SIS/TK 280 Information och automation i produktlivscykeln

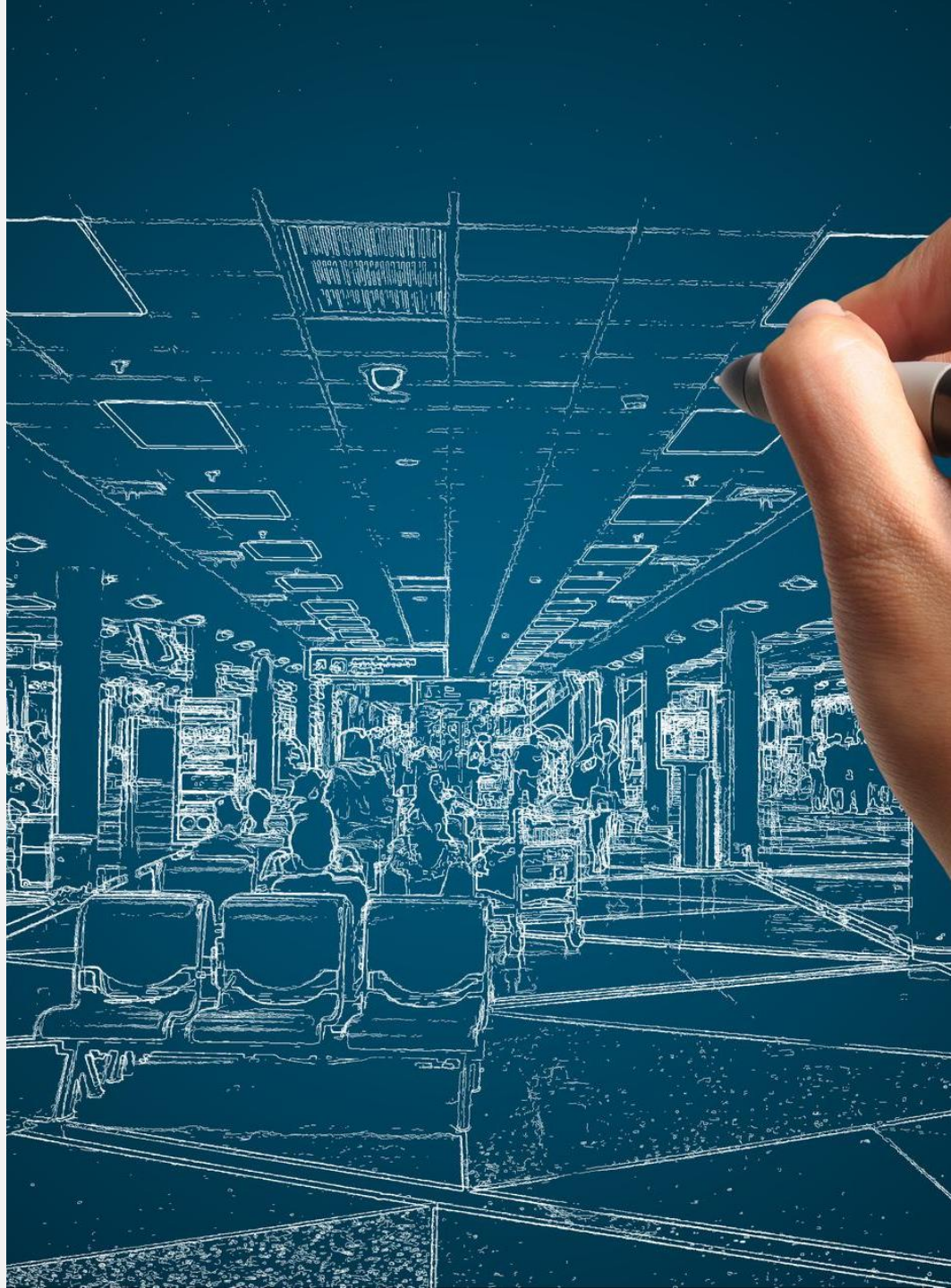
Jonas Rosén, ordförande i TK 280, Eurostep

Charlotta Johnsson, chair ISO/TC 184/SC5 deltagare TK 280, Lunds Tekniska Högskola

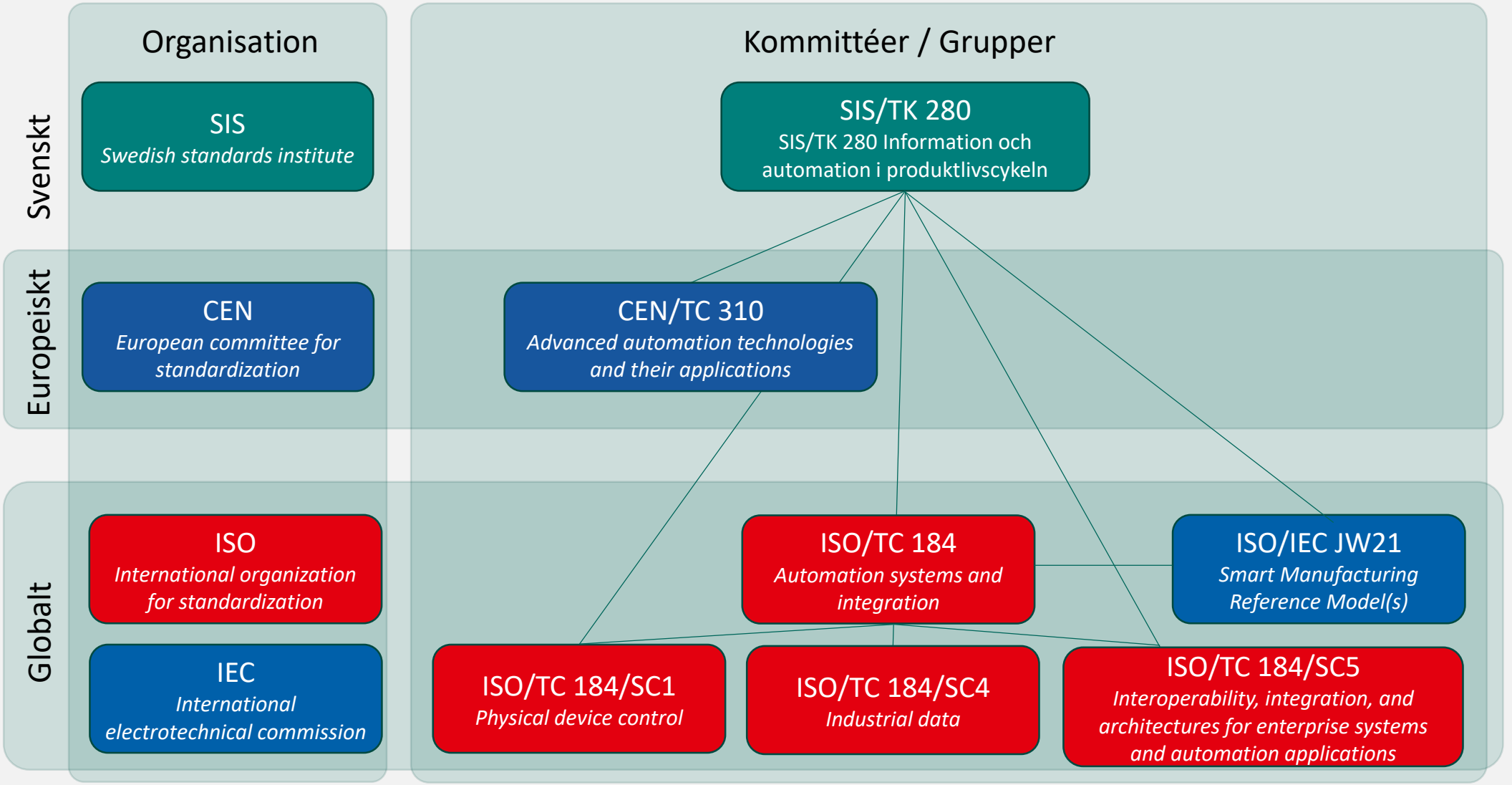
Ulf Carlsson, deltagare TK 280, Syntell

Katarina Widström, projektledare TK 280, SIS.

SWEDISH STANDARDS INSTITUTE



Organisation och kommitté



SWEDISH STANDARDS INSTITUTE

Charlotta

ISO/TC 184 Automation systems and integration

Standardization in the field of automation systems and their integration for all life cycle phases. Areas of standardization include information systems, automation and control systems and integration technologies.

ISO TC 184/SC1

Physical device control

- Numerical control systems for machine tools
- Reference model for cyber - Physically controlled smart machine tool systems

ISO TC 184/SC4

Industrial data

- Modelling of industrial, technical and scientific data to support electronic communication and commerce
- Digital twin

ISO TC 184/SC5

Interoperability, integration, and architectures for enterprise systems and automation applications

- Interoperability between IT and OT,
- Assuring KPIs for measuring energy efficiency and sustainability

SWEDISH STANDARDS INSTITUTE

Hitflyttat
Charlotta

TC 184/SC5 - Interoperability, integration, and architectures for enterprise systems and automation applications

53
Published ISO Standards Related to the SC

14
ISO Standards under development

11
Direct Working Group (SG, WG and JWG)

14
Participating members

13
Observing members

Chair: Charlotta JOHNSSON (Sweden)
Secretary: Walter ZOLLER (USA)

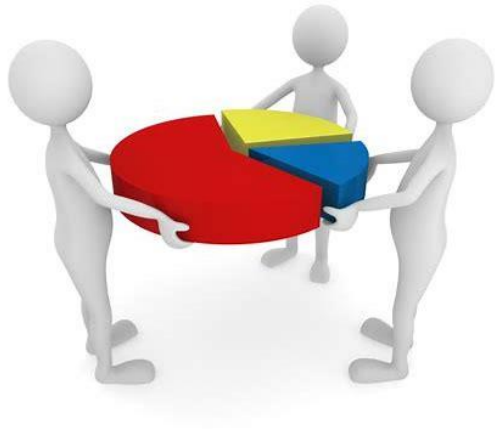
Hitflyttat Charlotta

TC 184/SC5 - Interoperability, integration, and architectures for enterprise systems and automation applications

Working Group	Title	Convenor
WG1	Modelling and Architecture	Richard Martin (USA)
WG4	Manufacturing software and its environment	Mitchiko Matsuda (Japan)
WG5	Open systems application frameworks	Hongye Su (China)
WG6	Application Service Interface	Robert Patzke (Germany)
WG9	Key performance indicators for manufacturing operations mgmt	Andreas Kirsch (Germany)
WG10	Evaluation of energy efficiency and other relevant factors of a manufacturing system with respect to its environmental influence.	Fumihiko Kimura (Japan)
WG12	Convergence of informatization and industrialization (CII)	Hongye Su (China)
WG13	Equipment Behaviour Catalogue	Naohisa Matsushita (Japan)
SG5	Model-based standards authoring Study Group	Dov Dori (Israel)
JWG5 (IEC)	Enterprise-Control System Integration	Dennis Brandl (USA)
JWG8 (SC4)	Manufacturing process and management information	Jochen Hartung (Germany)

SC5 contribution to Smart Manufacturing

WG1	WG4	WG5	WG6	WG9	WG10	WG12	WG13	JWG5	JWG8	JWG14



Mfg process and m.i.

Enterprise-Control Integration

Catalogization of Equipement Behaviour

Interoperability between IT and OT

Assuring KPIs for measuring energy efficiency and sustainability

Assuring that the KPIs for MOM are well-defined and applicable for many ind.

Integration of Devices for Measurement and Automation

Providing easy integration of Advanced-Process Control and Optimization

Manufacturing software and its environment

Providing Models and Architectures for the full lifecycle history of integration projects

Table of contents

SWEDISH STANDARDS INSTITUTE

Smart manufacturing, vad då?

Ändrad till Charlotta

Definitionen ISO SMCC och IEC SyC SM enats om:

- “Manufacturing that improves its performance aspects with **integrated and intelligent** use of processes and resources
- **in cyber, physical and human spheres**

to create and deliver

- **products and services, which also**
- **collaborates with other domains within enterprises’ value chains**."

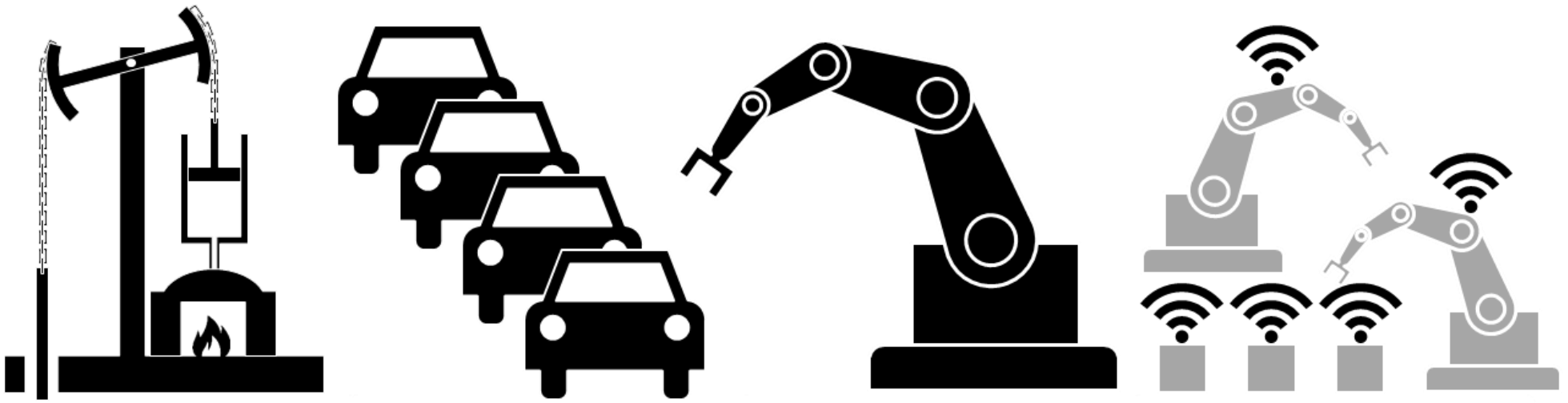
Note 1: Performance aspects include agility, efficiency, safety, security, sustainability or any other performance indicators identified by the enterprise.

Note 2: In addition to manufacturing, other enterprise domains **can include engineering, logistics, marketing, procurement, sales or any other domains identified by the enterprise**.

SWEDISH STANDARDS INSTITUTE

Ändrad till Charlotta

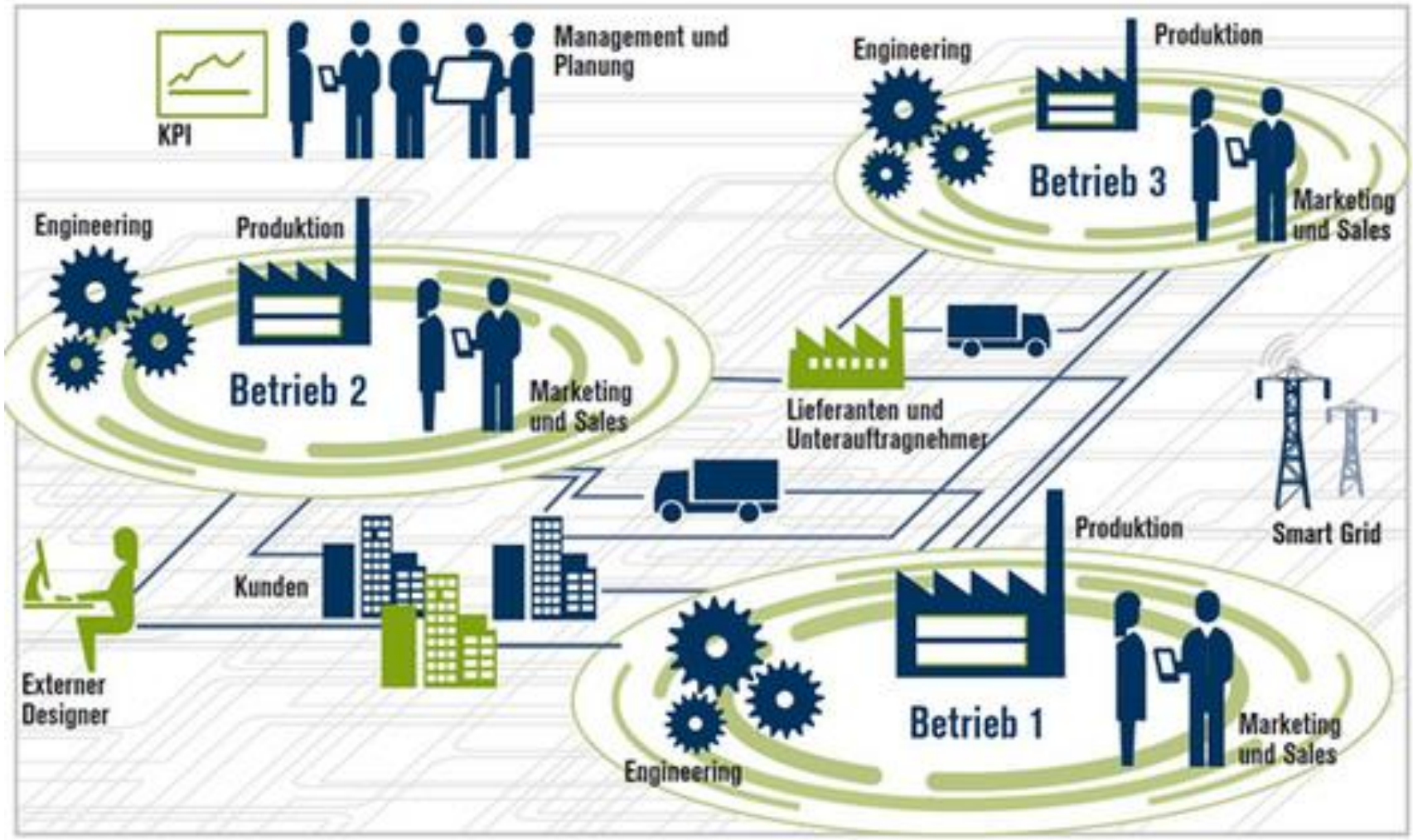
Industrial generations



1st	2nd	3rd	4th
Mechanization, water power, steam power	Mass production, assembly line, electricity	Computer and automation	Cyber Physical Systems

SWEDISH STANDARDS INSTITUTE

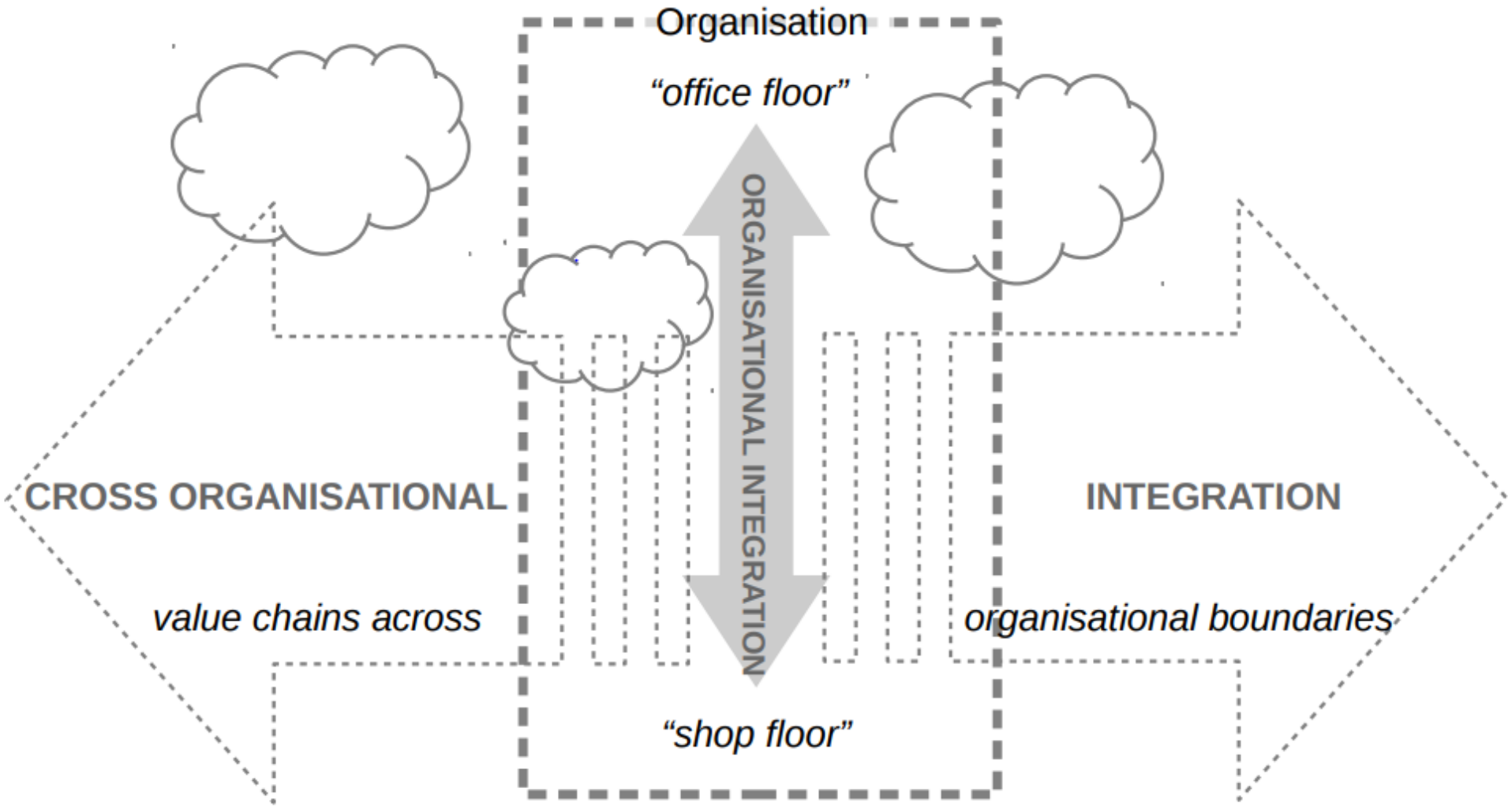
Horizontal digital collaboration



SWEDISH STANDARDS INSTITUTE

Hitflyttat
Charlotta

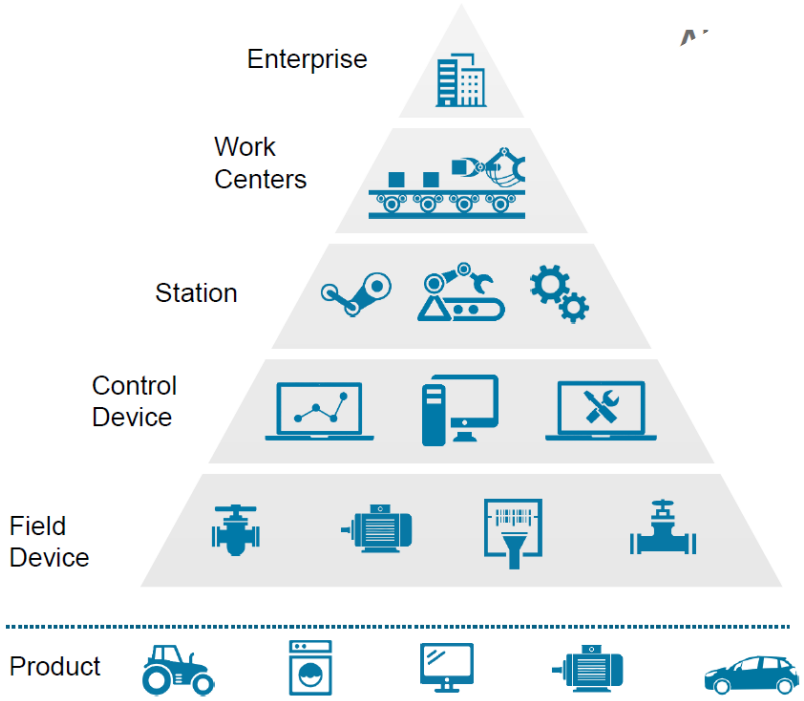
Vertical and Horizontal Integration



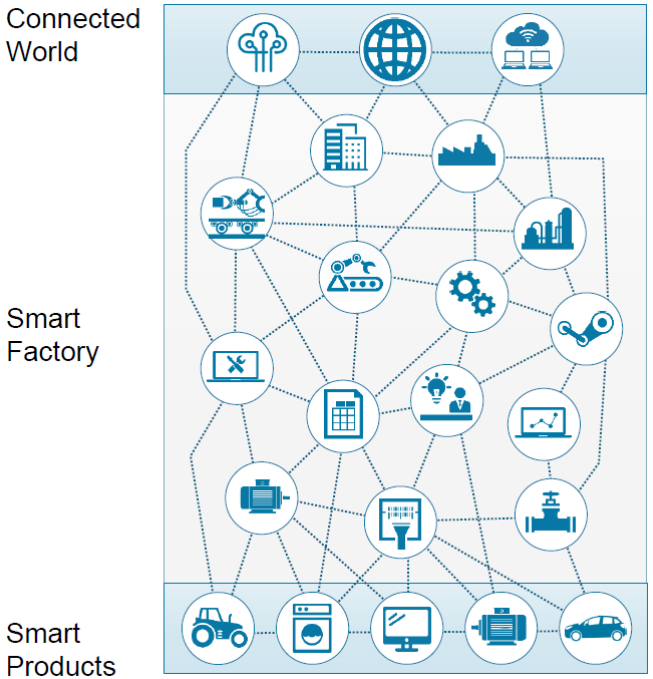
SWEDISH STANDARDS INSTITUTE

From Hierarchy to Network

IEC 62264 (ISA 95)
”Manufacturing Pyramide”



- Everything is connectable to each other.
- All participants can interact with each other.
- The product becomes an active part of the whole system
- Less Engineering, Plug & Produce
- New quality of Flexibility in machines and factories.
- Seamless Cross Vertical Integration
- Improved scalability



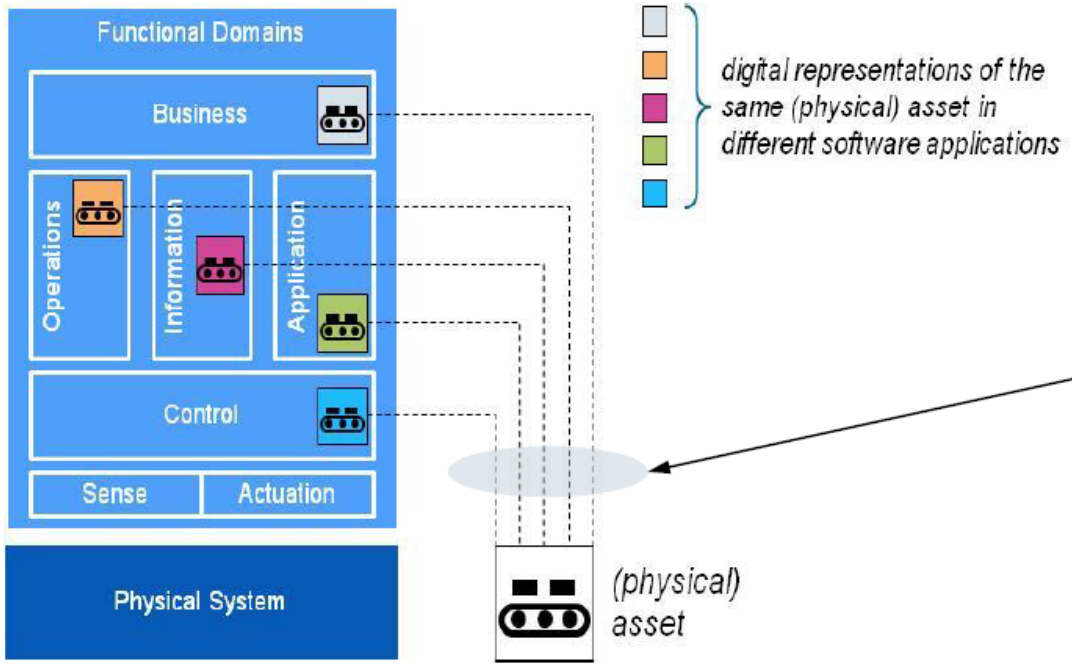
Today’s hierarchy → **Smart Manufacturing capabilities** → **Tomorrow’s Network**

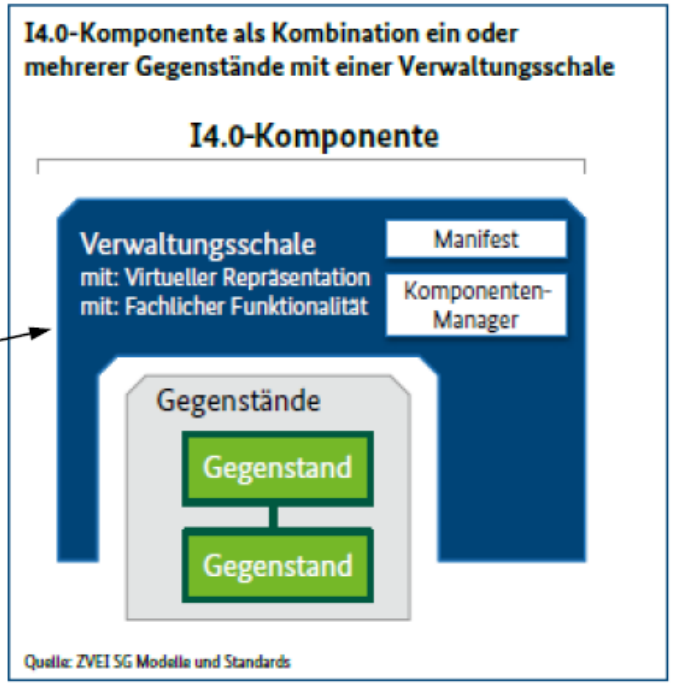
SWEDISH STANDARDS INSTITUTE

Standardized connectors for Smart Industry

The I4.0 Component makes an Asset a Smart Asset.
A fundamental concept for the Integration of I4.0 Systems

I40 Foundation 2: The Asset Administration Shell provides a standardized concept on how to get access to Asset - Services. It is the foundation for Digital Representations of Assets.





Guido Stephan
Senior Principal Key Expert Engineer
SIEMENS CT RDA CES

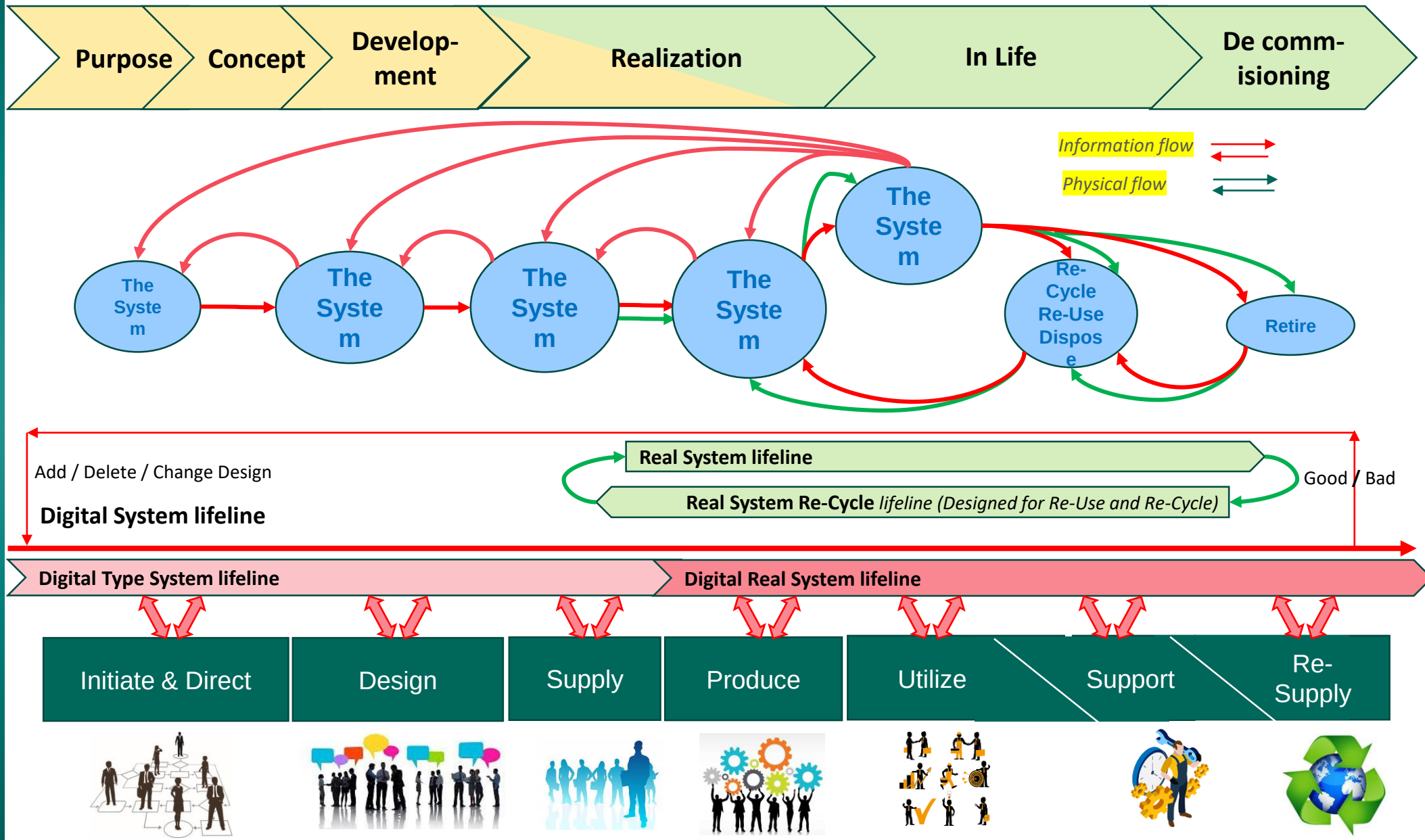
Dr. Michael Hoffmeister
Executive Expert Digital Business
FESTO TD

SWEDISH STANDARDS INSTITUTE

Livscykelperspektiv och standarder för produktinformation

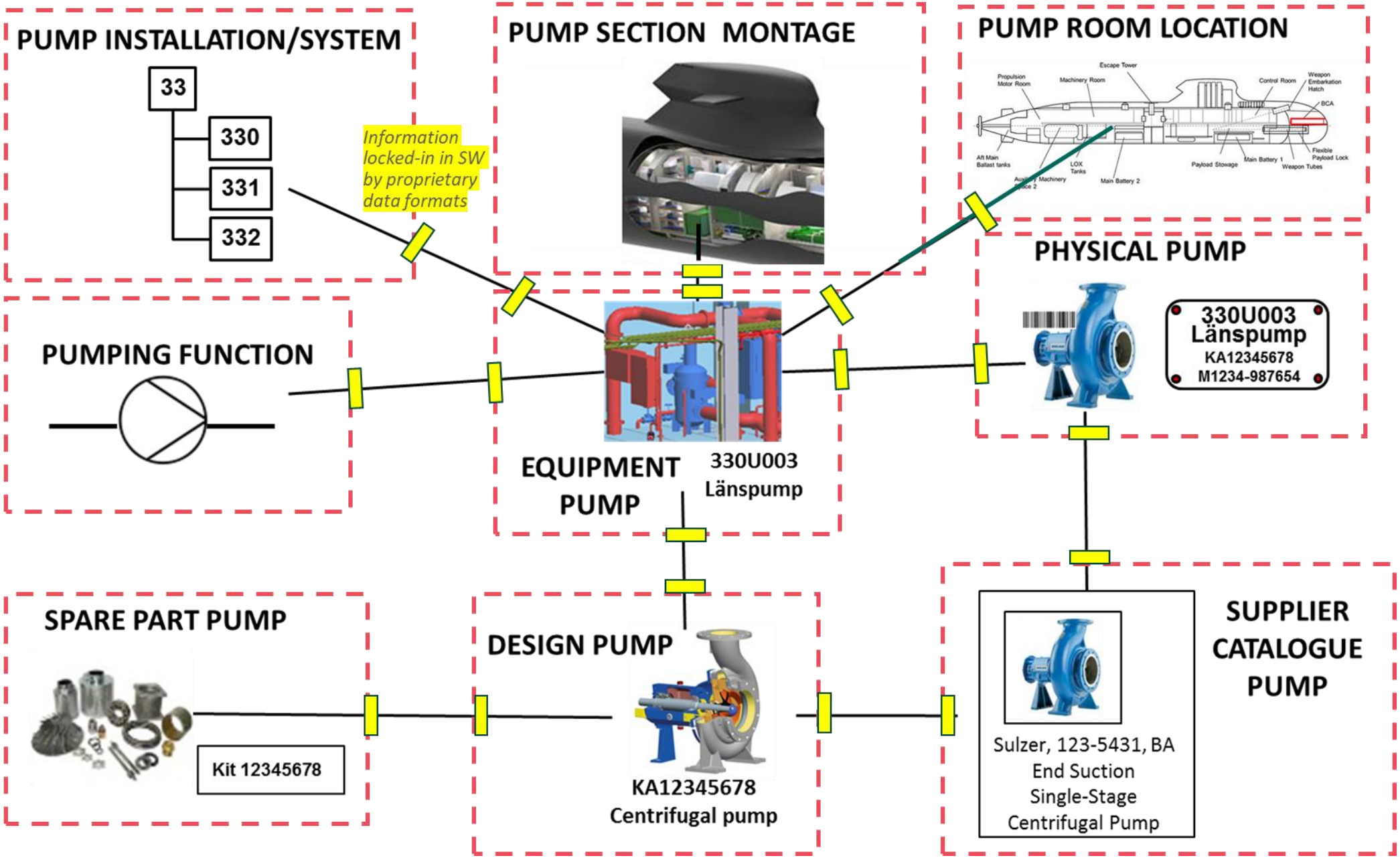
SWEDISH STANDARDS INSTITUTE

The digital- and real- system lifecycle



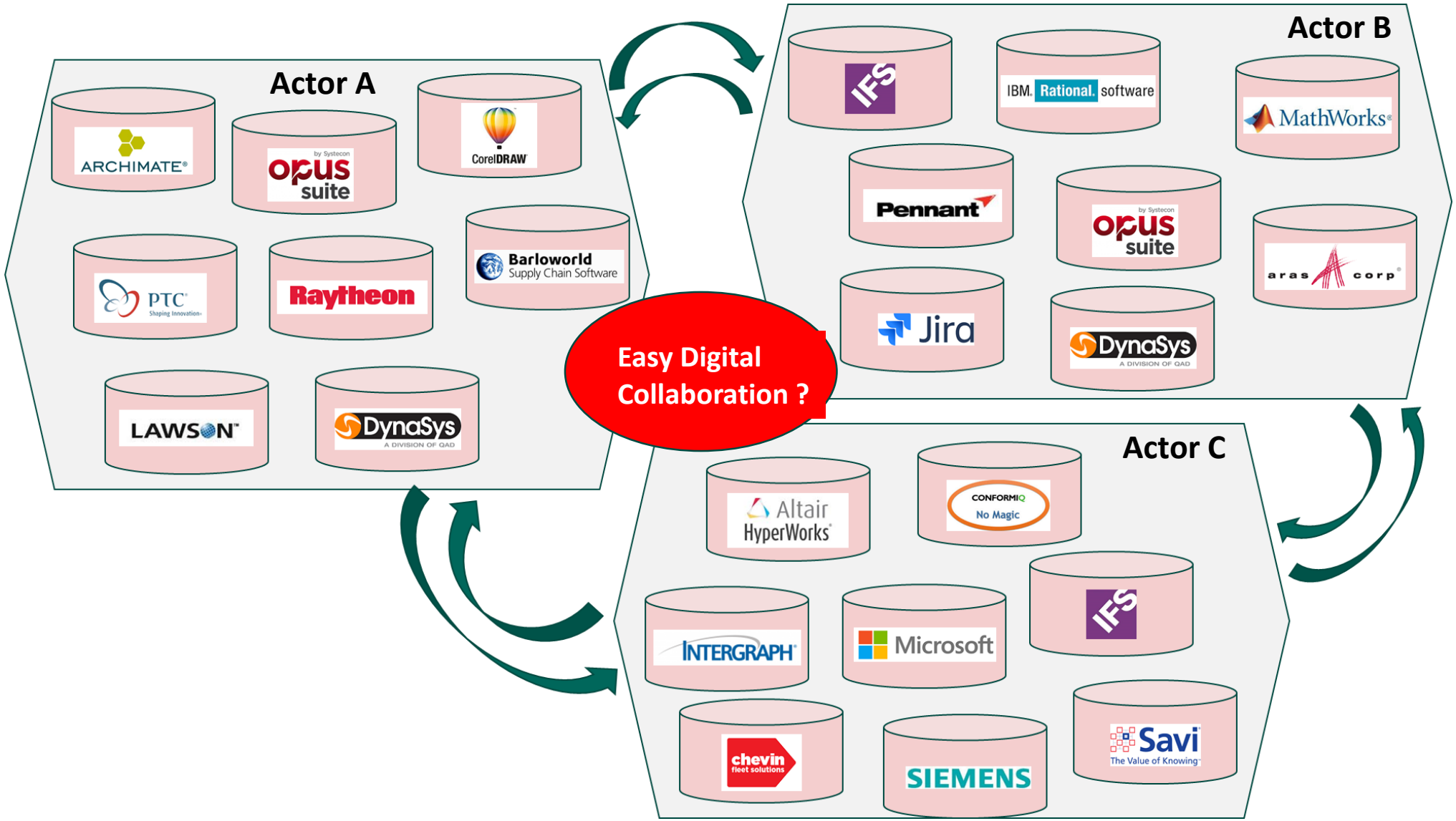
SWEDISH STANDARDS INSTITUTE

“Looked-in” Information about a the same? thing



SWEDISH STANDARDS INSTITUTE

Disparate IT-environments *(software examples)*



SWEDISH STANDARDS INSTITUTE

Not just tools (IT) enables the business

(Saab Kockums)

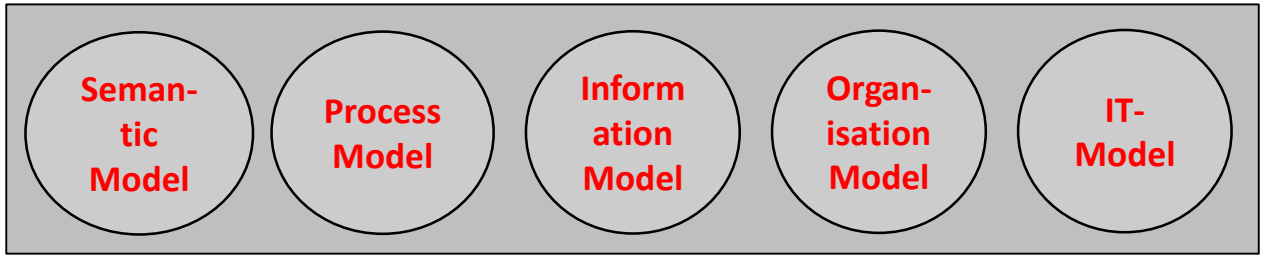
Software standardized interfaces

Information Standards

Well defined semantics

All the different layers have dependencies that must be considered in Business development

Architecture Model



SWEDISH STANDARDS INSTITUTE

Jonas

Product Life Cycle Support (PLCS)
ISO 10303-239

SWEDISH STANDARDS INSTITUTE

Jonas

Product Life Cycle Support (PLCS)

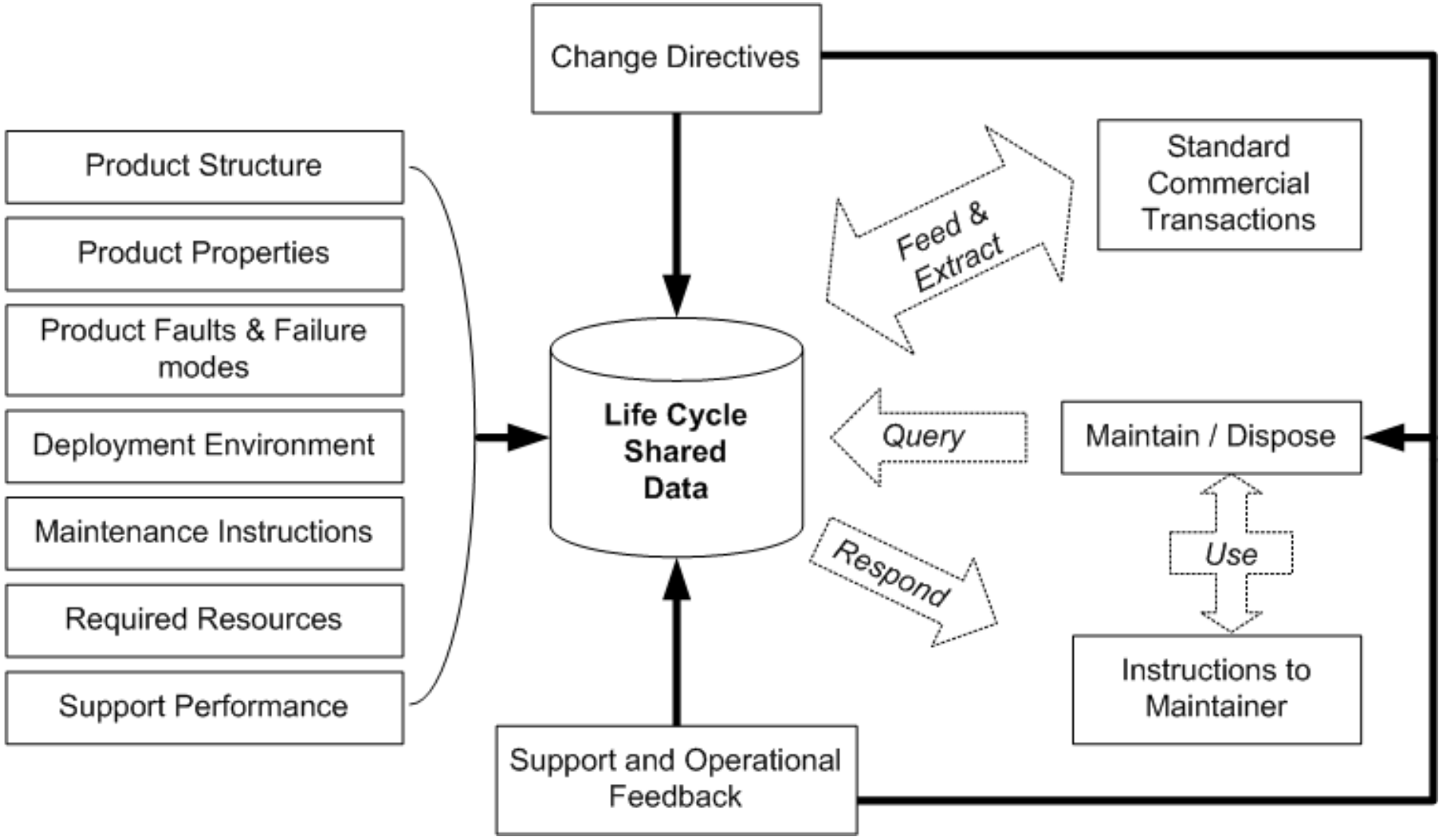
Unique Value Proposition

- International Standard for product support information
  - based on ISO 10303 STEP (PLCS is AP 239)
- Complete product life cycle – from concept to disposal
- Single source of assured product support information
- Data independence - processes, systems, format
- Interoperability across enterprises and systems through:
  - Standardization of semantics for product support
  - Integrated suite of data models for data exchange and information sharing
  - Framework for using PLCS
    (DEXs, ISO STEP stds, methods & tools, incl XML/XSLT)
- Extensibility and tailoring through the use of Reference data libraries

SWEDISH STANDARDS INSTITUTE

Jonas

ISO 10303-239: PLCS

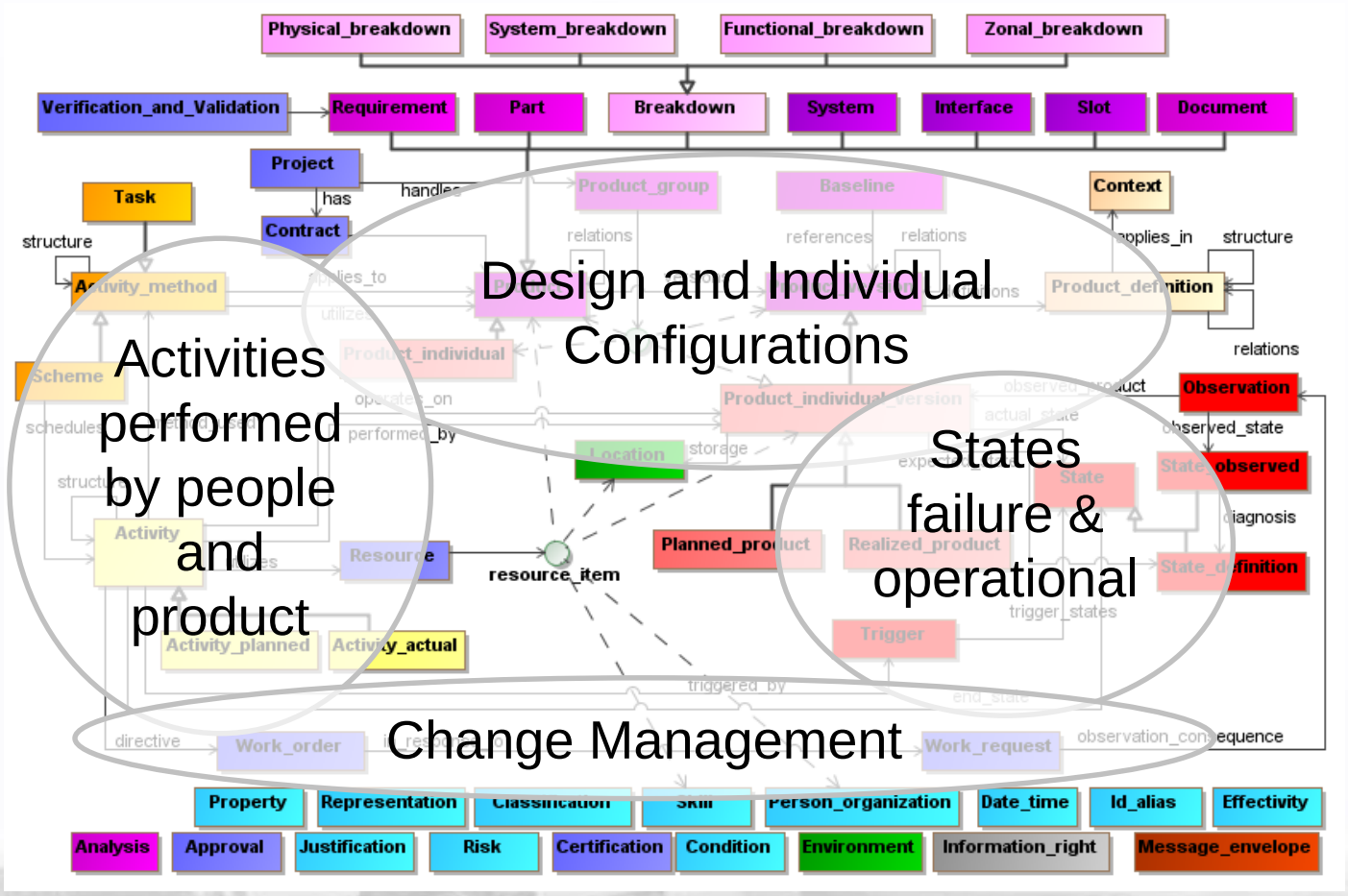


SWEDISH STANDARDS INSTITUTE

Scope of PLCS and supported histories

http://docs.oasis-open.org/plcs/plcslib/v1.0/cs01/data/PLCS/concept_model/model_base.html

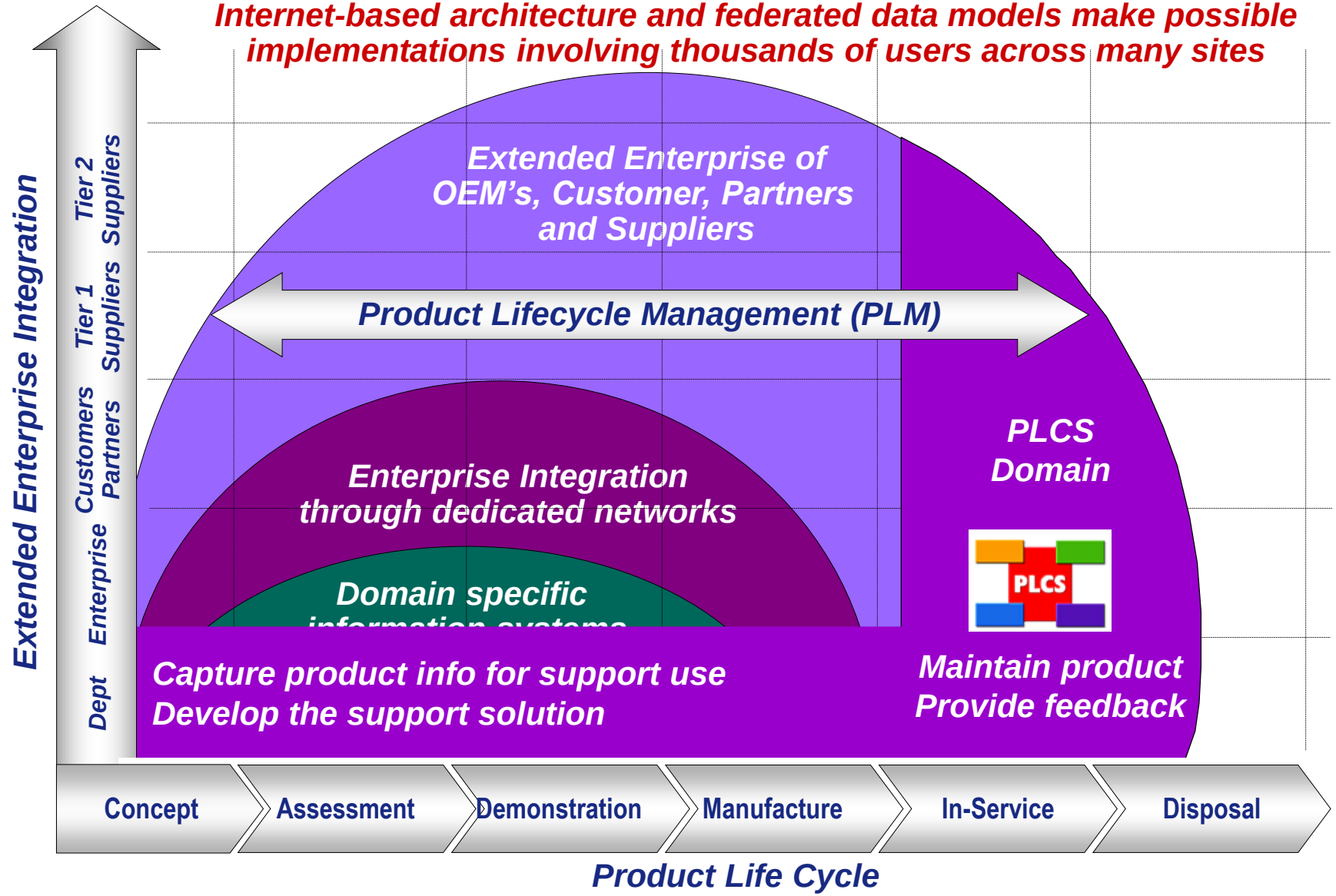
Jonas



Jonas

Product Life Cycle Support (PLCS)

Extended Enterprise enabled by Internet technology



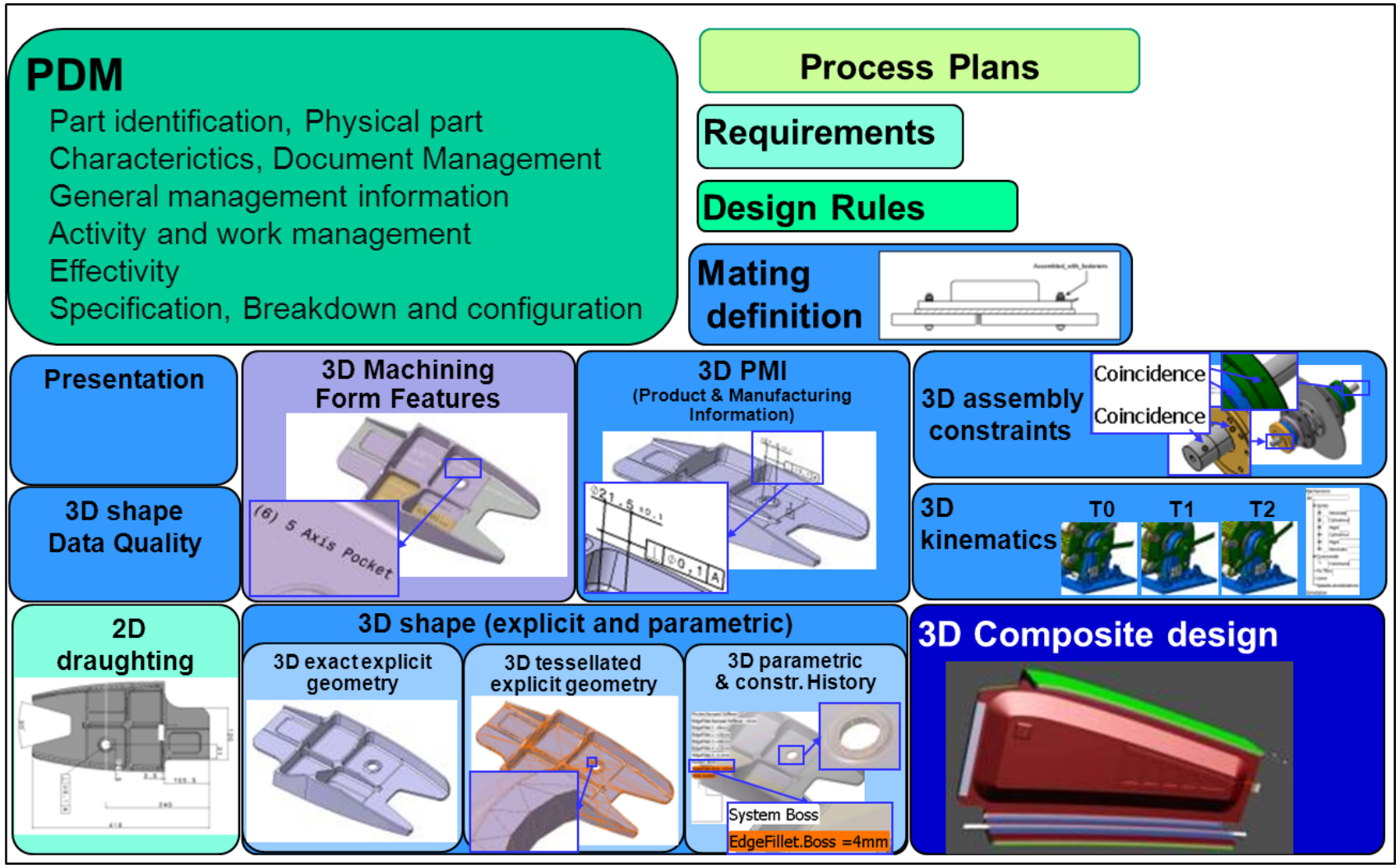
SWEDISH STANDARD INSTITUT

ISO 10303-242

Jonas

Source:http://private.ap242.org/web/ap242/ap242ed1

Overview of AP242 edition 1 information model



SWEDISH STANDARDS INSTITUTE

ISO 10303-243: MoSSEC

Jonas

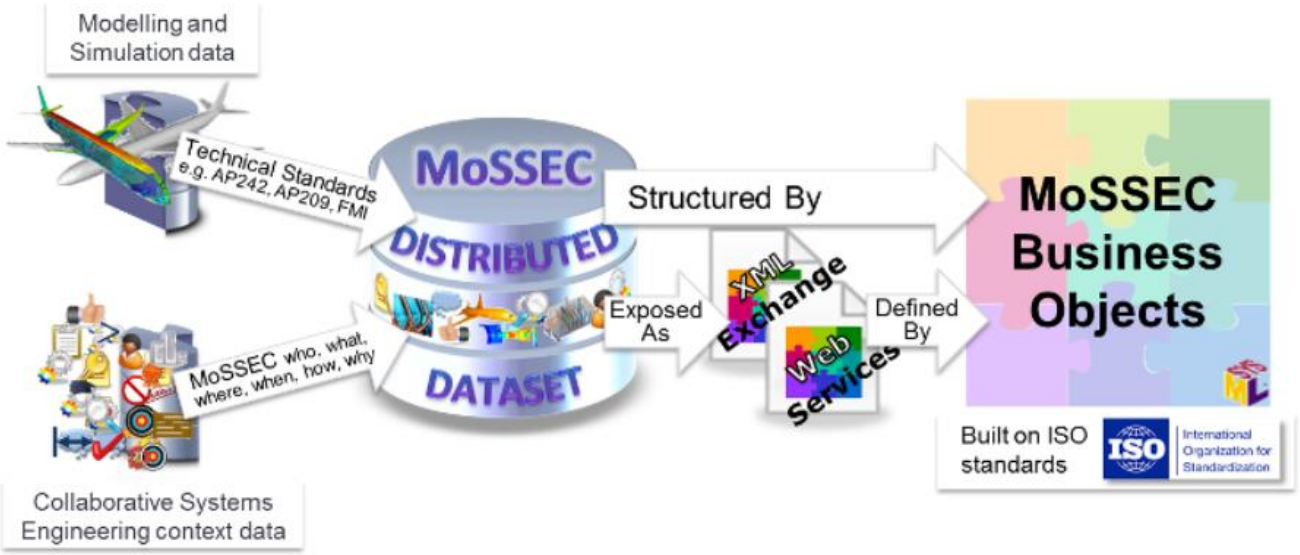
Source:http://www.asd-ssg.org/mossec

Interaction with other Standards

MoSSEC will provide the standard for the systems engineering context information which is linked to the modelling and simulation data whenever it is shared or exchanged.
For more information on how MoSSEC interacts with:

- **Technical standards** such as STEP and LOTAR
- **Linked data standards** such as OSLC
- **Systems Engineering standards** such as ISO 15288

Link to more detail



SWEDISH STANDARDS INSTITUTE

Jonas

ISO 10303-243: MoSSEC

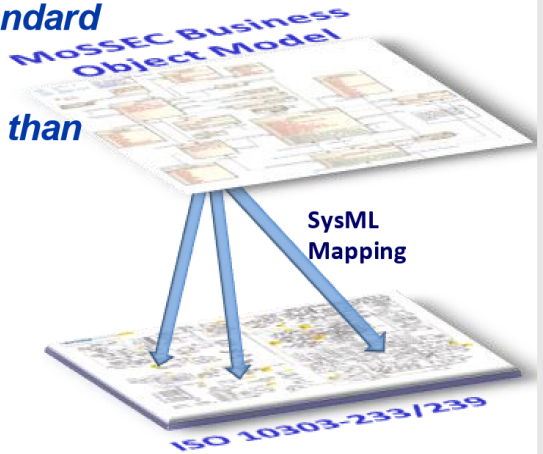
Source:http://www.asd-ssg.org/mossec

Why not just use the ISO standards?

Global Product Data Interoperability Summit | **2014**

PLCS (ISO 10303-239) is generic, flexible, and designed to be extended and specialised therefore:

- ➔ ***MoSSEC Business Object Model provides usage guidance to explain how the standard is used in context***
- ➔ ***MoSSEC Services are at a higher level than the standard, so are more efficient***



SWEDISH STANDARDS INSTITUTE

Jonas

EPISTLE
”European Process Industries STEP Technical Liaison Executive”

Source: CALS Technical Goal 2

The EPISTLE framework

Introduction

EPISTLE stands for the ‘‘European Process Industries STEP Technical Liaison Executive’’. It is a consortium of European process industry companies. The membership of EPISTLE includes such companies as ICI, Shell and IBM as well as a number of software and engineering contractors.

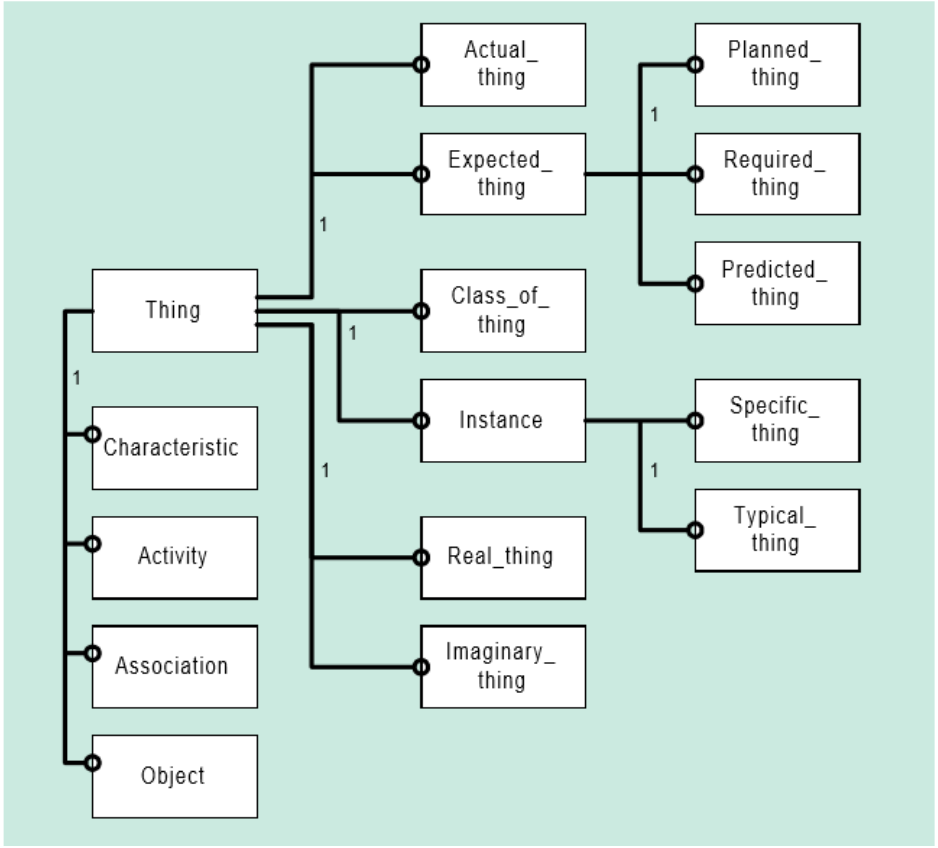
This section summarises the benefits (and some of the disadvantages) of the EPISTLE modelling approach. The philosophy of EPISTLE is discussed and related to real information management problems.

The goals of the EPISTLE framework are detailed, along with the business cases that drove its development. The framework is explained in terms of how it differs from other approaches, and the technologies which support EPISTLE development, such as STEP and in particular the EXPRESS language.

This chapter covers the EPISTLE core model concepts, and details those concepts which are seen as the most innovative and useful aspects of the model. Examples are given about how the model is used for classifying items and tracking those items throughout the product lifecycle.

Business drivers

Modern, large scale engineering projects involve the exchange and sharing of large amounts of information between many organisations across a number of international borders. Process plant projects are no exception, often involving hundreds of contractors, suppliers and consultants working on multi-million dollar projects. The sharing of information between these organisations has been identified as a significant part of the overall project cost, and is an issue which can seriously impede the progress of a project.



SWEDISH STANDARDS INSTITUTE

Jonas

ISO 15926 Background

Source: https://www.posccaesar.org/

https://www.posccaesar.org/

POSC Caesar Association

- Home
- About PCA
- Reference Data Services (RDS)
- RDS Operations Support
- Meetings and Conferences
- ISO 15926
- Special Interest Groups
- Technical Advisory Board
- Norwegian Continental Shelf Std
- Projects
- Search

POSC Caesar Association

POSC Caesar Association (PCA) is a non-profit global-standardization member organization that shall promote the development of open specifications to be used as standards for enabling the interoperability of data, software and related matters.

PCA initiated ISO 15926 "Integration of life-cycle data for process plants including oil and gas production facilities" and is committed to its maintenance and enhancement.

Join for membership!

Reference Data Service (RDS)

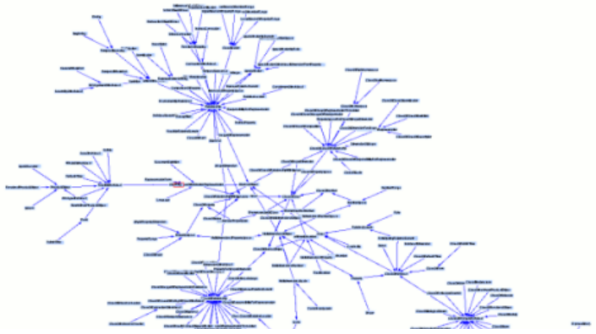
PCA operates the RDS as a public service for the global process industry including oil and gas. RDS contains all reference data in ISO 15926, the Oil & Gas Ontology (OGO), reference data from EU projects in environment and pipelines, reference data for capital intensive project, as well as some reference data from defense and ship industries. The Norwegian Ministry of Defense, Det Norske Veritas (DNV) and Norwegian Oil Industry (OLF) have funded the development of The Reference Data System and is now funding the operation of the system.

ISO 15926

PCA initiated ISO 15926 in 1997 and has chaired the group in ISO TC184/SC4 accountable for ISO 15926 ever since.

A statement from the IT industry:

> *ISO 15926 is extraordinarily robust and complete, both in its specification and the technical infrastructure through which it is deployed. These characteristics differentiate ISO 15926 from other, less formal attempts at standards development. Other standards initiatives have broken down due to their inability to scale the submissions process, cover the structural requirements of multiple disciplines and provide an enterprise-grade technology foundation.*



About

The POSC Caesar Association website is powered on Trac using a wiki, the svn version control system a ticketing system, discussion forums and more making the website a powerful and efficient tool for collaboration.

SWEDISH STANDARDS INSTITUTE

Jonas
Dold bild

15926 Parts

The parts ISO 15926

MANAGING RISK DNV

- The core part, (part 2)
  - The base *data model*
  - Specifies the structure of classes and relationships
  - Ex: `relationship, connection_of_individual, event, thing`
- Geometrical and topological data (part 3)
- The Reference Data Library, RDL (part 4)
  - Contains domain specific classes and relations
  - Adheres to the classes and relations in part 2
  - Ex: `Pump, Well head`
- Implementation methods, (part 7)
  - Templates, facilitating data entry and retrieval to/from 15926

SWEDISH STANDARDS INSTITUTE

Standarder en strategisk fråga i det digitala Industrilandskapet

SWEDISH STANDARDS INSTITUTE

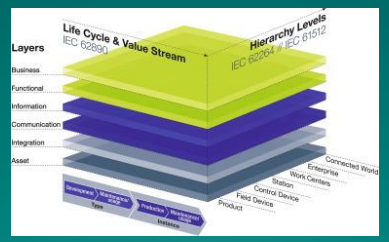
Other countries are mobilizing…

- Smart Industri
- Alliance Industrie du Future
- Plattform Industrie 4.0
- Piano Nationale Impresa 4.0
- Made in China 2025
- Industrial Value Chain Initiative
- Connected Smart Factory
- Smart Man. Leaders. Con.

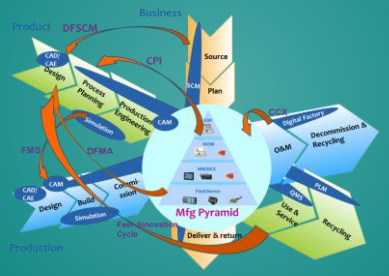
SWEDISH STANDARDS INSTITUTE

The Scandinavian Smart Industry Framework

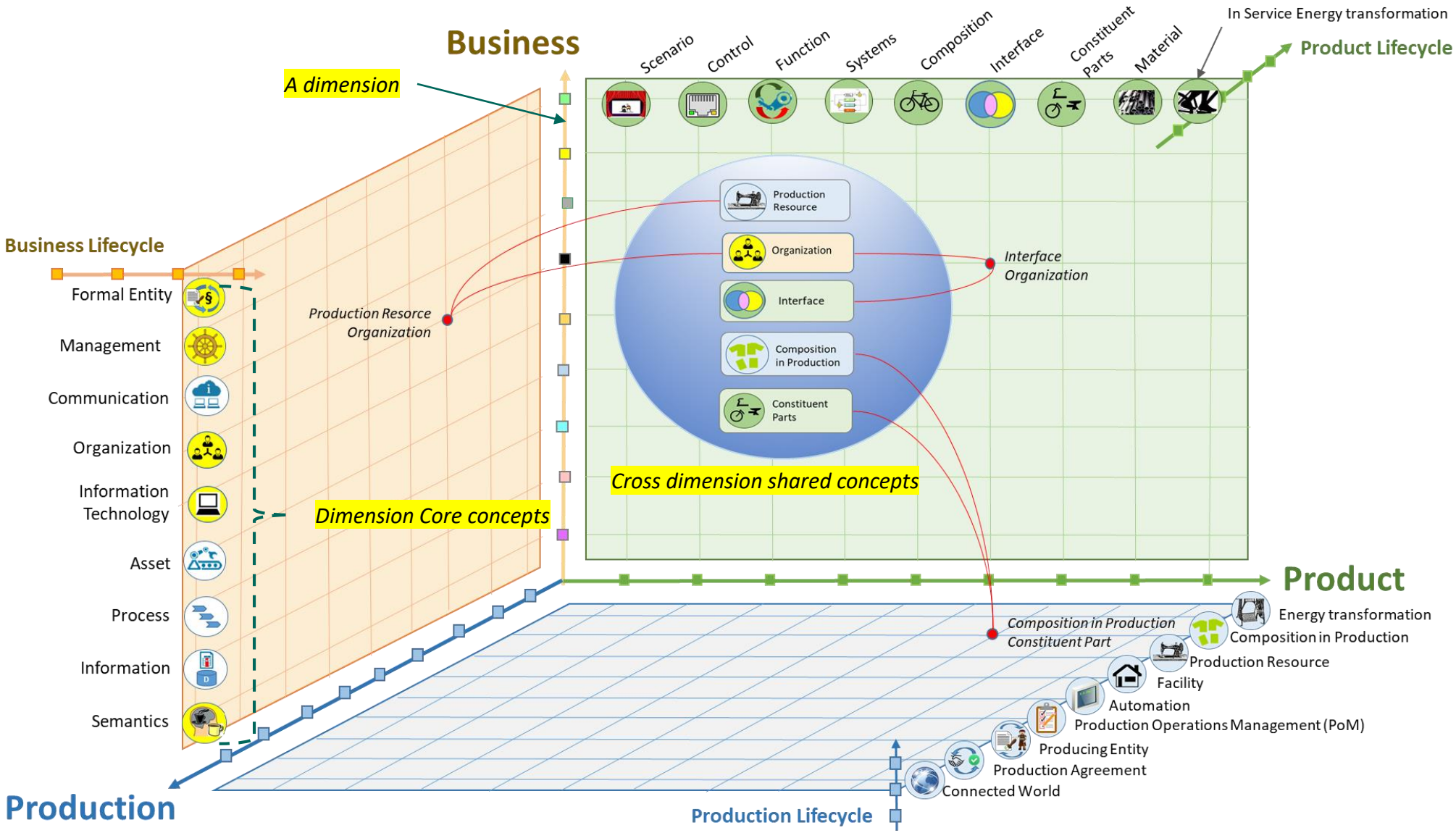
Germany
Industrie 4.0
RAMI



USA/ NIST
SMS Ecosystem



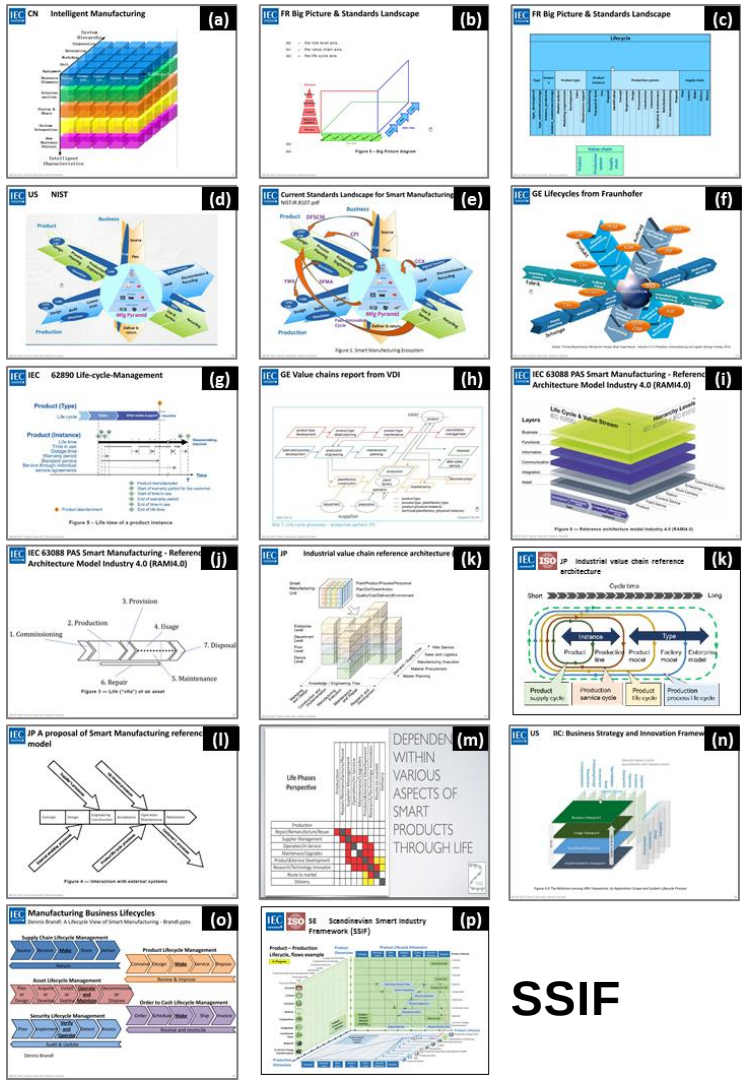
SWEDISH STANDARDS INSTITUTE



The industrial system enabling products trough their life cycle

JWG21 unified reference model for smart industry

Countries JWG21 Input reference models for smart manufacturing



SSIF

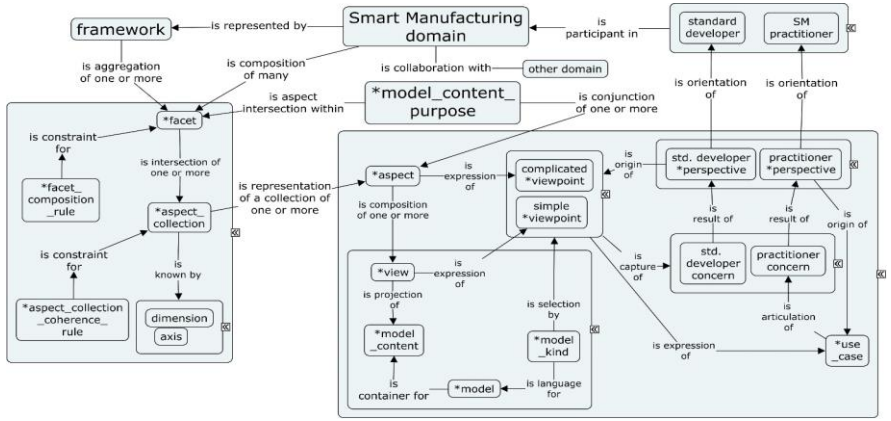
ISO/IEC SMRM

SM Reference System mofel

SM Use Cases

SM Standards

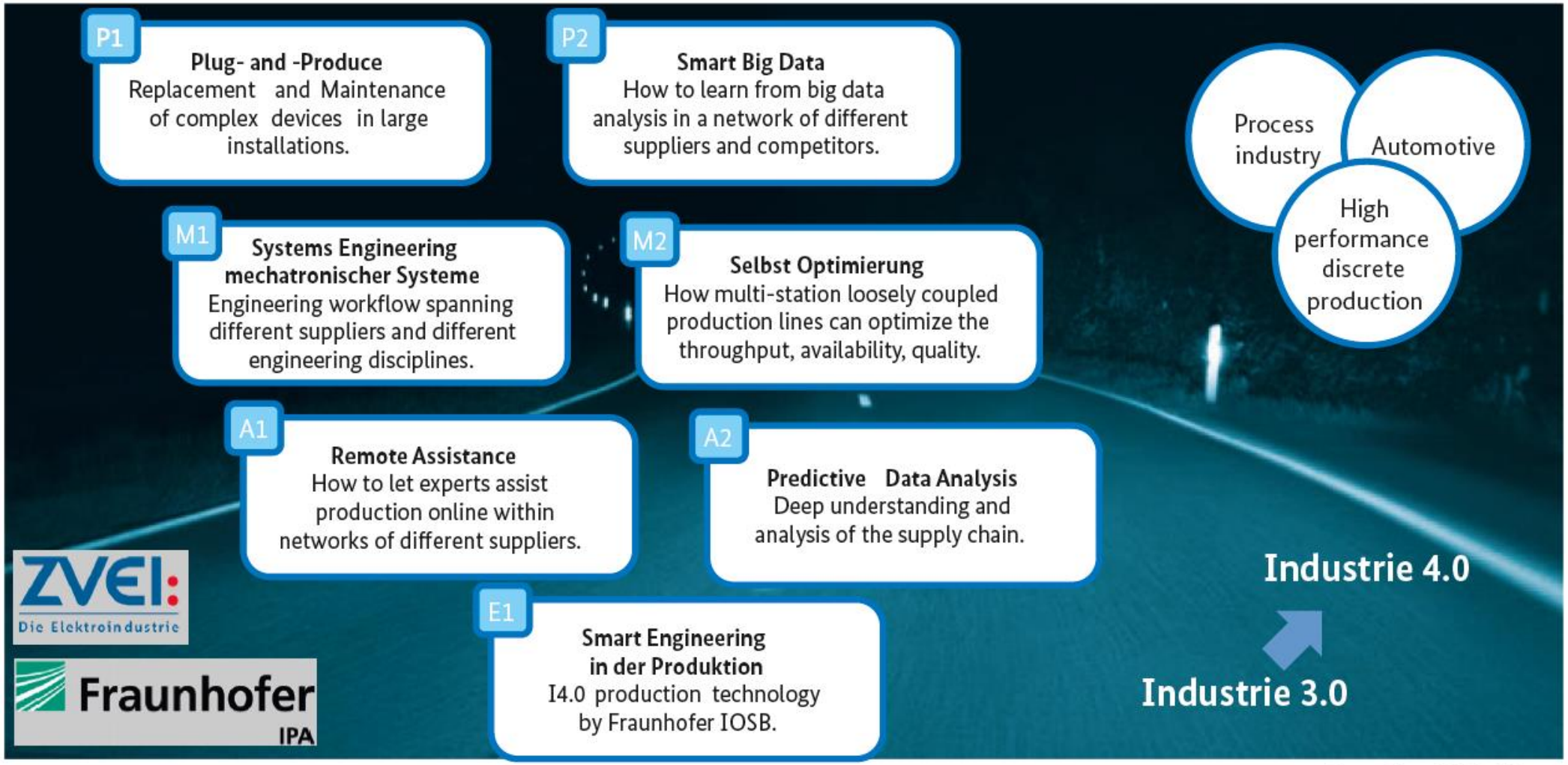
Meta-model for Smart Manufacturing Reference Model (SMRM)



SWEDISH STANDARDS INSTITUTE

Industrie 4.0 high level application scenarios

Ändrad till Ulf



Source: Festo AG & Co. KG

https://www.plattform-i40.de/PI40/Navigation/EN/InPractice/UseCases/use-cases.html

Ny länk

SWEDISH STANDARDS INSTITUTE

Ett svenskt exempel på Use case

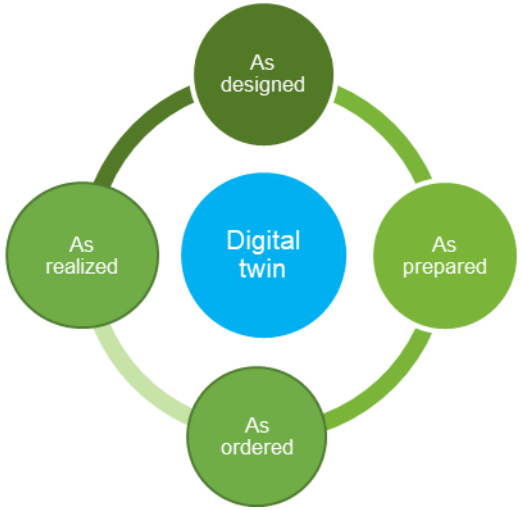
SWEDISH STANDARDS INSTITUTE

Digital Infrastructure for smart Manufacturing (Dig In)

Digital infrastructure - service oriented, based on standardized interfaces.

Digital twin – standardized information model coordinating information through the life cycle.

Demonstrations in Scania Smart Factory Lab.



POWERTRAIN MANUFACTURING FOR HEAVY VEHICLES APPLICATION LAB

June 2017-May 2020

Funded by the Swedish Strategic Innovation Program Produktion2030, a joint venture of VINNOVA, Formas and the Swedish Energy Agency.

PRODUKTION2030

For more information, contact Gunilla Sivard: Gunilla@kth.se

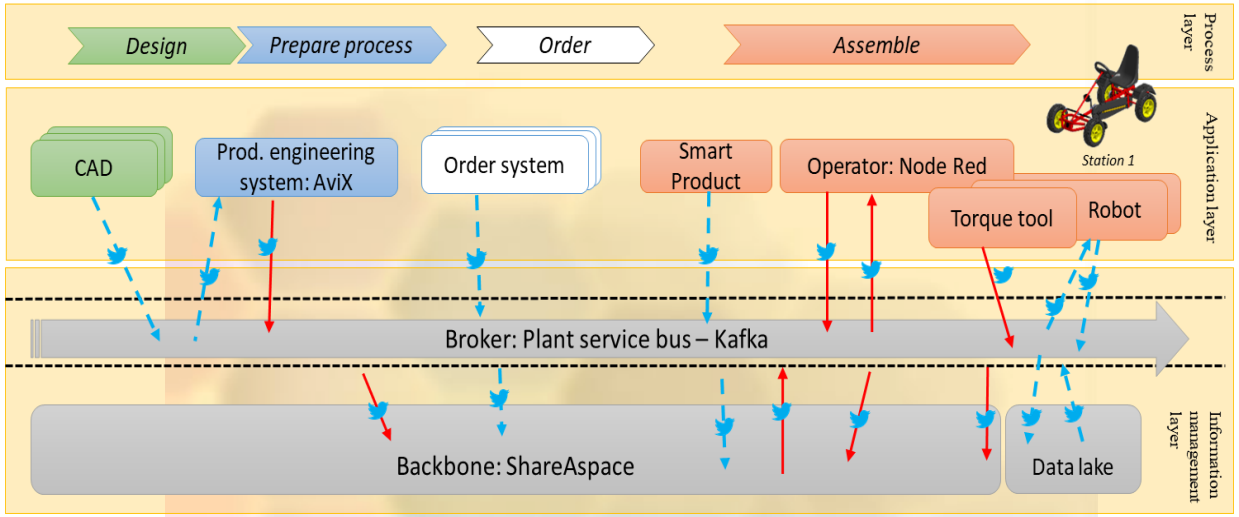
Smart Manufacturing
9 characteristic areas and technologies

1. Automation and automated decision making
2. Distributed system of systems
3. High interconnection between factory floor and digital representation
4. Ability to analyze outcome for improvement
5. Fast, wireless, communication (real time access)
6. Fast computing
7. Digital representations of systems and products with model based engineering
8. High interconnection across domains and life cycle phases
9. Secure access to information

1. Artificial intelligence for decision making, human-robot collaboration
2. Service oriented architectures, cloud computing, interoperability standards
3. Smart sensors, scanning, connection between physical reality and digital model
4. Statistics, machine learning
5. 4G, 5G, 6G, standard communication protocols
6. Cloud computing, Edge computing
7. Digital twins, product models, modeling principles, virtual reality, simulations
8. Lifecycle models, digital thread, model based collaboration methods, information standards
9. Block chains, PLM

DigIn as a use case for smart manufacturing

1. Automation and automated decision making
2. Distributed system of systems
3. High interconnection between factory floor and models
4. Ability to analyze outcome for improvement
5. Fast, wireless, communication (real time access)
6. Fast computing
7. Digital representations of systems and products for model based engineering
8. High interconnection across domains and life cycle phases
9. Secure access to information



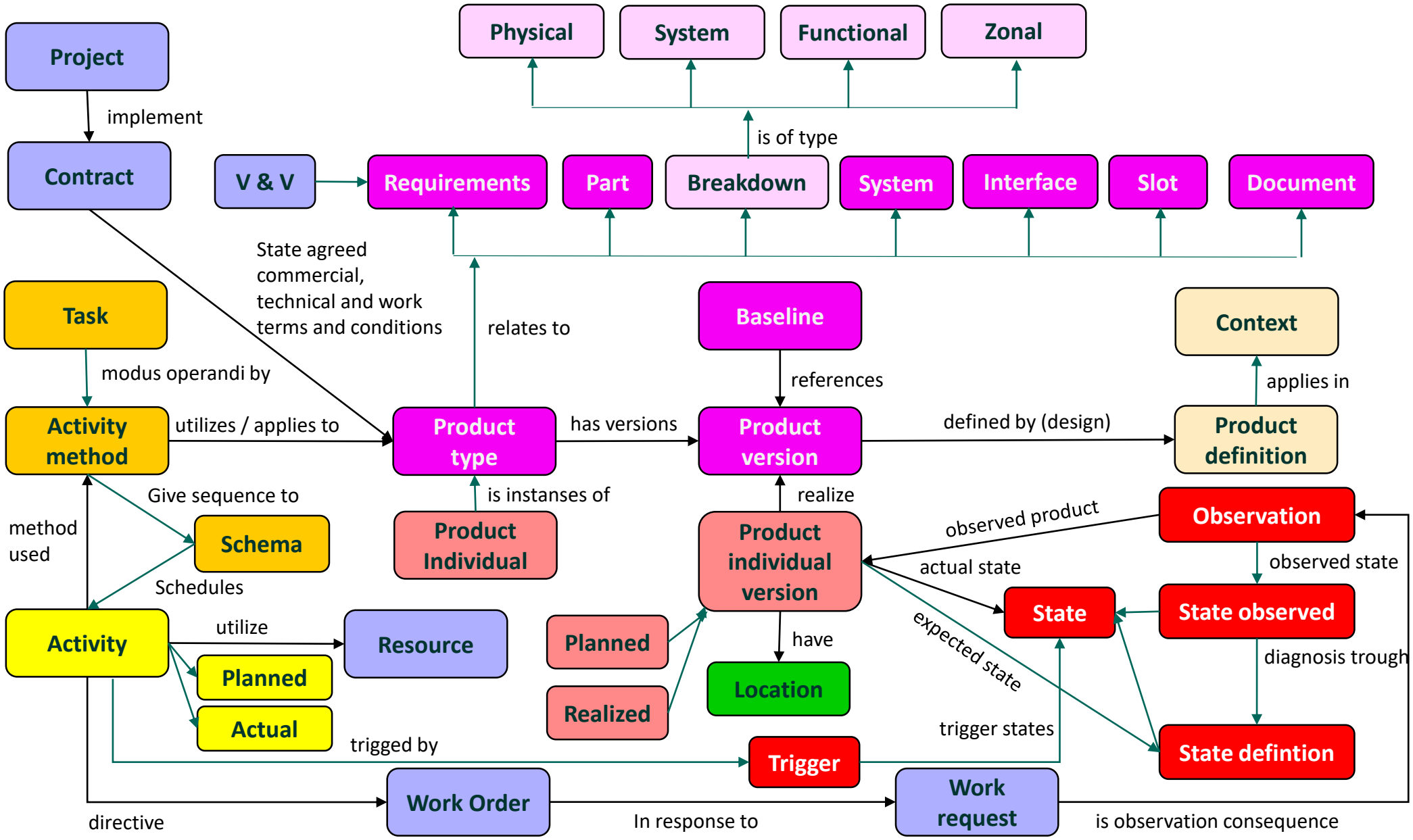
Övningsuppgift Smart Industri SIS/TK280

SWEDISH STANDARDS INSTITUTE

PLCS through life information standard *(ISO10303 AP239)*

PLCS overview concept model, PLCS official concept model http://www.plcs.org/plcslib/plcslib/data/PLCS/concept_model/model_base.html

Product Design
Individual Product
Product Breakdown
Product Description
Status
Activity Specification
Activity Lifeline
Product Environment
Management Process



SWEDISH STANDARDS INSTITUTE

Grupp		Processer som skapar (S) / använder (A) informationen																	
		Sälj och Order	Krav hantering	Uppdragsstyrning (Projekt och Ärenden)	Konfigura tions Ledning	Arkitekur	Simulering / Modellering	System design	Material admininistration	Uh- Design	CAD	Inköp & Supply	Produktions Planering	Produktion	Test och verifiering	Drifts uppföljning	Underhålls planering	Verkstads planering	Miljö/ Skrotning
	Informations kategorier	*Skriv in exempel på programvara som är källa till informationen i de celler som motsvarar de informationskategorier vilka programvaran hanterar*																	
Product Design	**Requirements**																		
	Product type																		
	Part																		
	Baseline																		
	Product version																		
	System																		
	Interface																		
	Slot																		
	Document																		
Individual Product	**Product Individual**																		
	Product individual version																		
	Planned																		
	Realized																		
Product Breakdown	**Physical**																		
	System																		
	Functional																		
	Zonal																		
Product Description	**Context**																		
	Product definition																		
Status	**Observation**																		
	State observed																		
	State defintion																		
	State																		
	Trigger																		
Activity Specification	**Task**																		
	Activity method																		
	Schema																		
Activity Lifeline	**Activity**																		
	Planned																		
	Actual																		
Product Environment	**Location**																		
Management Process	**Project**																		
	Contract																		
	V & V																		
	Resource																		
	Work Order																		
	Work request																		

Configuration Management

Tobias Ljungkvist, Syntell

SWEDISH STANDARDS INSTITUTE