



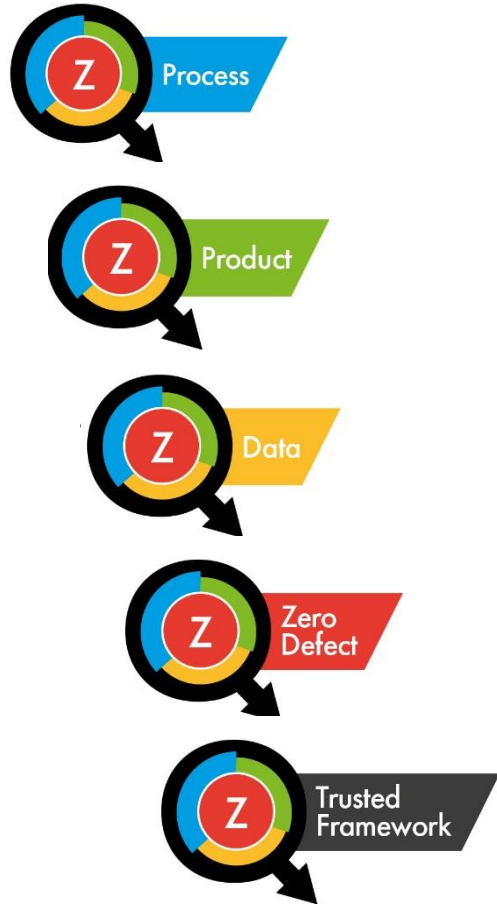
# Interlinked process, product, & data quality framework for zero defect manufacturing

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Scientific coordinator, TEKNIKER

European Zero-Defect Manufacturing - 08/07/2021

# InterQ Key Data



- **Project start:** Nov 2020
- **Project end:** Oct 2023
- **Nº partners:** 25 from 11 countries
- **EC contribution:** 9M€
- **Project leader:** IDEKO
- **Primary coordinator:** Jokin Muñoa
- **Scientific coordinator:** Mikel Armendia
- **Website:** <https://interq-project.eu/>



# Presentation of InterQ partners



FoF-14-2015



FoF-08-2015



Participant number	Participant organisation name	Short name	Type	Country
1 (coordinator)	Ideko	IDK	RTD	Spain
2	Engineering	ENG	Large	Italy
3	DNV GL	DNV	Large	Norway
4	ITP Aero	ITP	Large	Spain
5	Renault	REN	Large	Spain
6	Gamesa Energy Transmission	GET	Large	Spain
7	Comau	COM	Large	France
8	Danobat	DAN	Large	Spain
9	Inlecom	INLE	SME	Greece
10	ModuleWorks	MOD	SME	Romania
11	Pro-micron	PM	SME	Germany
12	Optosurf	OPT	SME	Germany
13	DataThings	DAT	SME	Luxembourg
14	Tributech	TRI	SME	Austria
15	VideoSystems	VS	SME	Italy
16	Q-DAS – Hexagon	QDAS	SME	Germany
17	Predict	PRD	SME	France
18	Aeromec	AER	SME	Spain
19	Cedrat	CED	SME	France
20	SINTEF AS	SIN	RTD	Norway
21	Tekniker	TEK	RTD	Spain
22	Technische Universitat Darmstadt	TUDa	RTD	Germany
23	UPV/EHU – CFAA	UPV	RTD	Spain
24	CeADAR University College Dublin	UCD	RTD	Ireland
25	BME	BME	RTD	Hungary

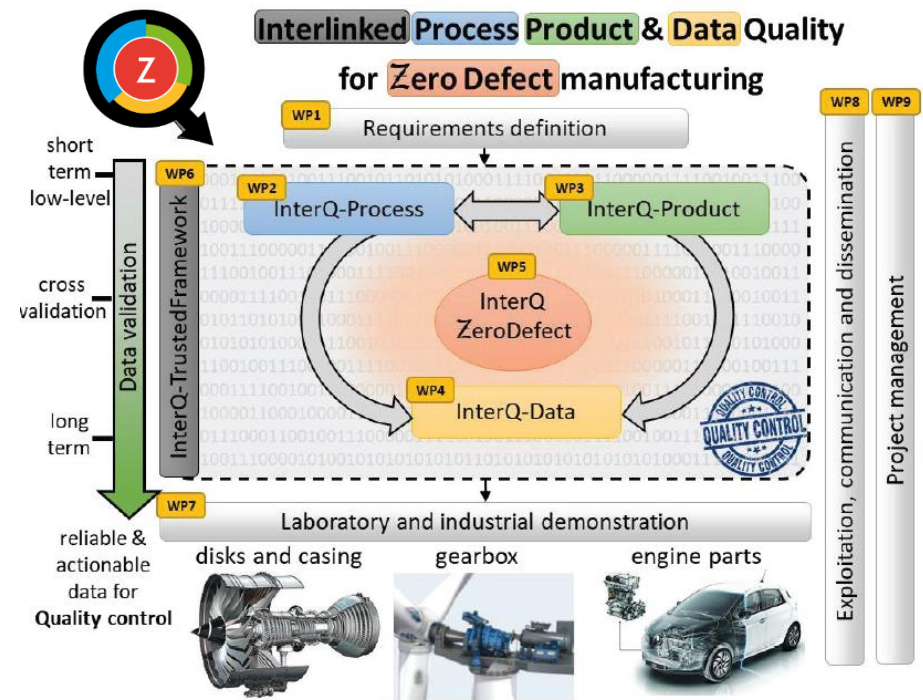
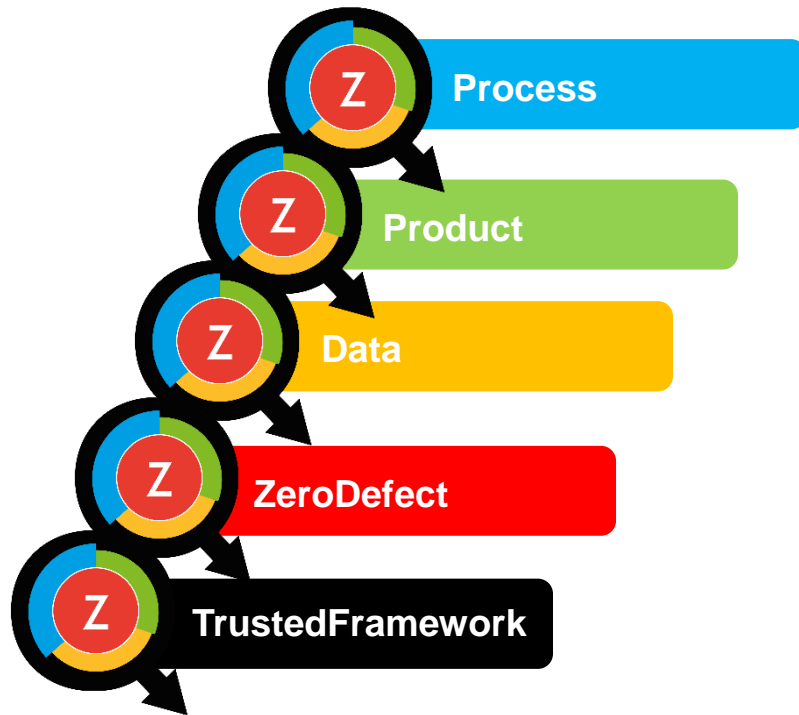
# InterQ objectives

The main objective of InterQ project is to measure, predict and control the quality of the manufactured products, manufacturing process and gathered data to assure Zero-Defect-Manufacturing by means of AI-driven tools powered with meaningful and reliable data.

- Objective 1: To measure/estimate process variables close to processing point
- Objective 2: To measure/estimate final product quality in-process using digital twins
- Objective 3: To ensure data reliability
- Objective 4: To optimize the product quality based on Artificial Intelligence for zero defect manufacturing
- Objective 5: To ensure security and traceability
- Objective 6: To demonstrate and validate the project concept and solutions

# InterQ Approach

InterQ will develop a platform based on five modules ready to increase the quality of European smart manufacturing. Those 5 InterQ modules will contribute to the creation, extension and usage of the **PPD (Product, Process, Data) Hallmark** to fulfil the specific project objectives.



# InterQ Demonstrators

InterQ concept will be applied in high-added value industrial applications.

## Aerospace



## Wind Power Energy



## Automotive



# Project status update

Focus has been put in detailed definition of demonstrators:

- Manufacturing process to be analyzed and optimized
- Machines/equipment used in the process
- Procedure and equipment used for quality control
- Main quality issues

This analysis has been used to set the requirements of the technologies to be developed in the project:

- New advanced sensors for process control → InterQ Process
- Physical and Virtual sensors for product control → InterQ product
- Data exchange formats, IT issues → InterQ Data and InterQ TrustedFramework
- Process optimization → InterQ ZeroDefect

# Project status update

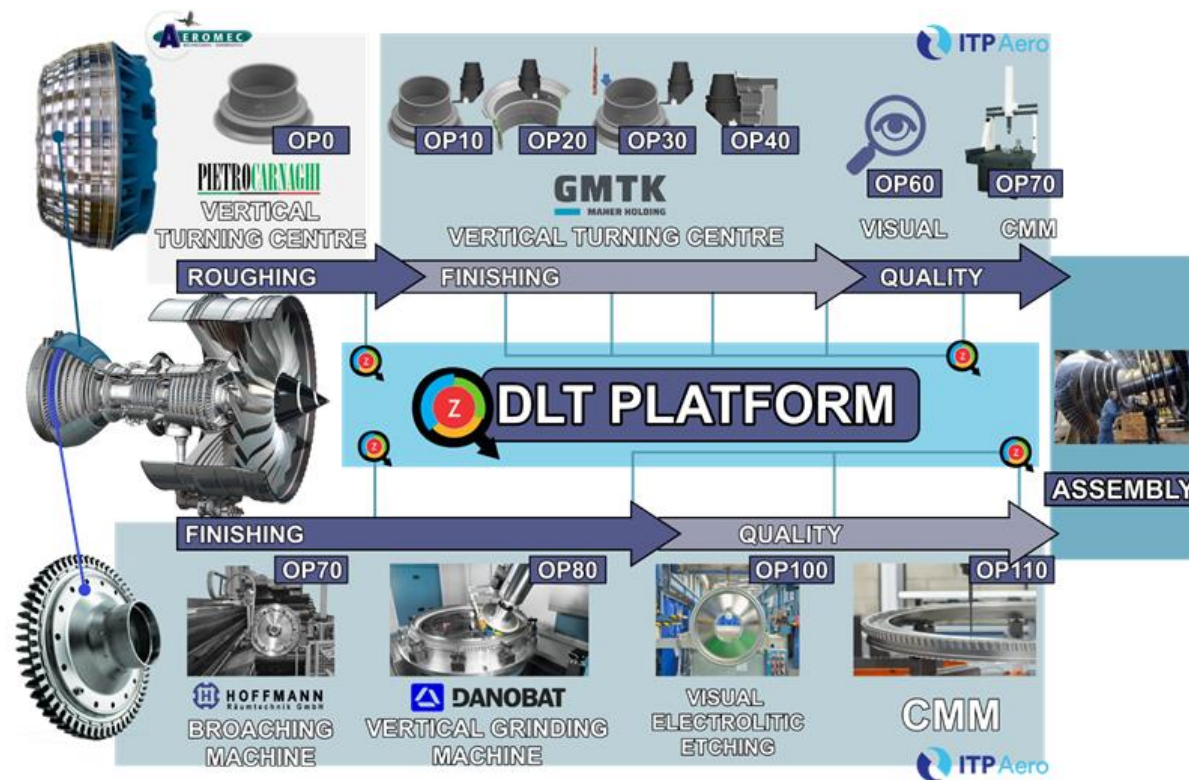
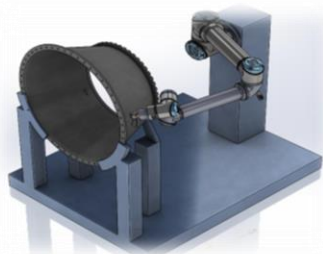
## Aerospace use case:

- Involved partners:
  - Aeromec: milling operation
  - ITP: rest of operations (broaching, grinding, turning)
  - Danobat: machine tool provider

## Machines:



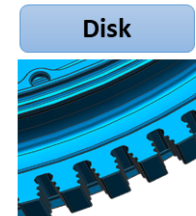
## Quality control:





# Project status update

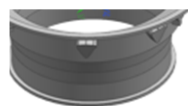
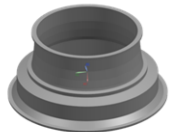
## Aerospace use case:



Disk



Casing



		Monitoring	New sensors /actuators	Virtual sensor	Operator feedback	Machine fingerprint	Process fingerprint
Disk Broaching OP70	REAL	CNC data in local (ITP/IDK) <i>3 broaching machines in ITP</i>	-	Broach wear (ITP)	-	-	-
	DUMMY	CNC data with cloud (UPV) Vibrations (UPV/IDK) <i>EKIN broaching machines CFAA</i>	Force sensor strain gauge (BME) Force sensor piezo (UPV)	Indirect broach wear measure (UPV) Force model (BME/MOD)	Text + voice + images (UCD)	-	Force pattern wear control (UPV)
Disk Grinding OP80	REAL	CNC data in local (IDK/DAN) vibrations (IDK) <i>Danobat vertical grinding in ITP</i>	-	Wheel wear (ITP / IDK)	-	-	Power pattern control (IDK/ITP)
	DUMMY	CNC data with cloud (IDK/DAN) vibrations (IDK) <i>Danobat vertical grinding Ideko</i>	Force sensor (PRO/DAN) Active damper (IDK) Active dresser (CED/IDK)	Wheel wear (IDK/PRO) Grinding burns (IDK)	-	Spindle + axes (DAN)	-
Casing Roughing OP0	REAL	CNC data in local (DAN/AER) vibrations (IDK/AER) <i>Soraluce milling machine in AER</i>	-	Machine stops indicator (IDK / DAT)	-	Spindle + axes (DAN / AER)	Vibration pattern control (IDK/DAT)
	DUMMY	CNC data with cloud (DAN) vibrations (IDK) <i>GMTK milling machine in CFAA</i>	-	-	-	Spindle + axes (DAN / IDK)	-
Casing Finishing OP10 -> OP40	REAL	CNC data in local (IDK) vibrations (IDK) <i>GMTK milling machine in ITP</i>	-	-	-	-	Vibration pattern control (???)
	DUMMY	CNC data with cloud (UPV/IDK) vibrations (IDK) <i>GMTK milling machine in CFAA</i>	Force sensor ? (PRO / UPV)	-	Text + voice + images (UCD)	-	-

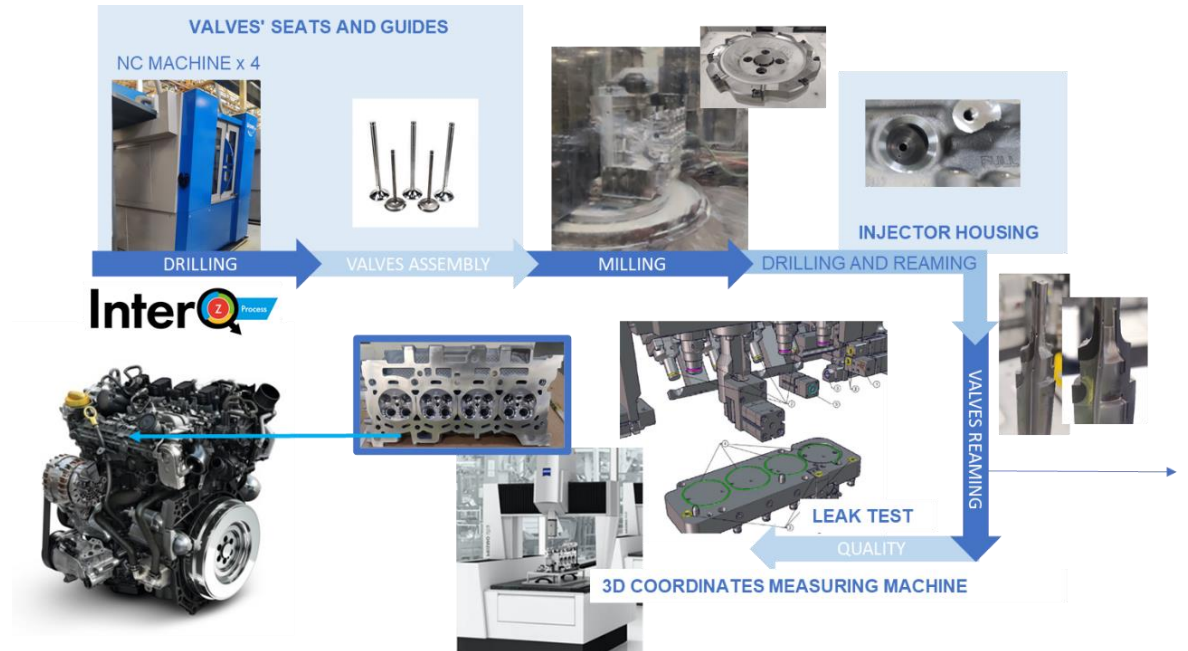
# Project status update

Equivalent work for energy and automotive use cases

## Wind energy



## Automotive



**GearboX** by Gamesa | Future proof

**DANOBAT**

**RENAULT**

**COMAU**

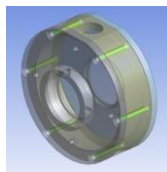
**DANOBAT**

# Project status update

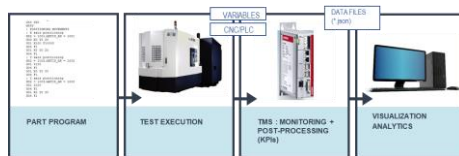
In parallel, required technologies are being developed



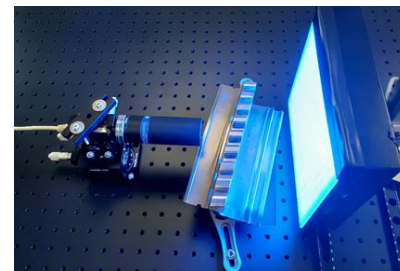
Integrated sensor for grinding tool holder



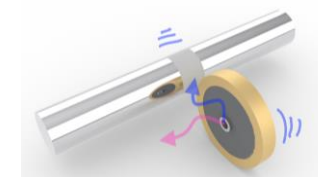
Strain gage force sensor



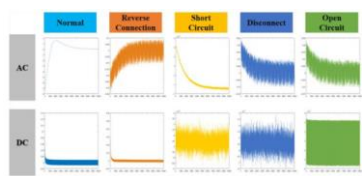
Machine & process Fingerprint



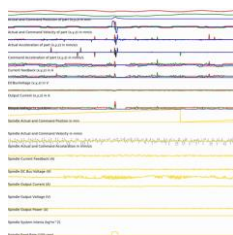
High-resolution geometrical visual inspection system



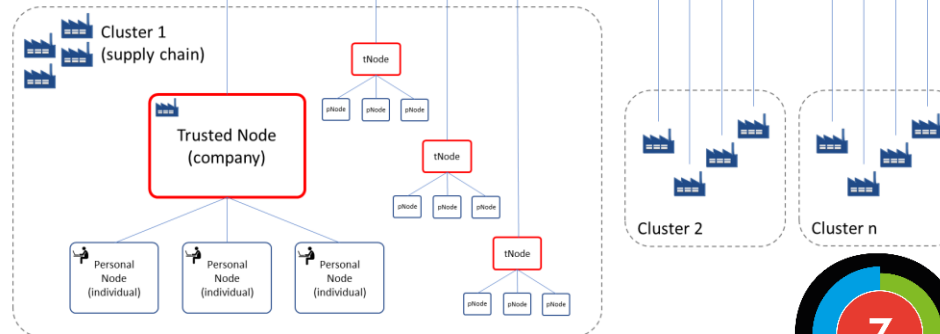
Digital Twin for product quality prediction



Broken sensor detection



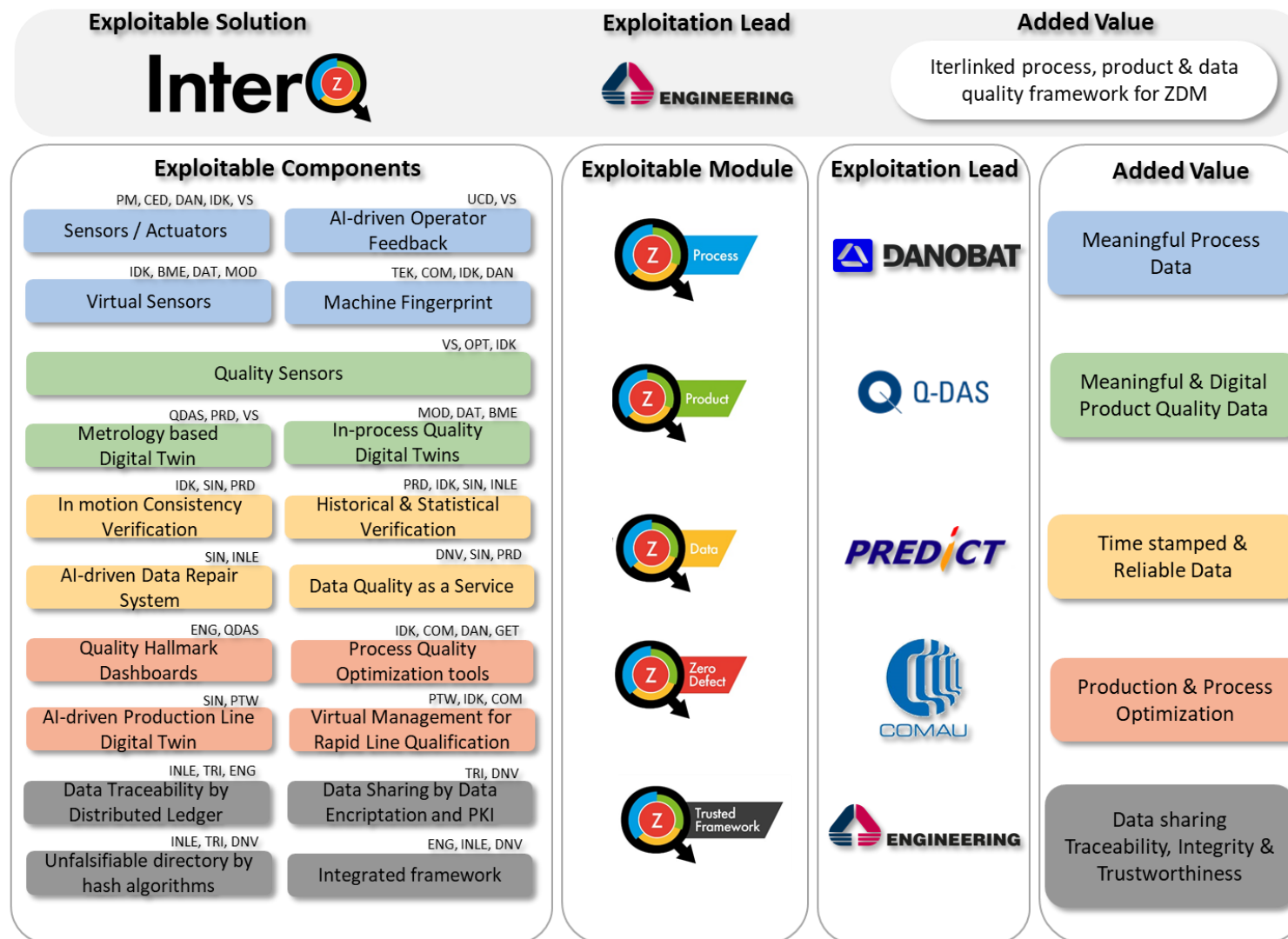
Data repair systems



Preliminary architecture definition



# InterQ Expected results



# InterQ Clustering activities



The SEA4DQ 2021 Workshop is sponsored by the research projects [InterQ](#) and [DAT4.Zero](#) that are funded by the European Union's Horizon 2020 Research and Innovation programme.

**InterQ**

**DATA.ZERO**

# Questions and Answers



# InterQ

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