Enabling step-change

For managers: About the interoperability standard for process plants ISO 15926, and the data handover standard CFIHOS based on it.

ISO 15926 & CFIHOS

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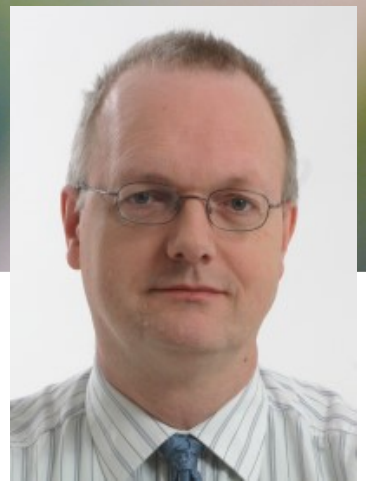


Purpose

- Interoperability using standards:
  - For data integration
    - **ISO 15926**
  - For data handover from Engineering contractor to Owner/Operator
    - **CFIHOS**

      (Capital Facilities Information Handover Spec)
- Purpose:
  - Decrease risk by higher data quality and save cost.

ISO 15926 – what is it?

- International standard, ISO TC184-SC4 WG3 (industrial data related to discrete products);
- Neutral layer used for data integration;
- Federation of databases – Semantic Web technology;
- Interoperability standard;
- Interoperability meaning:
  "the ability of different types of computers, networks, operating systems, and applications to work together effectively, without prior communication, in order to exchange information in a useful and meaningful manner".

What is in ISO 15926?

- Reference data library (RDL)
  - = A central online database
  - http://data.posccaesar.org/rdl
  - And also a work-in-progress data
  - http://data.15926.org/rdl

- Data integration and interoperability methodology
  - Open source software http://15926.tools

Why did we need ISO 15926?

- **Shell** said:
  - We need a data model that can withstand the changes of the times. A process plant can be running for a period up to 50 years while software typically is changing every 2 years.
- **BP** said:
  - A system of systems must interoperate through major projects and operations
  - Reference data is critical, but does not deliver interoperability alone
  - Standard connectors are required to deliver interoperability
  - Commercially available 'interoperability' solutions depend on fragile, expensive and proprietary integration

What is the scope of ISO 15926?

- ISO 15926 is targeted for data on process plants.
  - This is the whole spectrum.
  - The life cycle from FEED, Engineering, Procurement, Construction to operations/maintenance
  - Target is all kinds of process plants (not all implemented)
  - Data about equipment, but also purchase orders, schedule and milestones, etc.

How big is it? And how are changes supported?

- The POSC Caesar library had 11,000 core classes for a long time.
- There is a team called MRAIL (Major RDL Action Items List) lead by POSC Caesar, expanding it. Now 20,000 classes including those of CFIHOS and DEXPI.
- Support will continue to go through this team, through change requests.

What does it take to use ISO 15926?

- Make sure that each and every software application gets an ISO 15926 adapter that can export its generated information in the ISO 15926 format and can import data, generated by others, for its internal reference. That doesn't come free but is worth the effort.

- It is like learning one of the world languages, like English, so that you can communicate with others who master the same language. But unlike the situation with natural languages, in this case there is only one: ISO 15926, no matter what IT gurus (often with commercial ties) may tell you.

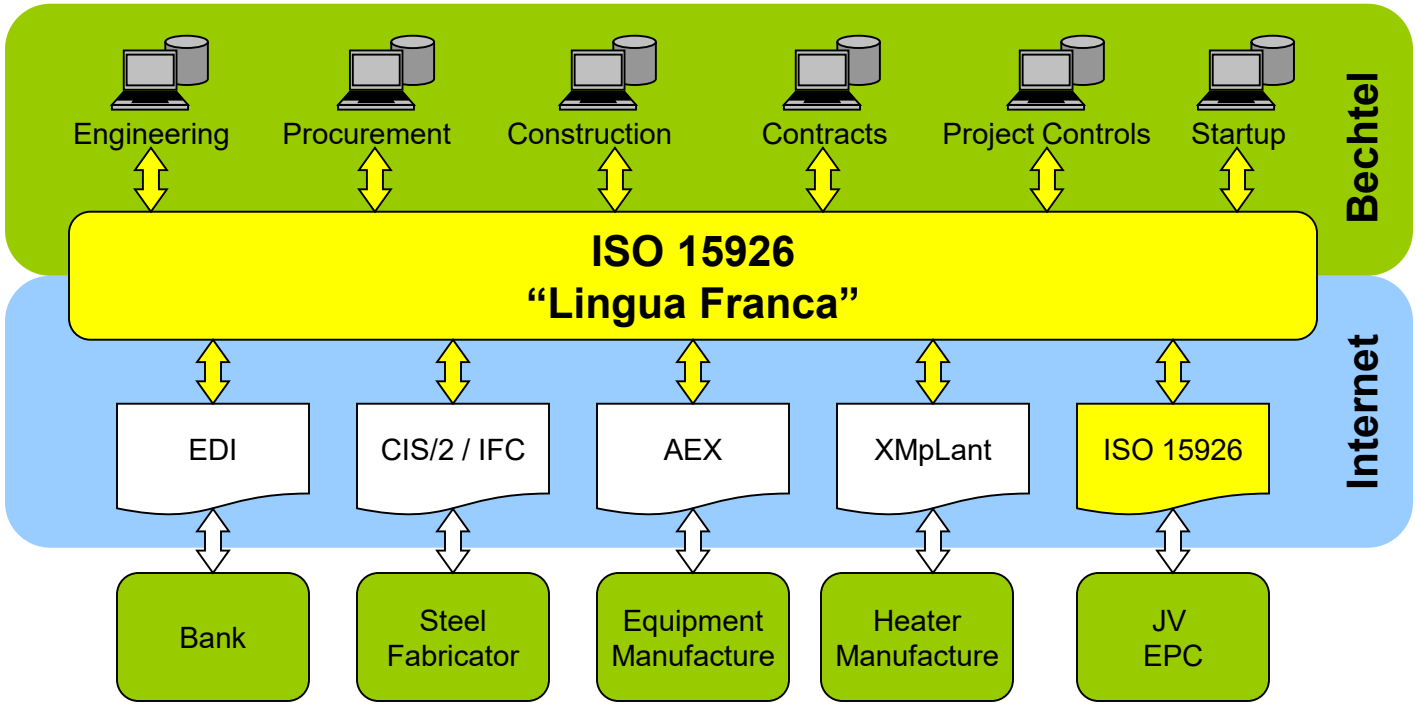
Are your current systems obsolete?

- By no means! These are as useful as always. ISO 15926 is not intended to replace any system. It is exclusively intended for data management, providing a neutral layer of information in an ISO-standard format to which your systems can upload information to and download information from.

- Any source applications uploads to the central information repository, any destination application downloads from that repository.

What is ISO 15926's goal?

- To be the lingua franca (trade language) between engineering computer systems



Implementation examples ISO 15926?

- Bechtel – Large internal development project, include subcontractors like Emerson, etc
- Fluor – Large, ongoing internal development project
- DEXPI (Data Exchange in the Process Industry) – BASF, Bayer, Evonik, Equinor, Covestro, Autodesk, AVEVA, Bentley, Hexagon, Siemens, X-Visual, PTC and eVision
- South Korea – Universities and research institutes working for the Nuclear Power industry

Development projects ISO 15926?

- Early use of ISO 15926 for data warehouses for information handover between EPCs and Owners/Operators (BP and Shell – ETAP 1996, Statoil – Åsgard 1997, Chevon, Total, etc. etc.)
- SHAREcat and Phusion (Pearson-Harper) – Technical information
- Engineering software (AVEVA, Bentley, Intergraph, Siemens etc.)
- MIMOSA – ISDD, ongoing project
- XMpLant- simplified plant modelling -> DEXPI (started by Noumenon)
- CFIHOS (Capital Facilities Information HandOver Specification), ongoing project lead by IOGP

Isn't ISO 15926 too complex?

- Yes it is complex. Engineering is complex and basing off a generic data model is complex.
- It has become much mature and every step held simplifications too. It is less complex now.
- Look at the methodology only if you're a programmer or a modeler. Engineers and super users have software to deal with it.

Step change

- No Model
  - There is no fixed data model other than the basis generic data model; any information type can be added later, on the fly. It is possible, though, to build modules for re-use.

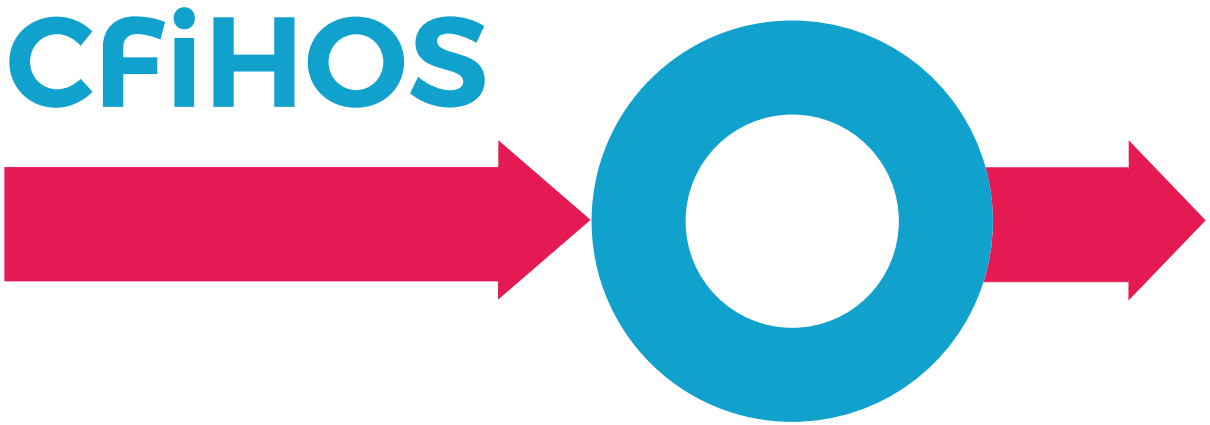
- How can you start?
  - When you consider yourself as a visionary manager: start a small Proof of Concept project and get in touch for help (no strings attached).

CFIHOS

Capital Facilities Information Handover Spec.

CFIHOS – what lead to the decision to start this?

- To create a standard for EPC contractor data handover
- The project:
  - The Shell Engineering Information Specification (EIS) Design and Engineering Practice was based on the EPISTLE handover guide, and approved as a Shell standard in 2004. It has undergone 3 revision, and has been used in 60+ projects and 10+ assets.
  - It was handed to USPI as seed standard for CFIHOS in 2012. The first version was approved for use in June 2014, version 1.4 was released in 2019.
  - Leadership over CFIHOS went over to IOGP

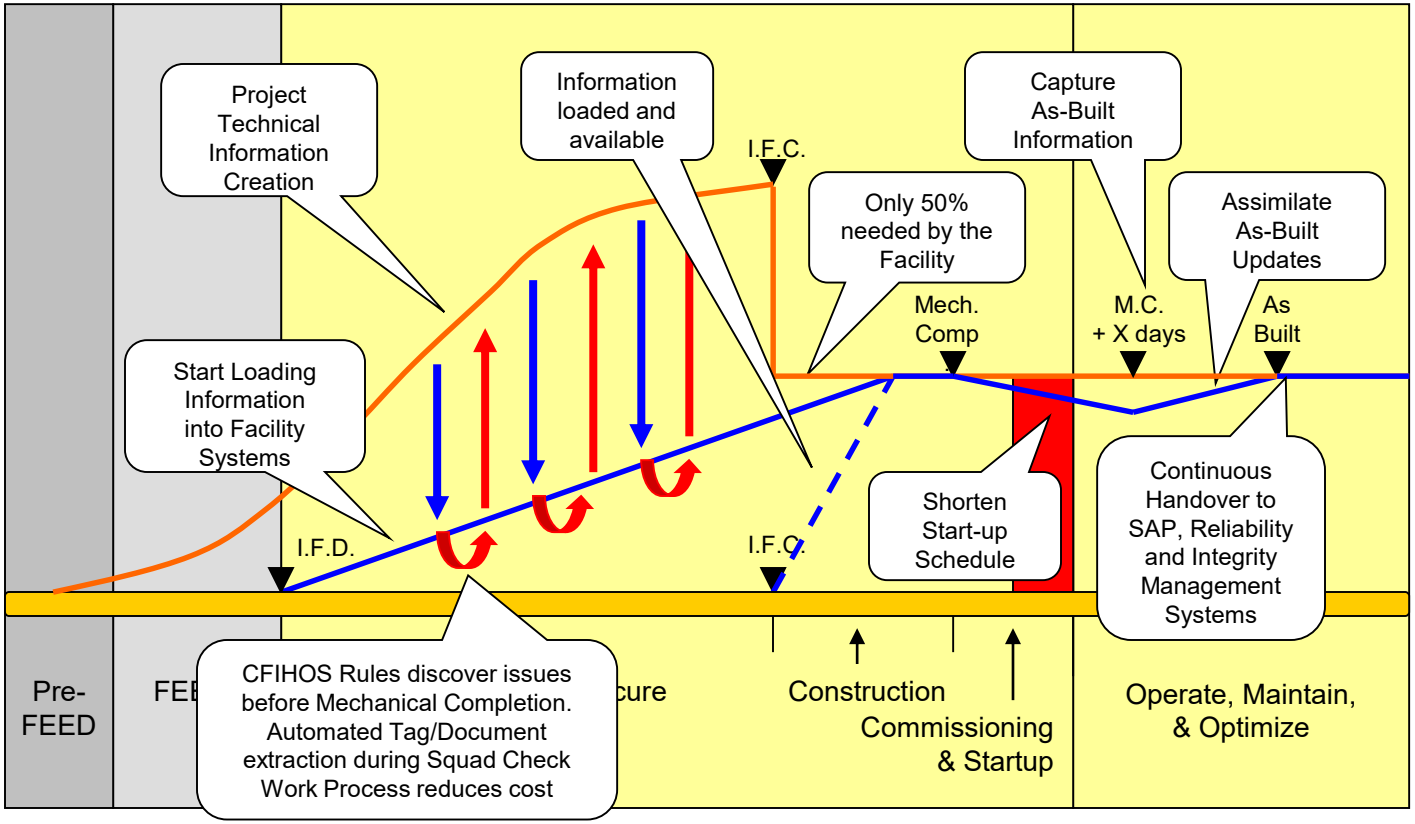


- Accenture
- Aker Solutions
- ASSAI, Software supplier
- Aucotec
- Autodesk GmbH
- AVEVA, Software supplier, UK
- Bechtel Corporation
- Bentley Systems Software supplier, UK
- BHGE, ITA
- BlueCielo, Software supplier, NL
- BP, Oil & Gas, UK
- CB&I
- Cenovus
- Chevron, Oil & Gas, UK/USA
- Covestro Deutschland AG
- Cure Maintenance Consultants, NL
- Dassault Systèmes
- Datum360, UK
- DMS Corporation
- DPS
- Eastman Chemical Company
- Evonik
- Equinor (Statoil)
- ExxonMobil, Oil & Gas, USA
- Fluor
- FNVI Limited
- Fujitsu Engineering Technologies
- Hexagon PPM, Software supplier, NL
- Honeywell Proces Solution
- JGC
- KAIST, Korea
- KBR
- KHNP, Hydro and Nuclear Industry Operator, Korea
- Kinsman Group LLC
- Kraken IM
- Kyungpook National University
- L&T Technology Services, India
- MatchIT
- McDermott Inc
- Mitsubishi Heavy Industries
- OpenText
- Opidis
- Petrofac, Engineering company, UK
- PETRONAS, Malaysia
- Phusion IM, UK
- Plant Resource Technology Ltd., China
- Reliance Industries Ltd.
- Repsol
- ReVisionz
- Saipem S.p.A, Italy
- SAP
- SBM Offshore
- Sellafield Limited
- Sharecat Solutions
- Shell Global Solutions International
- Siemens PLM Software
- Sirfull
- SNC-Lavalin
- Suncor
- Sweco Belgium
- Talent Swarm
- TechnipFMC
- Toshiba
- Total, oil and gaz France
- Unasys, UK
- Versatec Energy, Software supplier, NL
- Wood, Equipment supplier, UK
- Woodside
- Yokogawa Europe B.V.

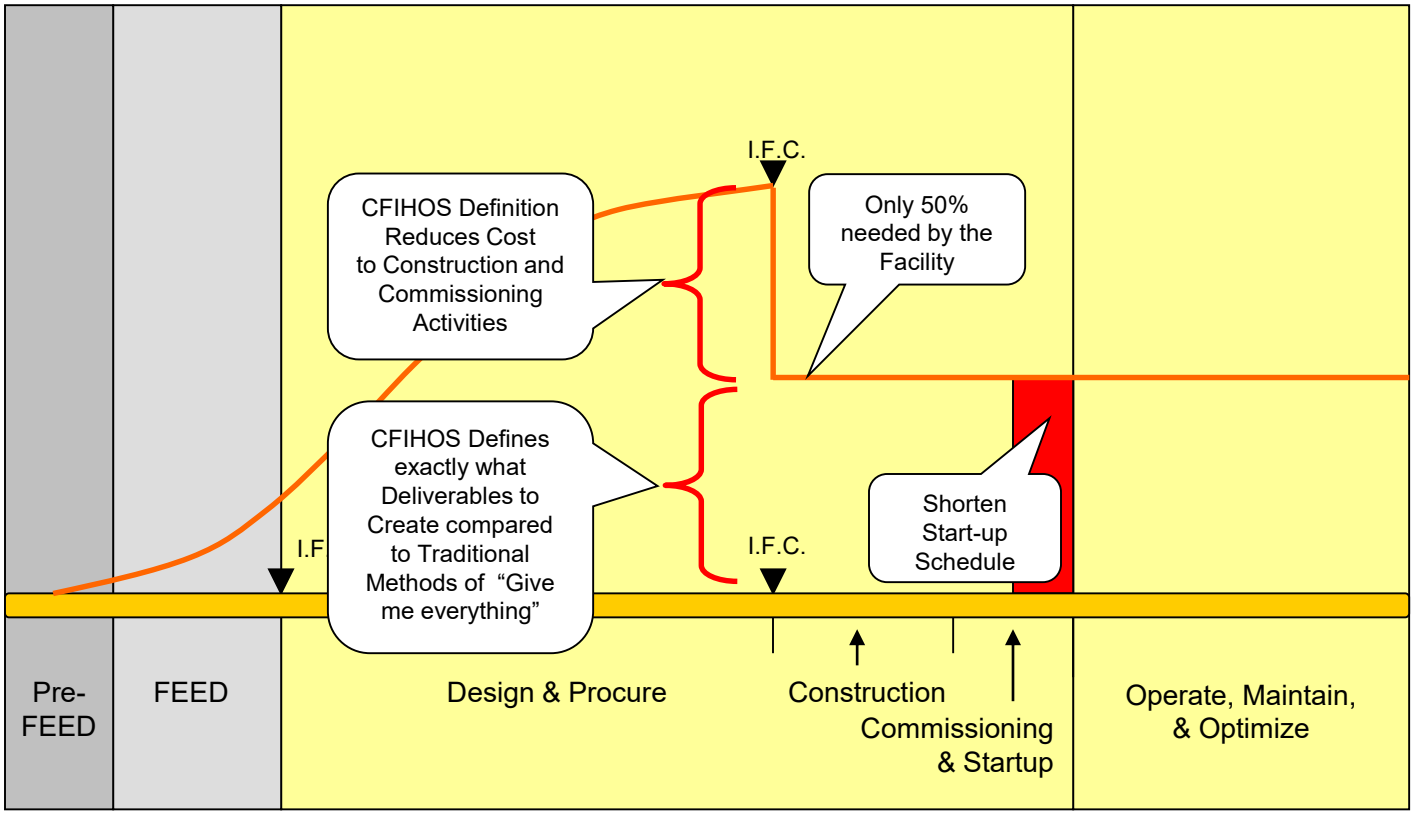
Why companies join CFIHOS?

- 70 companies are a member of the project. No need to be a member of IOGP.
- CFIHOS is driven by OO's – so real-world pain is the focus – its pragmatic
- CFIHOS increases EPC efficiency and consistency by utilizing standard set of requirements for data handover
- CFIHOS reduces OO's cost and effort in specifying consistent information requirements
- Adoption of CFIHOS will shorten the operational readiness timeline of a facility

Incremental Data Handover (Courtesy Hexagon)



Information Requirements Definition



What is in the CFIHOS package?

- **A technical specification document**
  Requirements, rules and principles for information handover

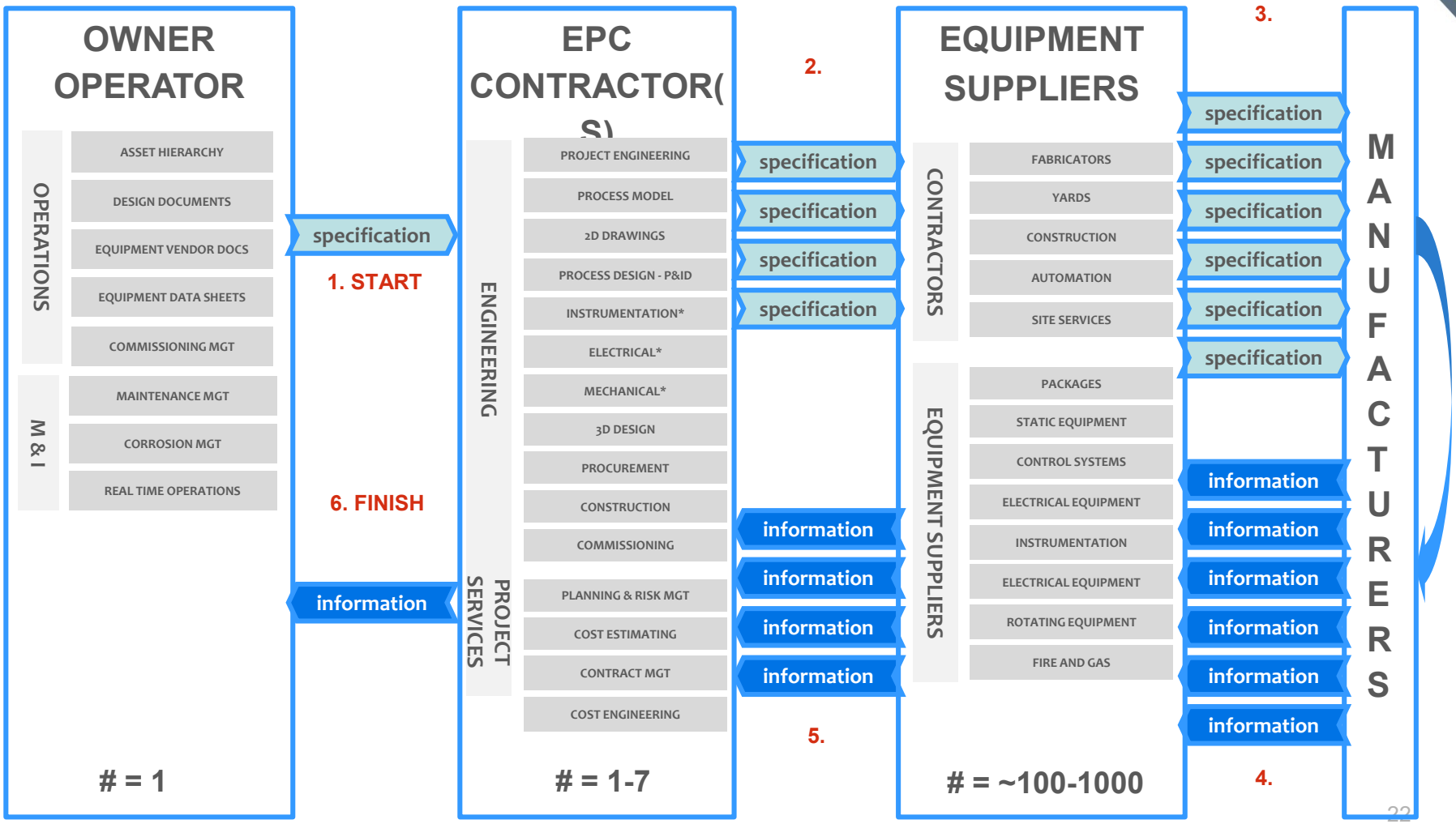
- **A dictionary** (Reference Data Library)
  Consistent naming equipment & documents, acc. ISO stds.

- **A data Model**
  For structuring data and documents about assets

- **A process & guidance document**
  Outlining implementation steps, do's & don'ts

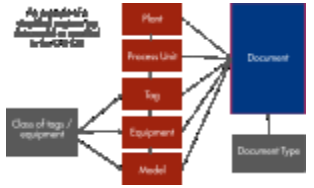
- **A set of requirements for implementation software**
  Outlining the functional requirements for handover systems

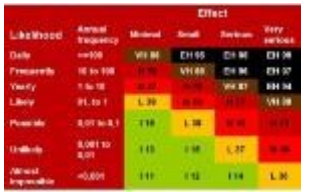
What is the scope of CFIHOS?



What are alternative uses of CFIHOS?

- **Interoperability:** Drive consistency through a common specification and dictionary from day 1 to reduce cost of consolidation of information at each step in the supply chain across the project
- **Debottlenecking:** Raise productivity by applying the "theory of constraints"1: e.g. find bottlenecks in design review & approval process using status reporting on information delivery & review
- **Accelerated handovers:** Continuously stage and validate asset data to assure data quality and accelerate population of operational systems to speed up the first oil date.
- **Speed up searches for information**. Reduce "search-time" by linking documents to tags (often quoted as 25% of operational staff time). Improve management of change for brownfield modifications.
- **Reduce operational risk.** Demonstrate control over "As Built" asset information. Use as a "minimum standard" for asset information. Use as a specification for integrated service contractors & data cleaning.





Conclusion

- The CFIHOS leadership
  - IOGP (international Oil and Gas Producers)
  - Project manager: Peter Townson pt@iogp.org
- The contract for EPC contractors
  - Will have CFIHOS in it
- Software for CFIHOS
  - Hexagon, AVEVA, Bently Systems and Datum360 sell commercial licenses
  - Open source public domain software is soon ready
- ISO 15926
  - POSC Caesar: Nils Sandsmark nils.sandsmark@posccaesar.org
  - Fluor: Onno Paap onno.paap@fluor.com