University of South-Eastern Norway

INCOSE International Symposium paper presentation

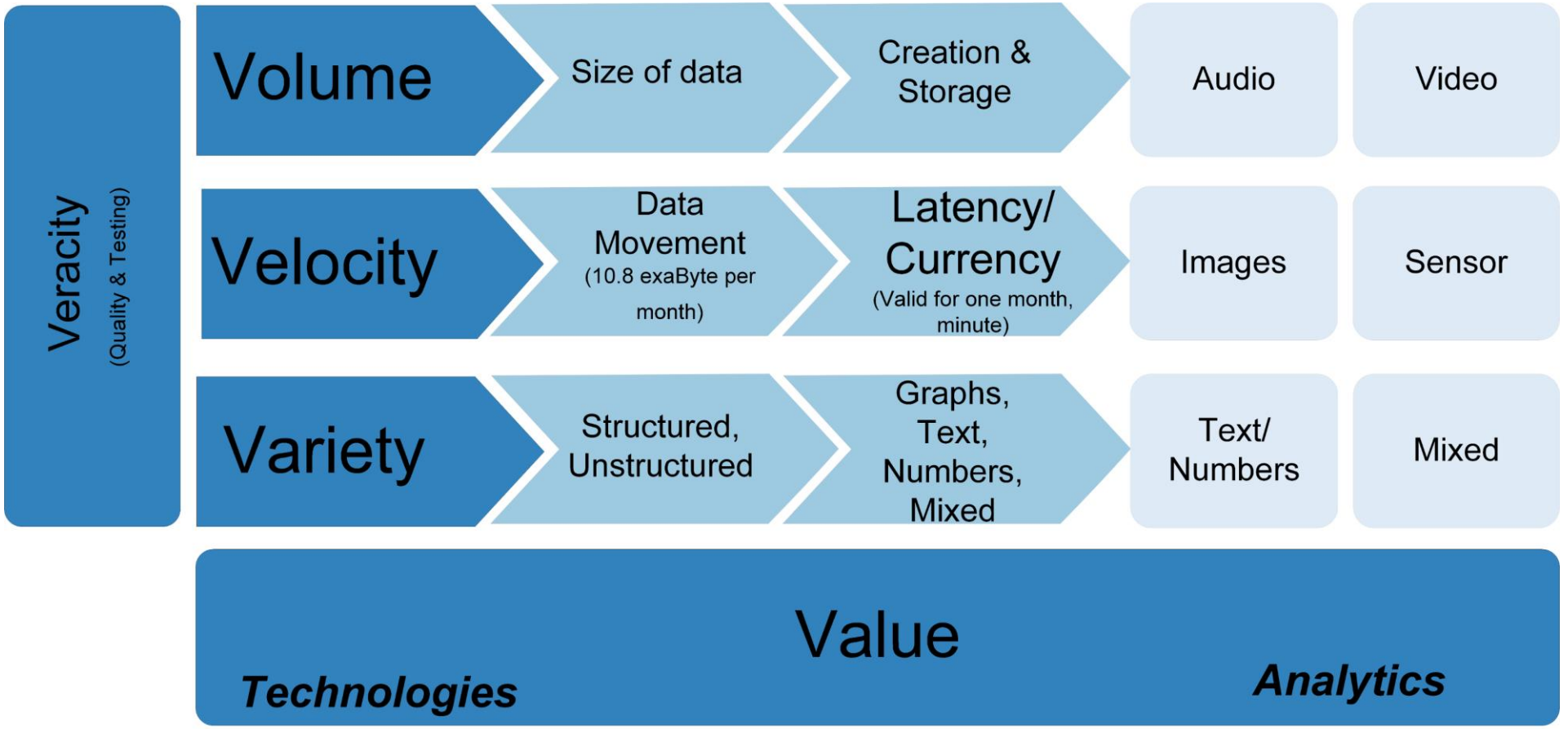
Unlocking the power of big data within the early design phase of the new product development process:

A case study in a Company

Haytham B. Ali

What is (big) data

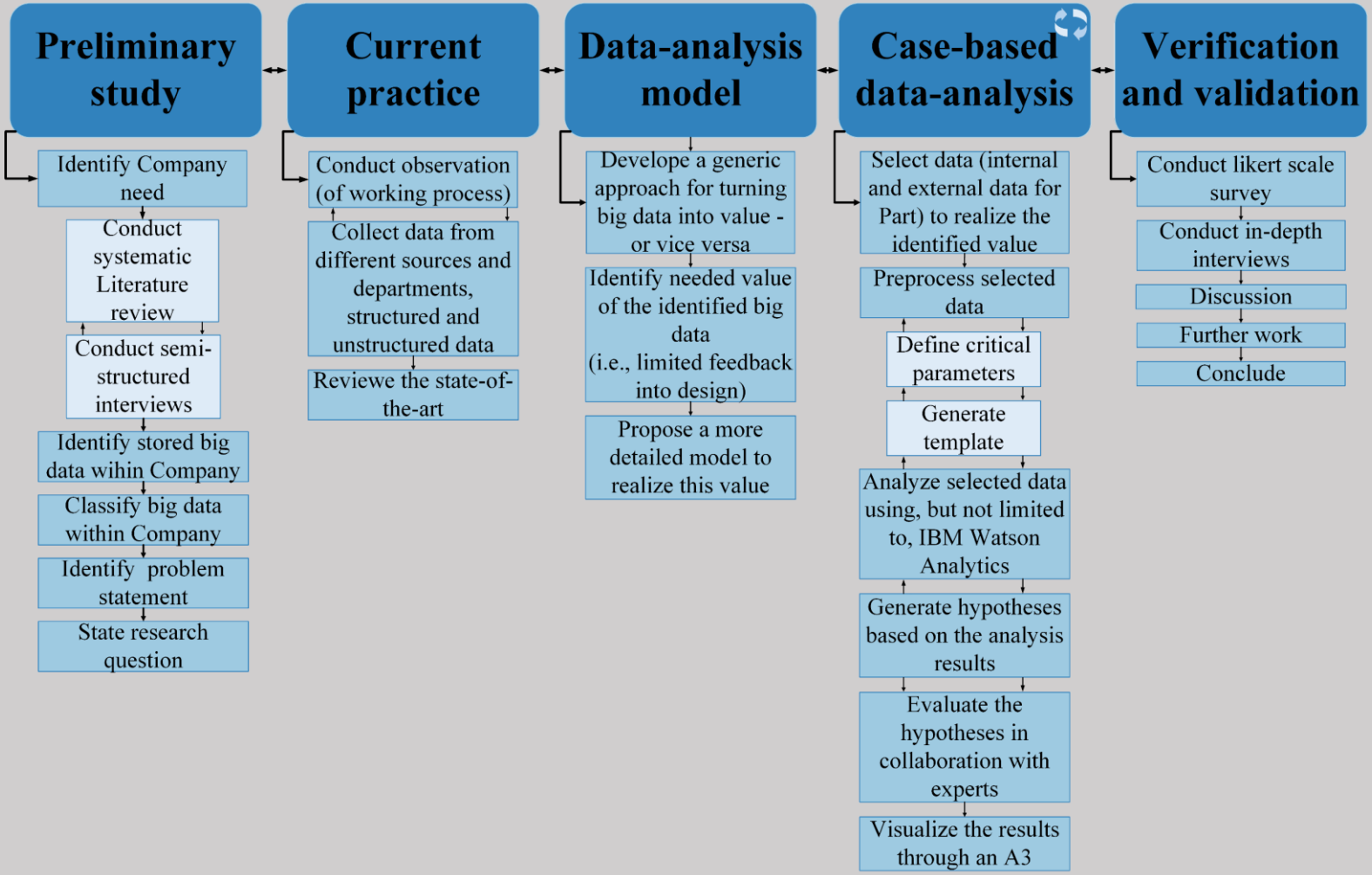
University of South-Eastern Norway



What is (big) data

"*Big data refers to datasets whose size or **complexity** exceed the **capability** of current or conventional methods and systems in Company.*"

Research Methodology



Problem statement (preliminary study)

Which data is identified as available (big) data within Company?

How to classify (big) data within Company?

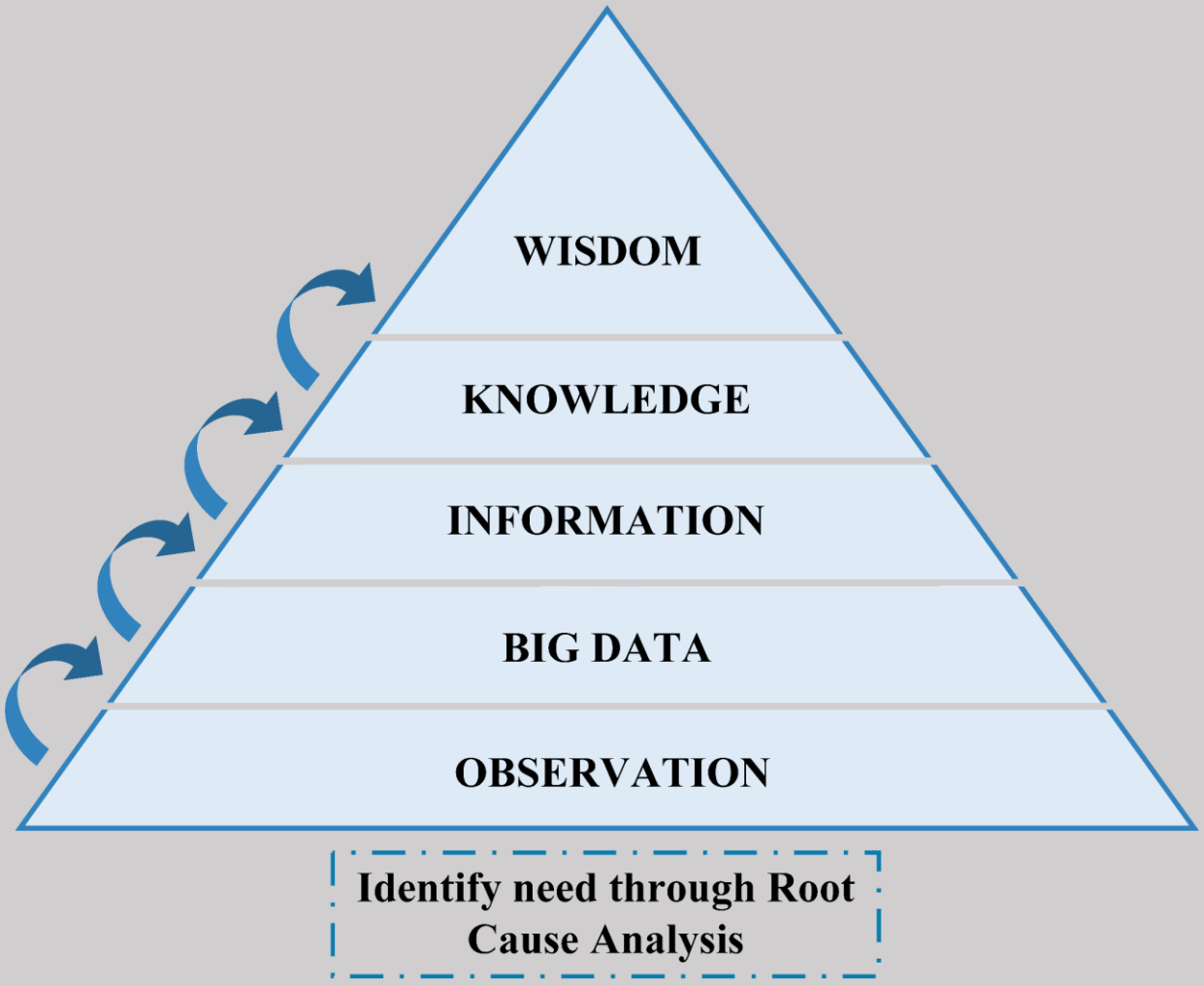
How does the industry utilize big data in the new product development process?

Research Question

How to exploit (big) data to offer more fact-based design decisions within new product development process?

(Big) data, in this context, refers to identified stored data in Company; External (user data), and Internal data.

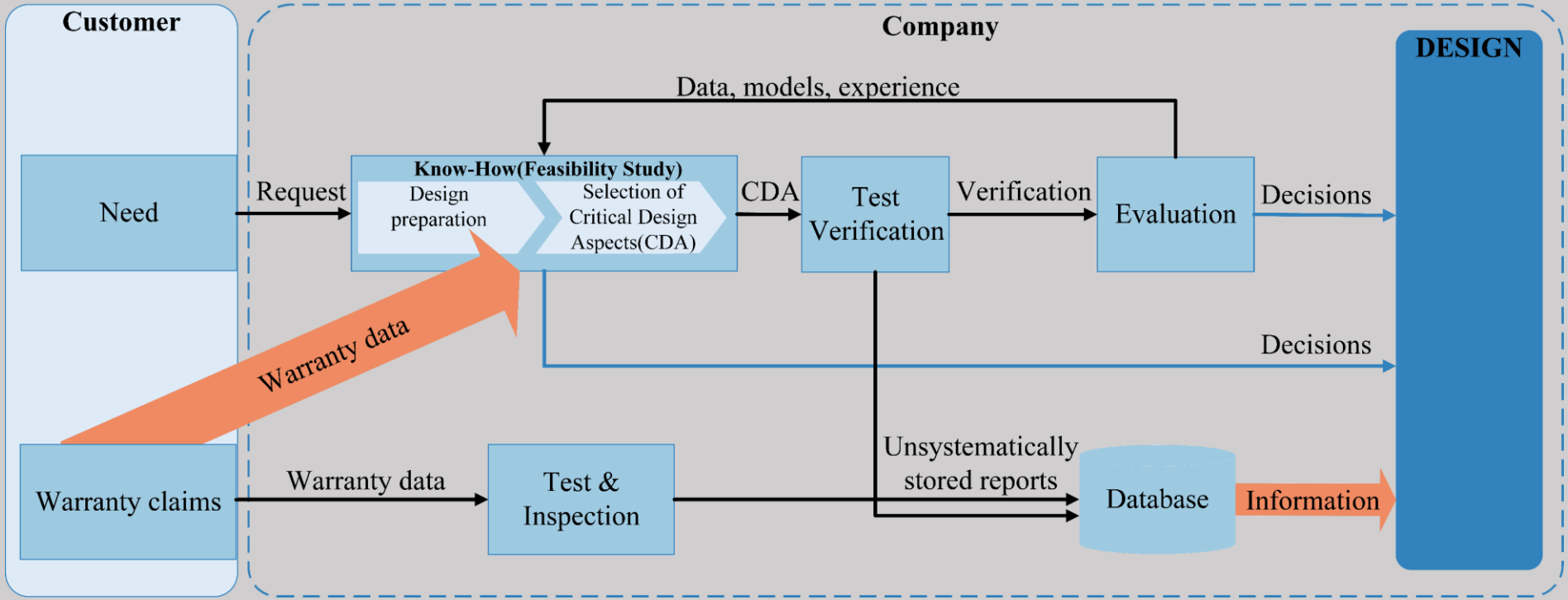
Data, Information, Knowledge, Wisdom



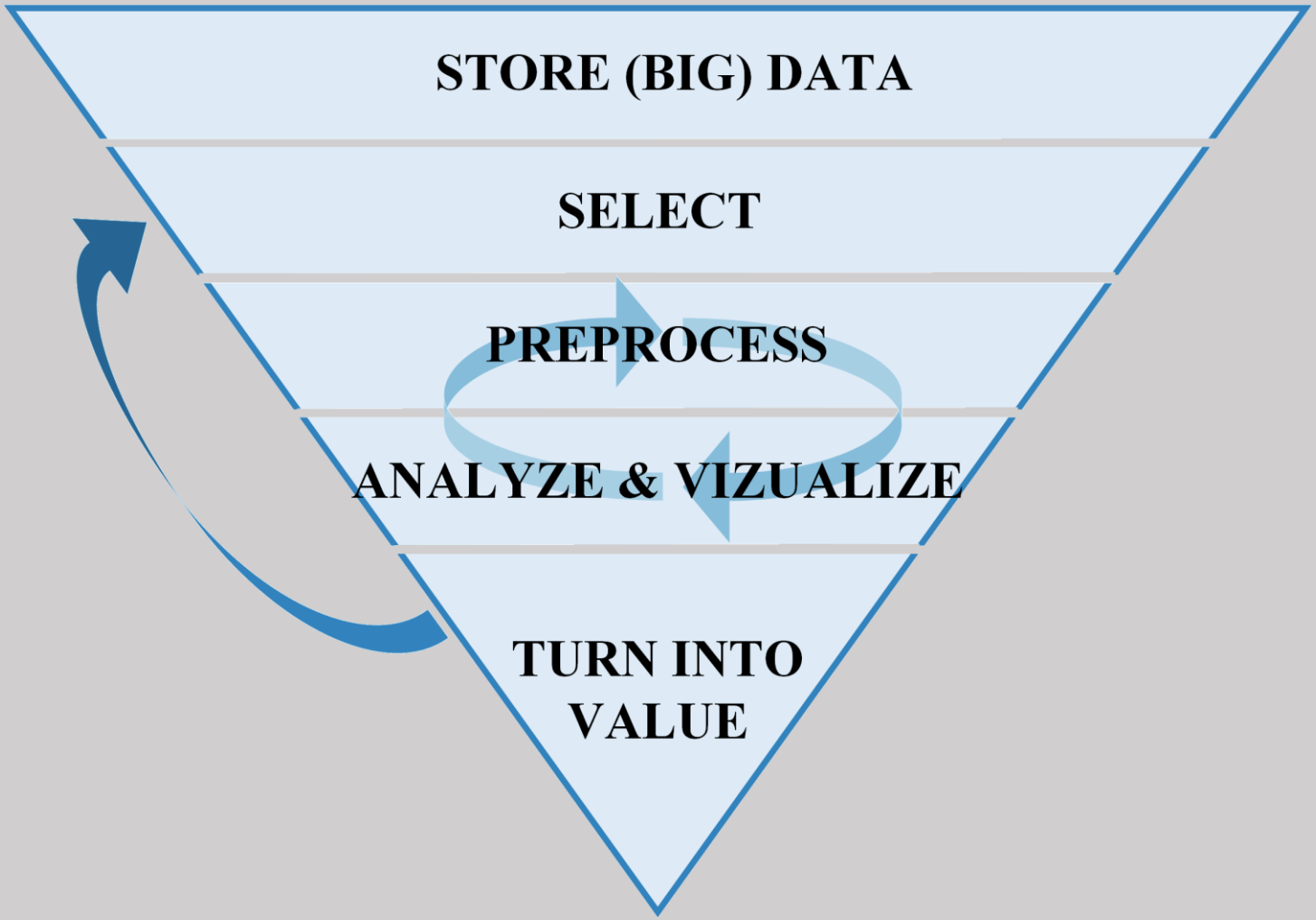
Observation

- Lack of verified data
- Shorter development cycles
- An identified need

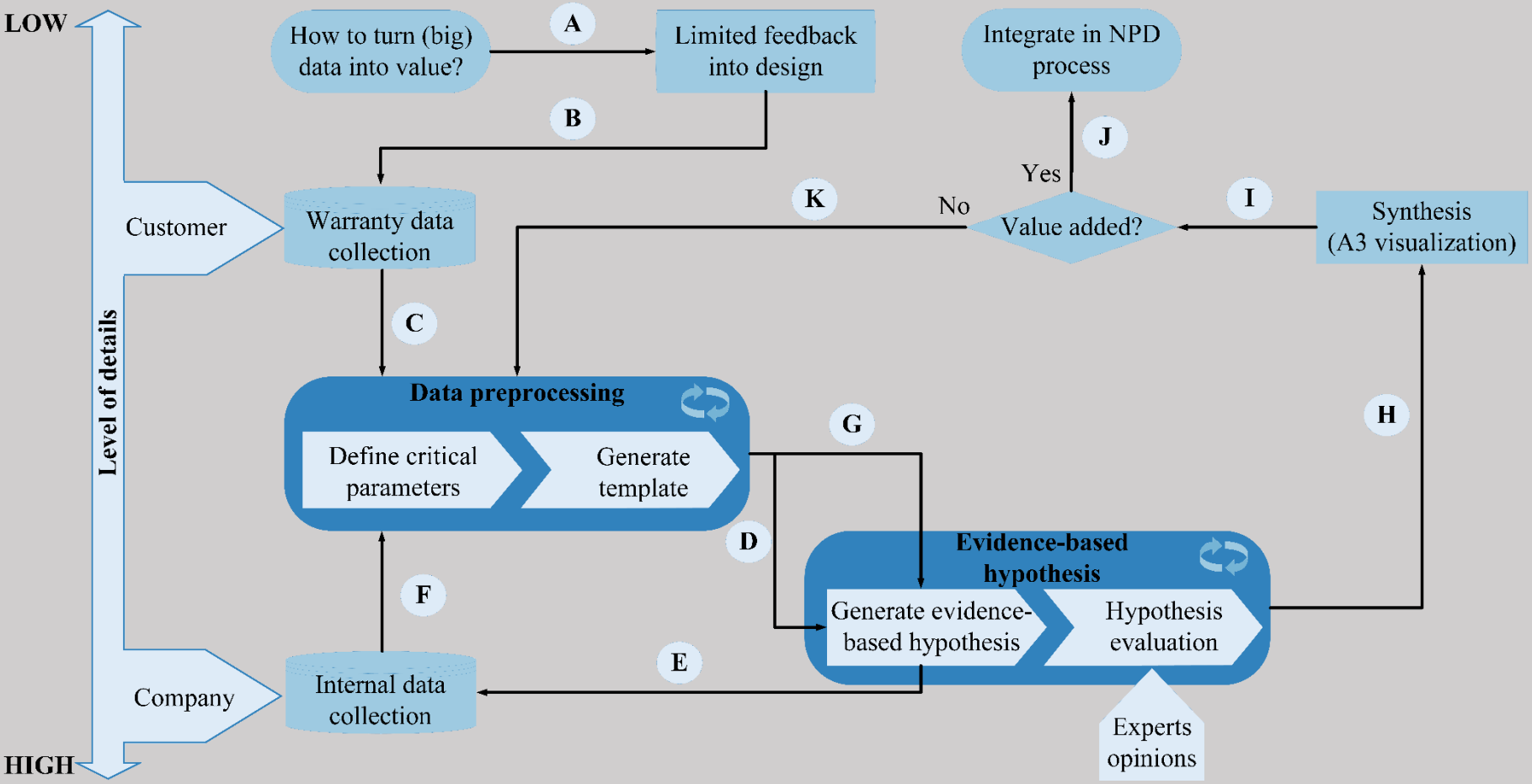
Current Practice in Company



Generic Approach



More detailed model



Data preprocessing

80% of analysis period

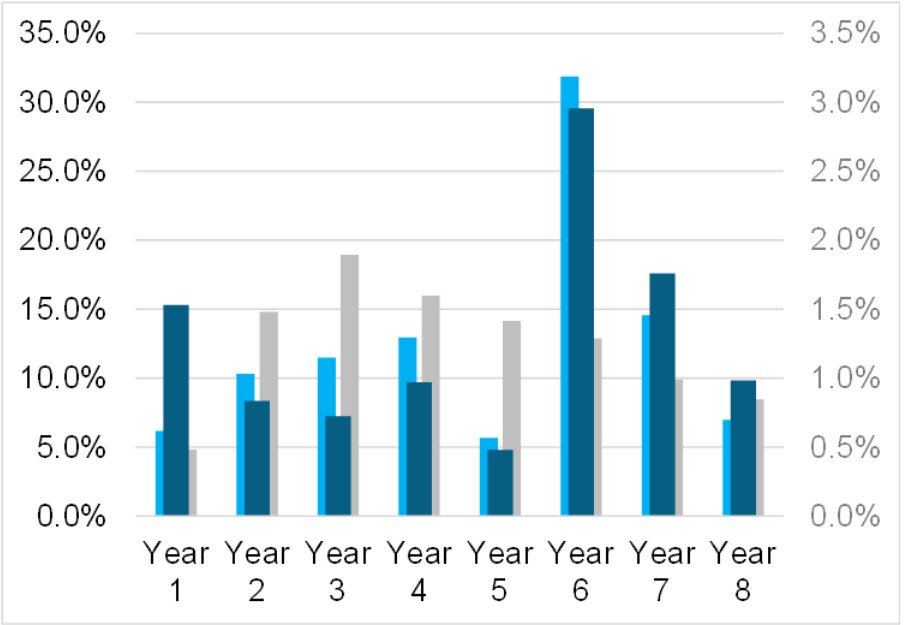
- Dispersed across the company
- Contains different types of document formats
- Poor quality in terms of structure
- Includes insufficient parameters
- Includes different templates
- Data mapping challenge

Tools analyzing data

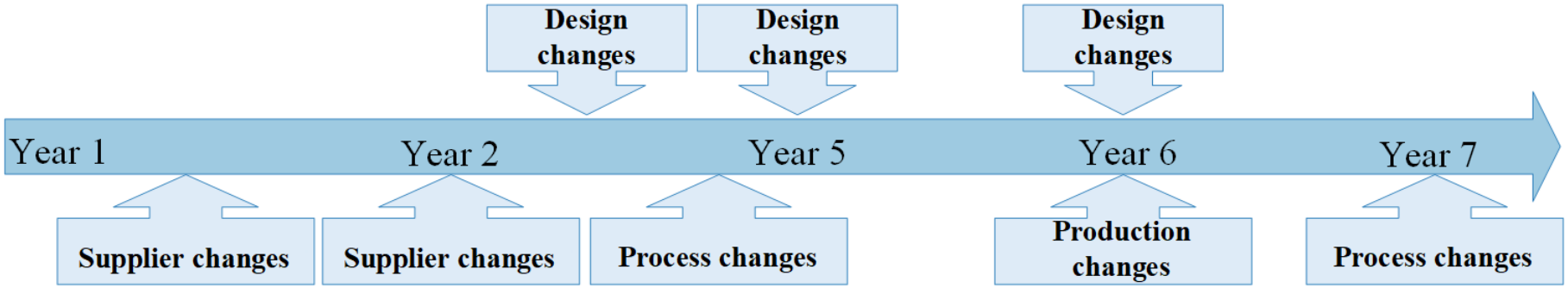
- IBM Watson Analytics (IBMWA)

- Microsoft Excel Analysis ToolPak

Data analysis results

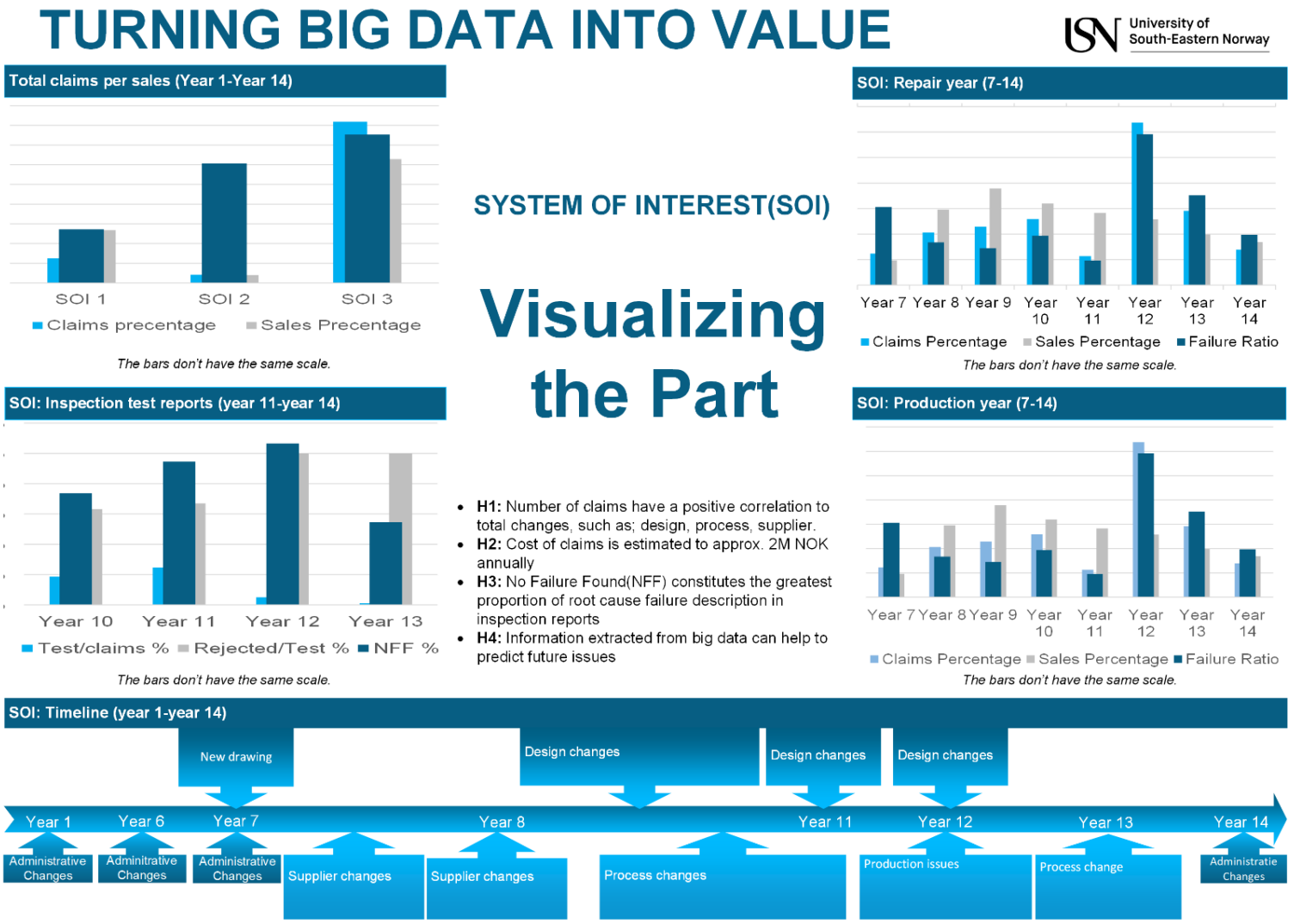


The yearly number of claims in percentage (light blue), failure ratio (dark blue), and sales in percentage (grey) for the Part.

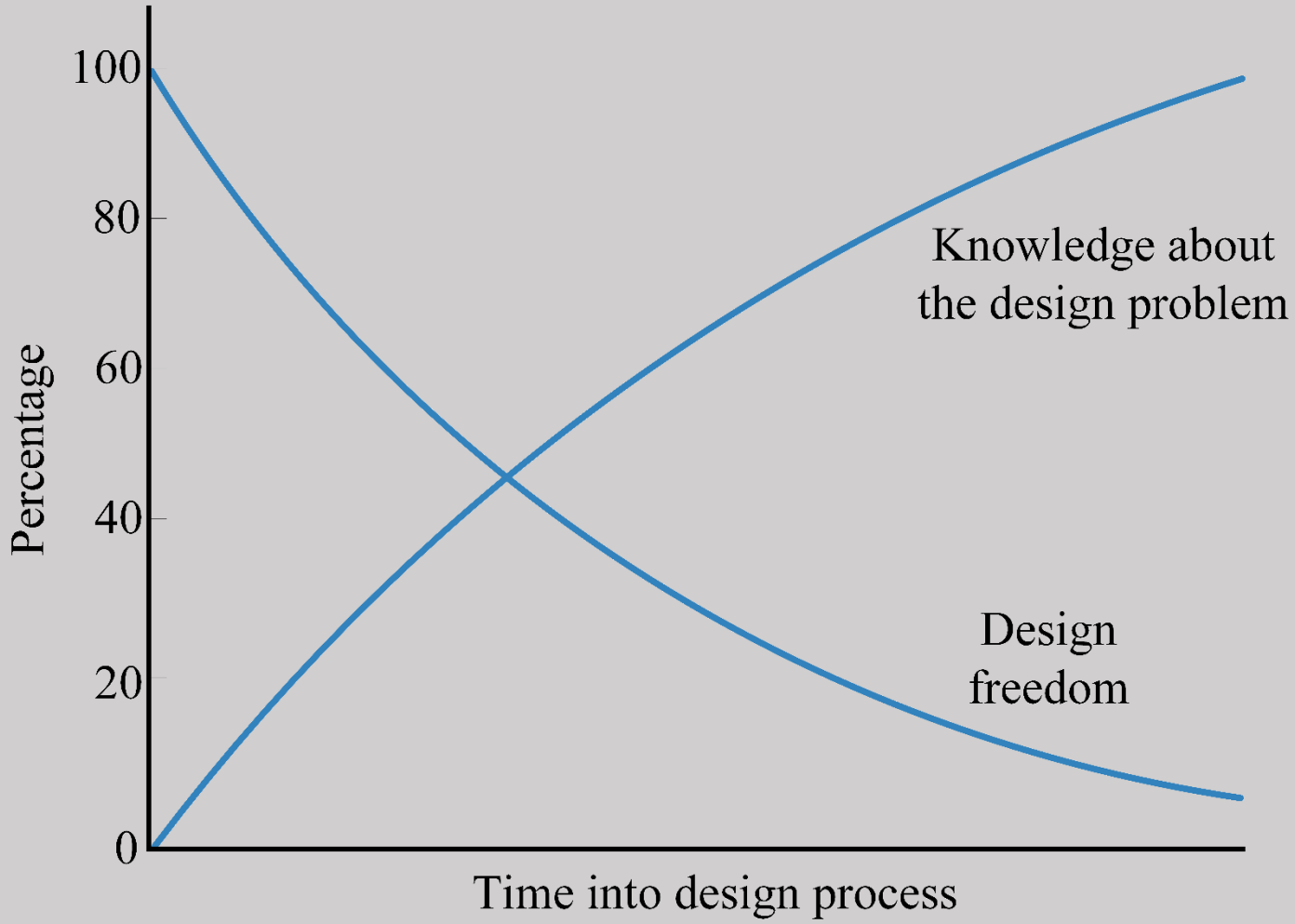


A timeline that evolved from ECN data for Part the last decade.

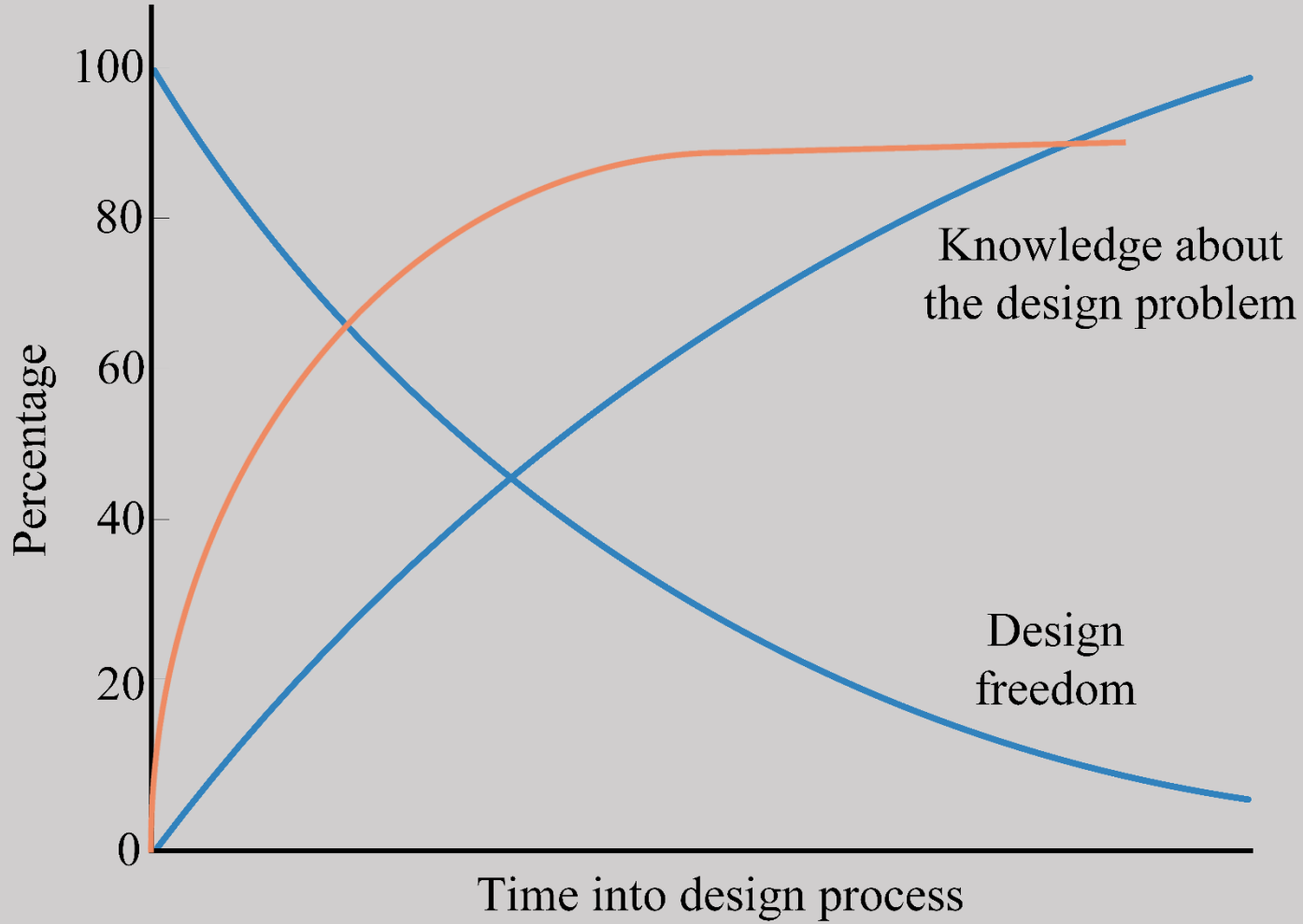
A3 overview


TURNING BIG DATA INTO VALUE
University of South-Eastern Norway
Total claims per sales (Year 1-Year 14)
SOI 1
SOI 2
SOI 3
Claims precentage
Sales Precentage
The bars don't have the same scale.
SYSTEM OF INTEREST(SOI)
Visualizing the Part
SOI: Repair year (7-14)
Year 7 Year 8 Year 9 Year 10 Year 11 Year 12 Year 13 Year 14
Claims Percentage
Sales Percentage
Failure Ratio
The bars don't have the same scale.
SOI: Inspection test reports (year 11-year 14)
Year 10
Year 11
Year 12
Year 13
Test/claims %
Rejected/Test %
NFF %
The bars don't have the same scale.
H1: Number of claims have a positive correlation to total changes, such as; design, process, supplier.
H2: Cost of claims is estimated to approx. 2M NOK annually
H3: No Failure Found(NFF) constitutes the greatest proportion of root cause failure description in inspection reports
H4: Information extracted from big data can help to predict future issues
SOI: Production year (7-14)
Year 7 Year 8 Year 9 Year 10 Year 11 Year 12 Year 13 Year 14
Claims Percentage
Sales Percentage
Failure Ratio
The bars don't have the same scale.
SOI: Timeline (year 1-year 14)
New drawing
Design changes
Design changes
Design changes
Year 1
Year 6
Year 7
Year 8
Year 11
Year 12
Year 13
Year 14
Administrative Changes
Administrative Changes
Administrative Changes
Supplier changes
Supplier changes
Process changes
Production issues
Process change
Administratie Changes

“As is” Design process paradox, Ullman (2010)



“To-Be” state of knowledge increase



Our contribution: Through our approach we can enhance early-phase decision-making by closing the loop with knowledge base.

Cost perspective of implementing our approach.

- The cost of customer feedback is ≈ 20 MNOK
- Decisions made through design phase determines 80% of a product’s cost

Further work

- Include other samples and sources of (big) data
- Enhance collaboration by sharing data across the company
- Implementing the value of analyzed data within the early phase in NPD
- Generalization of our findings

Q & A