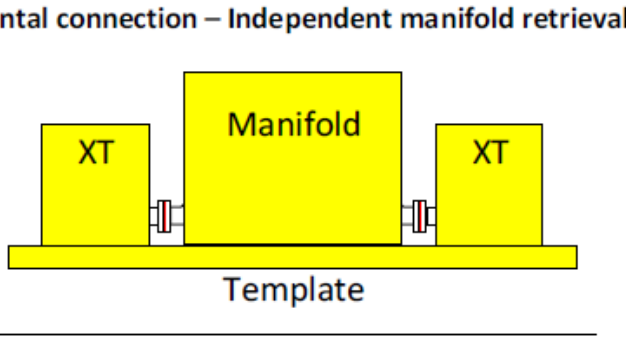
Simplified manifold requirement (1/3)

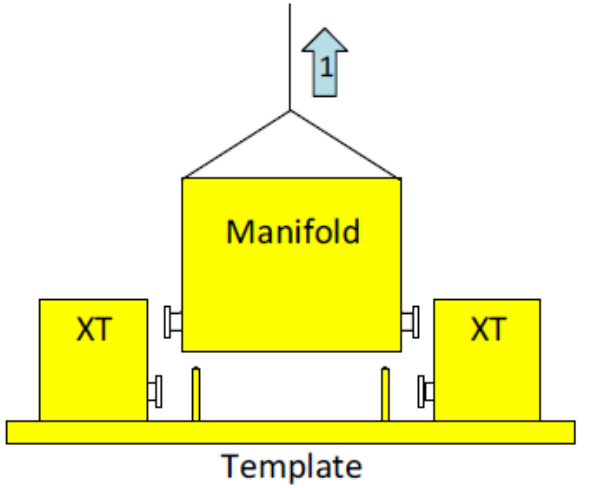




Original: *The manifold shall be retrievable and re-installable independently of the x-mas tree system.*

Simplified: *The manifold shall be retrievable and re-installable.*





Simplified manifold requirement (2/3)

Not possible to exactly quantify cost reduction as the alternative options were not further developed and estimated

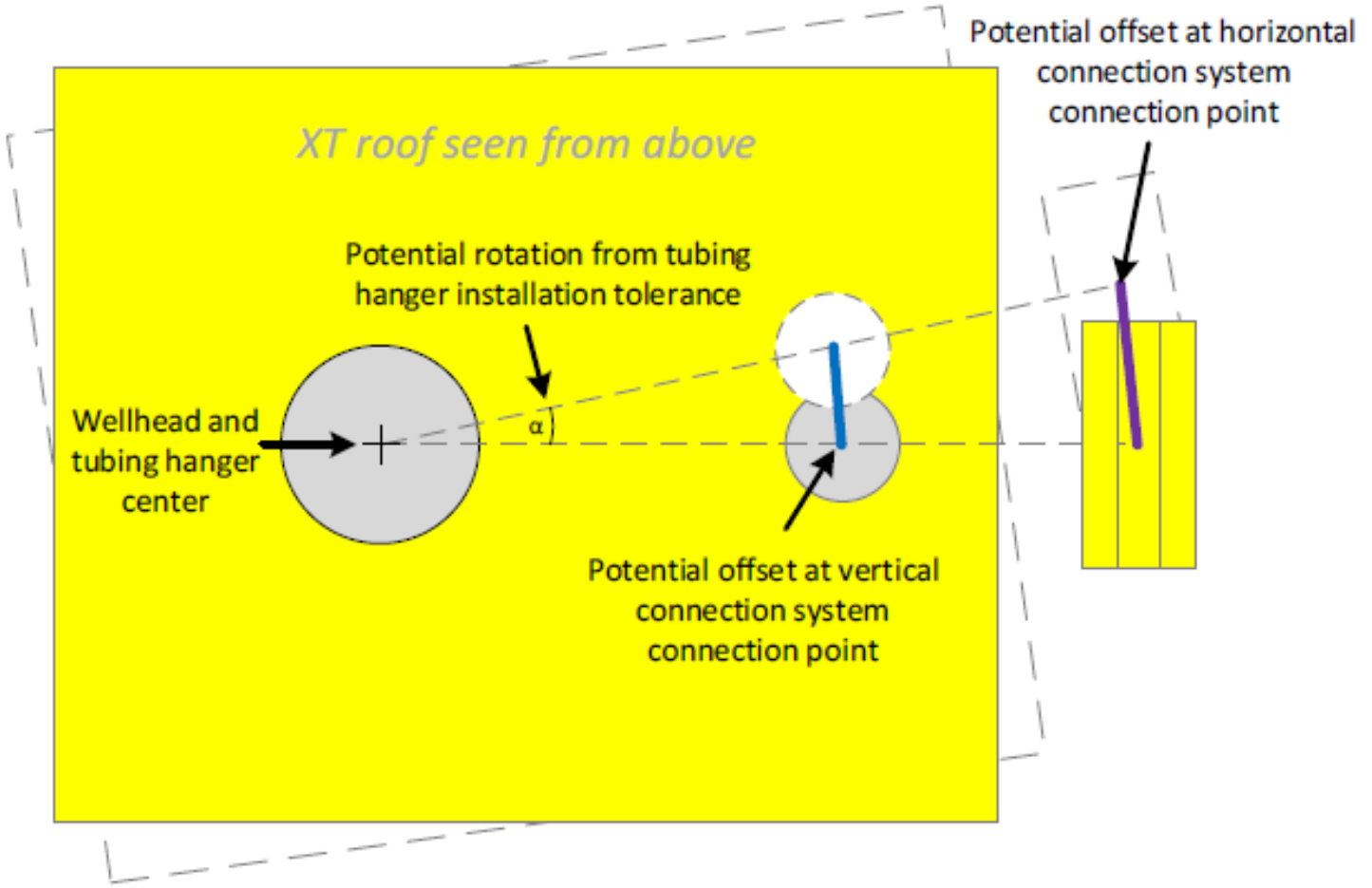


Figure 10. XT rooftop view of tolerance offset difference between a vertical connection point and a horizontal connection point. The horizontal connection point location requires a more flexible manifold piping due to the larger potential offset.

Simplified manifold requirement (3/3)

- Challenge the requirements
  - Detailed design ahead of fully defining system requirements

- SEBoK: *“Design definition is driven by specified requirements, the system architecture, and more **detailed analysis** of performance and feasibility.”*

- The method fills a void for established client-contractor relationship
  - **No need to do a full cycle** of the SE framework
  - Focused work on key requirements to improve project efficiency (cost)

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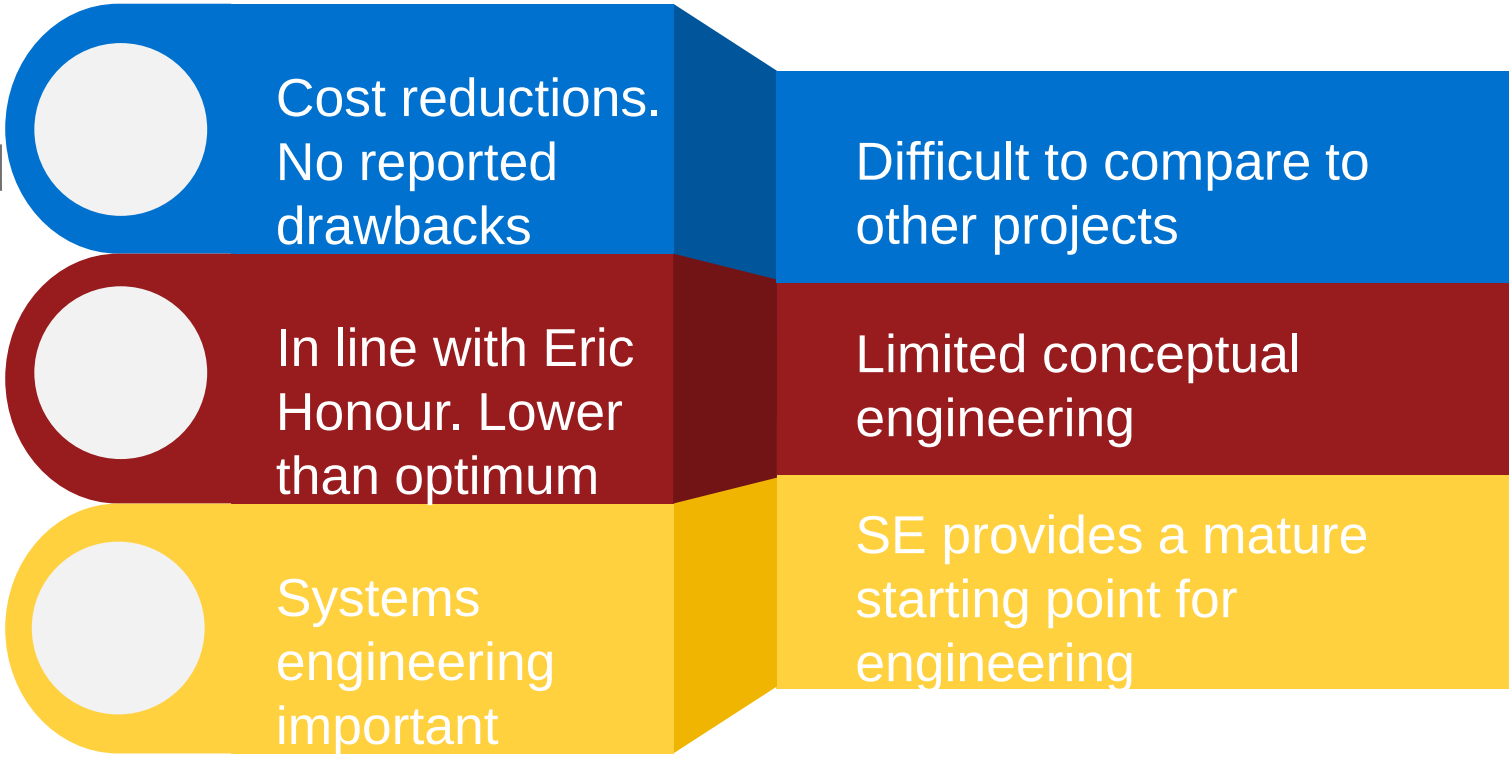
This work has analyzed 3+ projects where contractor and customer have worked closely over 6 years to bring down cost.

1. Improved project efficiency by simplified requirements
2. 6.5% of hours spent before contract awards
3. The planning priority is affecting project efficiency



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