



DIGITAL MANUFACTURING PLATFORMS FOR CONNECTED SMART FACTORIES

D2.6 Catalogue of ZDM Assets (Final Version)

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Abstract: This document reports the work carried out in Task 2.3 and is the final version of this deliverable. The work done includes all the (updated) ZDM assets provided in the context of QU4LITY project, the necessary work related to the authorization process, which enabled the main outcome of the task, which is the publication of the online Catalogue of ZDM assets. An effort was also made to liaison the work done in task T2.3 with the WP8 marketplace, by analysing the information collected in this task and the information required for the QU4LITY marketplace.



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HISTORY

Version	Date	Modification reason	Modified by
0.1	20/05/2020	Update ZDM Assets information	Unparallel
0.2	15/06/2020	Online Catalogue/ IoT-Catalogue description	Unparallel
0.3	17/06/2020	Methodology description	Unparallel
0.4	12/07/2020	Contribution to the IoT Trends section	Unparallel
0.5	28/08/2020	Contribution to the ZDM section	Unparallel
0.6	14/09/2020	Update ZDM Assets information	Unparallel
0.7	23/09/2020	List of published assets	Unparallel
1.0	24/09/2020	Final Version	Unparallel

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1. Introduction

The objective of this document is to provide an overview of the Zero-Defect-Manufacturing assets within the scope of QU4LITY project. This document is a report of the work carried out in Task 2.3 and is the final version of this deliverable, which had a previous version, delivered in M09.

This work was carried out in the context of task T2.3 - Catalogue & Analysis of ZDM Equipment, Processes and Digital Platforms, that started in month two (M2) and finalise in month eighteen (M18). The outcome of task T2.3 was provided in 2 deliverables: D2.5 - Catalogue of ZDM Assets (Version 1) with deadline in M9 and D2.6 - Catalogue of ZDM Assets (Final version) with deadline in M18.

This deliverable reports the activities of task T2.3, devoted to cataloguing, structuring and organizing the information on the rich set of background platforms and components that support the realization of the project's Autonomous Quality paradigm. As part of the task, an on-line catalogue of ZDM equipment platforms, digital automation platforms, simulation components, predictive maintenance platforms and various other digital enablers were made available. Based on the catalogue, the consortium analysed the technological and license compatibility of the various platforms/components. The latter compatibility will be exploited as a reference in the platform integration processes of the project (i.e. in WP7 as part of the pilots). Moreover, the catalogue will be reused in the scope of the multi-sided market platform in WP8.

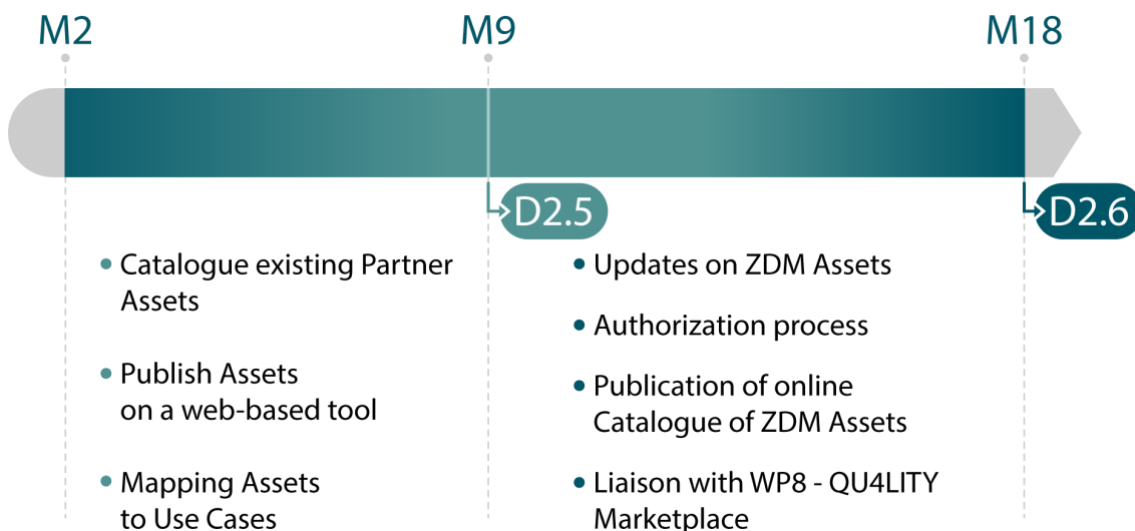



Figure 1: Task T2.3 – Timeline

This document, as the final report related to Task 2.3, provides all the details regarding the work carried out, including all the (updated) ZDM assets provided in the context of QU4LITY project, the necessary work related to the authorization process, which enabled the main outcome of the task, which is the publication of the online Catalogue of ZDM assets. Also, as part of the work carried out on the catalogue of ZDM assets, some effort was made in order to liaison the work done in

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task T2.3 with the WP8 marketplace, by analysing the information collected in this task and the information required for the QU4LITY marketplace.

Online Catalogue: IoT-Catalogue

In the scope of QU4LITY Project were developed and customized technologies to the needs of Zero-Defect Manufacturing (ZDM). The technologies were integrated as a part of ZDM solutions. These technologies were structured and organized and made available in an On-line Catalogue, named IoT-Catalogue.

The IoT-Catalogue is a web-based catalogue for Internet-of-Things (IoT) solutions, available at www.iot-catalogue.com. The IoT-Catalogue brings IoT users and technology providers together, from the domain needs to IoT products (and back) via validated solutions with components, assembly guides, and more.

The IoT-Catalogue offers a diversity of features, however, in this document the focus is given to technologies. In IoT-Catalogue, a set of technologies in a use case is called the solution.

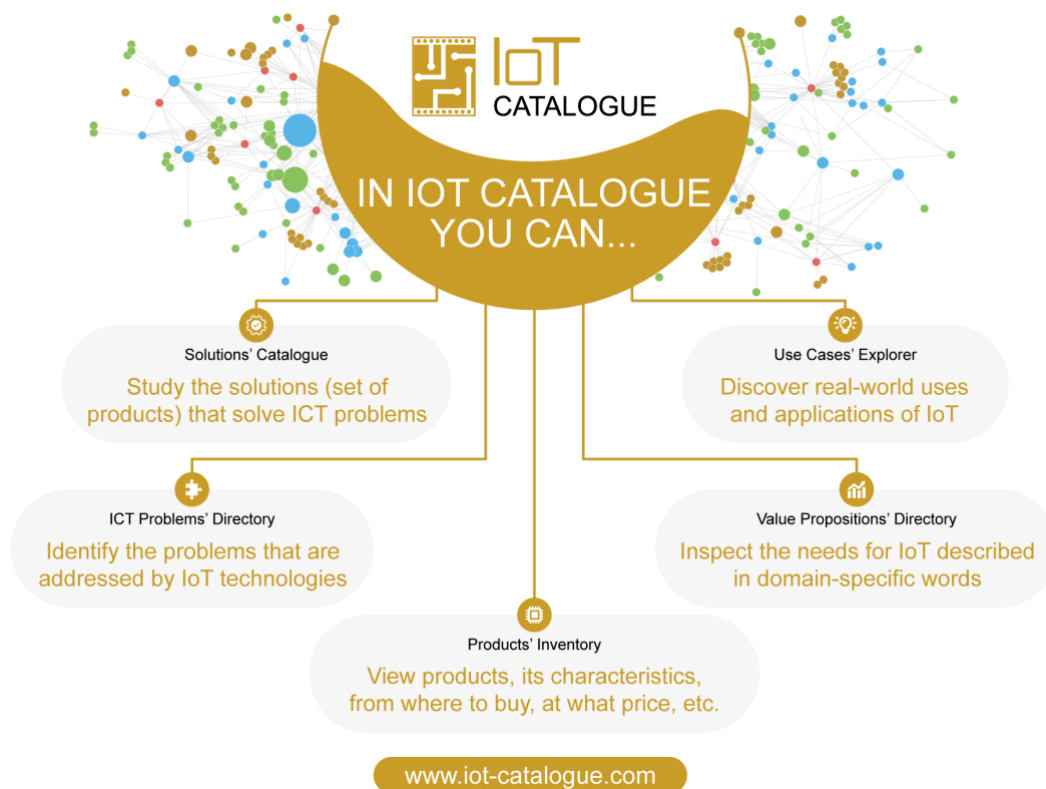


Figure 2: IoT-Catalogue functionalities

The IoT-Catalogue was chosen for the purpose of structuring and organizing the QU4LITY information, through of the characterization. All the QU4LITY technologies were characterized, allowing to aggregate and relate.

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It is important to mention that the IoT-Catalogue was not developed in the scope of the project. This web-based tool was chosen because is a reference tool in IoT and developed by a QU4LITY partner - UNPARALLEL. This relation provides flexibility to support new features or allow different kinds of information, that can be used to satisfy the needs of the project.

Methodology

In order to have valuable information in the IoT-Catalogue, there is a well-defined information flow, so that information providers, know in advance how the IoT-Catalogue behaves from the addition of new content to the catalogue, until providing it publicly to visitors of www.iot-catalogue.com. This information flow is depicted in Figure 3.

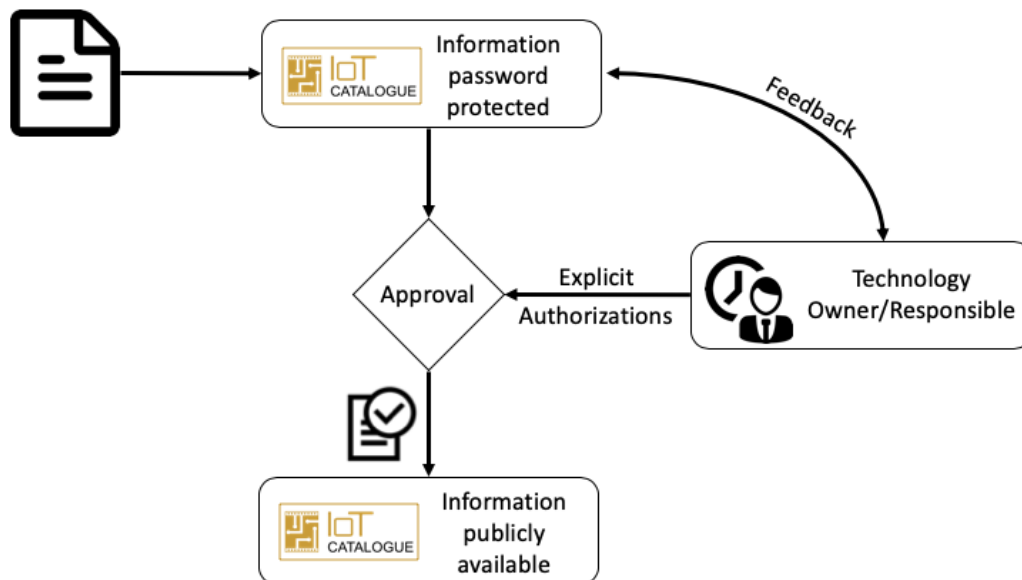


Figure 3: IoT-Catalogue information flow

The methodology used follows several steps. The first step is the requesting and gathering of information from all stakeholders. Such request was made through a questionnaire (ZDM Asset Questionnaire) using email messages. The information, which initially was considered as confidential, needed explicit consent from their owners to be exposed at IoT-Catalogue. Second step was to request such explicit consent from the Technology information owners.

When the explicit authorization is received by email message, the information is then made public. This was made case by case, upon approval arrival. It is possible to find the methodology in detail in Annex A – Task Methodology.

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2. Online Catalogue of ZDM Assets

As previously mentioned, the IoT-Catalogue is the Online Catalogue used to catalogue, structure and organize the QU4LITY assets information. Figure 4 represents the 3 pillars that support the Online Catalogue of ZDM Assets: the QU4LITY project page, the ZDM assets and the IoT-Catalogue. These pillars represent the different audiences that IoT-Catalogue can reach and present the ZDM Assets

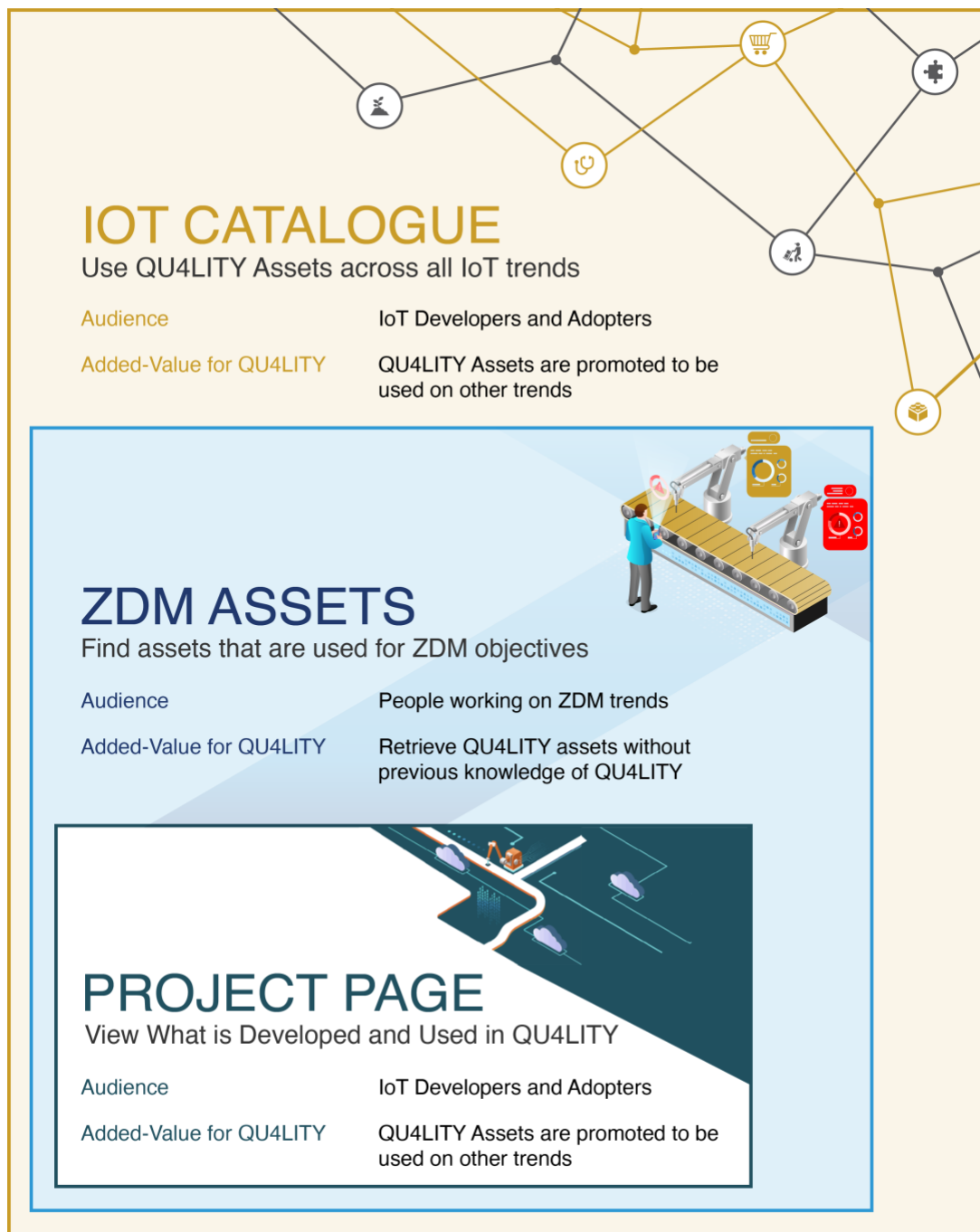


Figure 4: Outreach Audience and Added-Value for QU4LITY

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QU4LITY Project Page¹: is exclusive to QU4LITY project information. For this reason, accessing QU4LITY assets requires prior knowledge of the project.

ZDM Assets page²: IoT Trends page presents several trending domains, which includes ZDM-Zero Defect Manufacturing. Users can view all IoT-Catalogue assets organized and aggregated by trends. People working specifically on ZDM trends can access to QU4LITY assets without previous knowledge about project itself.

IoT-Catalogue³: Users from different communities use the IoT-Catalogue. To those, IoT-Catalogue provides mechanisms to visualise assets by characteristics/ features. This allows assets from different trends to be gathered and shown to the users. In this way, ZDM assets can be discovered by users in other trends and integrated in their solutions, even if not mainly related with ZDM.

Herein, the following sections explains in more detail the dynamics related to IoT-Catalogue, and how and User can access to ZDM assets:

- Quick Start Guide: Simple guide that explains how to access to the QU4LITY information in IoT-Catalogue;
- Published ZDM Assets: List of ZDM Assets, including developers and links to access each asset online page.

Quick Start Guide

The IoT-Catalogue offers a diversity of information about IoT technologies and how, and where, they are used. However, this quick start guide is exclusively aimed at accessing QU4LITY and/or ZDM assets, in IoT-Catalogue. Figure 5 presents the main page of the IoT-Catalogue where are identified the different ways that the user can follow to access the assets.

¹ <https://www.iot-catalogue.com/projects/5d9722c0f02fdc9e36eaf45a>

² <https://www.iot-catalogue.com/trends/5e95bac50af0772a0e09c191>

³ <https://www.iot-catalogue.com/>

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Figure 5: Landing Page – IoT-Catalogue

- **QU4LITY Project Page**

To access QU4LITY information, users can press “QU4LITY” logo. Figure 6 shows this page:

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HOME > PROJECTS > QU4LITY

QU4LITY

qu4lity-project.eu

Digital Reality in Zero Defect Manufacturing

QU4LITY will demonstrate, in a realistic, measurable, and replicable way an open, certifiable and highly standardised, SME-friendly and transformative shared data-driven ZDM product and service model for Factory 4.0 through 5 strategic ZDM plug & control lighthouse equipment pilots and 9 production lighthouse facility pilots. QU4LITY will also demonstrate how European industry can build unique and highly tailored ZDM strategies and competitive advantages (significantly increase operational efficiency, scrap reduction, prescriptive quality management, energy efficiency, defect propagation avoidance and improved smart product customer experience, and foster new digital business models; e.g. outcome-based and product servitisation) through an orchestrated open platforms ecosystem, ZDM atomized components and digital enablers (Industry 4.0 digital connectivity & edge computing package, plug & control autonomous manufacturing equipment, real-time data spaces for process monitoring & adaptation, simulation data spaces for digital process twin continuity, AI-powered analytic data spaces for cognitive digital control twin composable services, augmented worker interventions, European quality data marketplace) across all phases of product and process lifecycle (engineering, planning, operation and production) building upon the QU4LITY autonomous quality model to meet the Industry 4.0 ZDM challenges (cost and time effective brownfield ZDM deployment, flexible ZDM strategy design & adaptation, agile operation of zero defect processes & products, zero break down sustainable manufacturing process operation and human centred manufacturing).

[Read Less](#)

Team

1 Contact 62 Entities

Contact Entity

Jorge Rodriguez
jorge.rodrigu***@***s.net

VTT Finland
Unparallel Portugal
INTRASOFT Luxembourg
Fraunhofer IAO Germany
ATOS Spain
SIEMENS Germany

Developments in project

39 Products

AR information...
Worker support with Augmented reality for better understanding...
Platform +2

Additive Manufacturing...
AMS is a software tool to provide a quick and reliable process time estimation to...
Business Simulation

Best Practices for Zero...
A methodology and guideline with steps of how to improve in the ZDM
Guideline

BeyondMonitor
Real-Time visualization and monitoring service about the industrial furnace...
Platform Real-time data +3

BeyondReport
This component consists of another service derived from the furnace data...
Platform Data Data +1


CARISMA
The CARISMA tool platform support model-based security analysis based o...
Platform

View the IoT Catalogue with all the results available

QU4LITY MODE | Switch to QU4LITY Mode to see only with their results

This project has received funding from the European Union's Horizon 2020 research and innovation programme under agreement N° 825030

Figure 6: QU4LITY project page

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QU4LITY team and a contact of the person in charge is available in “Team” section (Figure 7).

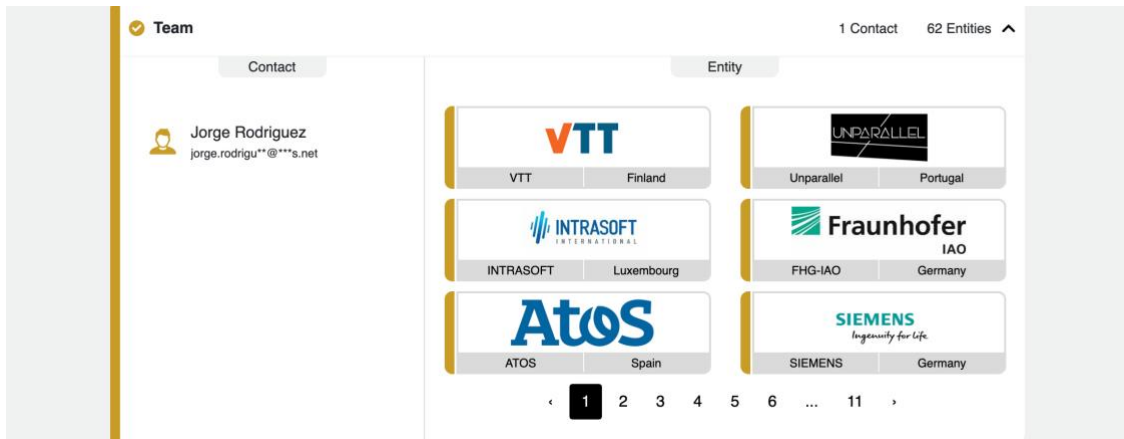


Figure 7: QU4LITY team – “Teams” section

The section “Developments in project” presents all the assets that had been developed or improved in QU4LITY context (Figure 8).

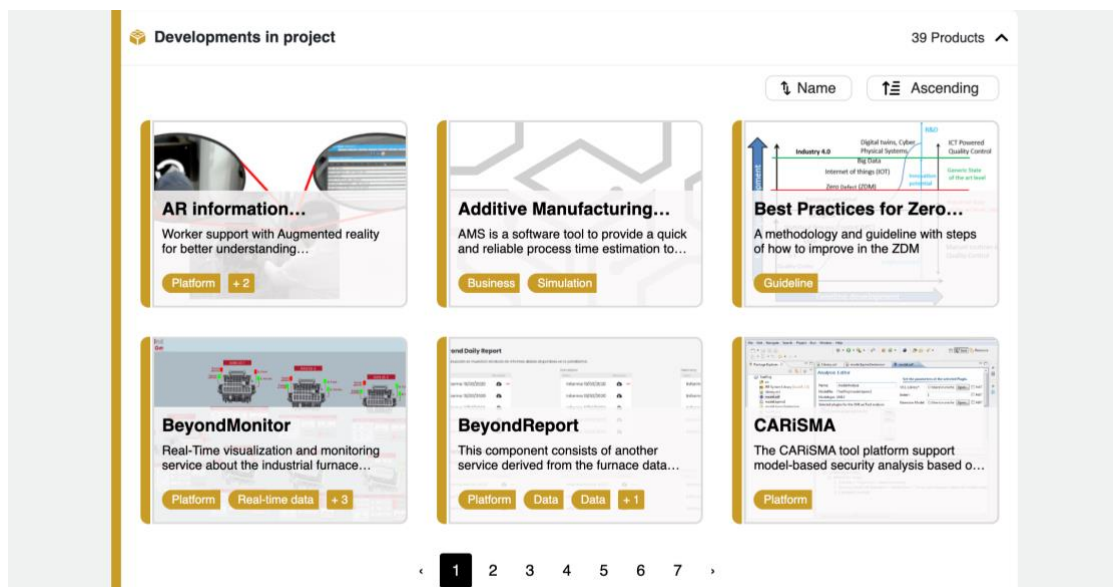



Figure 8: QU4LITY assets – “Developments in project” section

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- **ZDM - Zero Defect Manufacturing Assets page**

Figure 9, represents the IoT Trends page, with all the existing trends, so far, in IoT-Catalogue.

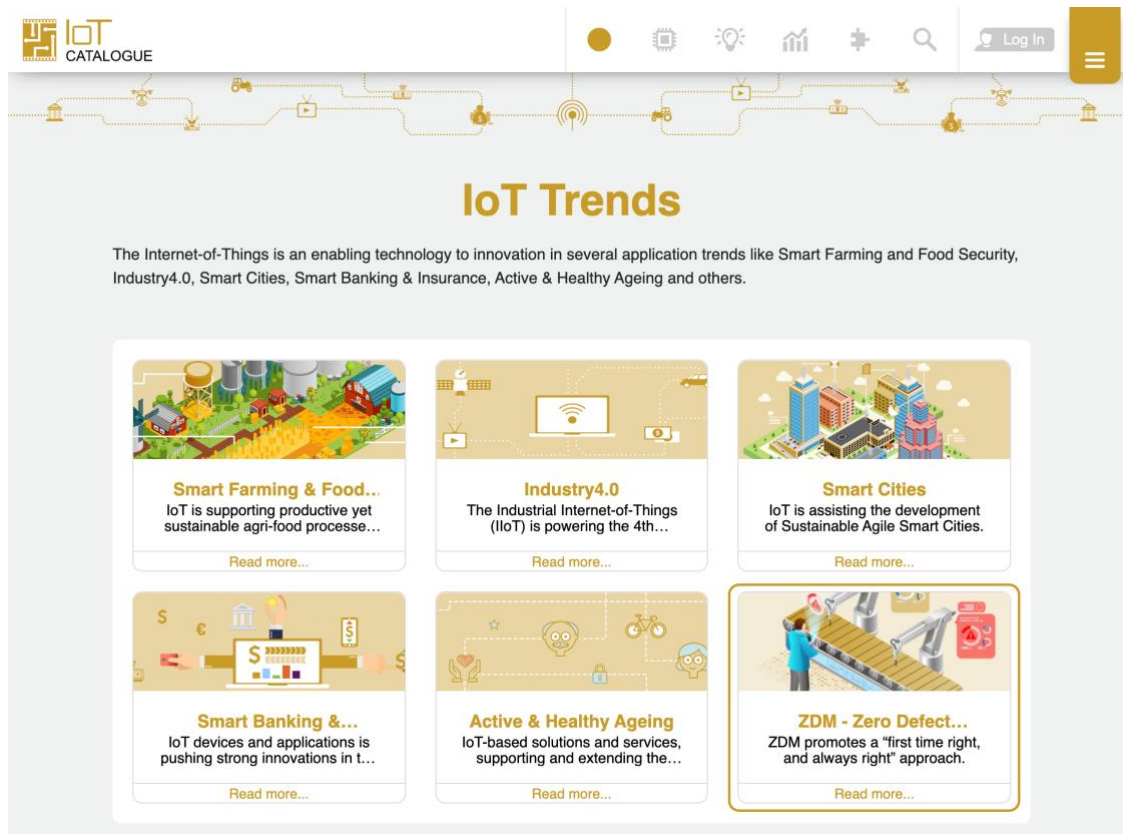


Figure 9: IoT Trends page

Each trend gathers all the projects and assets related to the respective trend in IoT-Catalogue. Figure 10 shows the ZDM – Zero Defect Manufacturing trend page, that is composed by:

- A brief description to the ZDM trend;
- A section with the projects related ZDM trend;
- And a section with the ZDM assets.

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QU4LITY
IoT CATALOGUE

ZDM - Zero Defect Manufacturing
ZDM promotes a “first time right, and always right” approach.

Traditional six-sigma techniques adopted in industry show strong limitations in highly turbulent, variable and changeable production contexts, characterized by small batch productions, customized, or even one-of-a-kind products, and in-line product inspections. Zero-defects manufacturing (ZDM) or is an emerging paradigm aiming at going beyond traditional six-sigma approaches in highly technology-intensive and strategic manufacturing sectors through knowledge-based approaches. It’s about “first time right, and always right”. ZDM brings most added-value and benefits at mass customisation and one-of-a-kind production as well as at complex and changeable manufacturing contexts. ZDM can radically increase productivity at multi-stage/single-stage levels and can bring system-level improvements at shop floor. ZDM puts together monitoring and control, inter-stage correlations, multi-sensor information, and advanced analytics, in order to act on defects repair, in-line reworks and proactive prevention.

Projects with ZDM - Zero Defect Manufacturing

QU4LITY
Qu4lity

Components 44 Components

AR information visualisation...
Worker support with Augmented reality for better understanding process/productio...
Platform +2

Additive Manufacturing...
AMS is a software tool to provide a quick and reliable process time estimation to...
Business Simulation

Best Practices for Zero...
A methodology and guideline with steps of how to improve in the ZDM
Guideline

BeyondMonitor
Real-Time visualization and monitoring service about the industrial furnace...
Platform Real-time data +3

BeyondReport
This component consists of another service derived from the furnace data...
Platform Data Data +1

CARISMA
The CARISMA tool platform support model-based security analysis based on...
Platform

1 2 3 4 5 6 ... 8

Figure 10: ZDM - Zero Defect Manufacturing page

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- **Assets List in IoT-Catalogue**

IoT-Catalogue overview (Figure 11) is a menu which allows the user to get a shortcut to any available page. This menu presents the information categories which are available in IoT-Catalogue.

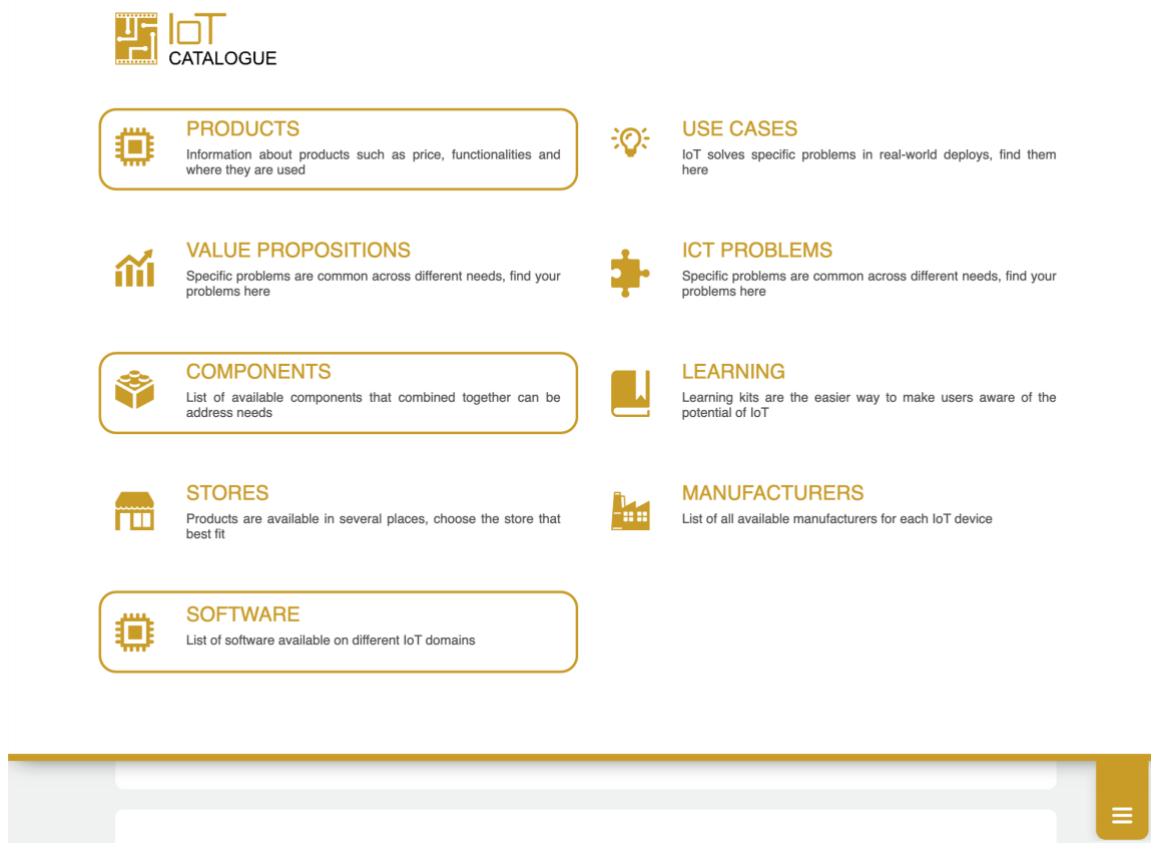



Figure 11: Overview menu

Currently, ZDM assets are distributed by the following pages:

- **Products:** A product is a device that has intrinsic characteristics that results from a manufacturing process. It can be used as itself or be composed by components. Moreover, it helps to reach the desired solution/function.
- **Components:** Components are part or element of a device or system (e.g. a module for a software, an electronic unit, etc.). They are described with a set of intrinsic characteristics used to identify them.
- **Software:** A set of instructions or programs instructing a computer to do specific tasks. It is a generic term used to describe computer programs that run on PCs, mobile phones, tablets, or other smart devices.

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The IoT-Catalogue is able to list all the assets, and filter using the characteristics available and associated to the assets. The dynamic is the same on each asset category page.

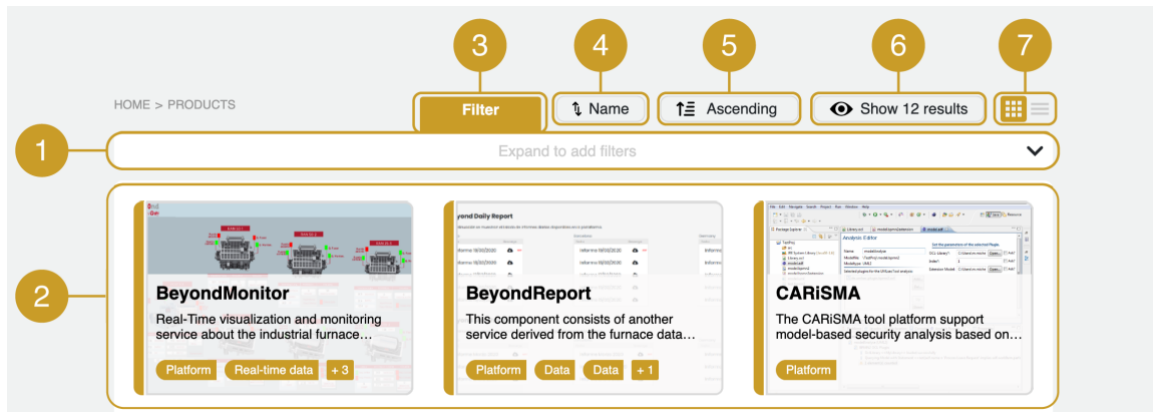



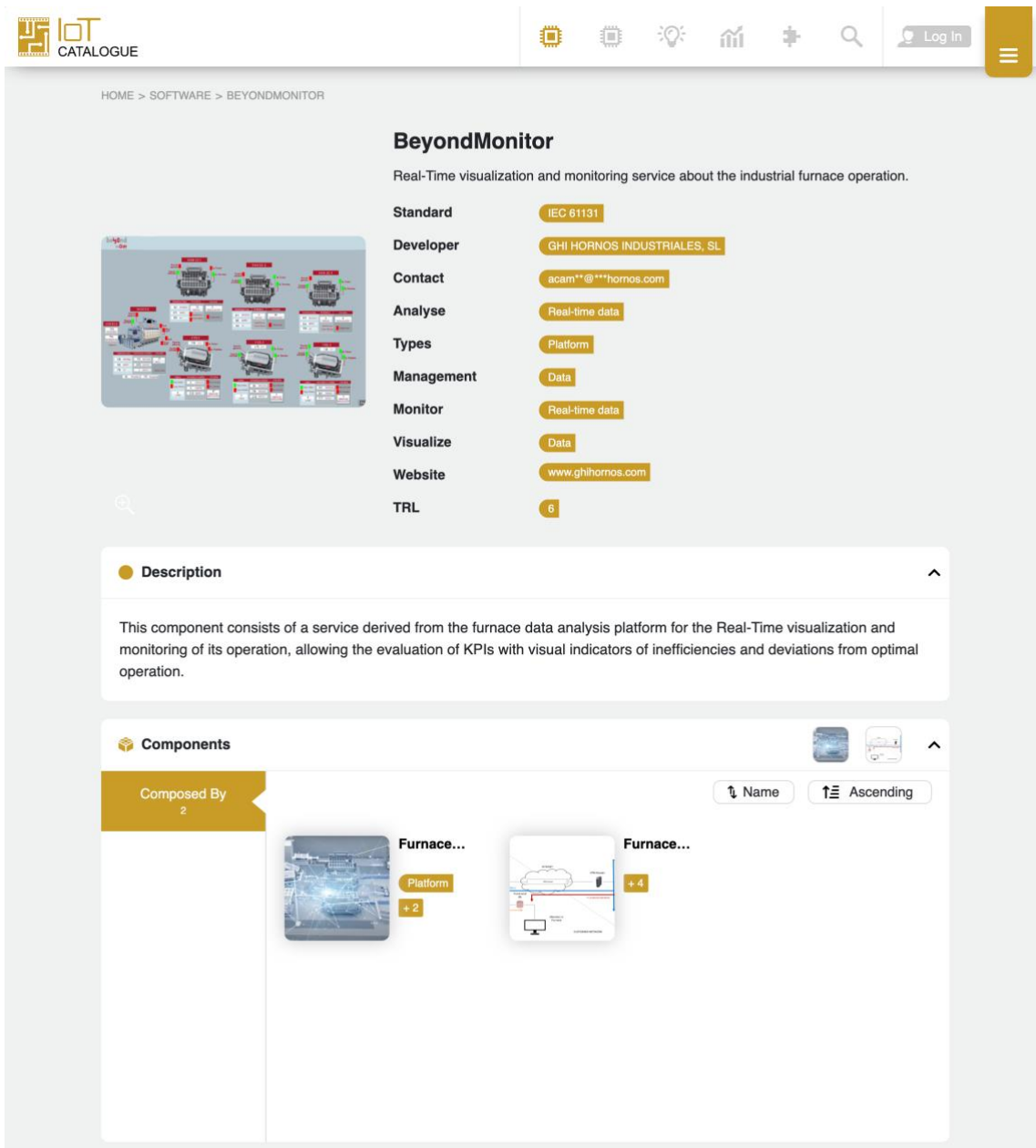
Figure 12: Filter assets

The way to access assets will have layout of Figure 12, which is described as:

1. A list with the filters to select (category and tag name)
2. List of assets
3. Filter tab (Clicking on this, hides the filter)
4. Sort tab (It can be sorted by name and price)
5. Sort by alphabetical order (ascending and descending)
6. Number of results per page
7. Changes the way results are shown. List or grid View

The asset page will have the appearance as it shown in Figure 13. In this page will have all the intrinsic characteristics which defines the asset.

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HOME > SOFTWARE > BEYONDMONITOR

BeyondMonitor

Real-Time visualization and monitoring service about the industrial furnace operation.

Standard IEC 61131

Developer GHI HORNOS INDUSTRIALES, SL

Contact acam**@**hornos.com

Analyse Real-time data

Types Platform

Management Data

Monitor Real-time data

Visualize Data

Website www.ghihornos.com

TRL 6

Description

This component consists of a service derived from the furnace data analysis platform for the Real-Time visualization and monitoring of its operation, allowing the evaluation of KPIs with visual indicators of inefficiencies and deviations from optimal operation.

Components

Composed By 2


Furnace... Platform +2

Furnace... +4

Figure 13: BeyondMonitor asset

Each asset is described in their own page. The information inside can have optional features. This includes:

- Brief description;
- Image representative of the asset;
- Product characterisation (all tags characterising the asset):
 - asset functionalities;
 - indication of asset type (e.g. software API, algorithm, etc.);
- Technology readiness level (TRL) of the asset;
- Standards that the asset complies with;

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- Entity related to the asset;
- Contact related to the person responsible or the entity;
- Asset website;
- A long description, with more detail about the asset;
- References of the asset, like Documentation, Repository, etc;
- The components that composes or is used in the asset;
- A gallery with images related with the asset.

Published ZDM Assets

This section lists all ZDM assets existing in the IoT-Catalogue (Table 1). Each asset has a link with direct access to the respective page, in IoT-Catalogue. The table is a list that represents the current version of ZDM assets. The list can be changed until the end of the QU4LITY project, with the development of assets or with authorisations to make more assets public.

Table 1: List of ZDM assets in the IoT-Catalogue

Asset Name	Developer	Link
Easybot AGV	ASTI MOBILE ROBOTICS S.A.U	https://www.iot-catalogue.com/components/5ba0c42fbfc8130b8868d42c7
Additive Manufacturing Simulator (AMS)	TTS TECHNOLOGY TRANSFER SYSTEMS SRL	https://www.iot-catalogue.com/components/5c3dc3770efe600de5613142
M3MH	UNIMETRIK SA	https://www.iot-catalogue.com/components/5c3dc3770efe600de5613144
FOOTPRINT - Fog Node for Non-Intrusive Part Profile Monitoring	Unparallel Innovation, Lda	https://www.iot-catalogue.com/components/5c3dc3770efe600de561314e
Decision Support System (DSS) and Strategies for ZDM	ATLANTIS ENGINEERING AE	https://www.iot-catalogue.com/components/5d24b5cca05eadc79298784f
AR information visualisation and Human Error Avoidance	Teknologian tutkimuskeskus VTT Ou	https://www.iot-catalogue.com/components/5d24b610402f1c8921474855
Best Practices for Zero Defect Manufacturing (ZDM) in Industry	SINTEF RAUFOSS MANUFACTURING AS	https://www.iot-catalogue.com/components/5d24b6126dda22c618dfa07
CARiSMA	UNIVERSITAET KOBLENZ-LANDAU	https://www.iot-catalogue.com/components/5d24b613969ef0851db0e2f3
Connected worker, CPS Plant, ZDM Working Management	SINTEF RAUFOSS	https://www.iot-catalogue.com/components/5

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Framework	MANUFACTURING AS	d24b616d80ca5c1c0fce381
Context Extractor & Device Centric Context Model	INSTITUT FUR ANGEWANDTE SYSTEMTECHNIK BREMEN GMBH	https://www.iot-catalogue.com/components/5d24b617a35f055b34be427c
Converters for interoperability	Mondragon Goi Eskola Politeknikoa Jose Maria Arizmendiarieta, S.Coop	https://www.iot-catalogue.com/components/5d24b618a2d4161f1cdc7886
CPC Analytics (data exploration based on unsupervised and supervised machine learning)	Fraunhofer Institute for Laser Technology	https://www.iot-catalogue.com/components/5d24b61a831341a792fa9180
Design4AM – Interactive Visualization solution	Fraunhofer Institute for Computer Graphics	https://www.iot-catalogue.com/components/5d24b61e7547d4abfe244442
High Performance Computing Cluster	Jozef Stefan Institute	https://www.iot-catalogue.com/components/5d24b62ddb1fda7ba93dff6
HolMS, Holonic Manufacturing System	SINTEF RAUFOSS MANUFACTURING AS	https://www.iot-catalogue.com/components/5d24b627b8ecd3089742e3e3
IEC 61499 IDE and runtime platform to design and deploy application of real-time distributed application	NXTControl GmbH	https://www.iot-catalogue.com/components/5d24b62822a358a89e87ac67
IKCLOUD	IKERLAN S COOP	https://www.iot-catalogue.com/components/5d24b62a39b5d5f83753cd83
IKSEC securization guidelines	IKERLAN S COOP	https://www.iot-catalogue.com/components/5d24b62b2a9222d007ed7b1d
Sinapro IoT MES/MOM	KOLEKTOR GROUP VODENJE IN UPRAVLJANJE DRUZB DOO	https://www.iot-catalogue.com/components/5d24b62ede2b6f8ac93fa2f3
Machining (milling) to manufacture die sinking electrodes, which are employed in moulds and die for aerospace and automotive sectors	Mondragon Goi Eskola Politeknikoa Jose Maria Arizmendiarieta, S.Coop	https://www.iot-catalogue.com/components/5d24b632b9ee5cdabee70d34
MANTIS Proactive Maintenance Service Platform	Mondragon Goi Eskola Politeknikoa Jose Maria Arizmendiarieta, S.Coop	https://www.iot-catalogue.com/components/5d24b6332ccb0cdd0332ef1f
MASAI	ATOS SPAIN SA	https://www.iot-catalogue.com/components/5d24b63580e51bb8d6968470
Modular solution for real-time	Fraunhofer Institute for Laser	https://www.iot-catalogue.com/components/5d24b63580e51bb8d6968470

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process monitoring & control (CPC-hardware)	Technology	catalogue.com/components/5d24b636c9865e2b346746b9
NEPRES	Fraunhofer Institute for Manufacturing Engineering and Automation	https://www.iot-catalogue.com/components/5d24b637289c00d6629ef7e4
NGAC based security framework	INSTITUT FUR ANGEWANDTE SYSTEMTECHNIK BREMEN GMBH	https://www.iot-catalogue.com/components/5d24b638f3b7861f20970b40
VTT OpenVA - Visual Analytics platform	Teknologian tutkimuskeskus VTT Ou	https://www.iot-catalogue.com/components/5d24b63a033171f00361a4d3
Pacelab TWIN	PACE Aerospace Engineering and Information Technology GmbH	https://www.iot-catalogue.com/components/5d24b63b676f1547f76332fa
Pacelab WEAVR	PACE Aerospace Engineering and Information Technology GmbH	https://www.iot-catalogue.com/components/5d24b63c246dd713374fdd2b
PPlan Ontology	Fraunhofer Institute for Industrial Engineering	https://www.iot-catalogue.com/components/5d24b63d6781dd128b7d6d5d
Prediction of defects based on asset's deterioration rate	ATLANTIS ENGINEERING AE	https://www.iot-catalogue.com/components/5d24b63eea4728f27bc49888
Production Management 4.0	Fraunhofer Institute for Industrial Engineering	https://www.iot-catalogue.com/components/5d24b64129138d8af6d4fb4f
Product Service System (PSS) Ontology	INSTITUT FUR ANGEWANDTE SYSTEMTECHNIK BREMEN GMBH	https://www.iot-catalogue.com/components/5d24b642f4f817b31efb35bf
Quality Prediction Model via Data analytics and machine learning	Technische Universität Dortmund	https://www.iot-catalogue.com/components/5d24b6437983e7824897592d
Real time data acquisition, visualization and processing environment (CPC software)	Fraunhofer Institute for Laser Technology	https://www.iot-catalogue.com/components/5d24b645fe6813aac85ef622
ReconCell: A reconfigurable robotic platform	Jozef Stefan Institute	https://www.iot-catalogue.com/components/5d24b6465eacef252f990a63
Safire Analytics Framework	IKERLAN S COOP	https://www.iot-catalogue.com/components/5d24b647d40264ac048d6fa2
Workplace 4.0	Fraunhofer Institute for Industrial Engineering	https://www.iot-catalogue.com/components/5

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		d24b65803d546158849d4bd
Distributed Ledger	ENGINEERING - INGEGNERIA INFORMATICA SPA	https://www.iot-catalogue.com/components/5dced110b95e1f741ff98168
Digital Industry Data Analytics (DIDA) Platform	ENGINEERING - INGEGNERIA INFORMATICA SPA	https://www.iot-catalogue.com/components/5e56677c3f140cd12c67a37b
BeyondMonitor	GHI HORNOS INDUSTRIALES, SL	https://www.iot-catalogue.com/components/5e95be3474a029dc29fcbe37
BeyondReport	GHI HORNOS INDUSTRIALES, SL	https://www.iot-catalogue.com/components/5e95be394a341219fd71ab2c
Furnace Data Analysis	GHI HORNOS INDUSTRIALES, SL	https://www.iot-catalogue.com/components/5e95be3a00aea417e5c7c096
Furnace Data Gathering System	GHI HORNOS INDUSTRIALES, SL	https://www.iot-catalogue.com/components/5e95be3b7b095429a0c176b7
Qu4lity Trend Cockpit	TTS TECHNOLOGY TRANSFER SYSTEMS SRL	https://www.iot-catalogue.com/components/5f159e22234c7a18caae36ff

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3. Future Work

The work in task T2.3 finishes with this deliverable. However, the results of this task will be used on other work packages.

One feature that is already available in the IoT-Catalogue, is the possibility to export information available within IoT-Catalogue, to external entities, such as the QU4LITY Marketplace. This will enable that the Marketplace being developed in WP8, will have access to all the information collected from the QU4LITY partners, and available in the IoT-Catalogue.

IoT-Catalogue is great platform to disseminate the ZDM assets, by providing an organized and eye-catching interface to present the information, proving a useful tool for dissemination and exploitation activities (WP9). Moreover, IoT-Catalogue targets the several communities, including the ZDM community. This will allow QU4LITY's ZDM assets to be disseminated even after the lifetime of QU4LITY project.

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List of Abbreviations

Abbreviation	Explanation
DoA	Grant Agreement Document
IOT	Internet of Things
TRL	Technology Readiness Level
WP	Work Package
ZDM	Zero Defect Manufacturing

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Annex A – Task Methodology

In order to have valuable information in the IoT-Catalogue, there is a well-defined information flow, so that information providers, know in advance how the IoT-catalogue behaves from the addition of new content to the catalogue, until providing it publicly to visitors of www.iot-catalogue.com. This information flow is depicted in Figure 14.

This is to ensure quality of information, so the information providers of the assets described in the IoT-Catalogue need to check if the information is updated, but also to prevent from confidential information to be made public. The main objective of this process is to guarantee the catalogue always contains updated information for each component.

To tackle the public/confidential information issue, a private and internal version of the IoT-Catalogue was created, which allows interaction between the responsible for each component and the information on the IoT-Catalogue, allowing a feedback process to be made, which end on an explicit authorization on the information made publicly available.

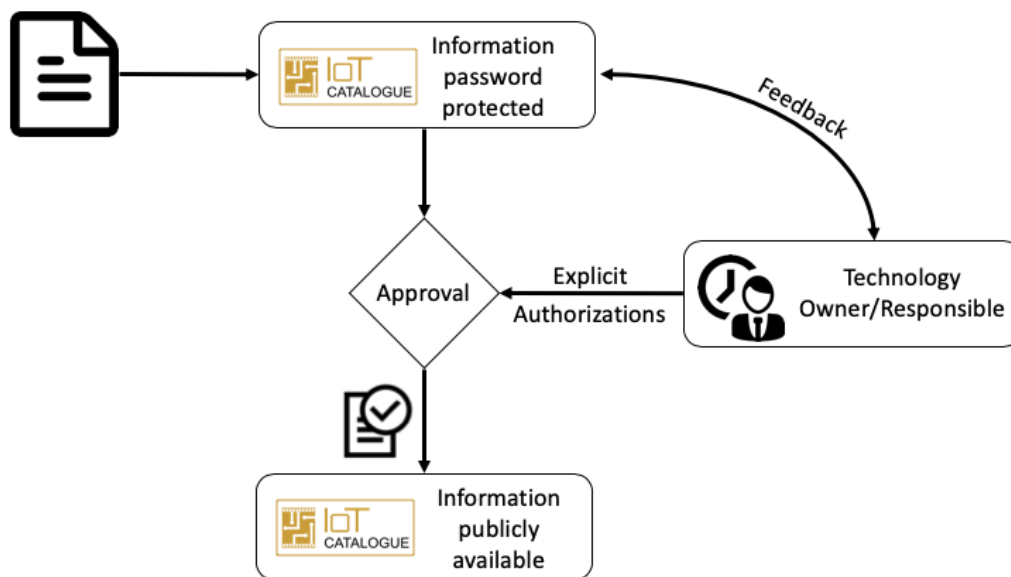



Figure 14: IoT-Catalogue information flow

The different steps for having tools in the IoT-Catalogue are described in the following sections:

- **Tool: Draft description**

This step corresponds to the analysis of the DoA document and the collection of information regarding QU4LITY related technologies which was collected in order to create a baseline of technologies planned to be used in the project.

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This means, as a first stage (made available in the first version of this deliverable – D2.5), information regarding QU4LITY related technologies was collected from the Grant agreement, in order to create a baseline of technologies that were planned to be used in the project. This was then followed-up by the elaboration of a questionnaire that was shared with all consortium partners, so to gather additional and updated data. This questionnaire was created to identify the state of each technology. It was designed to identify relevant information about QU4LITY technologies in terms of use, functionalities, documentation, and compliance to standards. In this sense, the partners who provide digital technologies were asked to complete the questionnaire.

This made possible to identify all QU4LITY related technologies and to characterize each one of them, and at the same time update the association between technologies and QU4LITY use cases. The questionnaire was coordinated by WP2 and created by a taskforce from Task 2.3 and Task 2.4, with the objective of reducing partners effort by providing information in unique way to both tasks.

It is possible to find the Questionnaire and respective detailed description in the last section of the Annex (ZDM Asset Questionnaire).

Within the 2nd stage of the task, there were new technologies added to the catalogue related to ZDM Technologies, and also updates made on existing ones.

The information collected was then made available through the web-based IoT-Catalogue.


- **Private password protected information @ IoT-Catalogue**

The result of the initial collection, made in the previous step is made available within IoT-Catalogue in password-protected pages, only accessible for specific groups of registered users. Unparallel provides special credentials to information providers, so they have access to their information.

- **Data protection**

With respect to the authorization process, the IoT-Catalogue itself already provides some terms and conditions related to the information stored. The following terms, provide a clear view on this:

- The Data always belongs to the owner of information, not to UNPARALLEL Innovation, Lda.
 - The owners of the data always have control to edit or delete the data, either directly on the website, or by request
 - We don't share the data with third parties
 - IoT-Catalogue processes the data to gather statistics and relations between information on the scope of IoT-Catalogue, but never change the original data
- The editor must always have permission to use the information
 - Editor must be the owner of the information
 - Editor must have authority to use the information

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- Editor can decide the level of dissemination for the information:
 - Public information will be visible to everyone who access the IoT-Catalogue
 - Non-public information will only be accessible to specific groups or users
 - Information is always private prior to explicit publication
- Type of information:
 - Content: Information about IoT Related Information, including, branding, descriptions, characterization, photos, etc.
 - Institutional: Including, contact information, logos, etc.
- Everyone can join the IoT-Catalogue, if they agree with the terms and conditions

As we're collecting information related to the technologies used or planned to be used within the QU4LITY project, we will also require all information providers to accept the following terms:

- The information owners allow the IoT-Catalogue to share the information to all QU4LITY project activities (e.g. QU4LITY marketplace)
- **Feedback from Technology Owner/Responsible**


With access to the IoT-Catalogue password-protected pages, users can check the content available and change, update or improve the information available in the IoT-Catalogue. This feedback is then taken into consideration, and the necessary changes are applied to the IoT-Catalogue so to improve the quality of the content.

- **Approval**

With the necessary corrections and updates made by technology owners/responsible, we'll ask for their approval so to move the content to publicly available pages (not password-protected), so that external stakeholders have access to the list of ZDM technologies.

- **Authorization process**

In order to get the necessary permission from the technology owner/responsible, to make the ZDM technologies publicly available in the IoT-Catalogue, a process was defined to ease this activity.

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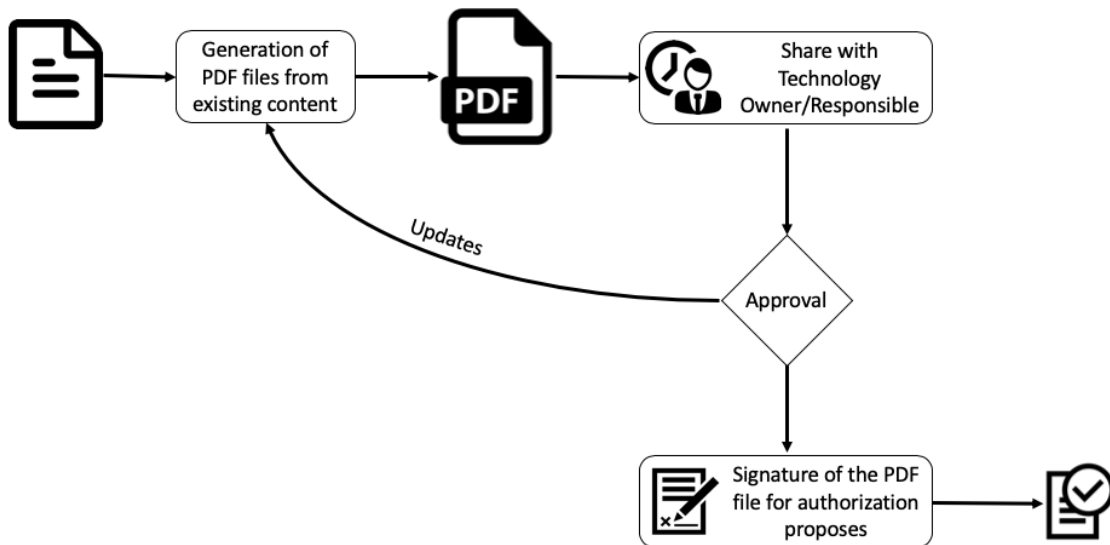


Figure 15: Authorization process

The information available in the password-protected pages, within the IoT-Catalogue, will be individually exported in a PDF file, which will be then shared with the owner/responsible of the information. Each owner will then validate the information present in the PDF file and provide the necessary authorization to make the information publicly available in the IoT-Catalogue.


This authorization, made by the owner/responsible for the technology, is done by signing the PDF file and sent to Unparallel, so that the technologies can be made publicly available. The use of the PDF file, in this process, is due to the fact that the PDF represents a snapshot of the information available at the time the authorization is provided.

- **Information publicly available**

With the approval from technology owners/responsible, the IoT-Catalogue will make the information publicly available. This means that any user browsing through the IoT-Catalogue can check the information provided. As detailed in the next chapter, the information providers keep the ownership of the information and can request changes/updates whenever needed.

- **ZDM Asset Questionnaire**

In order for the IoT-Catalogue to display correctly the component page, we defined a data model for all the components within the IoT-Catalogue. The following section provides the structure of the data used to describe components. This will clarify all the fields presented in each element. Components have features that need to be addressed. Addressing components characteristics is a very useful task as it helps

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to distinguish between each other, providing a better and clear view its usefulness for each identified use case.

We're also using this document to collect relevant information regarding quality, safety and equipment compliance standards to be followed by the QU4LITY reference architecture and digital platform implementations.

It is important to notice that we need a section for each component, as we need the details for each of the component to be included in the IoT-Catalogue.

The following table provides a guide of what information is needed related to each specific component.

Table 2: Description of the information needed per component

Component description	Name	Name of the component
	Summary	Short summary with a maximum of 280 char.
	Description	Relevant description of the component
	Image	Image to be used alongside the description of the component (e.g. in the IoT-Catalogue)
	QU4LITY pilot	Which of the QU4LITY pilots does your technology belong to?
Responsibility claims	Responsible entity	The entity responsible for the component
	Responsible entity type	The responsible entity type field should be used to identify the responsible role regarding the component (e.g. software developer, hardware manufacturer, system integrator)
	Contact	Contact of the responsible person(s)
Characterization	Hardware/Software	Is this component based only on software?
	Component type	The component type should be characterized by in order to be clear its role. Some examples of component types can be connector, platform, framework, etc. Each component can have multiple types.
	TRL⁴	Current Technology Readiness Level of the Solution – select the one from the list below: <ul style="list-style-type: none"> ▪ TRL 1 – basic principles observed ▪ TRL 2 – technology concept formulated ▪ TRL 3 – experimental proof of concept

⁴ https://ec.europa.eu/research/participants/data/ref/h2020/other/wp/2016_2017/annexes/h2020-wp1617-annex-q-trl_en.pdf

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Additional Information		<ul style="list-style-type: none"> ▪ TRL 4 – technology validated in lab ▪ TRL 5 – technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies) ▪ TRL 6 – technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies) ▪ TRL 7 – system prototype demonstration in operational environment ▪ TRL 8 – system complete and qualified ▪ TRL 9 – actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies; or in space)
	Internal Components	If the component is aggradation of different components, a list of these components is required (if applicable)
	Component License (is it open source?)	Is the component open source? (Please provide details on the license of the component based in spdx format, check the list here)
	Website	The website of the component (if available)
	Developments in Qu4lity	If the tool will be improved in the context of Qu4lity project
	WP/Task	Where these developments will occur
	Documentation	PDF files or an URL, aiming at helping how to use the component.
	Stores	List of stores where the component available to purchase (if applicable)
	Libraries	Software Libraries used with the component, for example a library to connect to other existing systems (when applicable)
	Notes (not publicly shown)	<p>Notes about the components. This information is not made available to the general public, only users with special permissions may view the notes.</p> <p>Examples of specific notes are Future TRL, Enhancements to be done and use of tech within QU4LITY. Each note should be composed by title and body text.</p> <p>More information regarding the project that is not yet mapped to the IoT-Catalogue can be added as notes.</p>

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Relevant Standards	Standards already in compliance	Please provide information regarding the standards with the component complies with. (e.g. DIN, ISO, IEC, IEEE, ASTM)
	Standards planned to be introduced	What standards are you planning to introduce or use with regard to this component?
	Known Standardization gaps	What errors / gaps / application problems could you identify regarding standardization of this technology?

- **Component #1**

(Detailed information regarding component #1)

Component description	Name	
	Summary	
	Description	
	Image	
	QU4LITY pilot	
Responsibility claims	Responsible entity	
	Responsible entity type	
	Contact	
Characterization	Hardware/Software	
	Component type	
	TRL⁵	
	Internal Components	
	Component License (is it open source?)	

⁵ https://ec.europa.eu/research/participants/data/ref/h2020/other/wp/2016_2017/annexes/h2020-wp1617-annex-q-trl_en.pdf

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Additional Information	Website	
	Developments in Qu4lity	
	WP/Task	
	Documentation	
	Stores	
	Libraries	
	Notes (not publicly shown)	
Relevant Standards	Standards already in compliance	
	Standards planned to be introduced	
	Known Standardization gaps	

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Partners:

