

Information management with ISO 15926

Applied on the 2e Coentunnel project

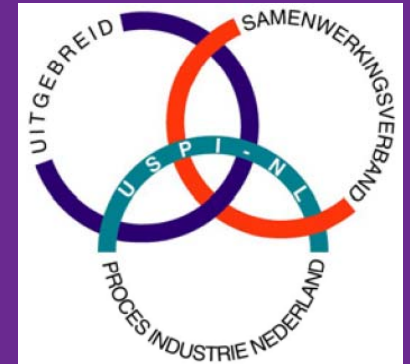


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USPI

EUROMIND:

*Creating an innovative **European Open Maritime Industry** through facilitating the integration of standards into new business practices and services.*

Agenda

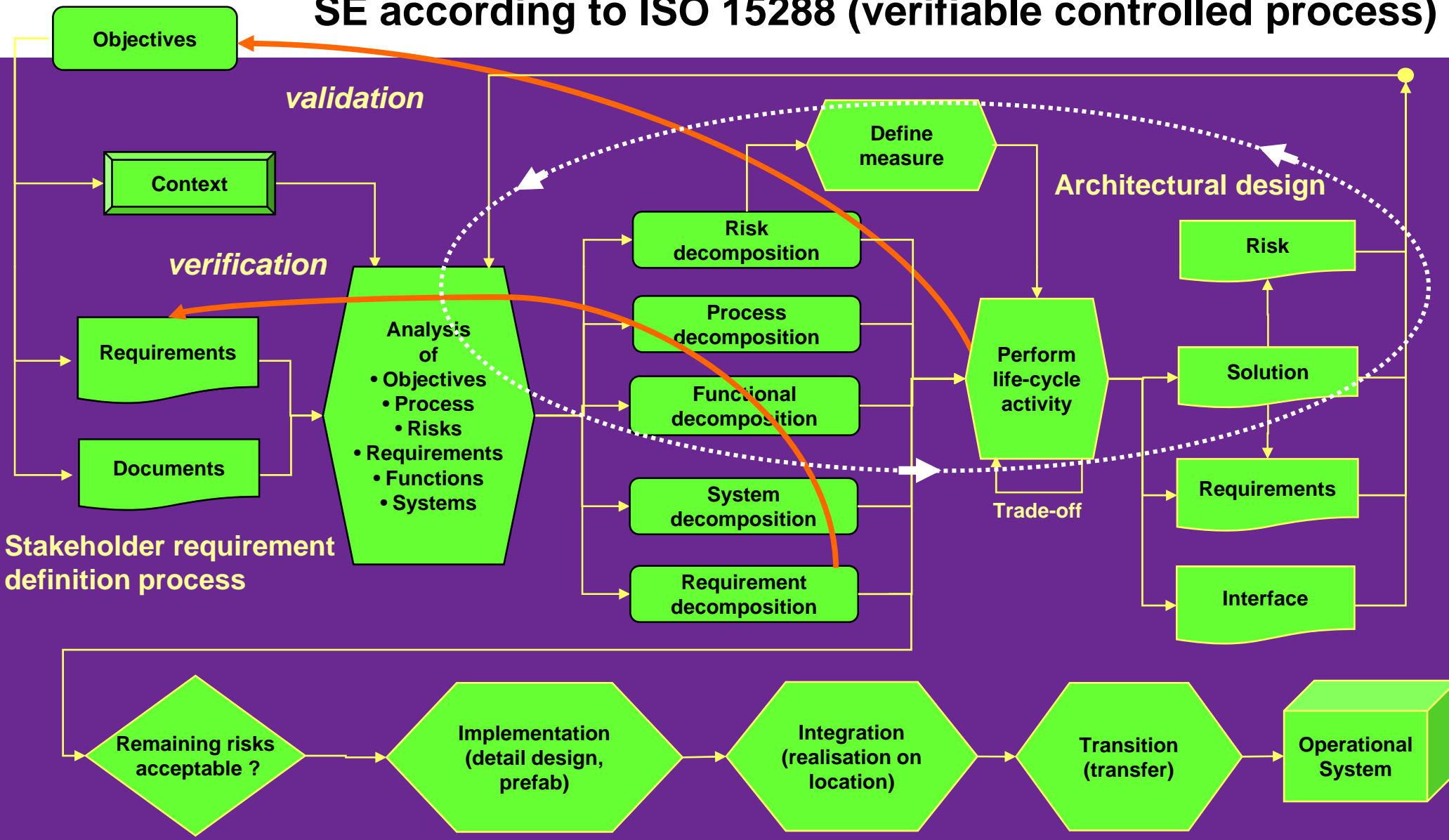
- **Business case**
- **Information management in the context of Systems Engineering**
- **Data Integration standard ISO 15926**
- **The use of the Generic Engineering Language (Gellish) in addition to ISO 15926**
- **Example: implementation requirement management within the business case**

Business case: characteristics

Contract	: Design, Built, Finance and Maintain
Term	: Construction + 25 years maintenance
Start	: 2007
Completion	: end of 2012
Cost	: 500 – 600 million euro (NPV)
Financing	: by consortium
Payment	: Availability Payment per period <ul style="list-style-type: none">• Pay for availability, not asphalt or concrete• Penalties on Lane Closures and process failures
Required methodology	: ISO 15288 Systems Engineering

Client focuses on auditing the Systems Engineering process of the consortium

SE according to ISO 15288 (verifiable controlled process)



Systems Engineering process issues

- **Which requirements have lead to a certain solution and what is there source ?**
- **If this requirement were to change, what should be revised?**
- **Is everything documented and are all documents traceable?**
- **Are all project activities defined, related and assigned including interfaces?**
- **Are we compliant with all requirements?**
- **Does our product contribute effectively to the objectives of our client ?**

Information exchange issues

- **There are approximately 5000 natural languages used in this world**
- **Each discipline has its own jargon**
- **Information is stored in a proprietary format**
- **Systems (and people) work with 'implicit' information**
- **Present standards, such as for e-business, are too limited in scope**
- **Etc....**

Systems Engineering (SE) complexity

From an information management perspective, applying SE is often seen as a project risk because of its reputation to be complex

Information management in the context of SE requires new steps: ISO 15926 is a new step in defining, store and retrieve information in an explicit, unambiguous, traceable way

ISO 15288



ISO 15926

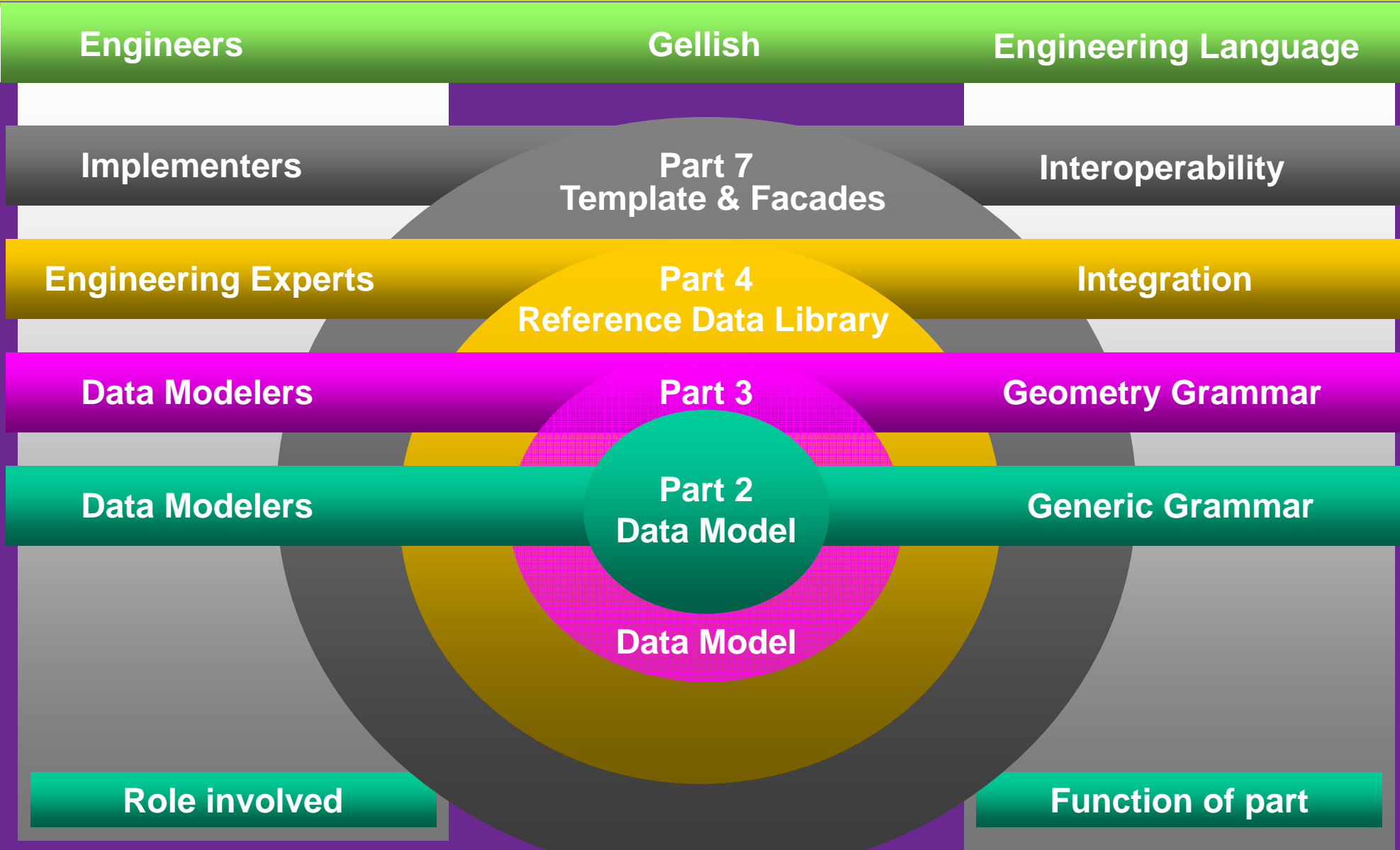
What is ISO 15926?

A standard for explicit information integration and interoperability (data exchange)

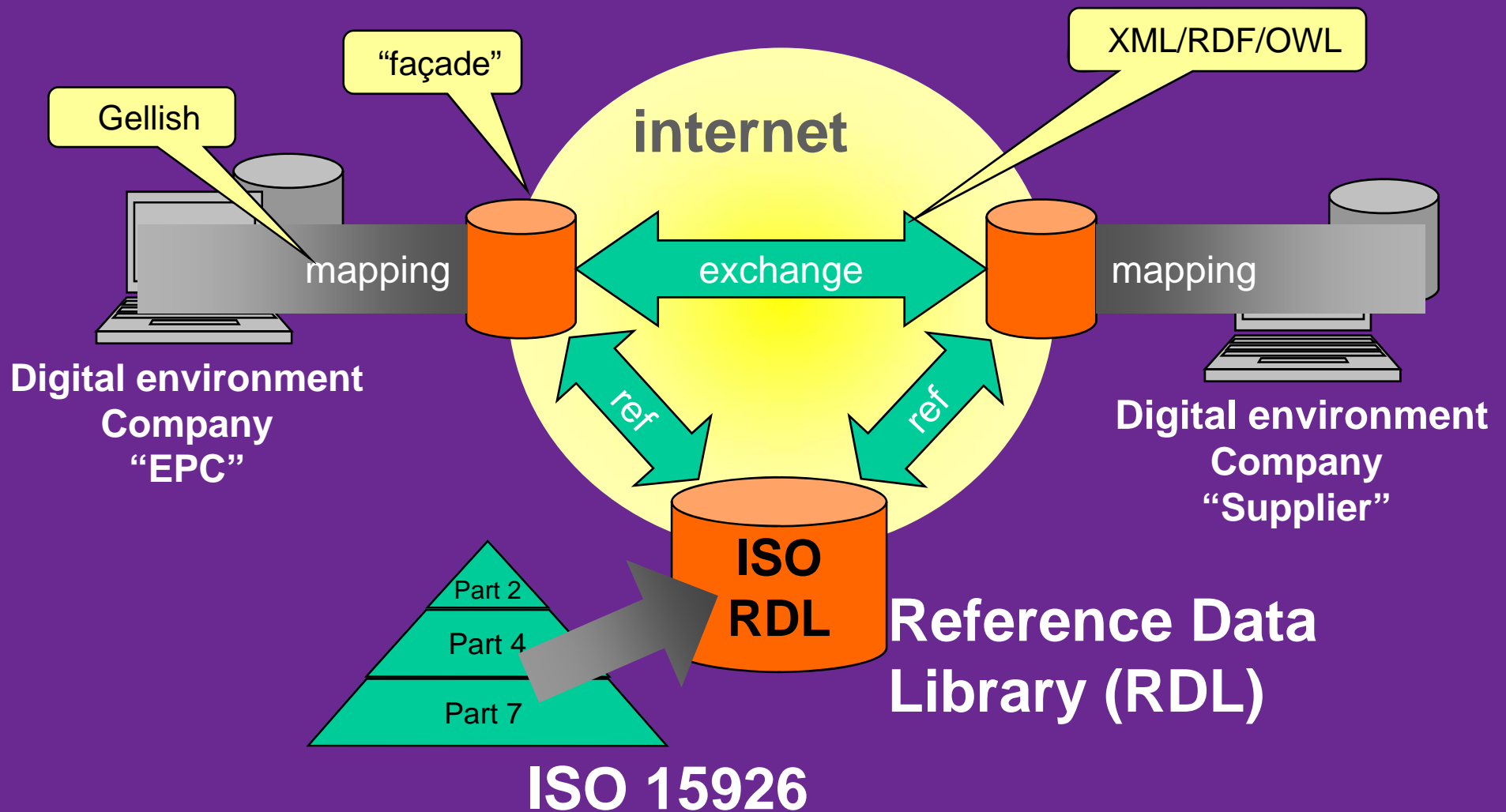
Standardizes:

- Terminology
 - Information organization
 - How systems connect and exchange information
- } **Explicit information**

**Implemented using standards from the
World Wide Web Consortium (W3C)**



ISO 15926: How it Works



ISO 15926 developing Projects (oil & gas and industry)

POSC Caesar (DNV, Norway)

- Intelligent Data Sheet (IDS) Project, based on ISO 15926

FIATECH (USA: plant owners, EPC contractors, software vendors)

- Accelerating the Deployment of ISO 15926 Project (ADI)
 - *Subproject: standardizing the use of Gellish/RDF as extension on 15926 (by USPI Netherlands; use case: Systems Engineering 2e Coentunnel)*

Strategy:

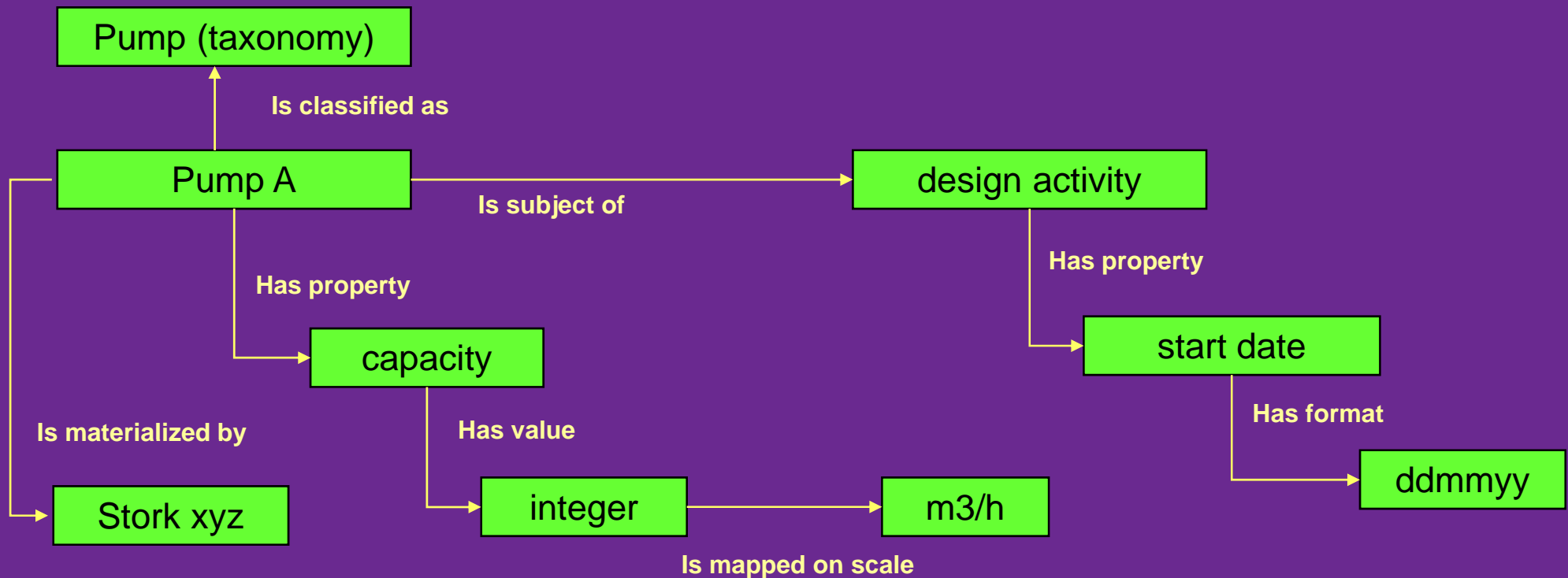
- Integration of IDS, ADI and Gellish projects
- Software vendors Bentley, Intergraph, Aveva and others will equip their software products with an ISO 15926 interface (for mapping to a façade).
- Façade software (ISO 15926 internet side) will be freeware, first products are ready.
- ISO 15926 Part 4 RDL is downloadable (free of charge).

Fundamental system elements (according to ISO 15926 / Gellish)

Objects: Physical thing, activity, function, people, document, requirement etc.

Properties: Characterises objects

Relations: Meaningful, semantical relationships between objects (“Gellish relations”)



Examples of applicable Gellish relations

15926 part 4 type of object (left hand object)	Gellish relation (approx. 100)	15926 part 4 type of object (right hand object)
Physical Object	is physically connected to	Physical Object
Physical Object	Has aspect	Property
Functional Object	is logically connected to	Functional Object
Activity	is performed by	Role
Person	is author of	Information Object
Organization	is responsible for	Activity
Information Object	is description of	Physical Object
Compound	is material for	Physical Object
Feature	is a part of	Physical Object
Role	is approver for	Information Object
Spatial Location	is location for	Physical Object

Examples of the actual ISO 15926-4 Reference Data Library

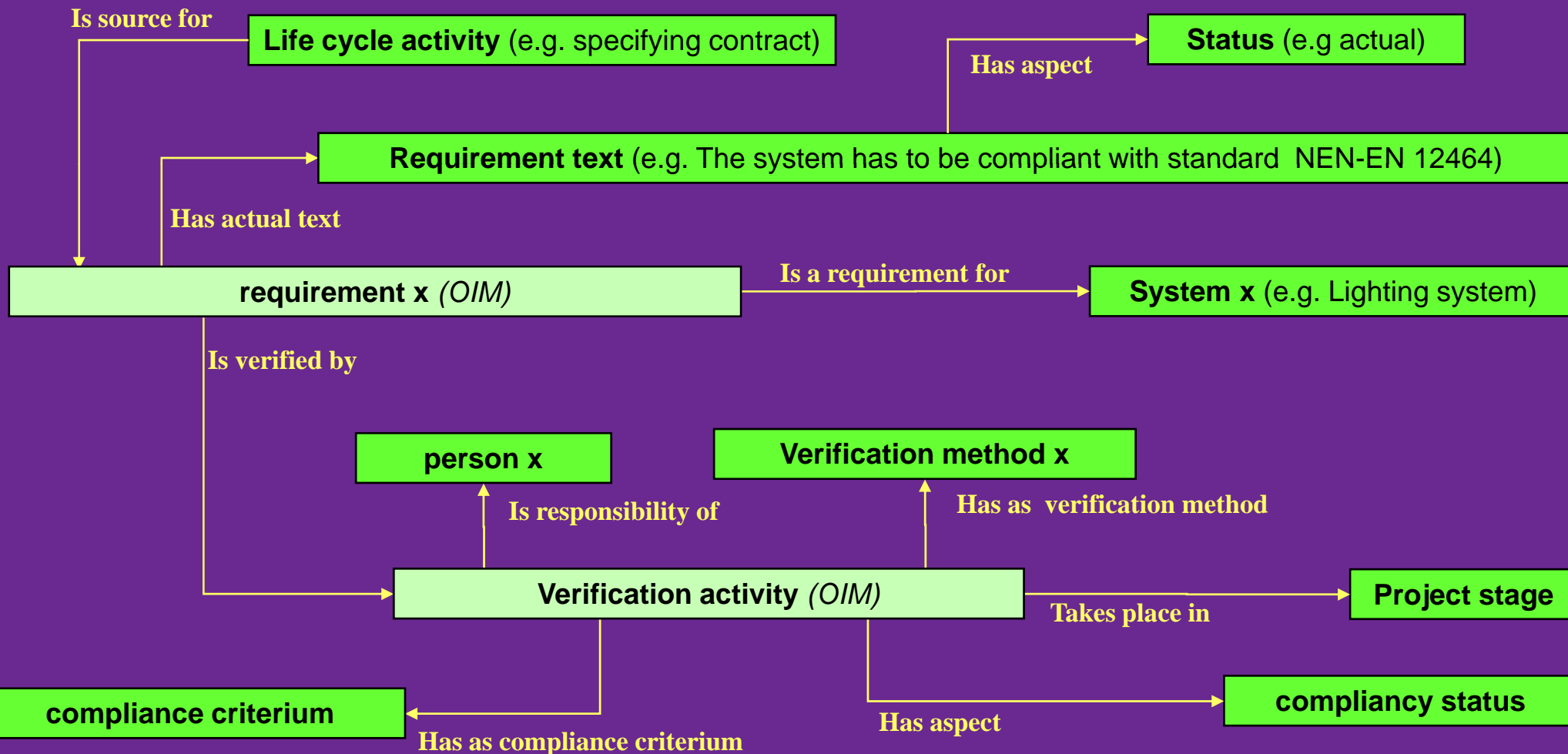
- Property types**
(specialization hierarchie)
- ! radiant exitance
 - ! radiant intensity
 - ! radioactivity
 - [-] ! rate
 - ! absorbed dose rate
 - ! energy fluence rate
 - ! exposure rate
 - [-] ! flow rate
 - ! flow rate mole basis
 - ! flow rate per area mass basis
 - ! flow rate per area mole basis
 - ! flow rate per area volume basis
 - ! flow rate per length mass basis
 - ! flow rate per length volume basis
 - ! heat flow rate
 - ! mass flow rate
 - ! radiant flux
 - ! shear rate
 - [-] ! ratio
 - ! absorption factor
 - ! activity coeff
 - ! activity coeff
 - ! activity of sol
 - ! attenuation
 - ! binding fraction
 - ! break down torque multiplier
 - ! breakdown torque multiplier
 - ! charge number of ion
 - ! coupling factor
 - ! directional spectral emissivity
 - ! dissipation factor

- Physical object types**
(specialization hierarchie)
- [+] ! switchgear and controlgear compartment
 - [-] ! switchgear and controlgear
 - ! control station
 - [+] ! distribution board
 - [+] ! enclosed switchgear and controlgear
 - ! factory-built switchgear and controlgear
 - ! indoor switchgear and controlgear
 - ! motor control centre
 - ! outdoor switchgear and controlgear
 - [+] ! switchboard
 - [-] ! switching device
 - [-] ! mechanical switching device
 - ! auxiliary switch of a mechanical switching device
 - [-] ! circuit-breaker
 - [-] ! air circuit-breaker
 - [+] ! earth leakage circuit-breaker
 - ! miniature circuit-breaker
 - ! moulded-case circuit-breaker
 - ! circuit-breaker with lock-out preventing closing
 - ! current-limiting circuit-breaker
 - ! dead tank circuit-breaker
 - [-] ! gas-blast circuit-breaker
 - ! air-blast circuit-breaker
 - ! integrally fused circuit-breaker
 - ! live tank circuit-breaker
 - ! oil circuit-breaker
 - ! sf6 circuit-breaker
 - ! vacuum circuit-breaker
 - [-] ! contactor
 - ! air contactor
 - [-] ! contactor relay

Has as definition

“A circuit-breaker in which the contacts open and close in air at atmospheric pressure.”

Example: implementation requirement management within the business case



Implementation of Object Information Model (OIM) “requirement”:

requirements tree (contractview)

- NHK-77007-050019 Objectspecificatie Energieverdeling
- NHK-77007-050020 Objectspecificatie Terreinverlichting
- NHK-77007-050021 Objectspecificatie Verlichting dienst
- NHK-77007-050022 Objectspecificatie Verlichting vluchtwe
- NHK-77007-050023 Objectspecificatie Aanduiding van vlu
- NHK-77007-050024 Objectspecificatie Verkeersgeleidingsv
- NHK-77007-050025 Objectspecificatie Evacuatieverlichting
- NHK-77007-050026 Objectspecificatie Tunnelverlichting
- NHK-77007-050026 1 Functionele eisen
 - NZKkr-TUV-0180
 - NHK-77007-050026 1.1 Algemeen
 - NHK-77007-050026 1.2 Ingangszoneverlichting
 - NHK-77007-050026 1.3 Tunnelverlichting
 - NZKkr-TUV-0020
 - equability of the enlighting**
 - NHK-77007-050026 1.4 Besturing
 - NHK-77007-050026 1.5 Bediening
 - NHK-77007-050026 2 Externe raakvlakken
 - NHK-77007-050026 3 Randvoorwaarden
 - NHK-77007-050026 4 Aspecteisen
- NHK-77007-050027 Objectspecificatie Waterafvoersyster
- NHK-77007-050028 Objectspecificatie Verkeersdetectie tu
- NHK-77007-050029 Objectspecificatie Brandblusvoorzien
- NHK-77007-050030 Objectspecificatie Brandblusinstallatie
- NHK-77007-050031 Objectspecificatie Hulpkasten
- NHK-77007-050032 Objectspecificatie Brandmeldinstallatie
- NHK-77007-050033 Objectspecificatie Hoogfrequentinsta
- NHK-77007-050034 Objectspecificatie Omroepinstallatie
- NHK-77007-050035 Objectspecificatie Telefoon- en interc
- NHK-77007-050036 Objectspecificatie Digitaal beeldopslag
- NHK-77007-050037 Objectspecificatie Geluidsbakeninstall
- NHK-77007-050038 Objectspecificatie Ventilatie tunnelver
- NHK-77007-050039 Objectspecificatie Overdrukventilatie

equability of the enlighting

requirement

equability of the enlighting

general is requirement for PKM relations

Attributes		properties	
name	value	Name	Value
name	equability of the enlighting	context	contract requirement
remark		identifier	NZKkr-TUV-0174
reference		impact on project	needs special attention

is actual presented on text

Name	Description	relation type	reference
NZKkr-TUV-0174 text	Concerning the whole length of the tunnel must be, in the middle of the traffic lanes on an altitude of 1.2 meter above the road surface, the horizontal equability of the enlighting be at least 0.4.	actual	

will be verified by activity

Verificatie	
Verificatie NZKkr-TUV-0174 Gelijkmatigheid verlichtingssterkte.	

has severity (impact of non-compliance) <1:1>

Name	
critical	

has higher level requirements

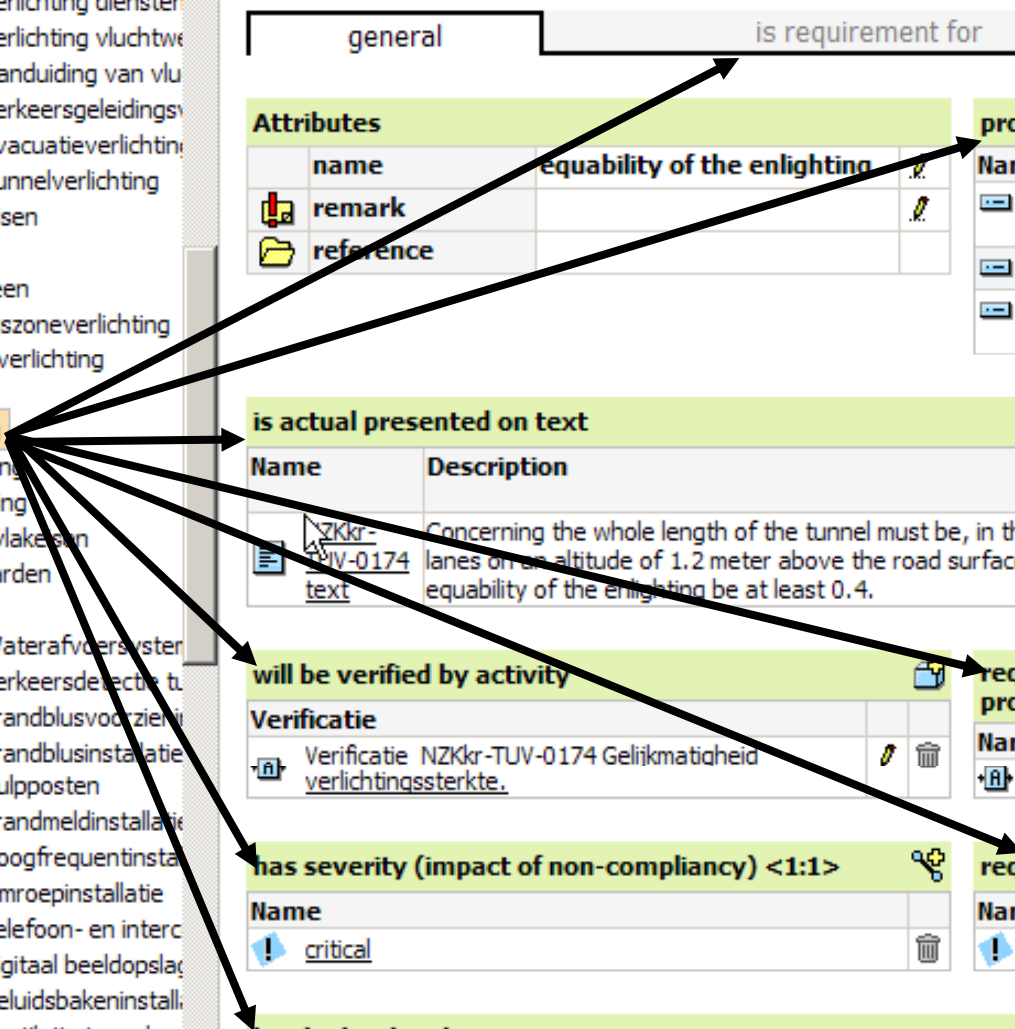
Eis naam	text
VMS/NZKkr-ctt-0082	De verkeerstechnische- en tunneltechnische installaties binnen het Nieuwe System moeten het vereiste veiligheidsniveau voor alle gebruikers realiseren.

requirement is relevant in the context of ISO 15288 process

Name	
implementation process	

requirement is about aspect

Name	Description
usability	



OIM “verification activity” of this requirement

Name	verification activity roughness surface course of a road	
Description	based of the experiences with roads is demand that 2 times each year a roughness measurement is performed for guarding the needed roughness-level	

properties

property	value
compliance status	fully compliant
context	verification in the context of the contract
processing status	active

verification takes place in life cycle stage	
name	
exploitation phase	

has as verification method	
name	
manual measurement	

evidence of compliancy is described by	
description	
reportage of measurement	

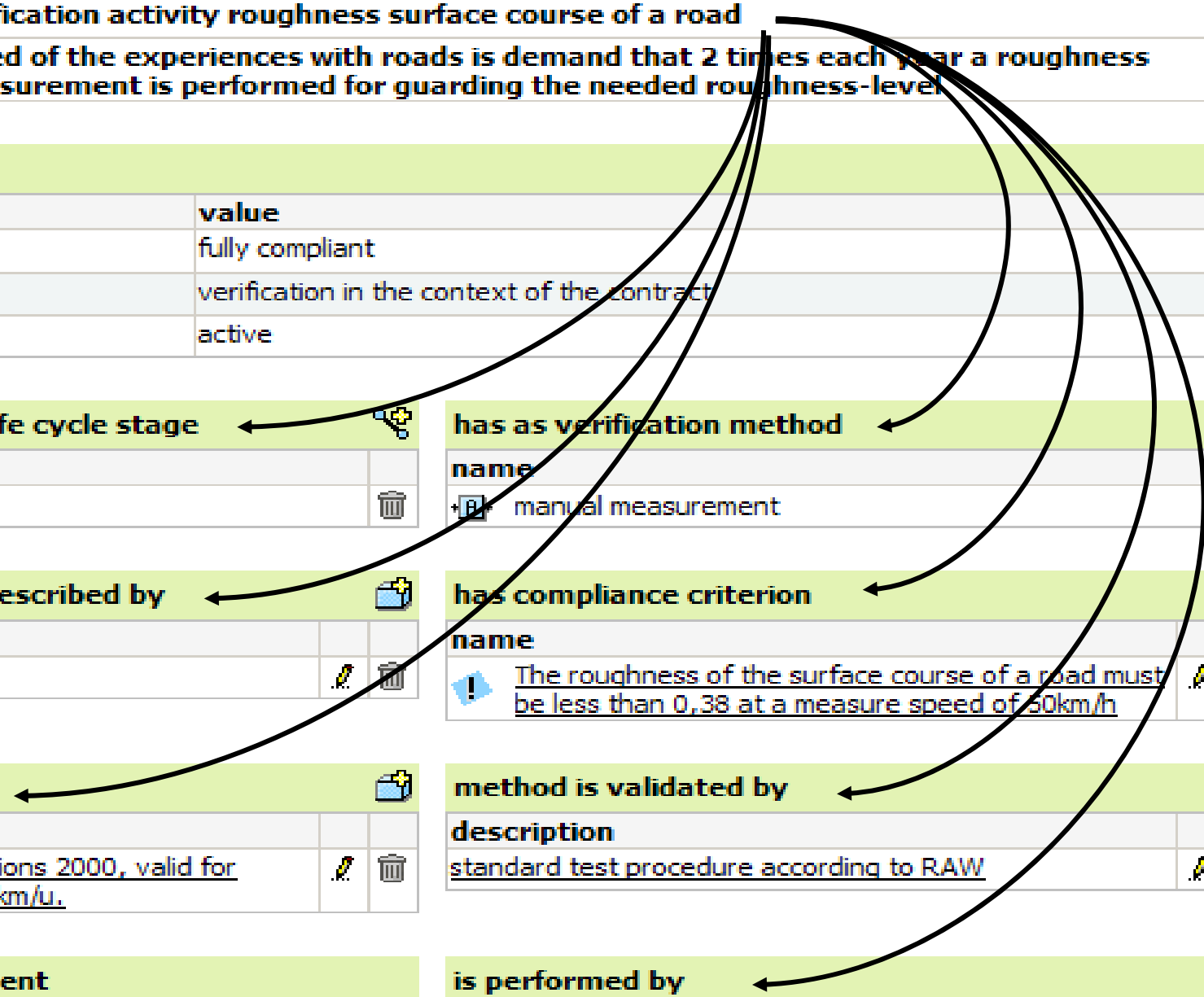
has compliance criterion	
name	
The roughness of the surface course of a road must be less than 0,38 at a measure speed of 50km/h	

has verification method	
description	
Test 150 Standard RAW Regulations 2000, valid for measurements at a speed of 70 km/u.	

method is validated by	
description	
standard test procedure according to RAW	

is a verification of requirement	
Name	description
roughness requirement surface course of a road	

is performed by	
Name	Description
designer Roads	



Implementation issues of a data integration standard like ISO 15926

- **Be aware of the internal and external level of data readiness**
- **Engineers are not used to work with explicit information.**
- **Explicit information requires more selections to make in the user interface**
- **The benefits of explicit information goes beyond the direct work field of engineers**
- **Keep the modelers stuff away from users e.g. engineers**
- **Implementation needs a strategy and a roadmap for each organization**

Thanks for your attention

“ one of the actions for next year is to extend the RDL and (demo) implementations of ISO 15926 with / in the area of shipbuilding ”
(USPI)

Example: Applying the method making requirements explicit:

Requirement 365 as part of the contract: Heating

“Heating system will consist of heat exchanger tube type, suitable for thermal oil to hot water with pumps, piping, etc. to provide hot water to the central air handling units. Two pumps will be installed for circulating the hot water, each capable for 50% of the capacity”

“Implicit” heat exchanger requirement is made explicit using Gellish (white refers to part 4 RDL):

heating system	<u>shall have as part a</u>	<1:1>	heat exchanger
heat exchanger	<u>shall be performer of a</u>		exchanging heat between two streams
primary stream	<u>shall participate in a</u>		exchanging heat between two streams
secondary stream	<u>shall participate in a</u>		exchanging heat between two streams
primary stream	<u>shall be qualified as a</u>		thermal oil
secondary stream	<u>shall be qualified as a</u>		hot water
heat exchanger	<u>shall have as part a</u>		pump system
pump system	<u>shall have as part a</u>	<2:2>	pump
pump system	<u>shall have as part a</u>	<1:n>	pipe
pump system	<u>shall be performer of a</u>		providing hot water to central air handling units
pump	<u>shall be performer of a</u>		circulating secondary stream
pump	<u>shall have as aspect a</u>		pump capacity
pump capacity	<u>shall be qualified as a</u>		50% of the full heating system capacity
primary stream	<u>shall be a responsibility of a</u>		client
secondary stream	<u>shall be a responsibility of a</u>		contractor

Applied on a specific area: traditional specifications

Phrases are derived from existing class regulations but are not quoted as such

“Loose” or “poor” qualifications are used, e.g. ‘suitable’, ‘fitting’, ‘matching’

Use of redundant terms

Components are extensively specified, mostly with unnecessary details

Parts of the specification are not consistent with other parts of the specification

Solutions are specified without telling the context and or Why

Prevailing requirements and/or design philosophy of client are not explicitly stated

Requirements contains implicit information