ISO 8000: the international data quality standard

ISO TC184/SC4/WG 13 Industrial data quality | ISO TC 184/WG 6 Asset intensive industry interoperability

Machine-readable data:

"data in a format that can be easily processed by a computer without human intervention while ensuring no semantic meaning is lost."

* Definition from the US OPEN Government Data Act. January 2019

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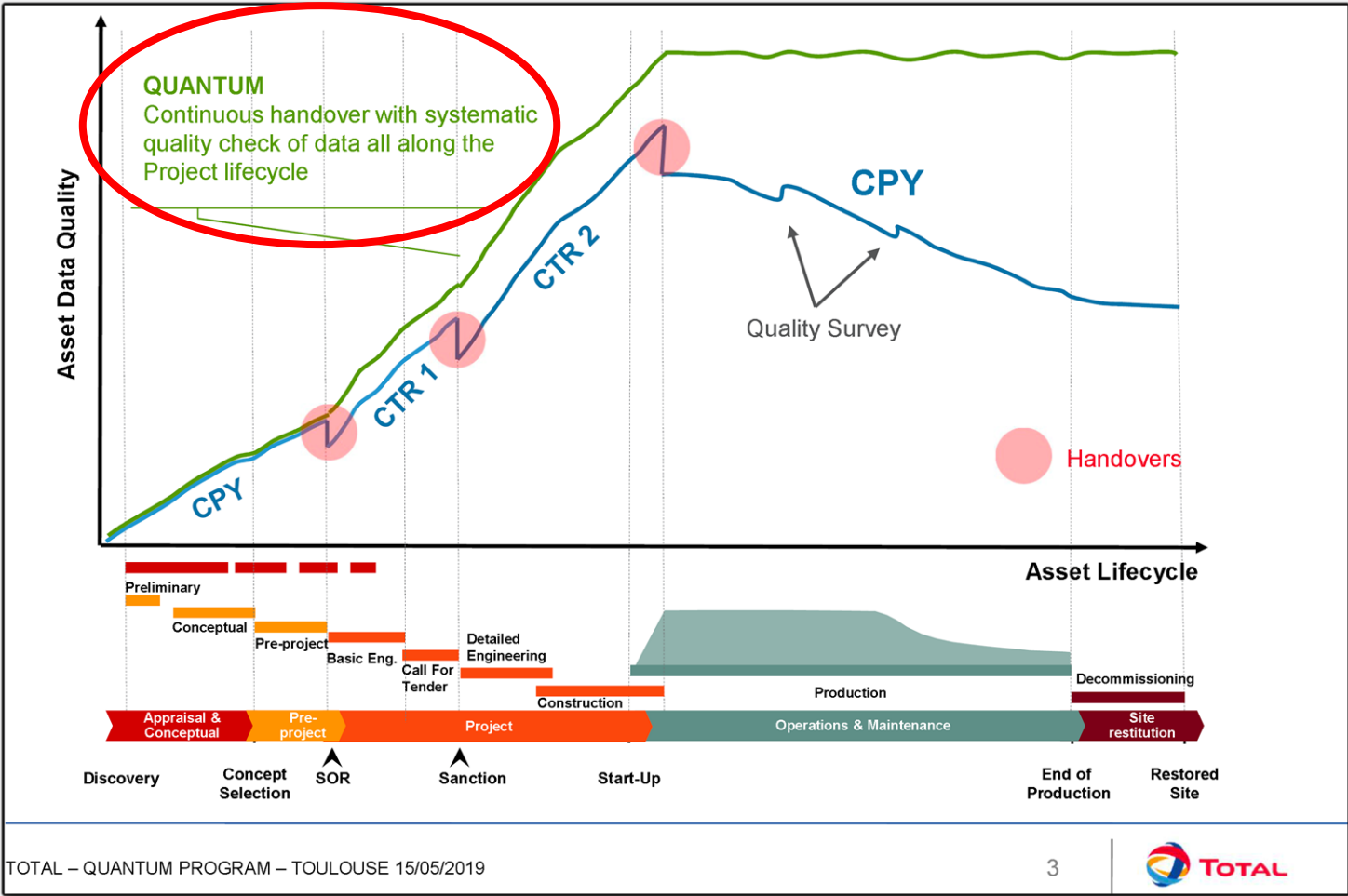ISO International Organization for Standardization

Standardized references & assets data library lifecycle

DATA QUALITY CHALLENGES

Progressive loss of data quality over time

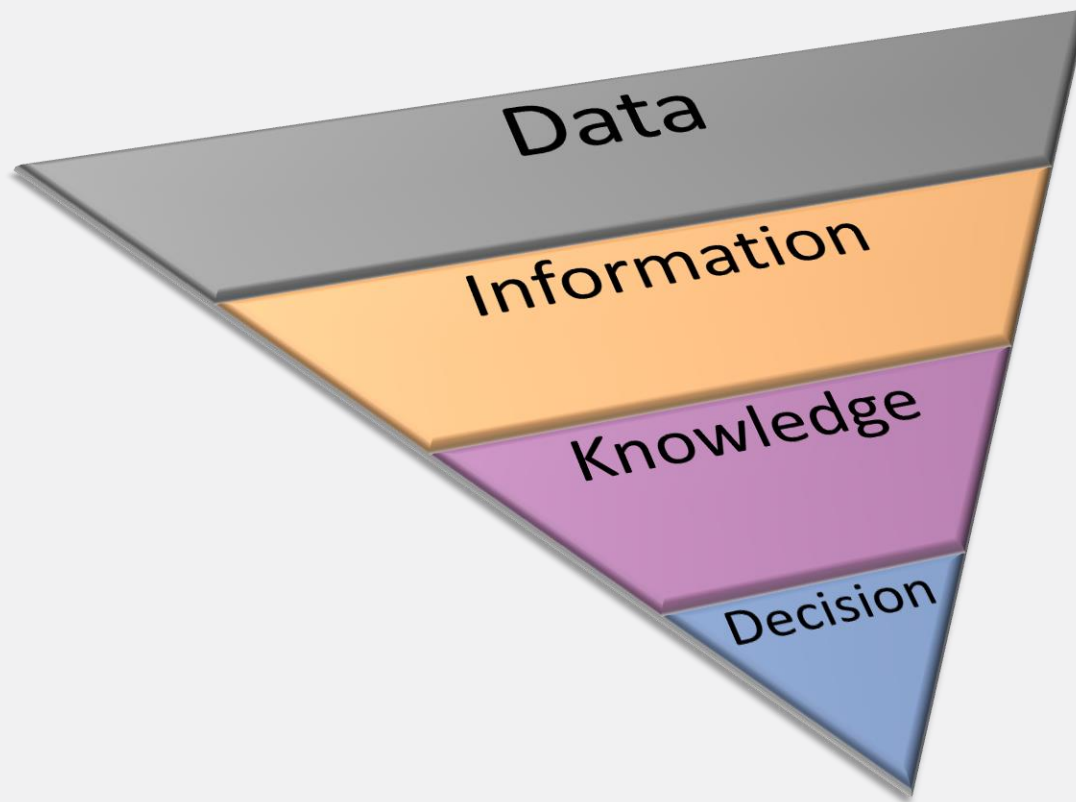**Slide reproduced courtesy of TOTAL's QUANTUM PROGRAM**

As presented by:
Jean-Charles Leclerc – TOTAL
to the ISO TC184/SC4 Plenary
May 2019 - Toulouse

Get quality right first time – Toyota principal 5

– Data quality is addressed during the **data** creation phase to ensure the accuracy of future decisions;

– Data aggregation from multiple sources turns data silos into coherent and relevant **information;**

– Analysis of that information by experts creates corporate **knowledge;**

– That expert knowledge enables informed **decision** making.

Specify machine-readable data, not digital data
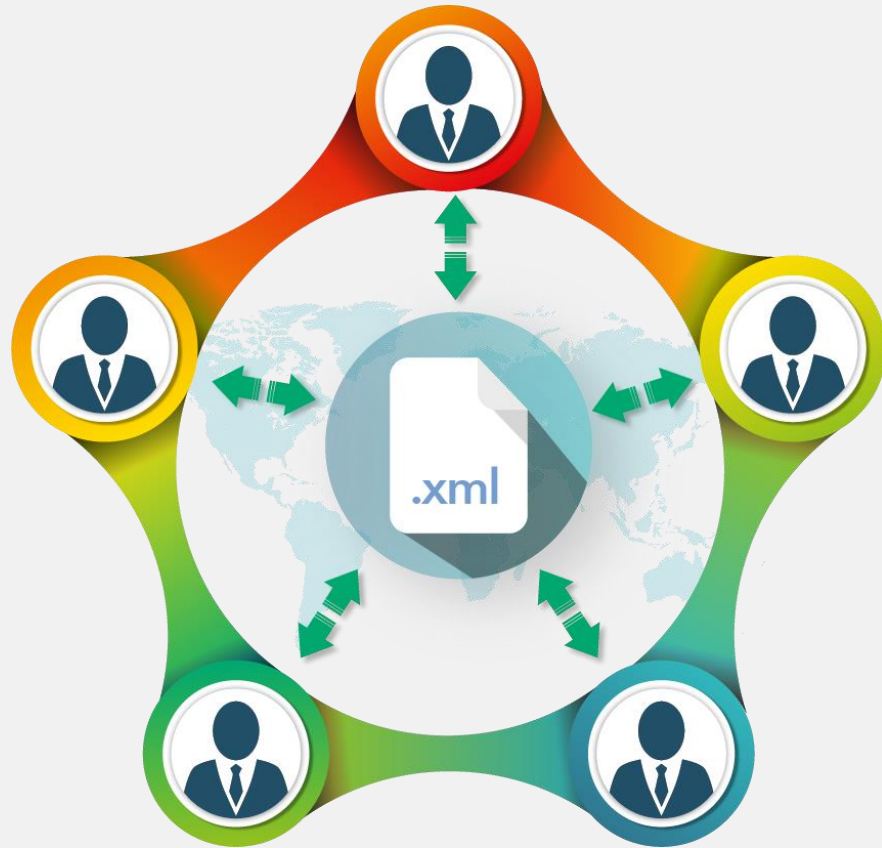
– Machine-readable data, is data in a format that can be automatically read and processed by a computer, such as JSON or XML;

– Machine-readable data must be structured data;

– Digital material may not be machine-readable. A PDF document containing tables of data is digital, but not machine-readable because a computer would struggle to access the tabular information – even though the tables are human readable.

Source: http://opendatahandbook.org/glossary/en/terms/machine-readable/

Standards are designed to referenced in contracts
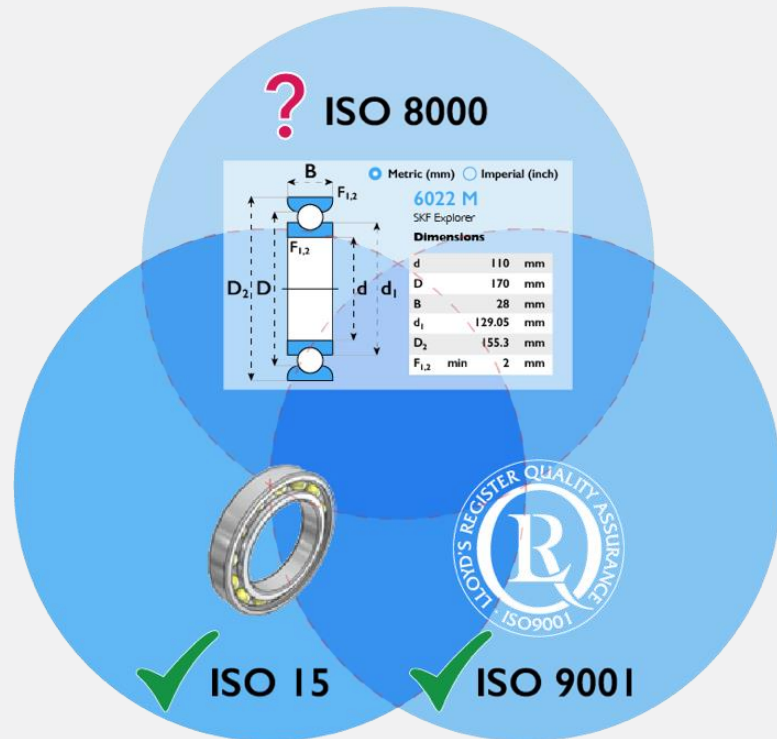
- – When purchasing equipment or materials, owner/operators specify a manufactured product must conform to an international standard such as ISO 15;

- – Owner/operators also frequently specify that the manufacturer must be accredited to an international standard such as ISO 9001;

- – So why do owner/operators fail to insist that the data they require describing the product must conform to an international standard such as ISO 8000?

- – **The result of failing to specify data quality standards is a build up of extra costs, known as a technical debt.**

Standards are designed to referenced in contracts

To ensure ISO 8000 compliant data, a specific clause such as below can be added to purchase orders:

The contractor, sub-contractor or supplier shall, as and when requested to do so, supply technical data in a machine-readable format on any of the items covered in this contract as follows:

"The supplier shall supply technical data for the products or services they supply. Each item shall contain an ISO 8000-115 compliant identifier that is resolvable to an ISO 8000-110 compliant record with free decoding of unambiguous, internationally recognized identifiers."

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ISO International Organization for Standardization

ISO 8000-1: 2011, data quality - architecture

Master data
ISO 8000-110

e.g.
ISO 22745-40

Data specification

e.g.
ISO 22745-30
ISO 13584-32

Identification scheme

e.g.
ISO 29002-5

globally unique resolvable id

Formal syntax for data

e.g.
XML

syntax

Data Dictionary

e.g.
ISO 29002-6
ISO 22745-10

semantics

e.g.
ISO 29002-10

uses identifiers from

specifies preferred terminology for concepts in

specifies data requirements (templates, rules and constraints) for coding data using concepts from

conforms to

conforms to

conforms to

Identifies concepts, terminology and supporting elements

is coded using concepts in

uses identifiers from

cylindrical bore: bearing bore

ISO 5593:1997(en-US), 02.02.1

Property   tap

tapered bore: bearing bore or

ISO 5593:1997(en-US), 02.02.1

Property   (be

(bearing) bore diameter: inner

ISO 5593:1997(en-US), 04.03.0

Property   (be

(bearing) outside diameter: ou

ISO 5593:1997(en-US), 04.03.0

Property   (be

(bearing) width: axial distance

ISO 5593:1997(en-US), 04.03.0

2 related terms
1 related definition

View Entry   Remove

2 related terms
1 related definition

View Entry   Remove

21 related terms
4 related definitions

View Entry   Remove

20 related terms
4 related definitions

View Entry   Remove

11 related terms
9 related definitions

View Entry   Remove

Concept Type: Property

Remove

Concept Identifier: 0194-1#02-DF5G67#1

Terms

(bearing) bore diameter
ISO 5593:1997(en-US), 04.03.02
English, United States

d - bore
TIMKEN 2017(en-US) - http://www.timkenbearings.com/en-in/knowledge/glossary/pages/BearingTermsGlossary.aspx
English, United States

bore diameter, d
SKF 2017(en-US)
English, United States

diamètre de l'alésage (d'un roulement [d'une butée])
2 terms

диаметр отверстия (подшипника)
2 terms

Průměr díry
1 terms

Bohrungsdurchmesser

Definitions

(bearing) bore diameter: inner ring bore diameter of a radial bearing or the shaft washer bore diameter of a thrust bearing - ISO 5593:1997(en), 04.03.02
ISO 5593:1997(en-US), 04.03.02
English, United States

The inside diameter of the inner ring or cone.
TIMKEN 2017(en-US) - http://www.timkenbearings.com/en-in/knowledge/glossary/pages/BearingTermsGlossary.aspx
English, United States

Inner Ring (cone) design inside diameter (Bore), typically labeled as "d" on Timken drawings
TIMKEN 2017(en-US)
English, United States

diamètre de l'alésage de la bague intérieure [de la rondelle arbre] d'un roulement [d'une butée]
1 definitions

1 - 10 of 64

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KOIOS Core
quality data engine

Identification Guide: casing (Imperial)

Download Template ⬇

Upload Master Data ⬆

Type	Class Concept	Measurement System	Unit of Issue
Catalogue Item	casing	Imperial	joint, JT

Property Details

Properties	Data Type	Representation	Unit of Measure	Qualifier of Measure	Required	Network
end-finish type - end 1	list-of-values buttress thread casing connection (BC) long round thread casing connection (LC) short round thread casing connection (STC) extreme line casing connection (XC) plain end (P)				☑	
end-finish type - end 2	list-of-values buttress thread casing connection (BC) long round thread casing connection (LC) short round thread casing connection (STC) extreme line casing connection (XC) plain end (P)				☑	
coupling	list-of-values special clearance coupling (SCC) with without				☑	
label 1	list-of-values 4-1/2 5-1/2 6-5/8		inches, in		☑	
API standard	list-of-values API 5CT				☐	

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Identification Guide: casing (Imperial)

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Upload Master Data ⬆

Type	Class Concept		Unit of Issue
Catalogue Item	casing		joint, JT

Data Type

list-of-values

buttress thread casing connection (BC)

long round thread casing connection (LC)

short round thread casing connection (STC)

extreme line casing connection (XC)

plain end (P)

Property Details

Properties	Data Type	Required	Network
end-finish type - end 1	list-of-values buttress thread casing connection (BC) long round thread casing connection (LC) short round thread casing connection (STC) extreme line casing connection (XC) plain end (P)	☑	
end-finish type - end 2	list-of-values buttress thread casing connection (BC) long round thread casing connection (LC) short round thread casing connection (STC) extreme line casing connection (XC) plain end (P)	☑	
coupling	list-of-values special clearance coupling (SCC) with without	☑	
label 1	list-of-values 4-1/2 5-1/2 6-5/8	inches, in	☑	
API standard	list-of-values API 5CT	☐	

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Identification Guide: casing (Imperial)

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Type	Class Concept	Measurement System	Unit of Issue
Catalogue Item	casing	Imperial	joint, JT

Property Details

Properties	Data Type	Representation	Unit of Measure	Qualifier of Measure	Required	Network
end-finish type - end 1	list-of-values buttress thread casing connection (BC) long round thread casing connection (LC) short round thread casing connection (STC) extreme line casing connection (XC) plain end (P)				☑	
end-finish type - end 2	list-of-values buttress thread casing connection (BC) long round thread casing connection (LC) short round thread casing connection (STC) extreme line casing connection (XC) plain end (P)				☑	
coupling	list-of-values special clearance coupling (SCC) with without				☑	
label 1	list-of-values 4-1/2 5-1/2 6-5/8		inches, in		☑	
API standard	list-of-values API 5CT				☐	

list-of-values

4-1/2

5-1/2

6-5/8

inches, in

Identification Guide: rotational ac motor (SI (Metric))

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Type	Class Concept	Measurement System	Unit of Issue
Catalogue Item	rotational ac motor	SI (Metric)	each, ea

Property Details

Properties	Data Type	Representation	Unit of Measure	Qualifier of Measure	Required	Network
ac motor synchronism	list-of-values asynchronous synchronous reluctance synchronous				☑	
rated input voltage (ac)	measured value	2 decimal places	volt, V	nominal	☑	
synchronous speed	measured value	2 decimal places	revolutions per minute, rpm	nominal	☑	
rated speed	measured value	2 decimal places	revolutions per minute, rpm	nominal	☑	
starting torque	measured value	2 decimal places	newton metre, Nm	minimum	☑	
main class of component	list-of-values electric/electronic component electromechanical component mechanical component magnetic part				☑	
terminal shape	list-of-values bus end cap flat printed wiring pin screw solid-lead stud				☑	

Identification Guide: rotational ac motor (SI (Metric))

Download Template ⬆ **Upload Master Data** ⬆

Properties and values from IEC-CDD

Type	Class Concept	Measurement System	Unit of Issue
Catalogue Item	rotational ac motor	SI (Metric)	each, ea

Property Details

Properties	Data Type	Representation	Unit of Measure	Qualifier of Measure	Required	Network
ac motor synchronism	list-of-values asynchronous synchronous relu... synchronous					
rated input voltage (ac)	measured value	2 decimal places	volt, V	nominal		
synchronous speed	measured value	2 decimal places	revolutions per minute, rpm	nominal		
rated speed	measured value					
starting torque	measured value	2 decimal places	revolutions per minute, rpm	nominal		
main class of component	list-of-values electric/electronic electromechanic... mechanical comp... magnetic part	2 decimal places	newton metre, Nm	minimum		
terminal shape	list-of-values bus end cap flat printed wiring pin screw solid-lead stud				☑	

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Manage Product: SKF:QJ 208

[Download as XML ☁]

Managing the detail allows users to score data quality

ISO 8000-115 Identifier
SKF:QJ 208

Class Concept
angular contact radial ball bearing
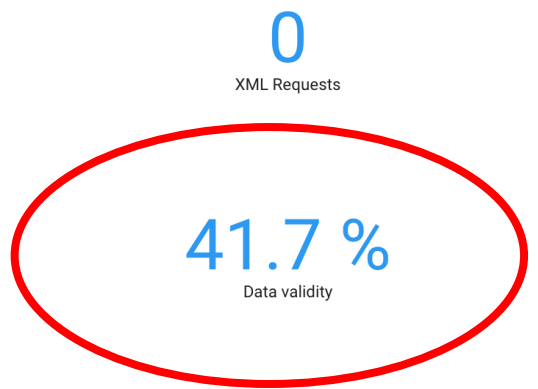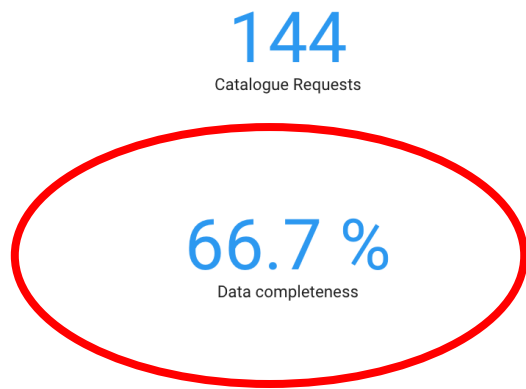
Measurement System
SI (Metric)

Unit of Issue
each, ea

Created at: No data

Created by: Matt Fancourt

Source file: No data

Last updated: 19/01/2020 16:54

144	0
Catalogue Requests	XML Requests
66.7 %	41.7 %
Data completeness	Data validity

ⓘ Data Validity: There are properties with pending values

Property Value Details

Filter Properties

Property	Value	Pending Value	Unit of Mesasure	Qualifier of Measure	
eCl@ss commodity class v11.0	<< Not implemented >>				+
UNSPSC commodity code v22.0601	31171531				✏
number of rows	1				✏
sealing	without				✏
sealing type		none			✏
(real) net weight		str1	kilogram, kg		✏

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Summary: ISO 8000 essentials
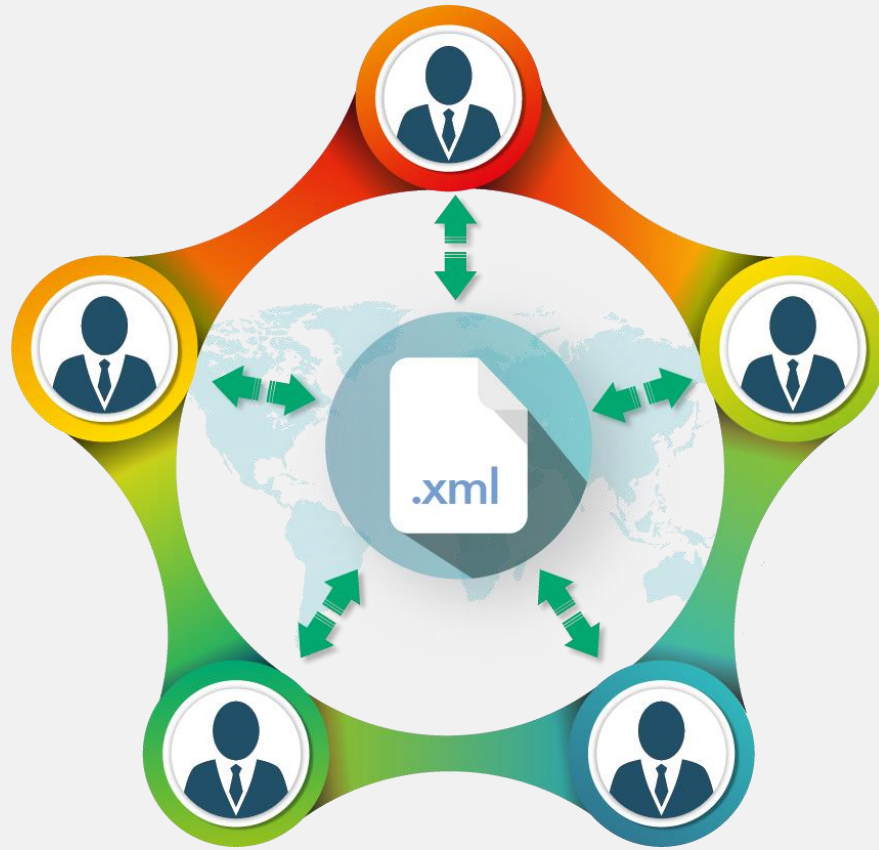
- The ability to create, collect, store, maintain, transfer, process and present data to support business processes in a timely and cost effective manner requires both an understanding of the characteristics of the data that determine its quality, and an ability to measure, manage and report on data quality;

- The approach of the master data quality series of parts of ISO 8000 is to address data quality from the "bottom up", i.e., from the smallest meaningful element, the property value;

- One of the key aspects of managing master data quality is managing duplication. A consistent approach to managing and eliminating inappropriate duplication is a critical part of master data management.

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ISO — International Organization for Standardization

ISO 8000 is designed to work with other standards

06 Unique identifier
01 Master data quality
05 Ensures provenance
02 Exchange format
04 Portable data
03 Global specification library

ISO 8000

– **ISO 8000-1** is one of the three normative references in **ISO 18101-1** and drives data quality and characteristic data exchange in that asset intensive industry interoperability standard;

– The data dictionary is an effective way of managing the differing classes, properties values, and units of measure from multiple sources, such as an **ISO 13584** parts library, an **ISO 15926** reference data library, the **CIFHOS** reference data library, or the **IEC 61360** common data dictionary (**IEC-CDD**);

– The identification scheme in **ISO 29002-5** is used by the IEC-CDD, the **ecl@ss** classification schema, **IEC 62832** Industrie 4.0 (I4.0) components, including the asset administration shell.

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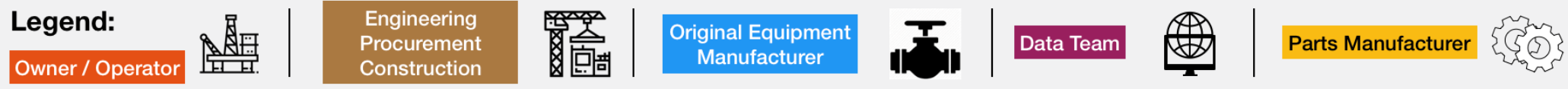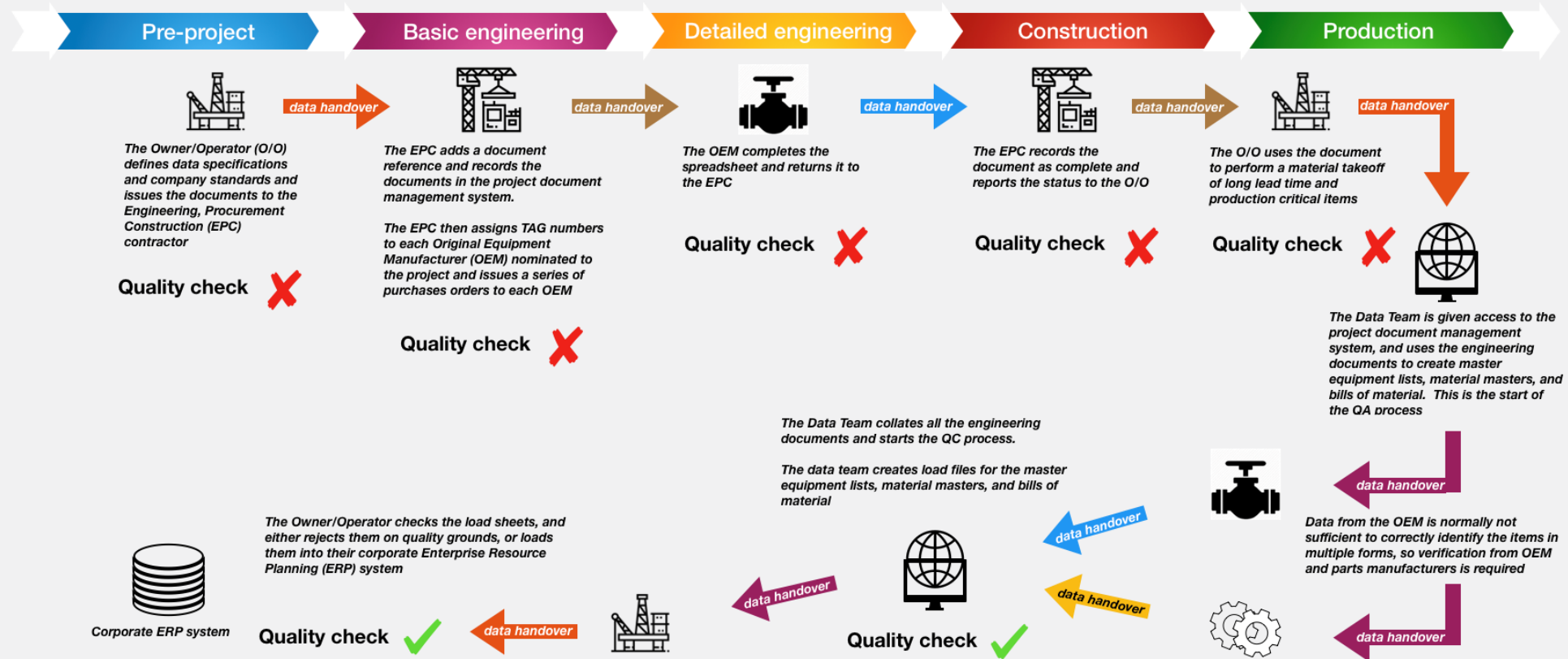# ISO 8000 compliant, quality master data is:

- – Derived from entries in a data (concept) dictionary;

- – Structured data;

- – Machine readable;

- – Exchangeable without loss of meaning;

- – Portable between systems.

Appendix 1: ISO 8000 approach to the SPIR process

Pre-project → Basic engineering → Detailed engineering → Construction → Production

Pre-project — *data handover*
The Owner/Operator (O/O) defines data specifications and company standards and issues the documents to the Engineering, Procurement Construction (EPC) contractor

Quality check ✗

Basic engineering — *data handover*
The EPC adds a document reference and records the documents in the project document management system.

The EPC then assigns TAG numbers to each Original Equipment Manufacturer (OEM) nominated to the project and issues a series of purchases orders to each OEM

Quality check ✗

Detailed engineering — *data handover*
The OEM completes the spreadsheet and returns it to the EPC

Quality check ✗

Construction — *data handover*
The EPC records the document as complete and reports the status to the O/O

Quality check ✗

Production — *data handover*
The O/O uses the document to perform a material takeoff of long lead time and production critical items

Quality check ✗

The Data Team is given access to the project document management system, and uses the engineering documents to create master equipment lists, material masters, and bills of material. This is the start of the QA process

data handover
Data from the OEM is normally not sufficient to correctly identify the items in multiple forms, so verification from OEM and parts manufacturers is required

data handover

The Data Team collates all the engineering documents and starts the QC process.

The data team creates load files for the master equipment lists, material masters, and bills of material

data handover
data handover

Quality check ✓

The Owner/Operator checks the load sheets, and either rejects them on quality grounds, or loads them into their corporate Enterprise Resource Planning (ERP) system

Corporate ERP system

Quality check ✓ — *data handover*

Legend:
Owner / Operator

Engineering Procurement Construction

Original Equipment Manufacturer

Data Team

Parts Manufacturer

Appendix 1: The current SPIR process is full of waste

Project design and construction

Operations and maintenance

Waste is an activity that absorbs resources but creates no value. The current SPIR process is disjointed, lacks flow and is an inefficient method of exchanging data;

– silo thinking; each party only looks inward to their own operational requirement and they never explain their exact requirements to the other parties;

– extensive rework is required every time because data quality is not checked from the user perspective until handover to maintenance;
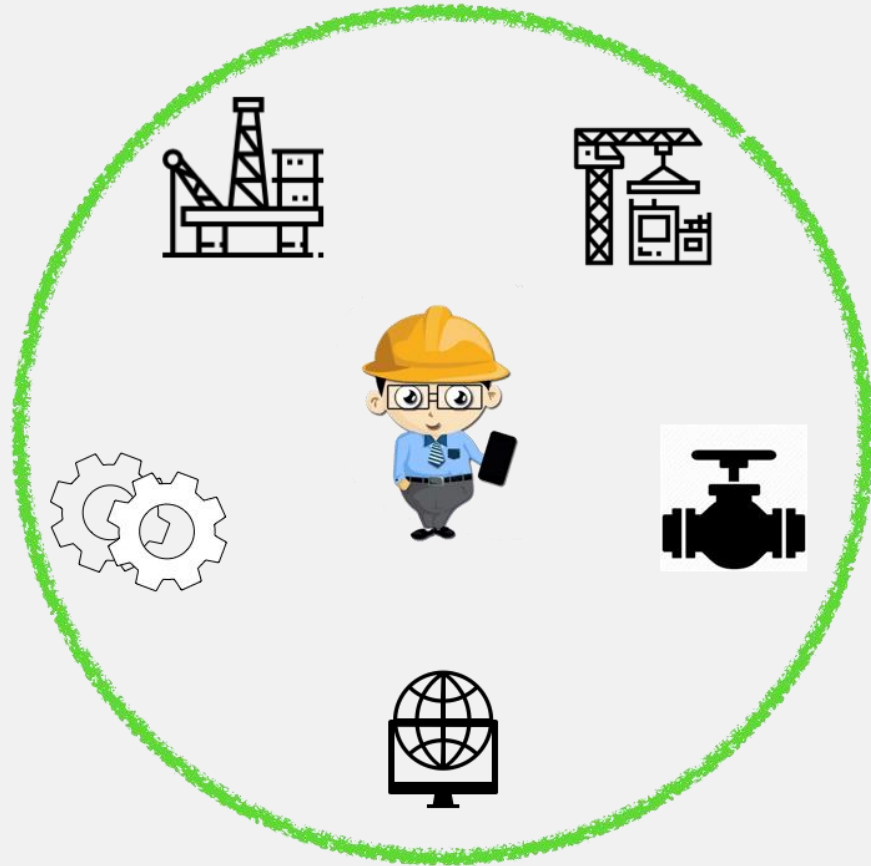
– there is no transparency in the process.

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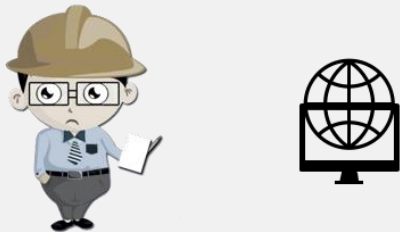
Appendix 1: How do we eliminate the waste?

1. a radical realignment of the process;

2. the introduction of a continuous process;

3. data quality must be built into the start of the process;

4. silos must be broken down between the project and operations teams;

5. the other process elements that operations and maintenance require to identify the requirements must be incorporated.

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Download Template ☁

Upload Master Data ☁

Extending the SPIR decision process to include operating factors reduces inventory

Type	Class Concept
LORA Tag Details Record	LORA Tag Details Record

Property Details

Properties	Data Type	Representation	Unit of Measure	Qualifier of Measure	Required	Network
tag equipment class	list-of-values ABEL: AUXILIARY BRAKE - ELECTRICAL ABGN: AUXILIARY BRAKE - GENERAL AMEL: AMMETER - ELECTRICAL BAEL: BATTERY - ELECTRICAL BBEL: BUS BAR - ELECTRICAL BCEL: BATTERY CHARGER - ELECTRICAL BDGN: BURSTING-RUPTURE DISC - GENERAL BEAL: BELL - ALARM BUDF: BURNER ELEMENT - DUAL FUEL BUFG: BURNER ELEMENT - FUEL GAS View Full List				☑	
tag criticality	list-of-values Vital Important Secondary				☑	
duty notion	list-of-values Main On-demand Emergency Auxiliary Indifferent				☑	

list-of-values

Vital

Important

Secondary

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Live visibility for all parties in the project on the SPIR progress and quality, reduces reporting time and increases transparency

Project A - Data Team

Project Name	Sitename	Owner/Operator	EPC	Location
Project A	Site B	Owner Operator A	EPC 1	DK-Offshore

SPIR overview

Summary

Equipment Procurement Contractor

Equipment Supplier

Status

5
SPIRs

12
Tags

209
SPIR Lines

Reports

Filters: Origin is Netherlands | Spare is CONSUMABLE | Spare is UNIT

Report Definition
SPIR [example] report

Document
Project.spir:SP-987654-012-FFC-03

Tag

Generate

Aggregate Function
Minimum

Aggregate Function
Completeness

Aggregate Function
Distinct Count

-
lead time
18 lines in scope
18 lines in filter
0 lines matched

89 %
price per unit
18 lines in scope
18 lines in filter
16 lines matched

View Results
manufacturer name
18 lines in scope
18 lines in filter
18 lines matched

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PE

Project A - Data Team

Project Name	Sitename	Owner/Operator	EPC	Location
Project A	Site B	Owner Operator A	EPC 1	DK-Offshore

SPIR overview

Summary

Equipment Procurement Contractor

Equipment Supplier

Status

5
SPIRs

12
Tags

209
SPIR Lines

Reports

Filters: Origin is Netherlands | Spare is CONSUMABLE | Spare is UNIT

Report Definition

SPIR cost report

SPIR weight report

SPIR [example] report

Tag

Generate

Aggregate Function
Sum

60565.00

Cost of Commissioning Spares
209 lines in scope
209 lines in filter
42 lines matched

Aggregate Function
Sum

149423.23

Cost of Operating Spares
209 lines in scope
209 lines in filter
79 lines matched

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Appendix 2: industrial data quality standards

ISO 8000 - data quality management series

Part 60: Overview of process assessment

Part 61: Process reference model

Part 62: Organizational process maturity assessment

Part 63: Measurement framework

Part 64: Organizational process maturity assessment: application of the test process improvement method

Part 65: Process measurement survey

Part 66: Data quality management assessment

Part 81: Data quality assessment based on data profiling

Part 82: Data quality assessment methods: data rule

ISO 8000 - master data quality series

Part 8: Information and data quality: concepts and measuring

Part 100: Exchange of characteristic data: overview

Part 110: Exchange of characteristic data: syntax, semantic encoding and conformance

Part 115: Quality identifiers

Part 116: Authoritative Legal Entity Identifier (ALEI)

Part 120: Provenance

Part 130: Accuracy

Part 140: Completeness

Part 150: Quality management framework

Appendix 2: industrial data quality standards

ISO 29002 - Exchange of characteristic data

Part 4: Basic entities and types

Part 5: Identification scheme

Part 6: Concept dictionary terminology reference model

Part 10: Characteristic data exchange format

Part 20: Concept dictionary resolution services

Part 31: Query for characteristic data

ISO 22745 - Open technical dictionaries and their application to master data

Part 1: Overview and fundamental principals

Part 2: Vocabulary

Part 11: Dictionary representation

Part 13: Guidelines for the formulation of terminology

Part 14: Dictionary query interface

Part 20: Procedures for the maintenance of an open technical dictionary

Part 30: Identification guide representation

Part 35: Query for characteristic data

Part 40: Master data representation

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ISO International Organization for Standardization

ISO 8000: the international data quality standard

ISO TC184/SC4/WG 13 Industrial data quality | ISO TC 184/WG 6 Asset intensive industry interoperability

Thank you

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