



Creating energy from data

Why do Equinor want to see Object Oriented
Information Exchange in a Standard Format

Agenda

- Some background for increased focus on digitalisation in Equinor
- Digitalisation within Equinor
- Focus on Standardisation
- Use of object oriented information exchange

WTI Crude Oil Historical Price Chart

Low oil price

The low oil price in 2016 showed that the investment and operational cost have become too high.

We had to look for more efficient ways of executing CAPEX projects.

And decrease OPEX.



Note: West Texas Intermediate (WTI) Crude Oil, prices in USD per barrel (bbl). Daily prices.

CAPEX = Capital Investment Project expenditures

OPEX = Operational expenditures

Cost of Technical information

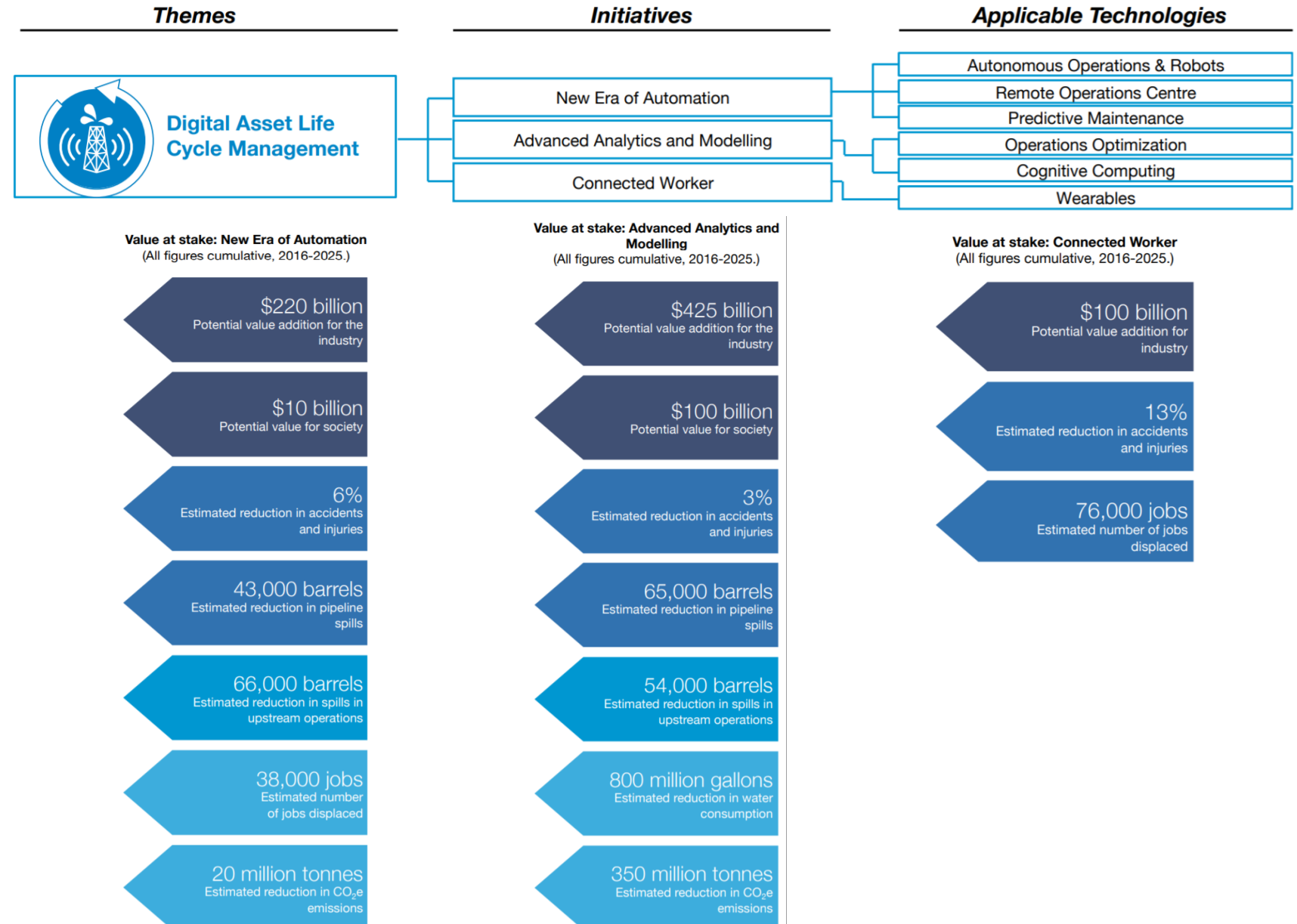
One arising area of concern was the cost of technical information in O&G business

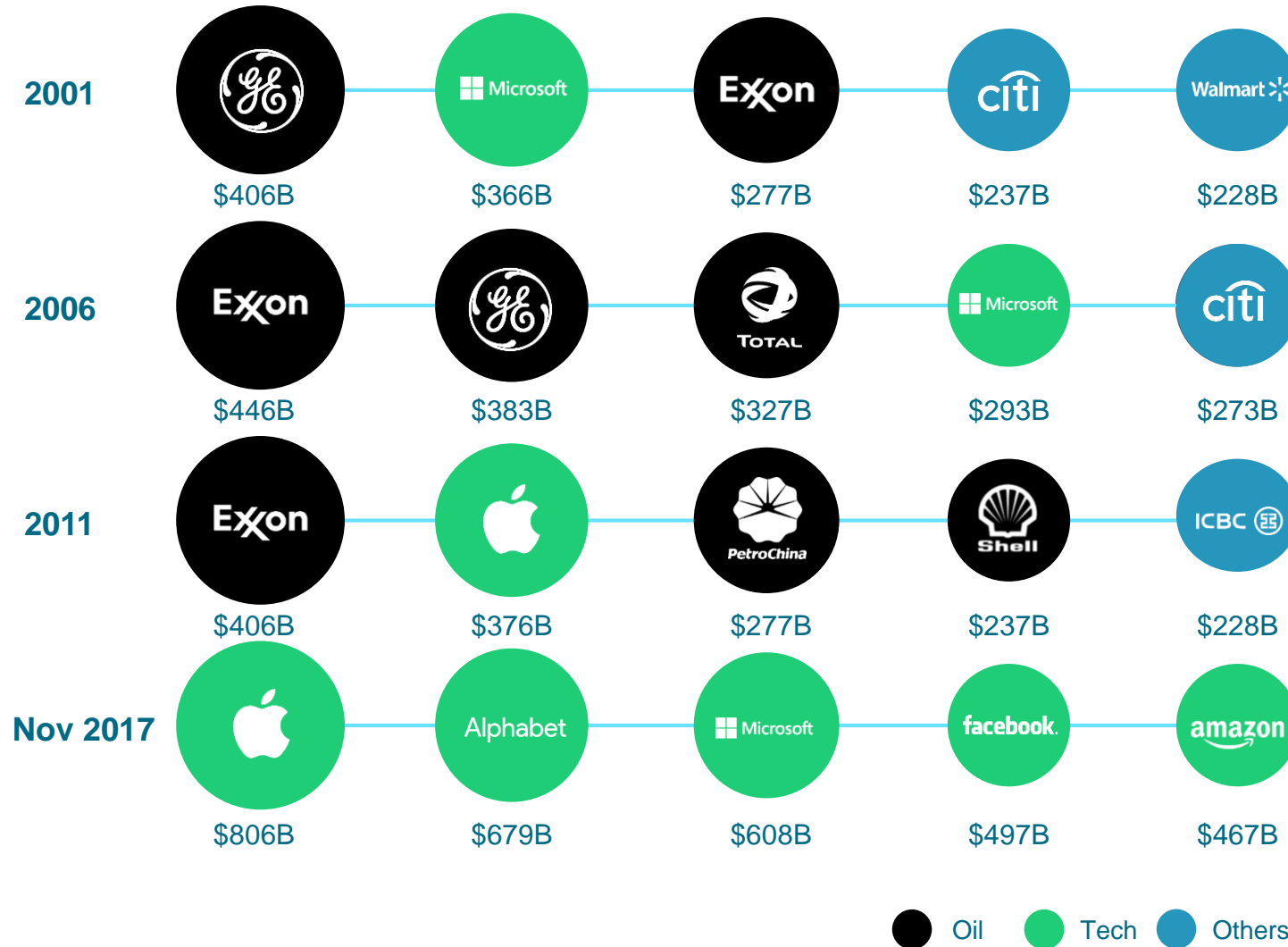


Figur 2-2: Totalkostnad ved produksjon av enkeltkomponenter til nybygg for operatør og andre aktører dekomponert til hhv. dokumentasjonskostnader og øvrige produksjonskostnader. Kostnaden for leveranse til andre aktører er normalisert til 100.



Estimated savings in the Oil and Gas Industry by digitalisation





Mastery of data and technology has led to the most rapid shift in economic models ever experienced by humanity.

Digitalisation drives the next wave of improvements

Safety and sustainability strengthened through
leveraging digital technologies

Digitalisation & innovation
Potential

Value creation producing fields

Above **2** bn USD

Automated drilling – cost
Around

-15%

Field of the future – capex
Around

-30%

Integrated remote operations US Onshore

Around **500** million USD
Added value

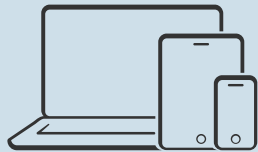


A new era

The world's most
valuable resource
is no longer oil,
but data

The Economist in 2017

At Equinor,
digital opportunity is driven by
three technological enablers



Process
digitalisation

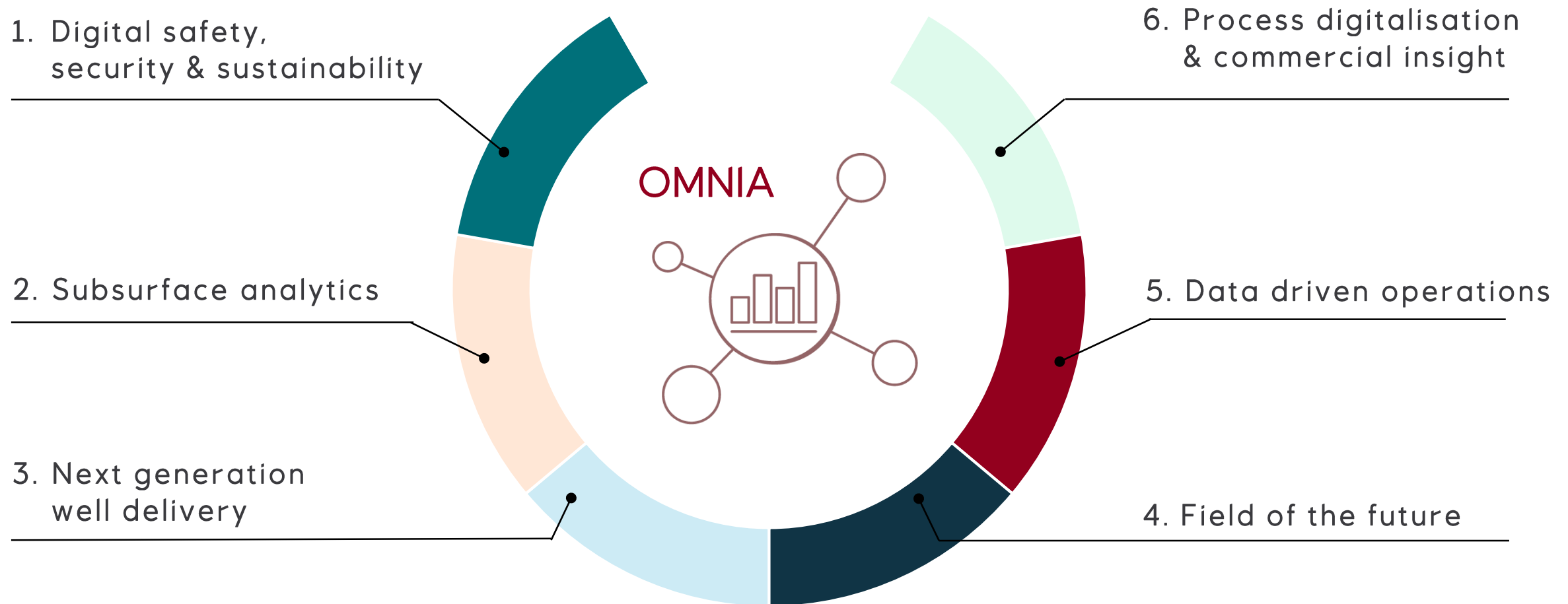


Data science and
analytics

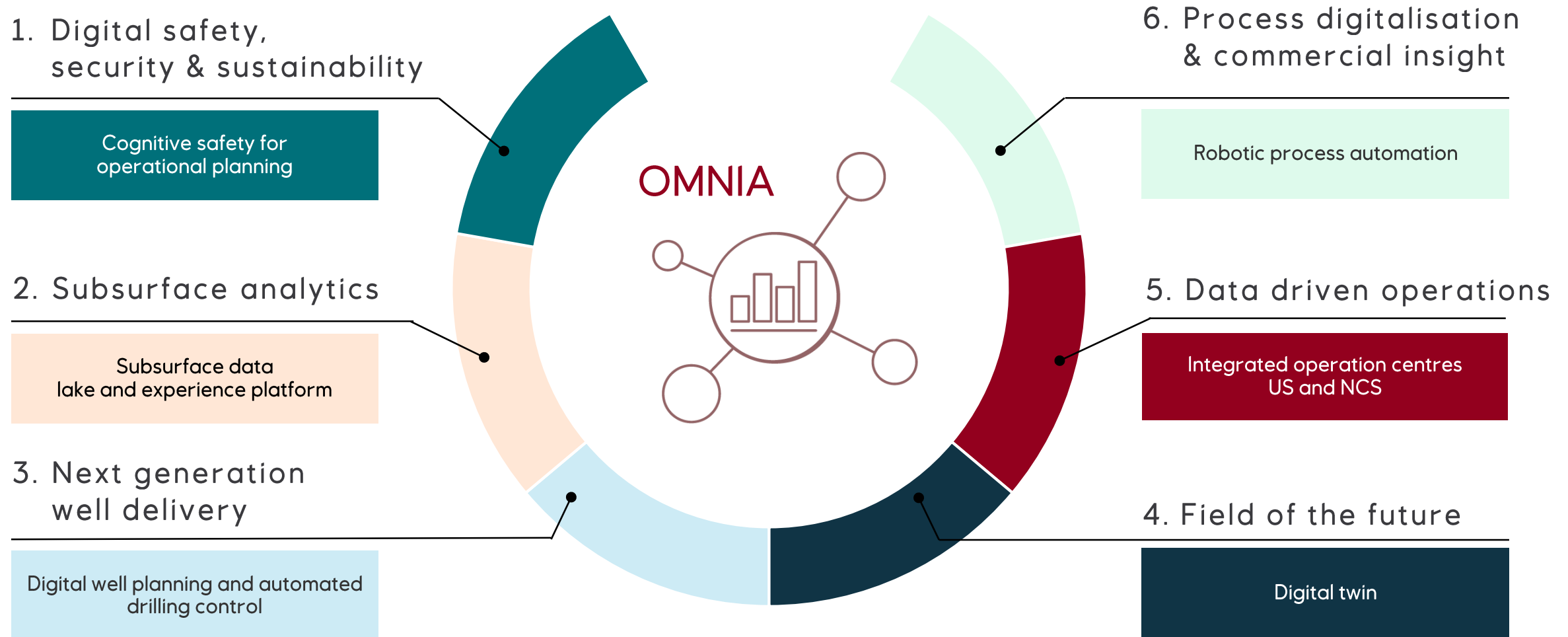


Robotics and remote
control

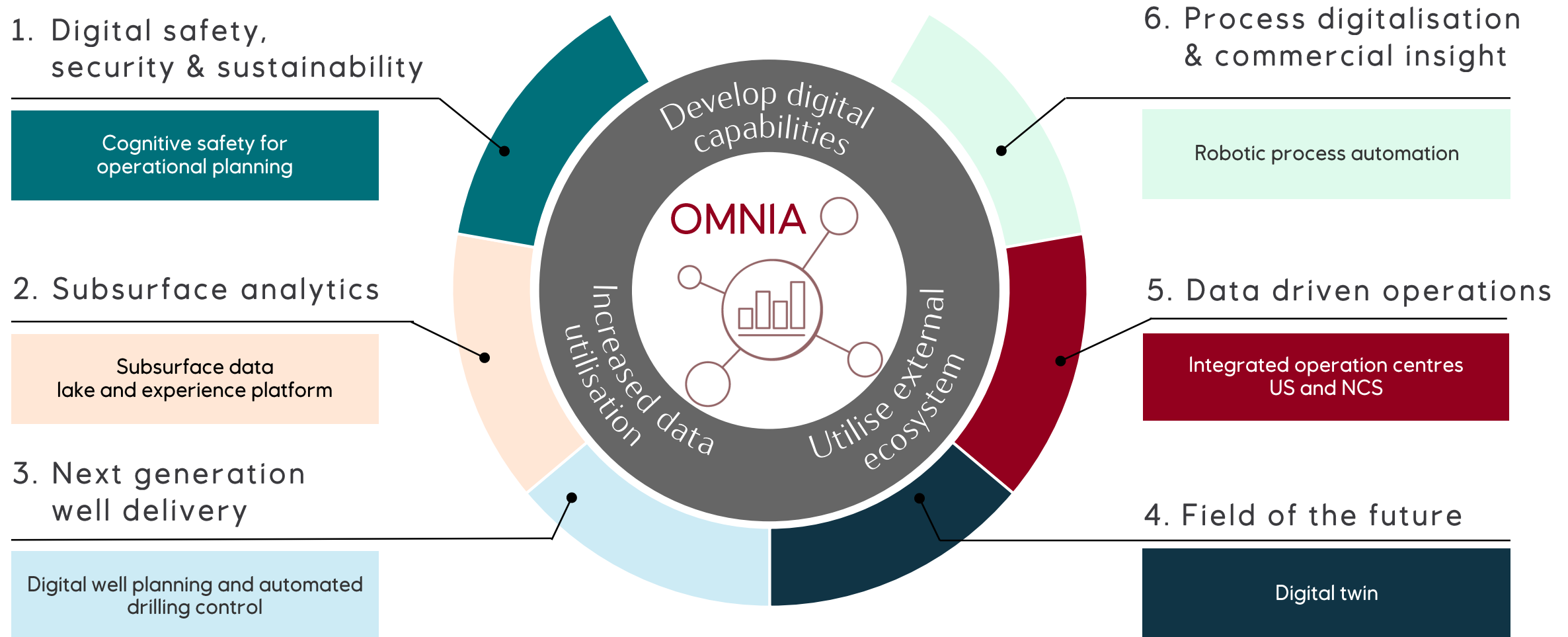
A roadmap to accelerate our development



A roadmap to accelerate our development

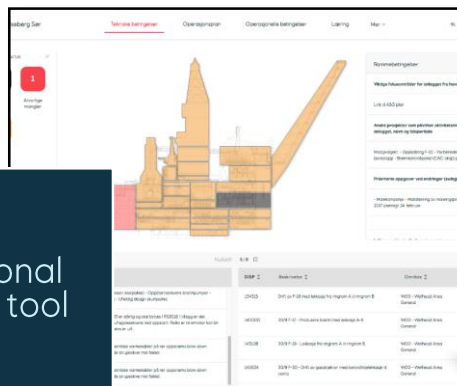


A roadmap to accelerate our development



Projects are already being delivered

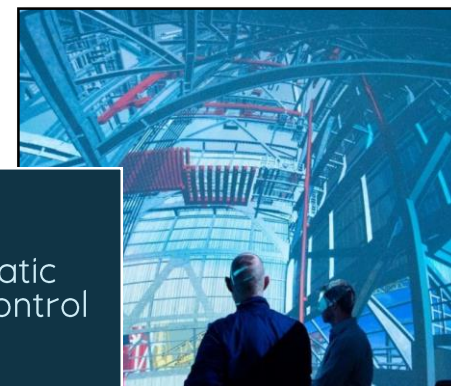
Operational planning tool



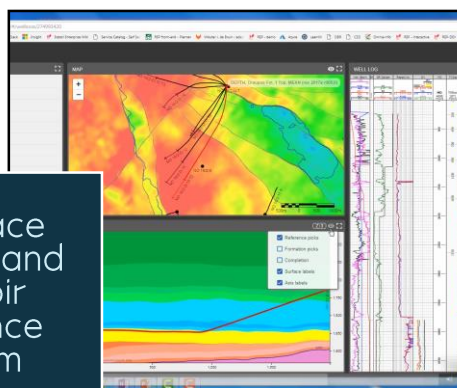
Digital twin v1.0



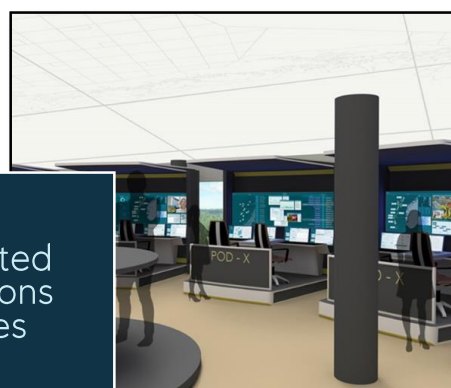
Automatic drilling control



Subsurface data lake and reservoir experience platform



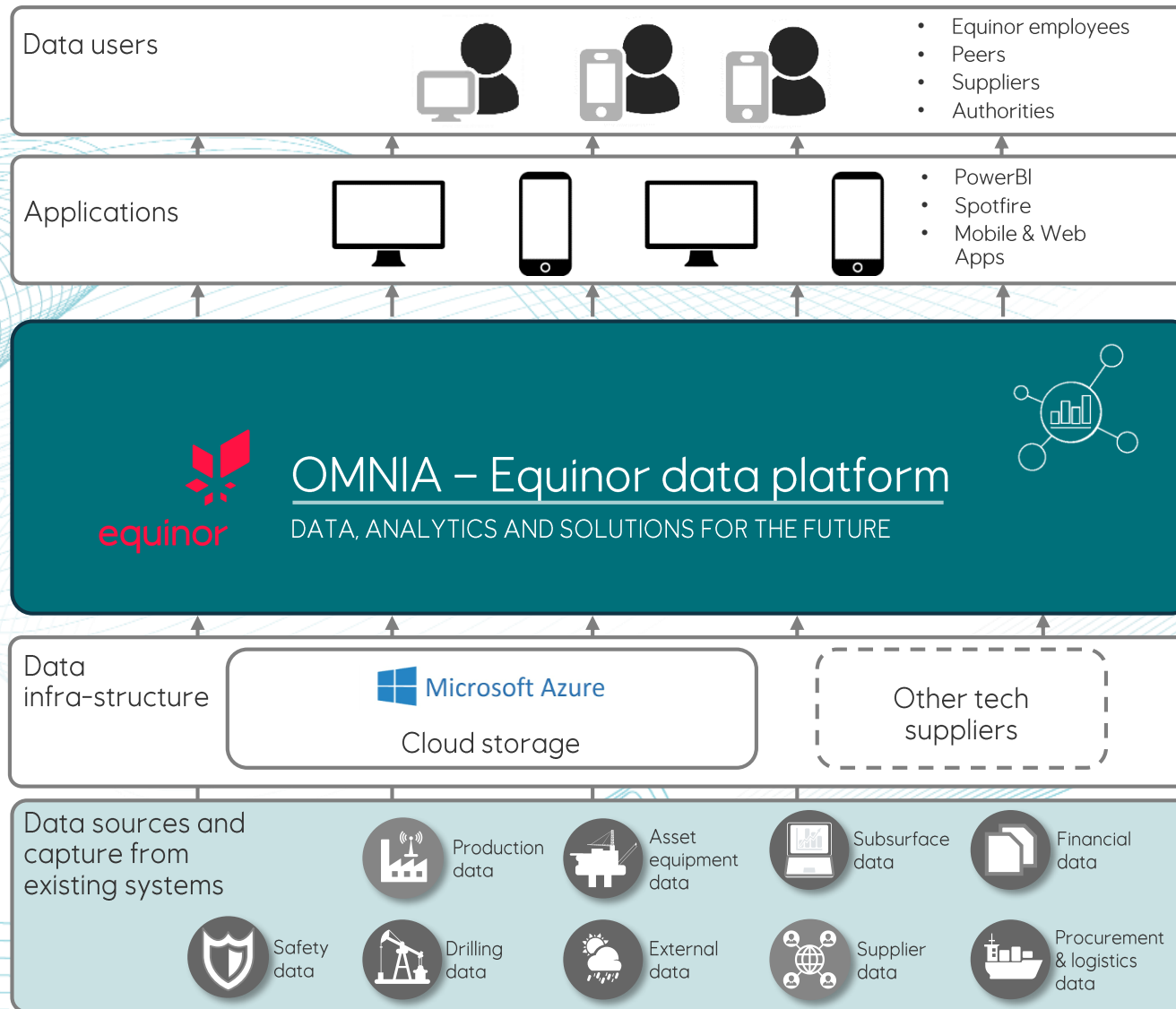
Integrated operations centres



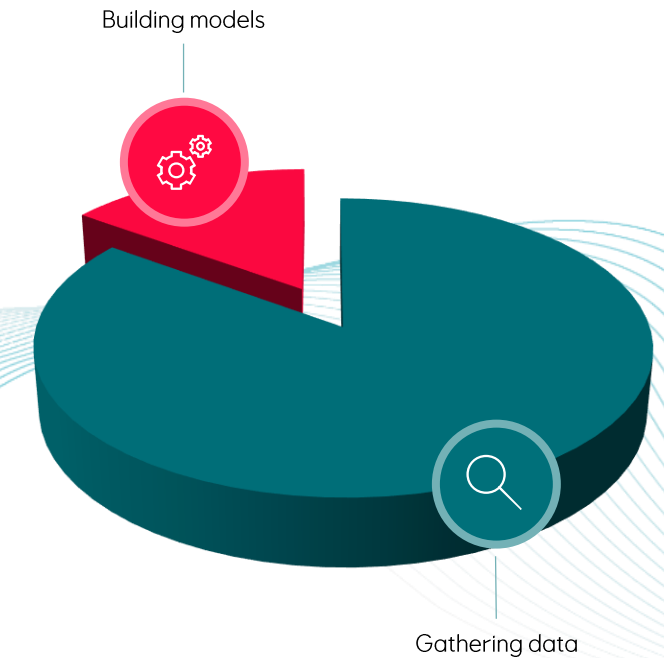
Digital field worker



Developing Equinor's data platform



Time spent looking for data



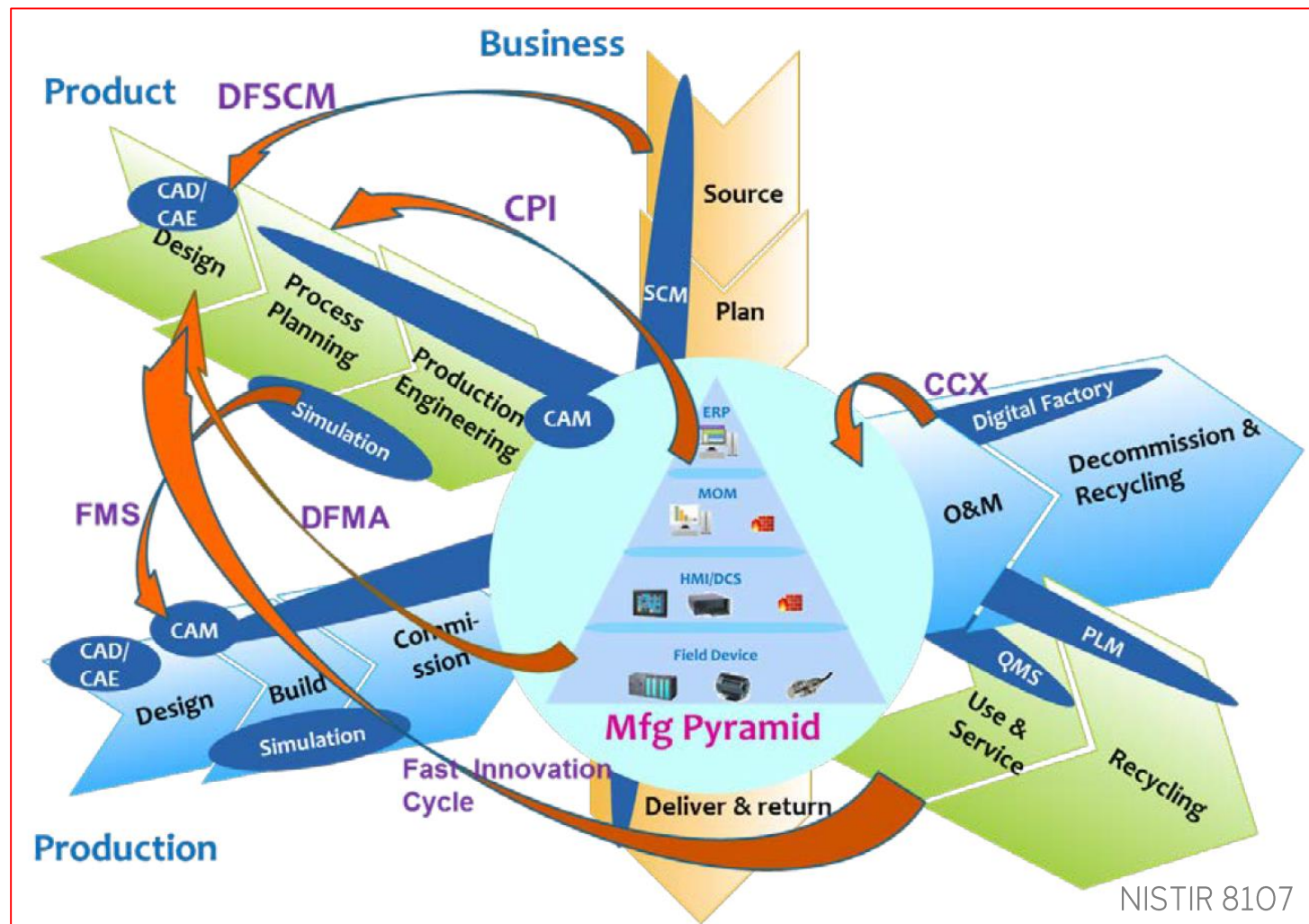
NISTIR 8107

Current Standards Landscape for Smart Manufacturing Systems

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NIST
National Institute of
Standards and Technology
U.S. Department of Commerce



NISTIR 8107

product
production
business

Manufacturing
pyramid

2.2 SMART MANUFACTURING ECOSYSTEM

The Smart Manufacturing Ecosystem encompasses a broad scope of systems in the manufacturing business including production, management, design, and engineering functions. Figure 1 illustrates three dimensions of concern that are manifest in SMS. Each dimension—product (green), production system (blue), and business (orange)—is shown within its own lifecycle. The product lifecycle is concerned with the information flows and controls beginning at the early product design stage and continuing through to the end-of-life of the product. The production system lifecycle focuses on the design, deployment, operation and decommissioning of an entire production facility including its systems. The business cycle addresses the functions of supplier and customer interactions. Each of these dimensions comes into play in the vertical integration of machines, plants, and enterprise systems in what we call the Manufacturing Pyramid (Figure 5). The integration of manufacturing software applications along each dimension helps to enable advanced controls at the shop floor and optimal decision-making at the plant and enterprise. The combination of these perspectives and the systems that support them make up the ecosystem for manufacturing software systems. Details of the lifecycle of the three dimensions, as well as the Manufacturing Pyramid, will be described in Section 3.

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Production - thread of design data, ending up as our Digital Twin

Production System Model Data & Practice

- ISO 10303 – 214, 221, 225, 227, ISO 16739 (IFC), ISO 18629 (PSL),
- IEC 62832 (Digital factory), IEC 62794, IEC 62237
- IEC 62424 (CAEX), ISO 17506 (COLLADA), PLC Open XML

Production System Engineering

- SysML, Modelica
- IEC 61011, 61499, 61804 -2, 62337
- IEC 61508, 61511, ISO 13849
- IEC 62714 (AutomationML)
- IEC 62453 (FDT), IEC 61804 (EDDL)



A digital twin is a virtual representation of the asset used from early design through building and operation. The digital representation provides both the elements and the dynamics of how a physical device or an asset operates. A digital twin can be seen as a bridge between the physical and digital world.

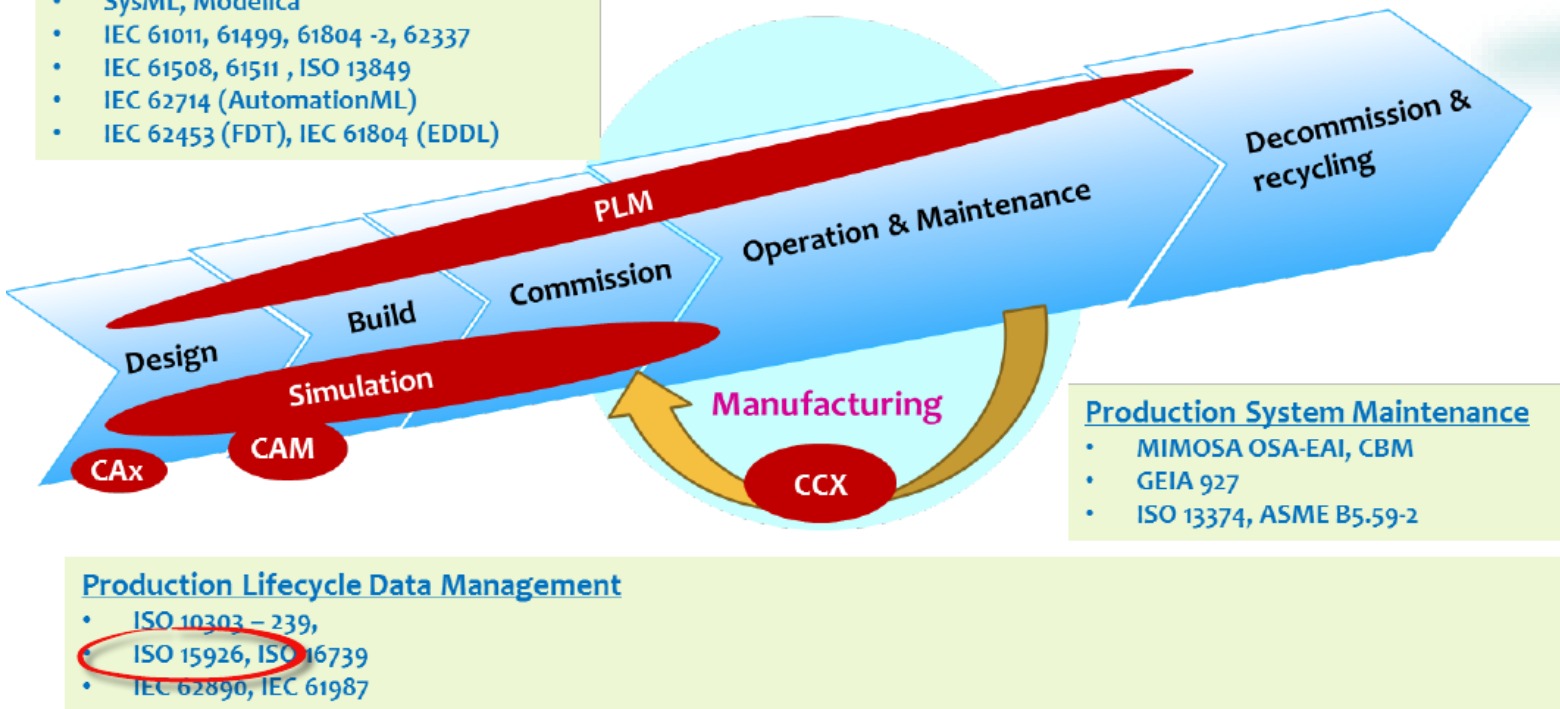
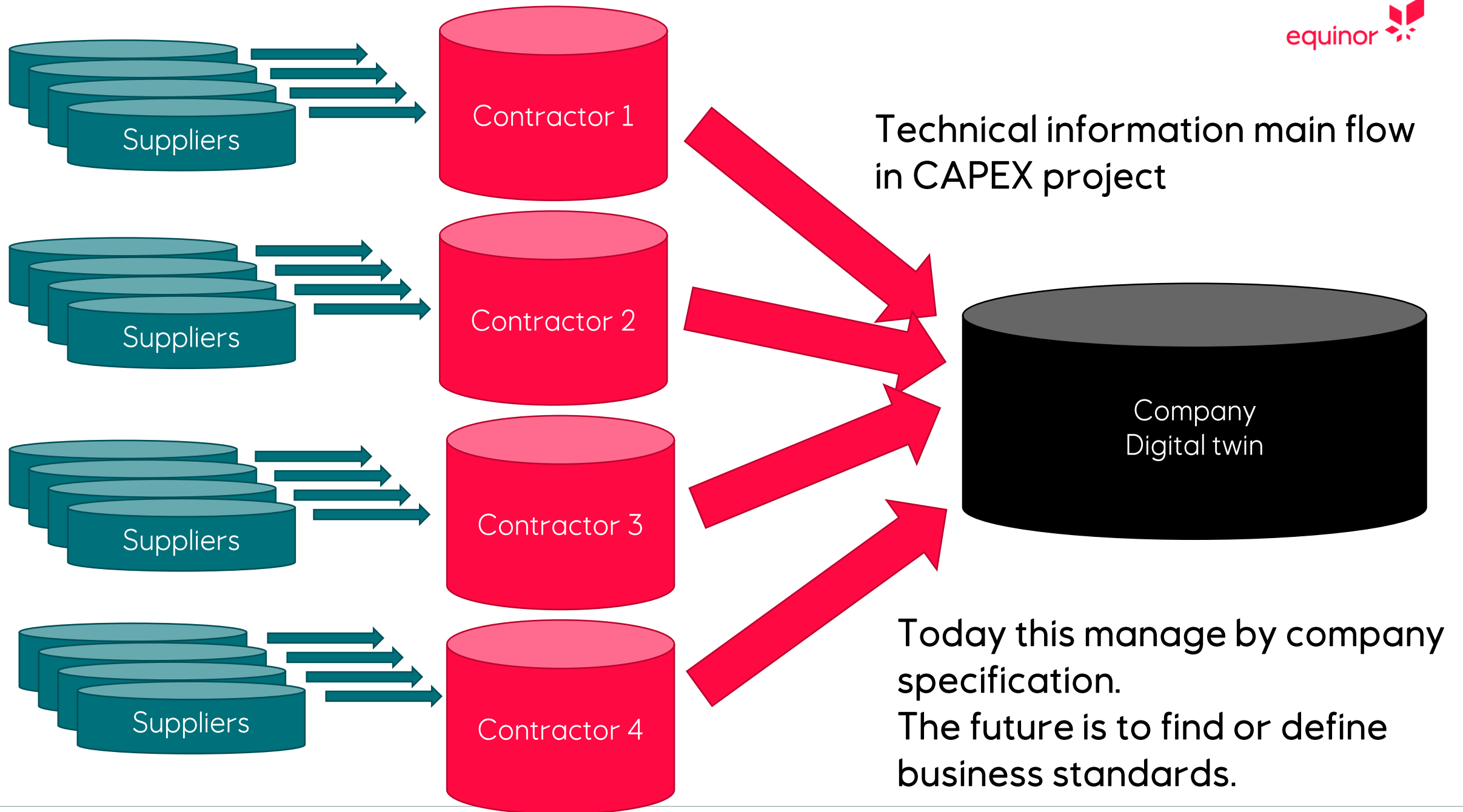
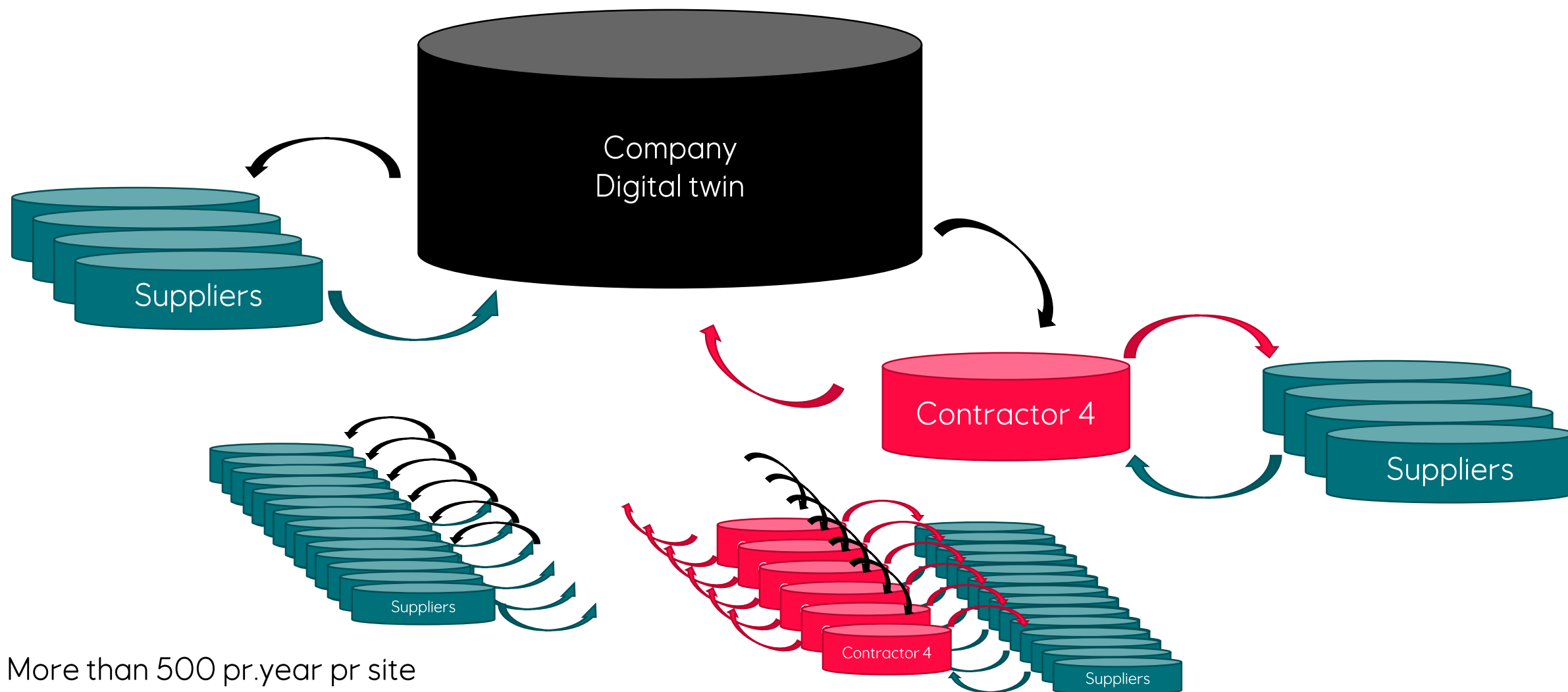


Figure 3. Standards for Production System Lifecycle NISTIR 8107

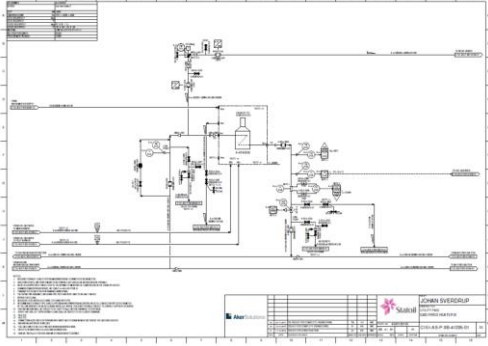


Technical information main flow in OPEX project Extensions, Repairs and modification projects



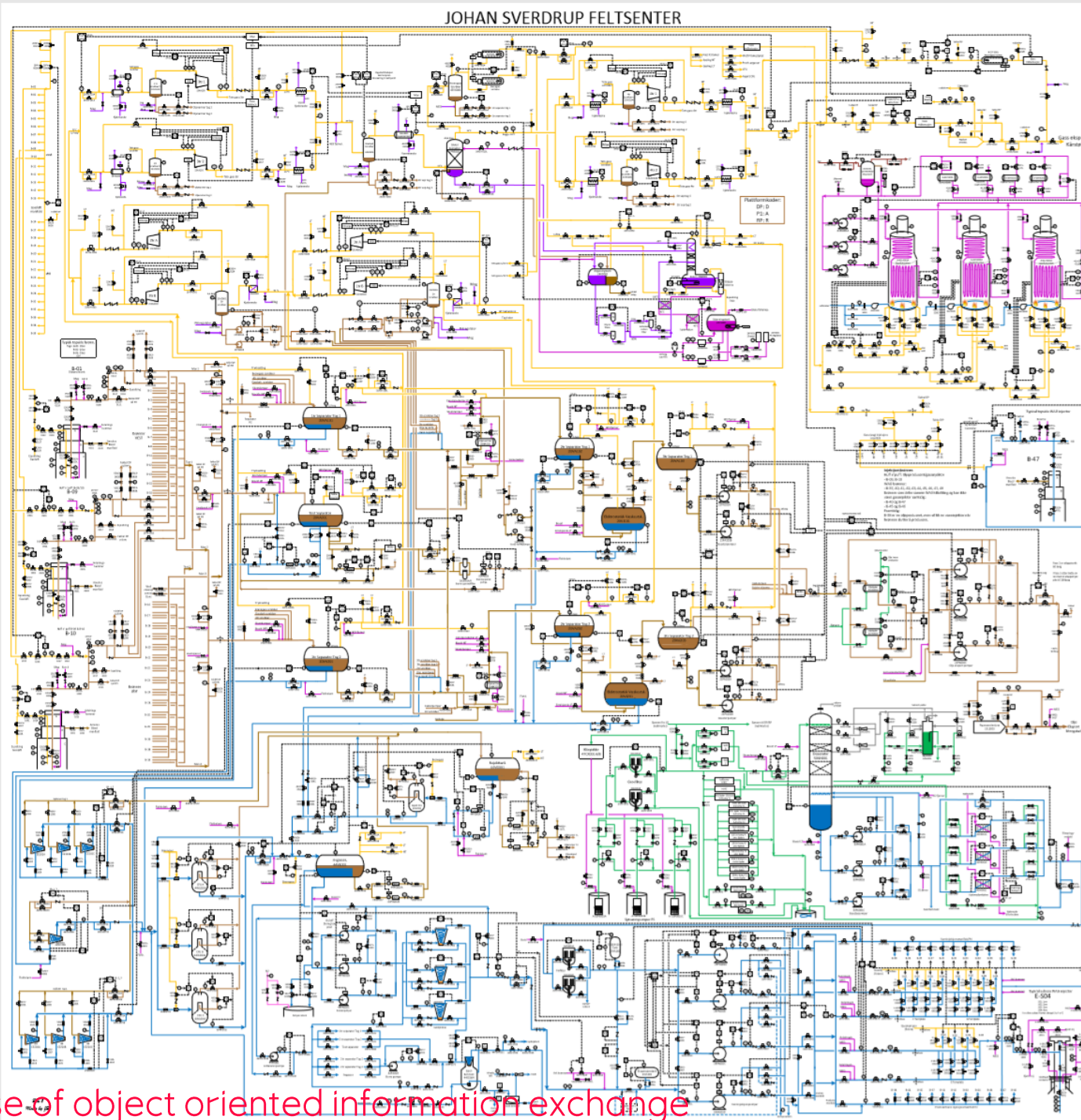
More than 500 pr.year pr site

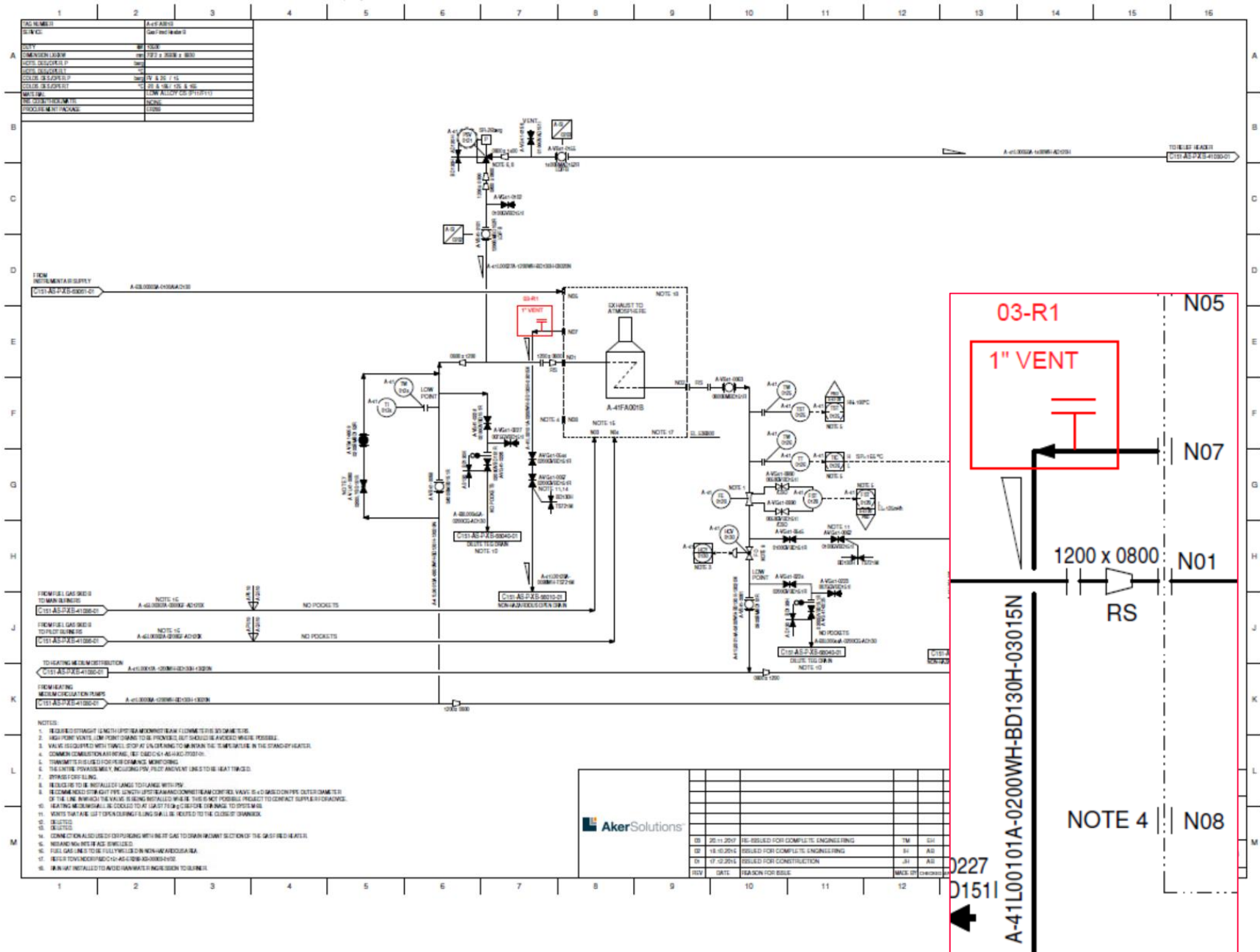
The Production process for Johan Sverdrup



1743 diagrams

Identifying over 96 000 physical objects

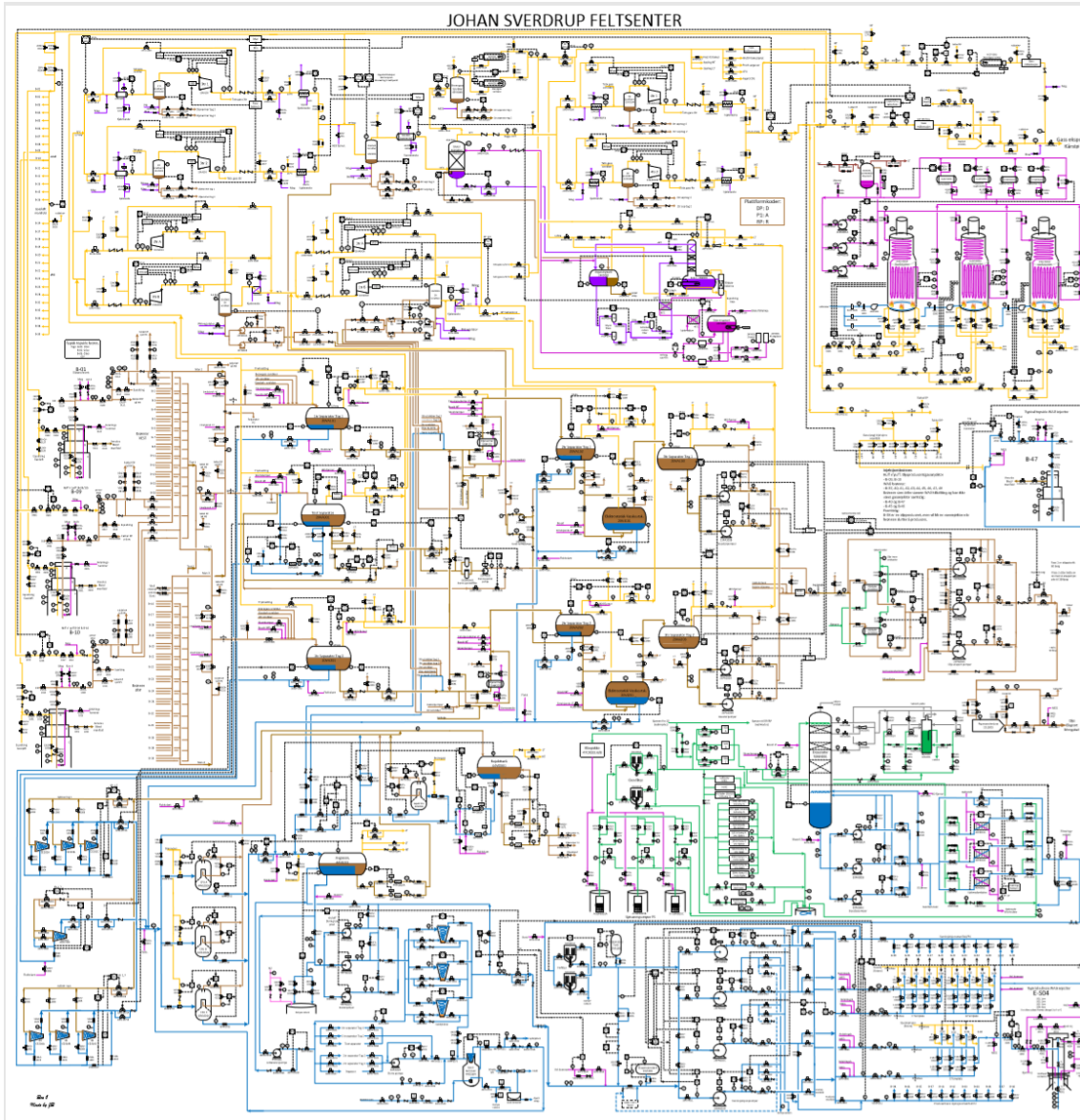




From Document
centric to Object
centric



Capture objects
and manage
information
object by object



Digital twin in the future:

All objects in a «Asset world map». The world map is described by several different informations models. Each seen as an separate aspect where the object sits.

Each object has its own lifecycle



No drawings only different views of collections of objects.

Why do Equinor want to see Object Oriented Information Exchange in a Standard Format

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