READI ⪫

Shaping The Future Of Digital Requirements And Information Flow In The Oil And Gas Value Chain

*THTH Spring Seminar
18, May 20202*

READI –
REquirement Asset Digital lifecycle Information

Why do the READI project (1)

World Economic Forum (2017): Digitalization of oil and gas industry have a value of 2,5 TUSD. More efficient transfer of data in our value and supply chain is an important part of this.

Data sharing report (2020): More efficient transfer of data in our supply chain have a huge value creation potential, important to standardize. READI is highlighted in the report.

NIST report (2002): More efficient transfer of data in our supply and value chain have a huge value creation potential.
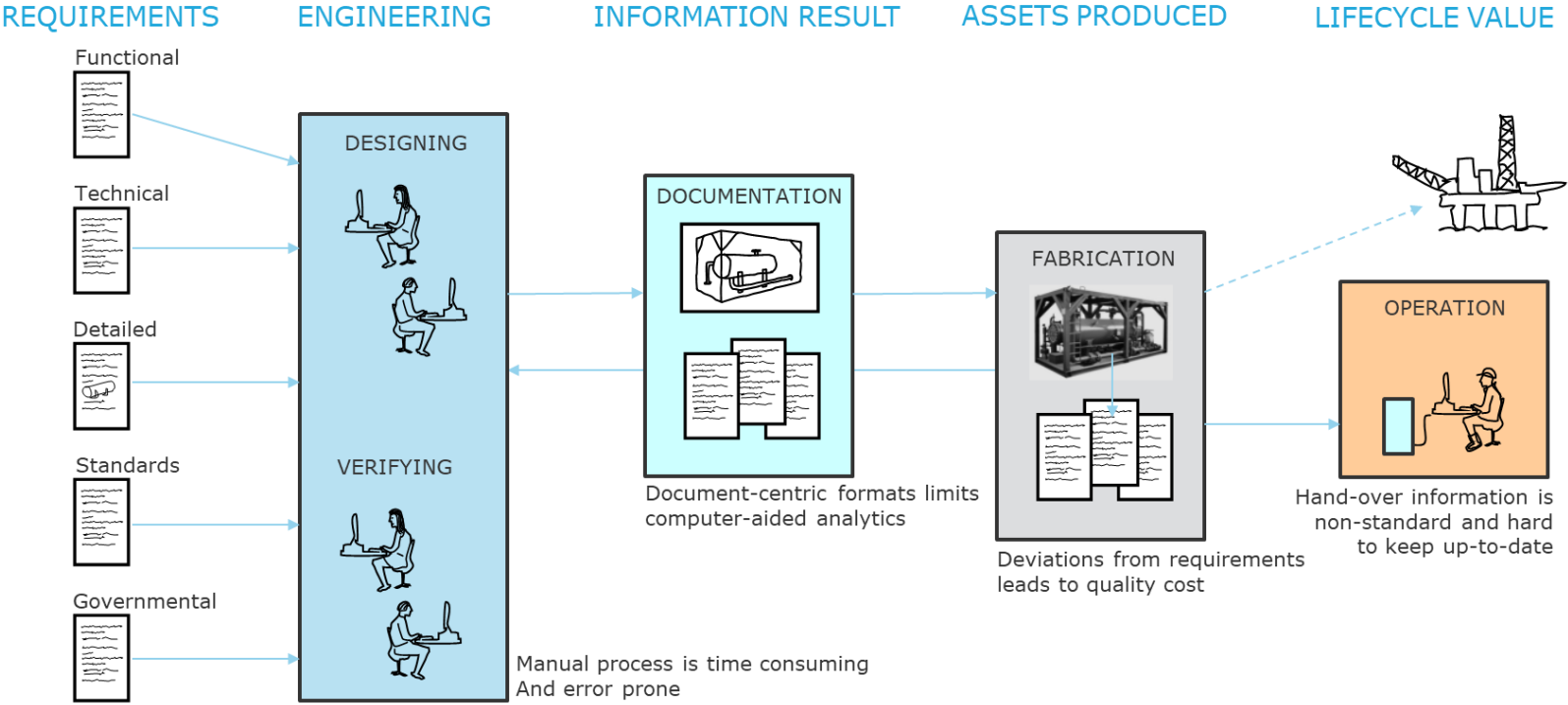
Strategy for the Oil and Gas industry – realization of Konkraft recommendations

Digital **transformation of business processes** for field development and operation

We need a **common digital language and framework** enabling efficient flow of information between disciplines and work processes
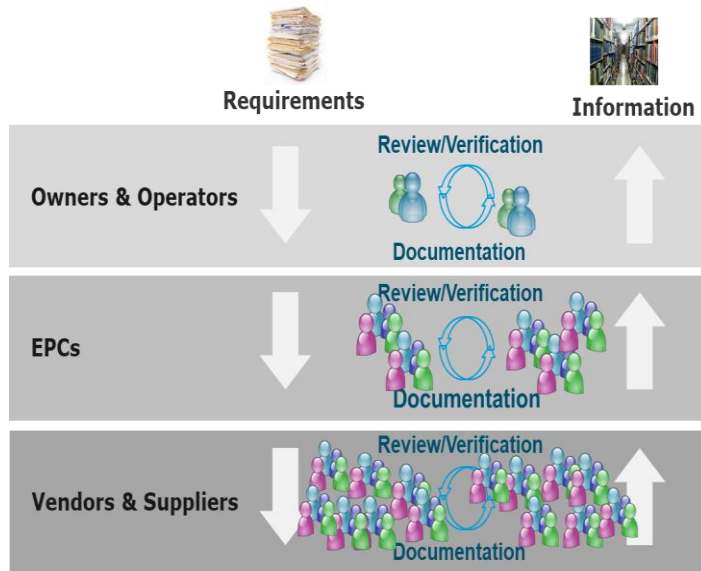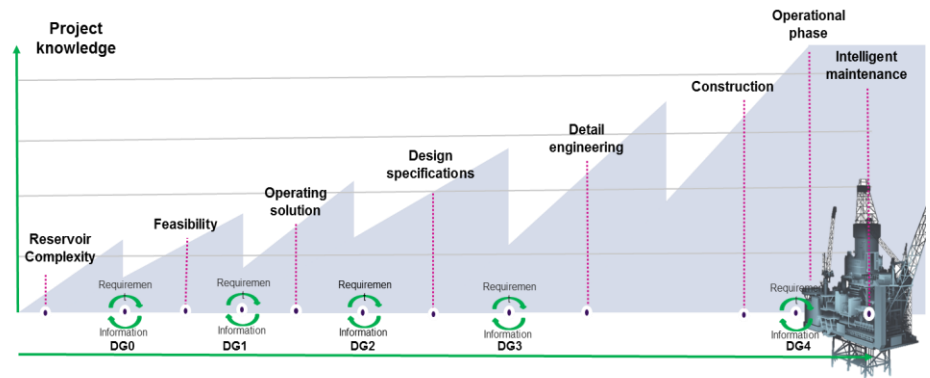
In a world where READI never was…

REQUIREMENTS ENGINEERING INFORMATION RESULT ASSETS PRODUCED LIFECYCLE VALUE

Functional

Technical

Detailed

Standards

Governmental

DESIGNING

VERIFYING

DOCUMENTATION

FABRICATION

OPERATION

Document-centric formats limits computer-aided analytics

Deviations from requirements leads to quality cost

Hand-over information is non-standard and hard to keep up-to-date

Manual process is time consuming And error prone

Human language format is imprecise and inconsistent, allowing for contradictory information, preventing automated verification

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Management of requirements and information is lost along the asset's life cycle

Requirements

Information

Owners & Operators

Review/Verification

Documentation

EPCs

Review/Verification

Documentation

Vendors & Suppliers

Review/Verification

Documentation

Resource intensive review and verification of requirement in the supply chain

Project knowledge

Operational phase

Intelligent maintenance

Construction

Detail engineering

Design specifications

Operating solution

Feasibility

Reservoir Complexity

Requiremen — Information — DG0

Requiremen — Information — DG1

Requiremen — Information — DG2

Requiremen — Information — DG3

Requiremen — Information — DG4

Source: Marianne Kalvenes, Equinor

Information is lost through life cycle due to:
- **Lack of precision**
- **High complexity**
- **Lack of automation**
- **Lack of interoperability**
- **Standardization is time consuming**

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Business cases points to significant benefits with digitalised requirements and documentation in E&P projects.

High level estimate for Norwegian Continental Shelf [1]
– broad implementation:

- Annual spending [2]:   NOK 72 billion
- Annual savings from [3]:   up to 5 %
- *Annual savings from :*   **NOK 4 billion**

Cost savings and enhanced safety due to:

- Precise requirements and digital control of documentation
- Re-use of concepts and products
- More effective and improved quality in engineering and procurement work processes
- Reduction of variants and avoiding duplication

> **AIBEL MMD[3]: 5% cost reduction for bulk material ordered amounts to > NOK 150 mill for a large project**
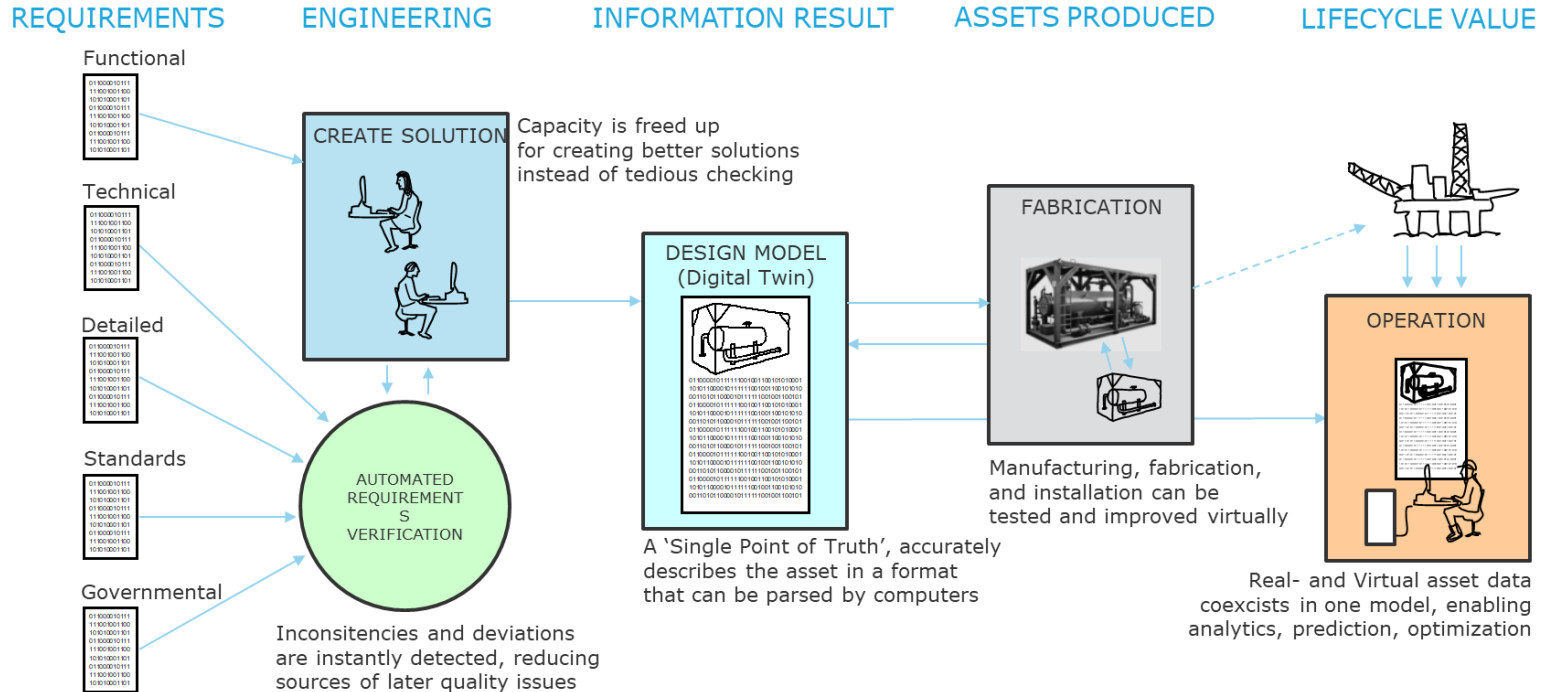
READI

The vision READI is pointing towards

We need a common digital language and framework enabling efficient flow of information between disciplines and work processes

READI value proposition - from paper to machine readable requirements

**READI – governance of digital requirements in the oil and gas industry**

The **open industry platform** READI translates **diverse company practises** into s**hared digital LCI and technical requirements**, and helps the industry to improve safety, cut costs and increase efficiency in **business critical processes** through automation.

Paper based standards

Company specific requirements
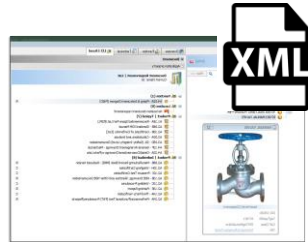
Updated and common requirements in a digital format

READI – Common industry vocabulary and digitalization method for machine readable requirements

Application for business process improvements

READI JIP

Industry applications

READI

Conceptual information model - main building blocks

READI Vision
- Automated digital verification of requirements and design in the oil and gas industry
- Used globally, based on international standards and open source technology
- Standardized breakdown of assets and identification of components for all projects and operation

READI framework

Governance

W3C standards

Digitalization methodology and tools

Information model

Upper ontology
ISO 15926

ISO/IEC 81346

Standard RDLs and vocabularies

Applications and use cases

Norsok Z-Ti harmonization and digitalization
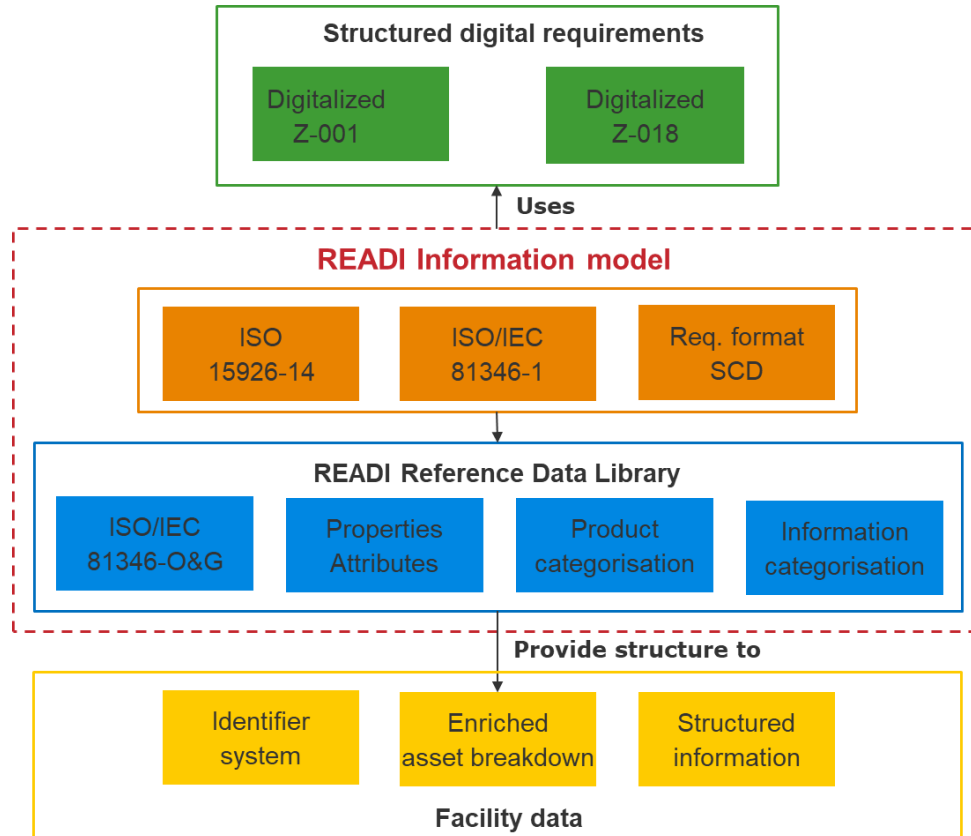
Current scope

Digital design basis

Ongoing dialogue

Piping commodity codes

IOGP JIP 33/36

READI ambition

Other

READI

# READI Information model (draft)

Comments:

- ISO 15926-14 gives upper vocabulary to READI Reference Data Library (RDL)

- ISO/IEC 81346-1 provides concepts for READI RDL

- The SCD format give precise requirements

- ISO/IEC 81346 O&G provides a flexible asset breakdown structures

- READI RDL provides standard vocabularies

- The READI RDL provides structure to organisation of facility data which enable automated data flow and extended automation of data processing

The solution

Why is semantic technology the solution?

We need a common vocabular and unambiguous requirements understood by humans and computers!
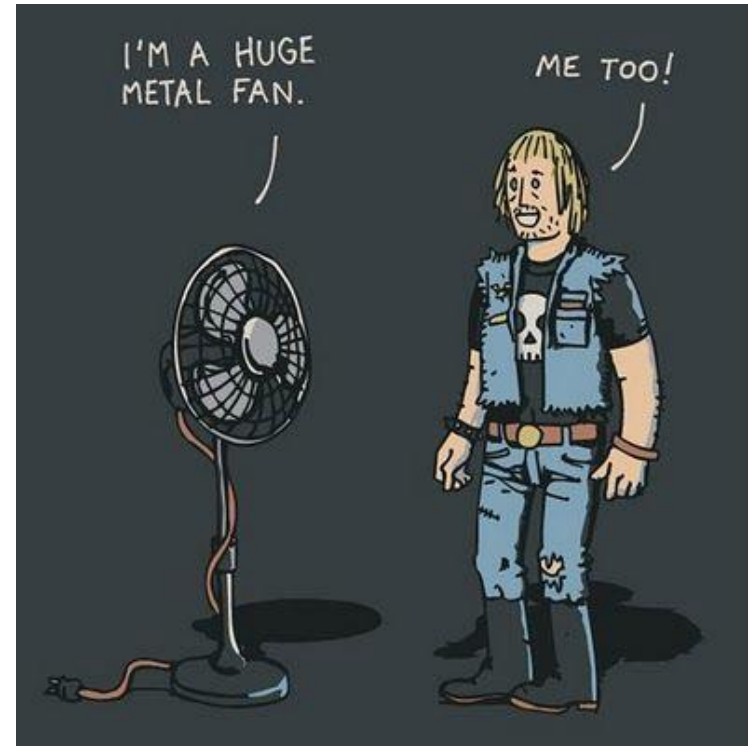
Writing unambiguous requirements: It's all about 3 letters

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SCD – Scope, Condition and Demand

Traditional method - Textual requirement

Equipment with a transport dry weight above 1000 kg shall be weighed by the manufacturer and a weight certificate shall be issued

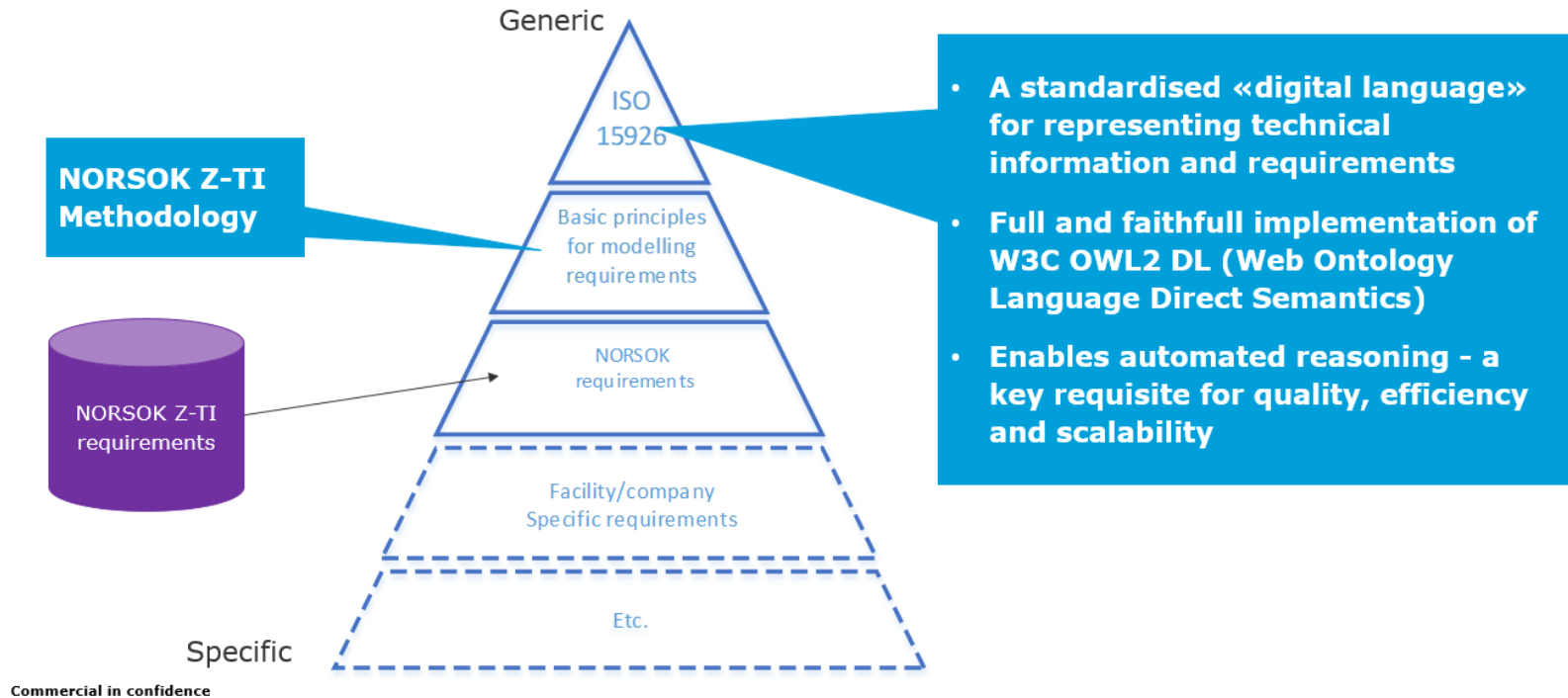**SCD method** - Digital requirement

Requirement 1

Scope

Equipment

Condition

Dry weight > 1000 kg

Demand

Weight certificate

READI information model
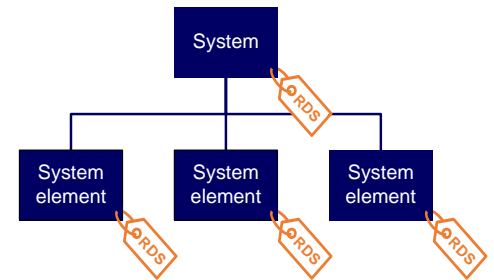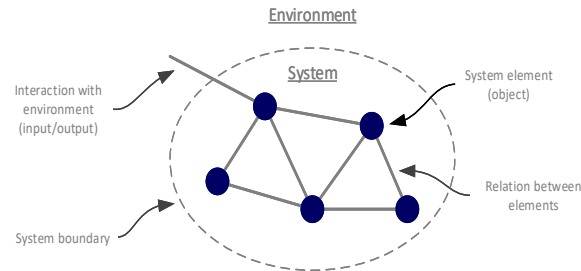

WP4 - ISO Standardisation: ISO 15926 – 14 TR (Technical Report)

Generic

ISO 15926

Basic principles for modelling requirements

NORSOK requirements

Facility/company Specific requirements

Etc.

Specific

NORSOK Z-TI Methodology

NORSOK Z-TI requirements

- A standardised «digital language» for representing technical information and requirements

- Full and faithfull implementation of W3C OWL2 DL (Web Ontology Language Direct Semantics)

- Enables automated reasoning - a key requisite for quality, efficiency and scalability

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We need a richer asset breakdown system:
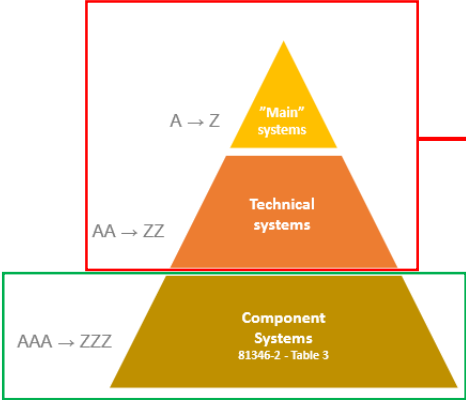# ISO/IEC 81346 Reference Designation System for Oil and Gas

- Existing identification system is not rich enough.

- Existing identification system has a limited form of hierarchy breakdown structure

- Existing identification system does not separate between functions, products, locations, type

- Existing identification system requires a master database from early project phase to avoid duplicates.

- Existing identification system is Norwegian oil and gas industry based with company and project specific adjustment.
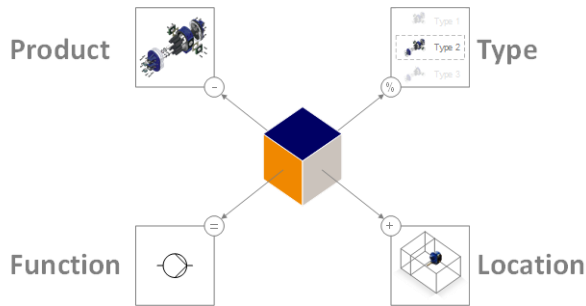
IEC/ISO 81346 RDS for O&G Scope and deliverables

PCA linked data

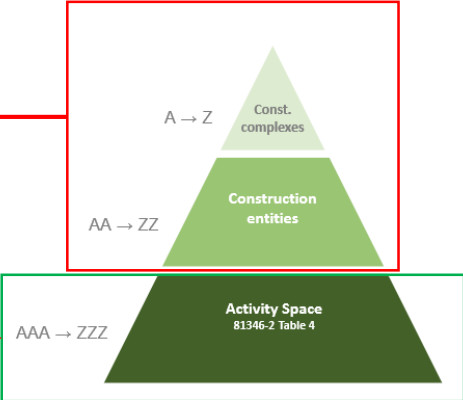○ The largest and most used linked data within our industry is the Posc Caesar Association (PCA) dictionary

○ One unique term and definition for part list: http://data.posccaesar.org/rdl/RDS16236529

○ Term: Part list

○ Definition: A document listing all components or parts the described artefact or item consist of

○ One stable, unique and trustworthy source for information

Internet features for common digital language

1. In the "old" days we had authoritative sources for naming from i.e. Oxford Dictionary.

2. Programmer don`t use dictionaries, this is one of the major problems with software – the all use different terms and definitions. Linked data solve this issue

3. Internet for terms and definitions is also named linked data

4. The largest and most used linked data within our industry is the Posc Caesar Association (PCA) dictionary

The READI JIP is executed in phases

June 2018   October 2020   2021

Initiation | Phase 1 | Phase 2 | Phase 3
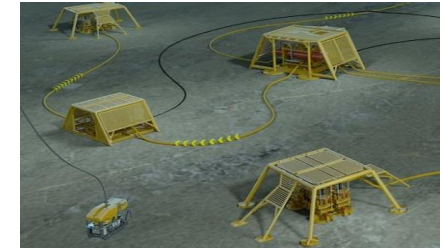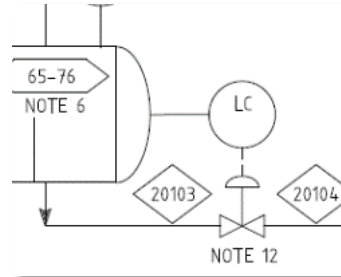
Phase 1:
Building the platform for digitalisation at a larger scale – Proof of Concept based on concrete pilots; valves (general) and subsea system

Phase 2:
Common DFO* requirements
Complete methodology and platform for digitalisation of requirements
International collaboration

Documents For Operation

Phase 3:
Digitalisation of DFO and Supplier documentation requirements

Extensive use case for practical application of shared digital requirements

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Some achievements Phase 1

Captured and structured more than 3100 documentation requirements for subsea and valves according to READI methodology.

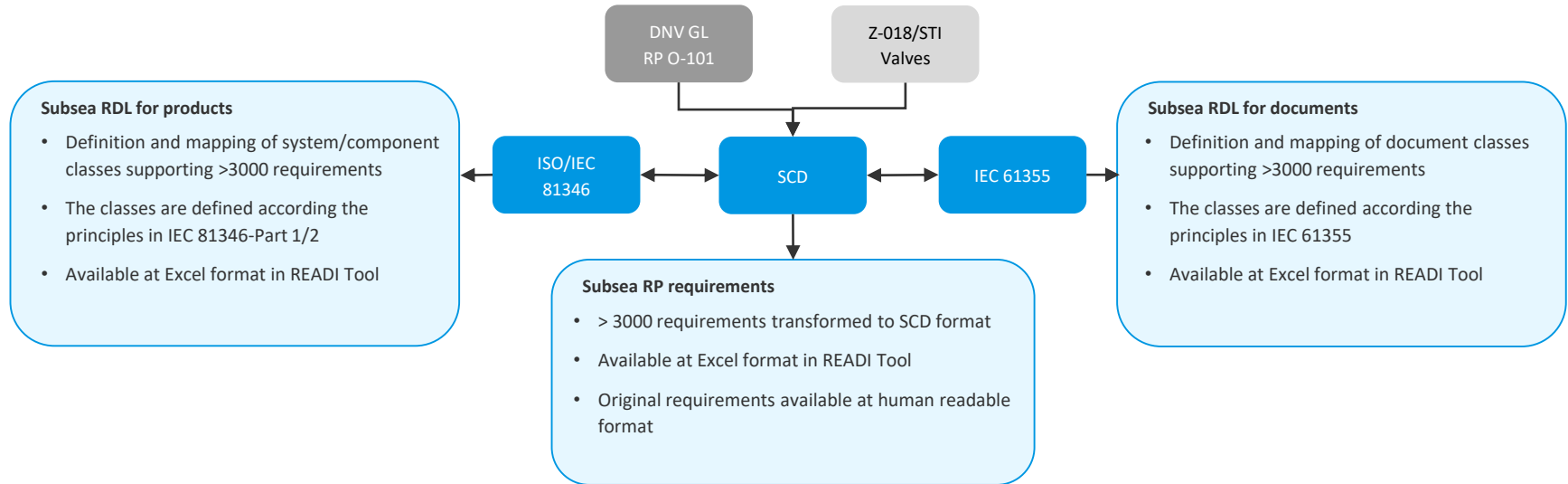Demonstrated that a >50% reduction in number of documentation requirements in DNV GL RP-O101 is achievable by application of the READI methodology .

Established core methodology and working tool enabling creation and automatic processing of digital requirements..

Demonstrated automatic consistency checks of requirements by use of the READI methodology and tools. The tool also recommends how to resolve inconsistencies.

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Subsea use case: Digitalisation of DNV GL RP O-101 and STI (valves)

DNV GL RP O-101

Z-018/STI Valves

Subsea RDL for products

- Definition and mapping of system/component classes supporting >3000 requirements
- The classes are defined according the principles in IEC 81346-Part 1/2
- Available at Excel format in READI Tool

ISO/IEC 81346

SCD

IEC 61355

Subsea RDL for documents

- Definition and mapping of document classes supporting >3000 requirements
- The classes are defined according the principles in IEC 61355
- Available at Excel format in READI Tool

Subsea RP requirements

- > 3000 requirements transformed to SCD format
- Available at Excel format in READI Tool
- Original requirements available at human readable format

- Transformation of RP O-101 to digital format completed, including of building the ontologies (triplets) – *only quality check remains*
- Decided to use RP O-101 as pilot case for demonstration of "proof of concept"
- The decision to use IEC 81346 as reference standard for system/component classification delayed the process, but important in order to meet overall ambitions related to automation and improved interoperability between current management/enterprise systems used by the industry.

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Development of READI TIRC for hosting of digital requirements
Live demo every 2nd week

The purpose is to show status of the ongoing work to develop the READI TIRC application
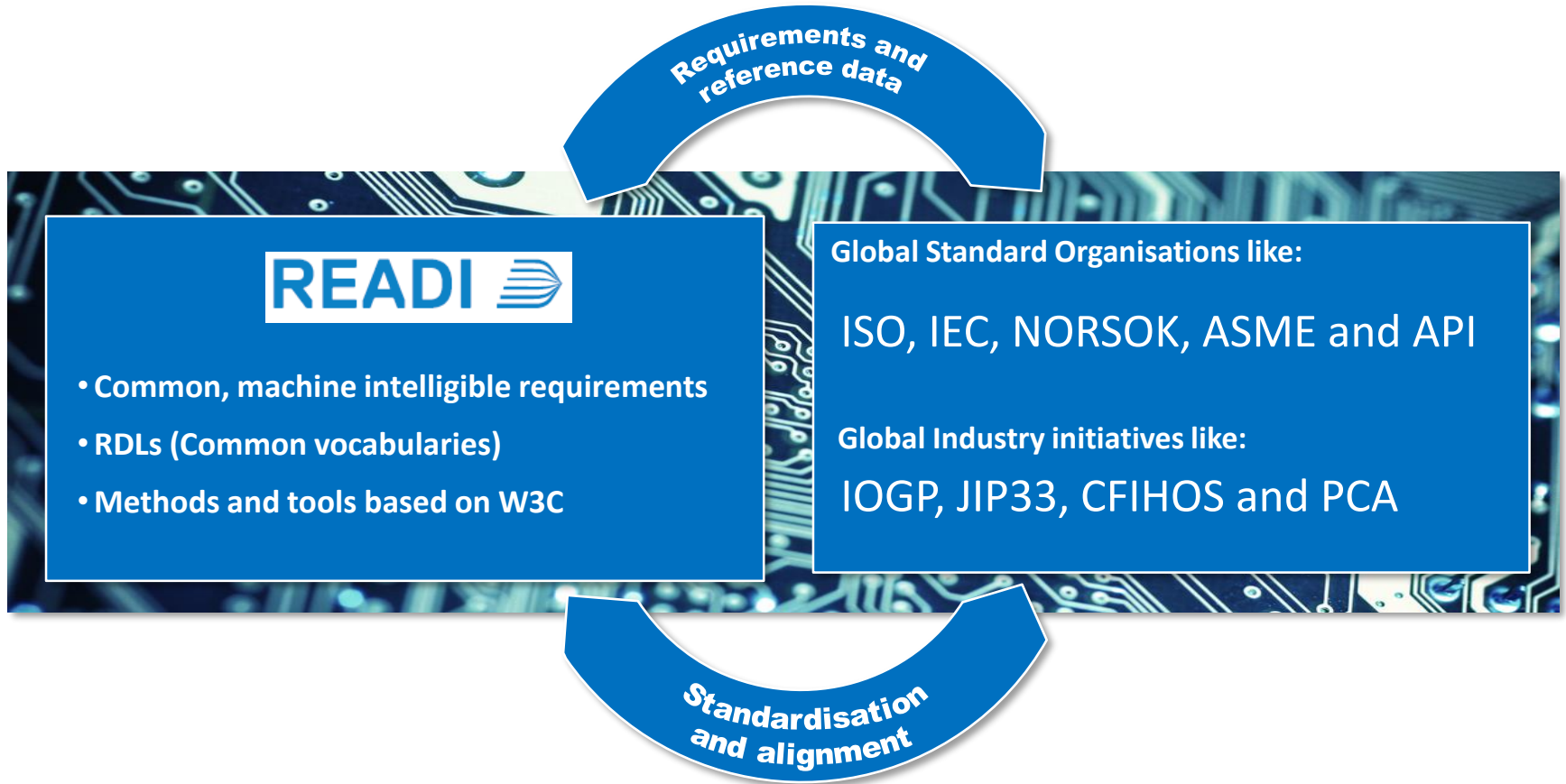
You are all welcome to join these demonstrations

Current Participants

Category	Company
Operators	Equinor
	ConocoPhillips
	Aker BP
	Lundin
	Shell
	Vår Energi (Eni)
EPC Contractors	TechnipFMC
	Aibel
	Aker Solution

Category	Company
Equipment and system vendors	ABB
	Computas
	Proenco
Authorities	Petroleum Safety Authority
	Ministry of Petr. and Energy
Others	Standard Norge
	DNV GL
	Sector Board Petroleum
Observers	NOROG
	POSC Caesar Association
	Norsk Industri

READI has global ambitions – bringing the digital platform to the O&G community

Requirements and reference data

READI

- **Common, machine intelligible requirements**
- **RDLs (Common vocabularies)**
- **Methods and tools based on W3C**

Global Standard Organisations like:

ISO, IEC, NORSOK, ASME and API

Global Industry initiatives like:

IOGP, JIP33, CFIHOS and PCA

Standardisation and alignment

READI

Bringing the oil and gas industry together

Share practises and requirements for improved cost efficiency and safety

Reducing complexity and risk for errors in work processes and information exchange

Enabling the automation of critical business processes and design

READI contact information

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https://readi-jip.org/

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