



31st Annual **INCOSE**
international symposium
virtual event

July 17 - 22, 2021

Systems Engineering

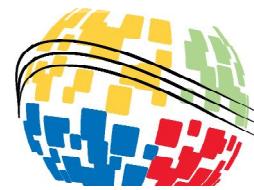
Developing domain-specific AI-based tools to boost cross-enterprise
knowledge reuse and improve quality



Agenda

- Topics
- Motivation
- Case study: MHWIRTH
- Results from the research
- AI-based knowledge reuse model
- Summary

Topics



Motivation

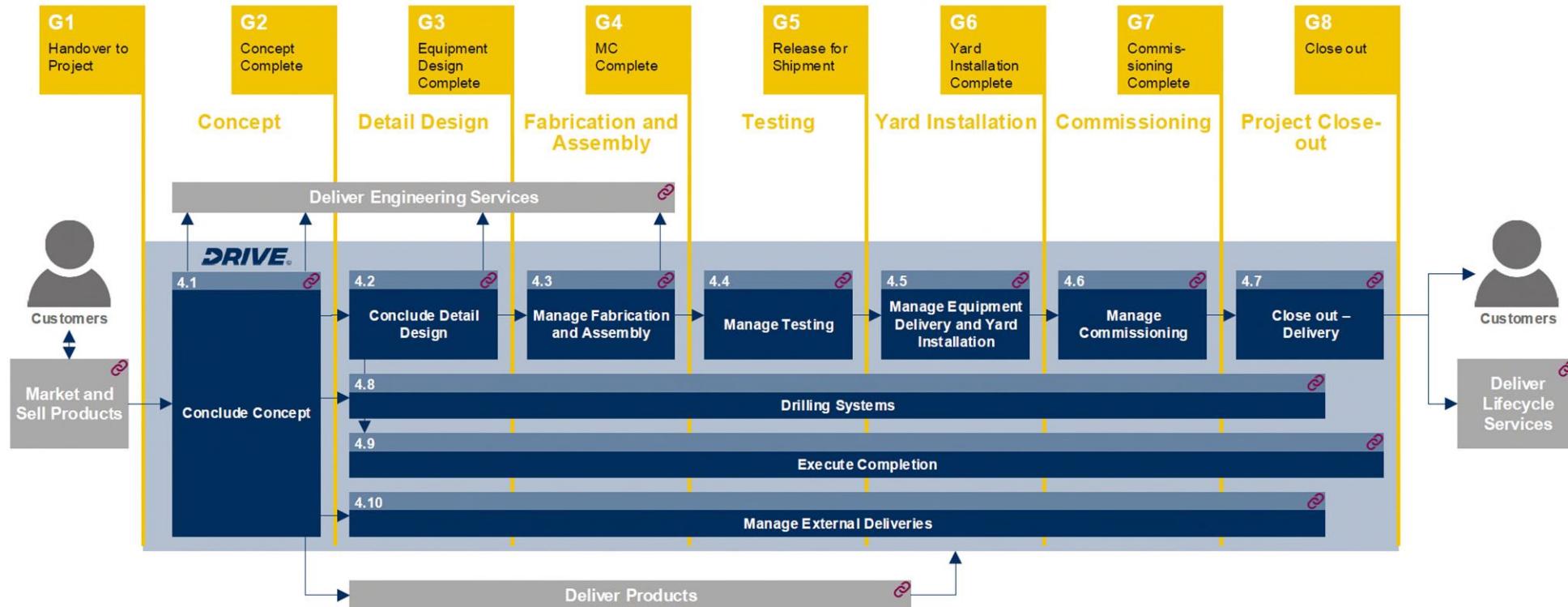


- Personal field experience
- Improve quality
- Importance of organizational knowledge
- Improve cross-enterprise knowledge sharing and reuse

MHWirth

- Advanced drilling systems and lifecycle s
- 125 years
- 12 countries
- Over 500 vessels







Research questions

- RQ1: Can quality issues discovered during the commissioning phase be linked to poor knowledge management?
- RQ2: How can cognitive search boost knowledge reuse and improve communication across different departments?
- RQ3: How can DRIVE© model benefit from cognitive search and sentimental analyses?

Research design



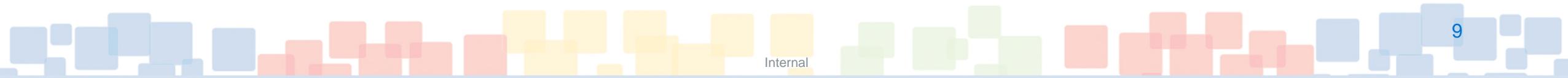
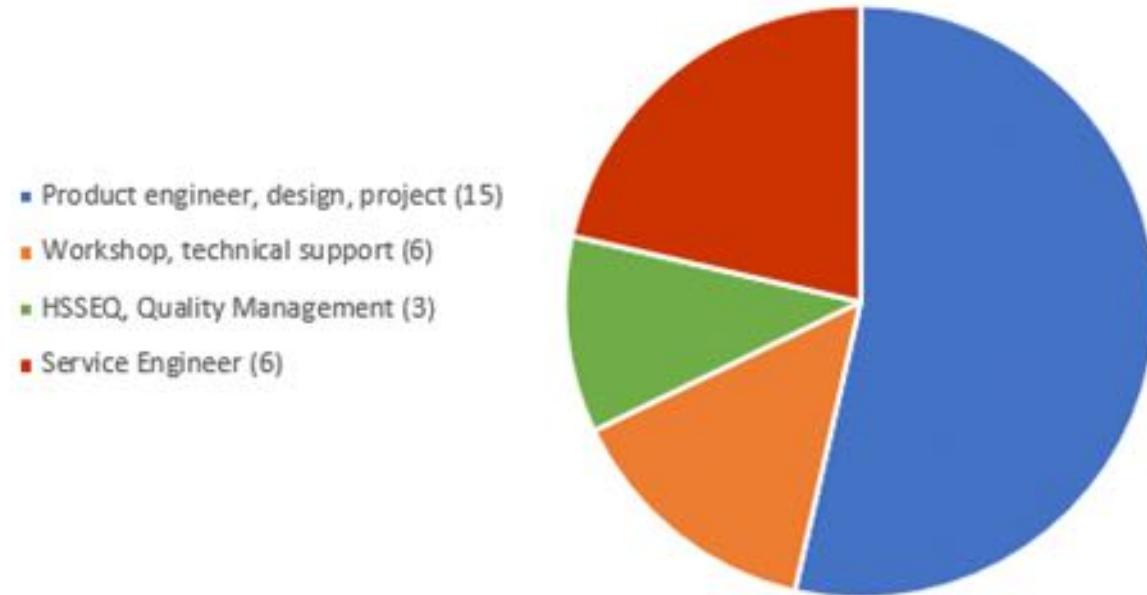
- Mixed methods
- Quantitative method: online survey
- Qualitative method: in-depth interviews
- Literature review
- AI platform review
- Limitations

Quantitative method: Online survey



- 20 questions
- Customer focus and continues improvement (QM and KM)

Q1: What kind of work do you do?



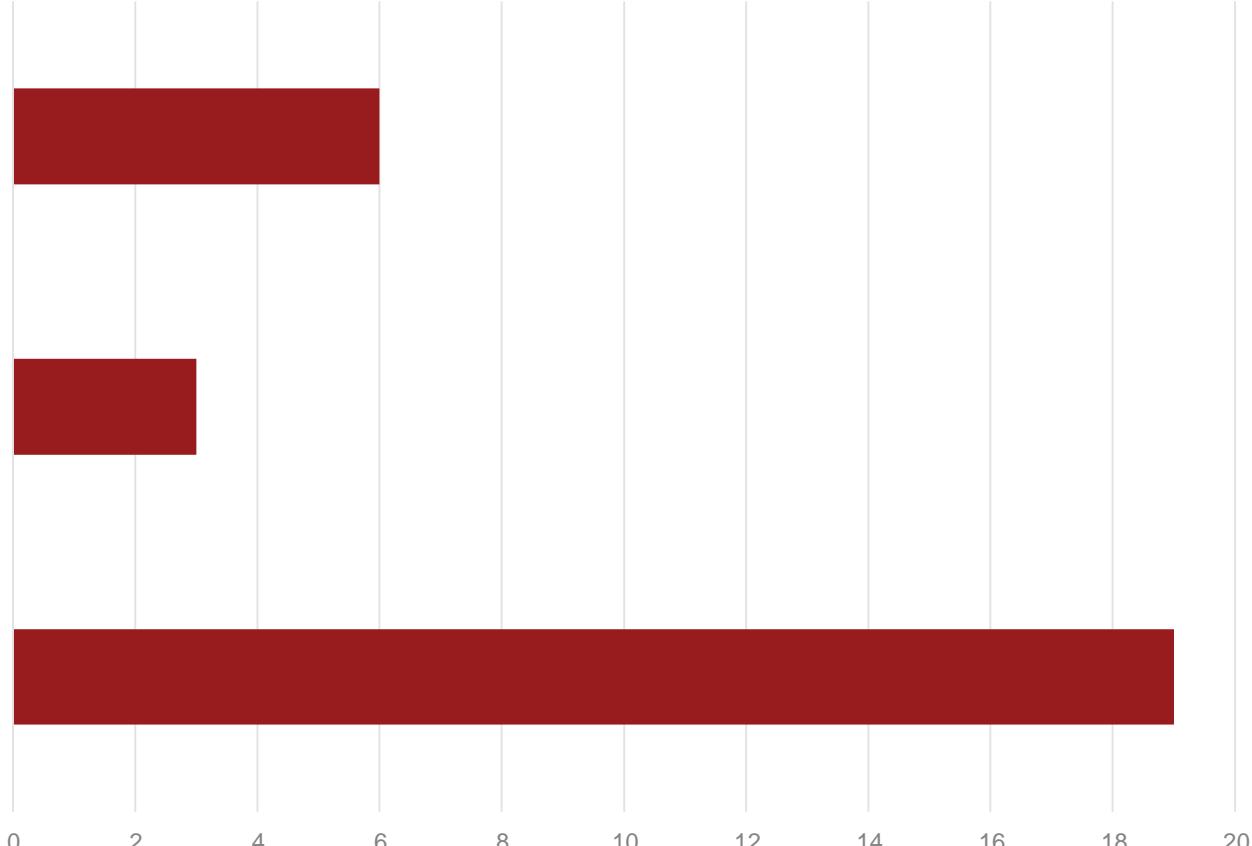
Question 8

No effective system for knowledge sharing



How is newly captured knowledge shared company-wide?

Any knowledge gained is routinely evaluated and shared company wide.
Searched knowledge is always easy to find and ready for use.



Online survey: Question 9

Knowledge silos

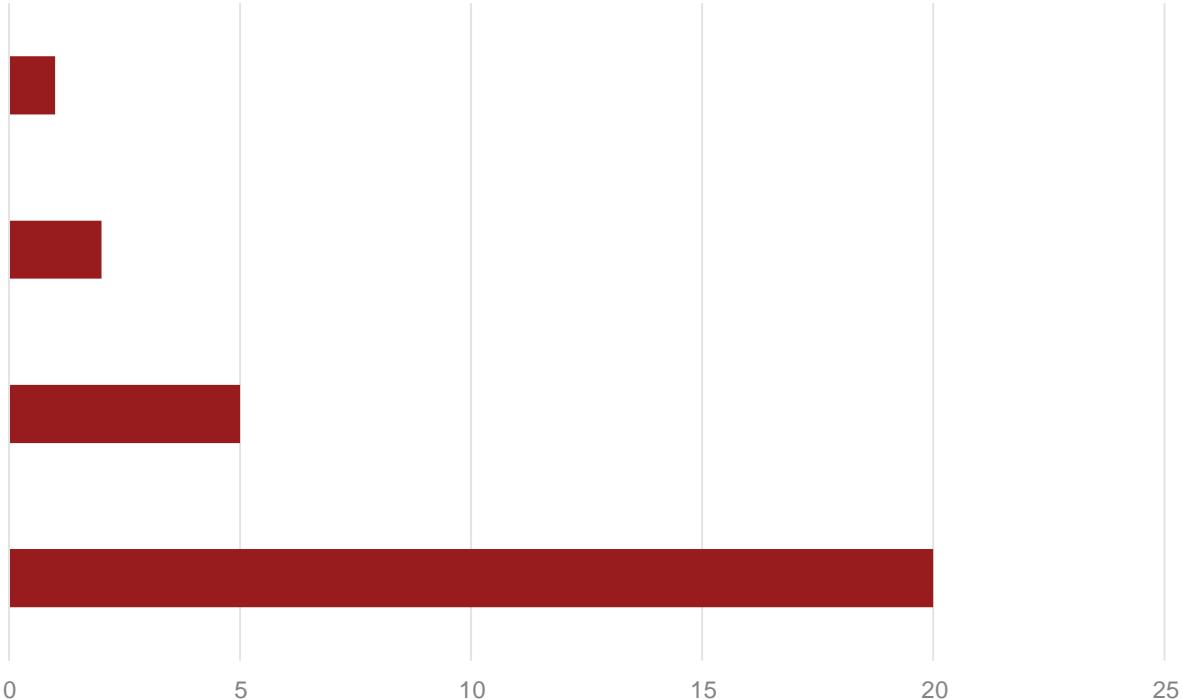


How does our company re-use captured knowledge?

Knowledge is captured and stored with the explicit purpose of being reused for future products. The process of generating, collecting and communicating knowledge is standardized and all learning, including failures is considered valuable.

The company has a strategy for capturing, generalizing and reusing knowledge but only a few individuals possess the key competences needed.

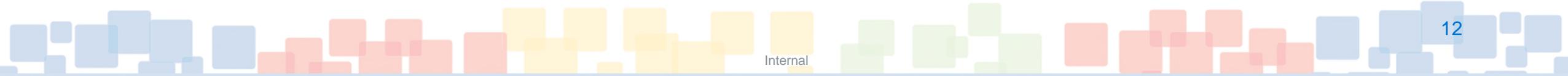
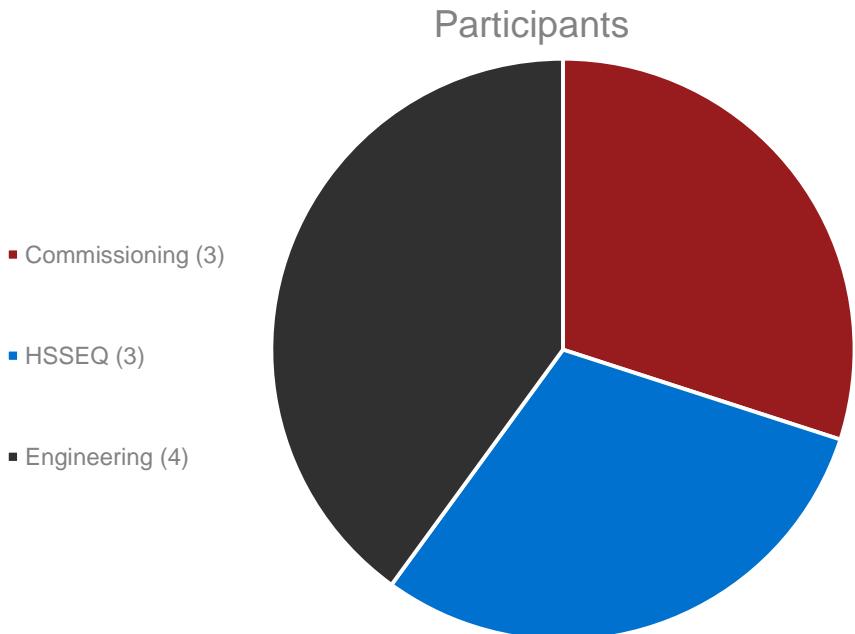
Knowledge is generated, saved and used by the individual. Key competences are dependent on a few individuals.



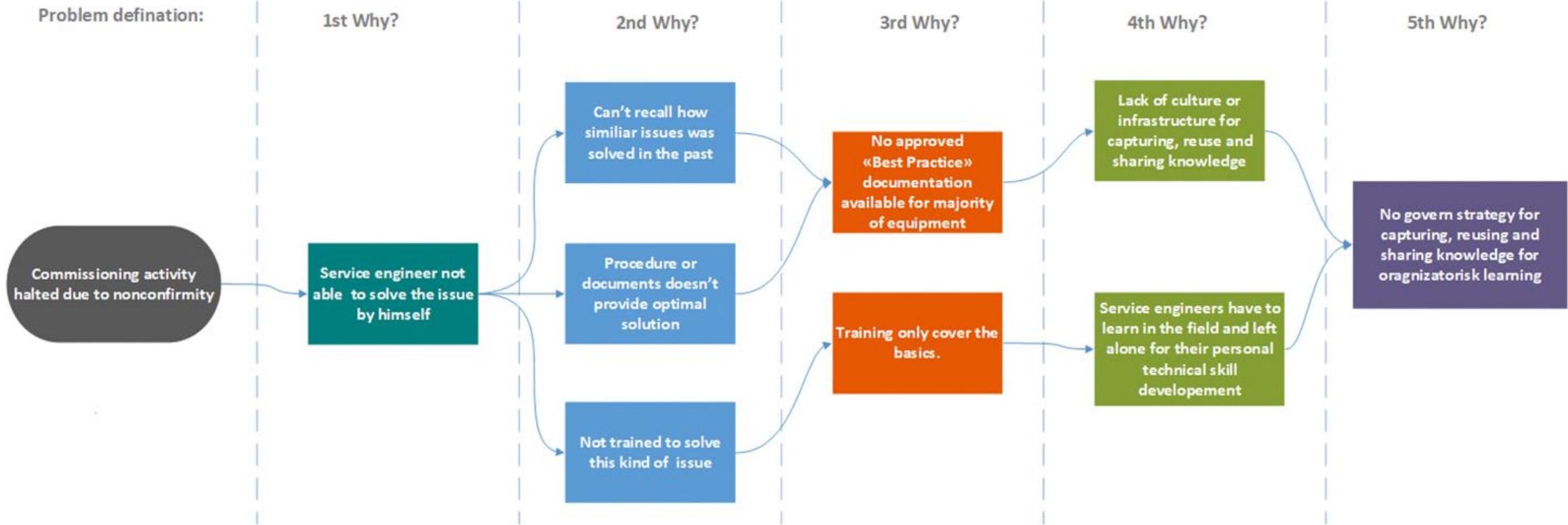
Qualitative method: In-depth interviews



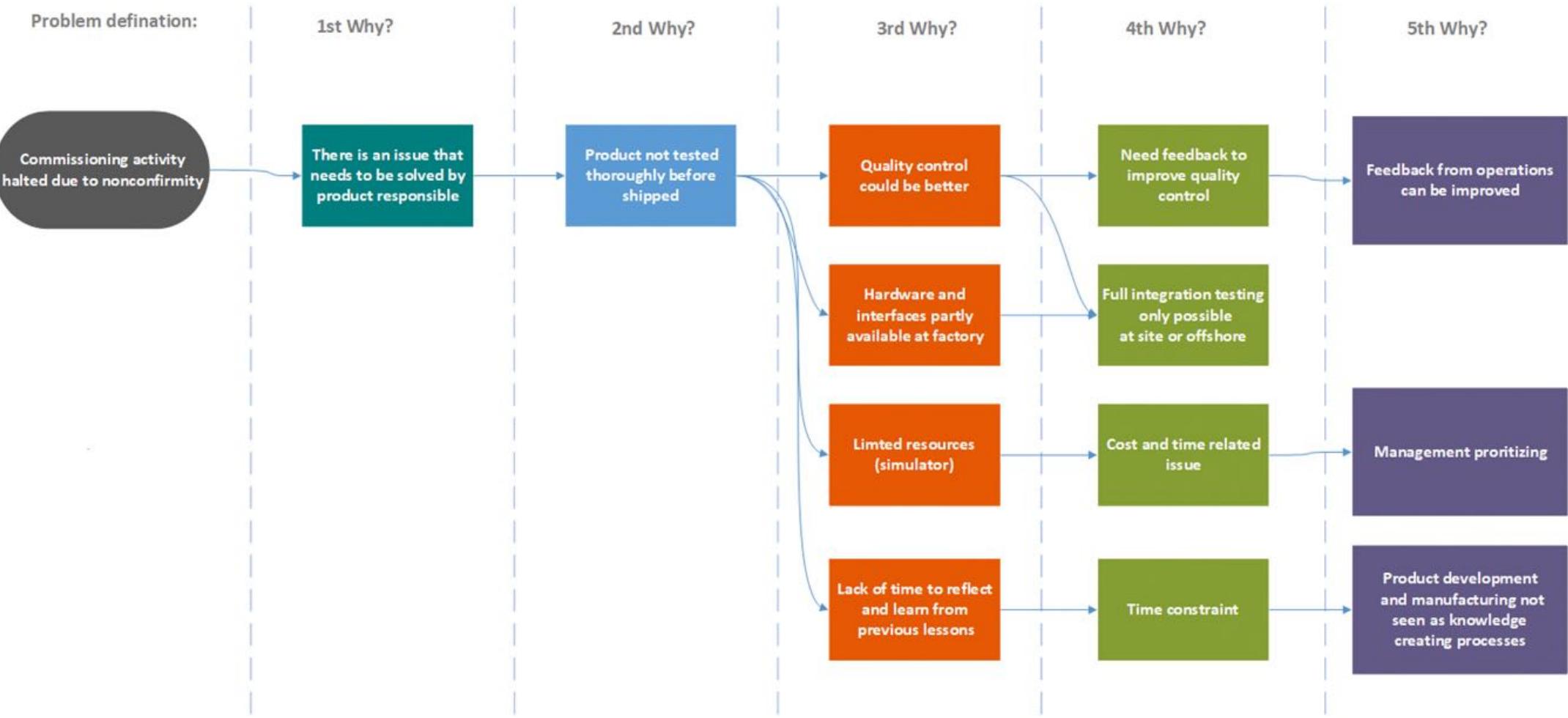
- 10 participants
 - Various background
 - Key competence
 - Long experience
- Retrospective view
- 5 Whys?



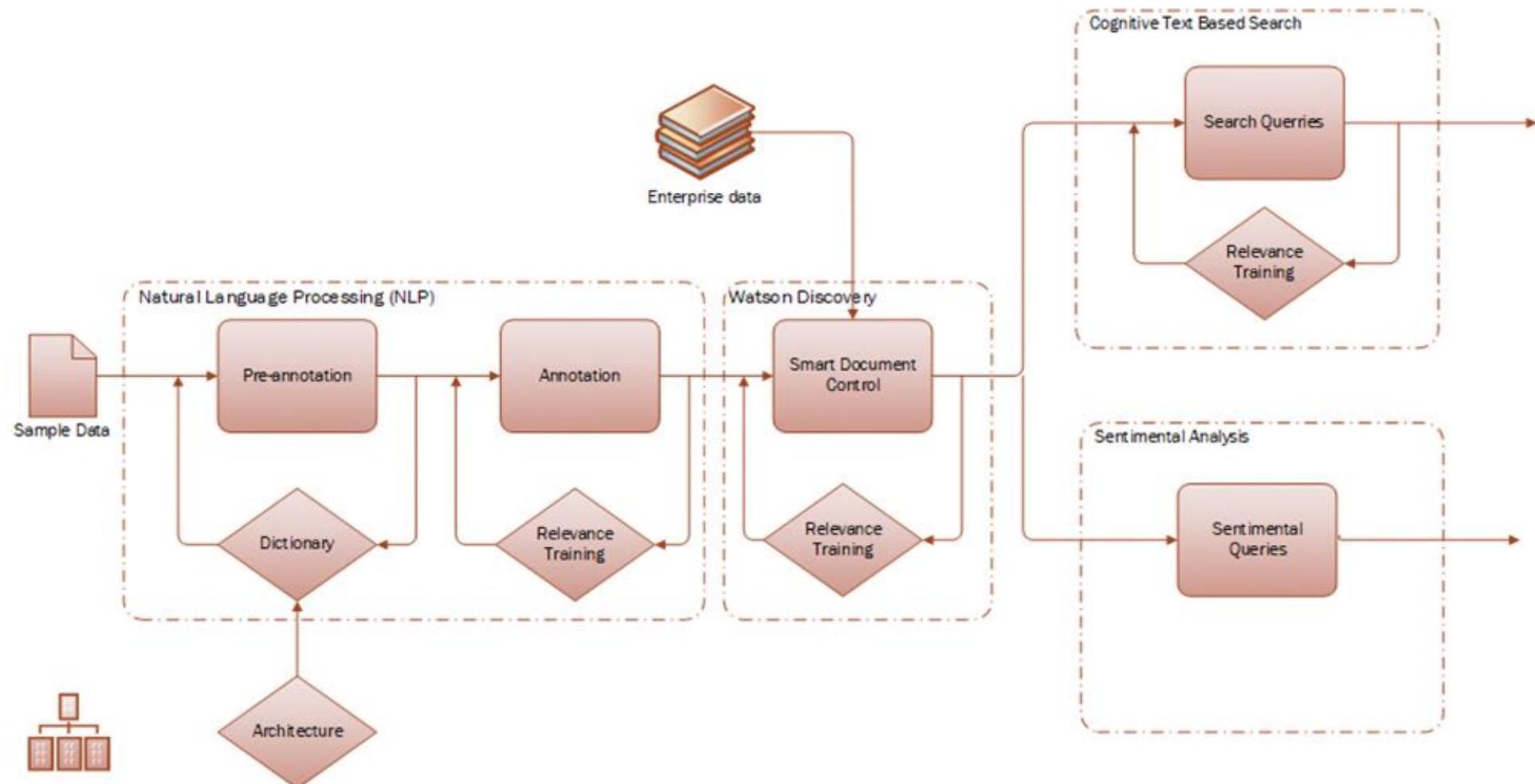
In-depth interviews: Root cause 1



In-depth interviews: Root cause 2



AI Based Tools



AI Based Tools



- Cognitive search

Why can't I open fingerboard latch?

SEVAN LOUISIANA-IZ411-02.11.2016-4-0...

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"... Tested casing finger board row 29 latches in Manual mode , the latches opened correctly this time. Test VPH in Normal mode , the latches opened correctly this time. As the casing fingerboard is full, the empty row 23 is not accessible due to the long drill pipe stands in row 22. ..."

"... Notification no.: 1. • Implement CCN0178 to fix Casing Fingerboard Row 29 latch open problem.

Show more

SEVAN LOUISIANA-IZ411-23.04.2019-13...

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"... • Interlock against opening of fingerboard latch in manual mode (PB-CS-036) Interlock against opening of latch is developed to prevent the opening of outer latches in Manual mode, if VPH is not in the correct position in front of the fingerboard. If selecting assisted stop, It also guides ..."

"... Implement CCN0188 and CN0192 for VPH to get: • Interlock against opening of fingerboard latch

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Rig electrician reported that when racking stands in FB (FWD Latch Finger) the latches would not open while running in normal mode. Rig had to switch to manual mode and open the latches manually.

The following criteria's must be fulfilled: The Row Change From must be smaller than Row Change To Both Row Change To and From must be inside selected fingerboard rows. For this project this

Show more

AI Based Tools



- Sentimental analysis
- Trend analysis

+ Search for documents

Include analysis of your results

Write an aggregation query using the Discovery Query Language

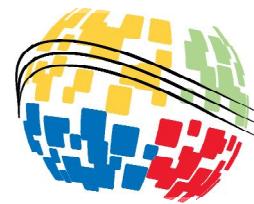
```
nested(enriched_text.entities).filter(enriched_text.entities.type:hardware).filter(enriched_text.entities.sentiment.score<-0.65).term(enriched_text.entities.t ext)
```

Build in visual mode

Aggregations

term(enriched_text.entities.text)

- Guide (32)
- Trolley (32)
- fingerboard (21)
- finger (13)
- BRC (11)



Research question 1

Can quality issues discovered during the commissioning phase be linked to poor knowledge management?

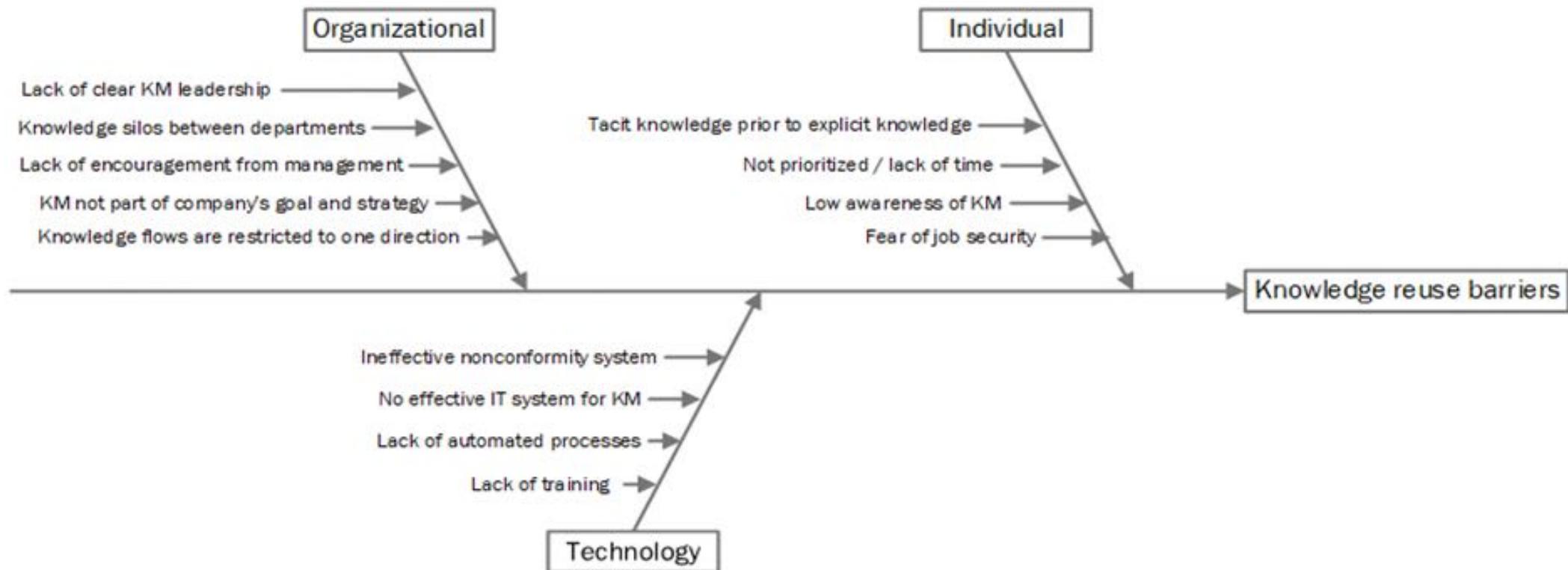
With better KM

- Service engineers could improve performance
- Product engineers improve products
- HSSEQ evaluate companies performance and customer satisfaction

Research question 1



Knowledge Reuse Barriers





Research question 2

How can cognitive search boost knowledge reuse and improve communication across different departments?

- Increase availability of information
- Extract relevant information from various sources
- Informed decisions
- Increase productivity
- Technical support, product engineers, HSSEQ etc.



Research question 2

Quotes from interviews

- «Reinventing the wheel»
- «Not learning from past»



Research question 3

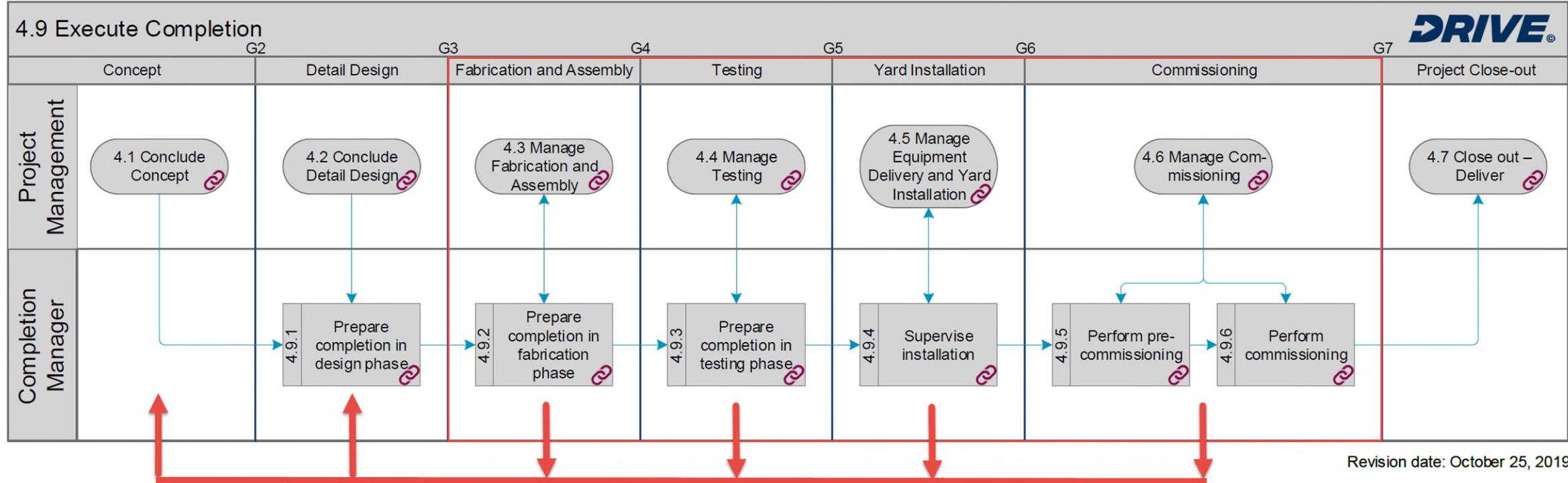
How can DRIVE© model benefit from cognitive search and sentimental analyses?

- Lack of formal feedback loops
- Cognitive search facilitates more informed decisions
- Sentimental analyses to analyse trends

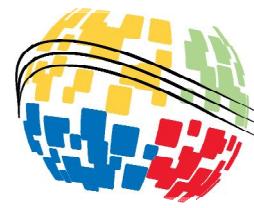
Research question 3



MHWirth Process: Deliver Packages



Conclusion



- Current QM can benefit from increased focus on KM
- AI tool can boost knowledge reuse but requires human interaction
- Focus on eliminating knowledge reuse barriers