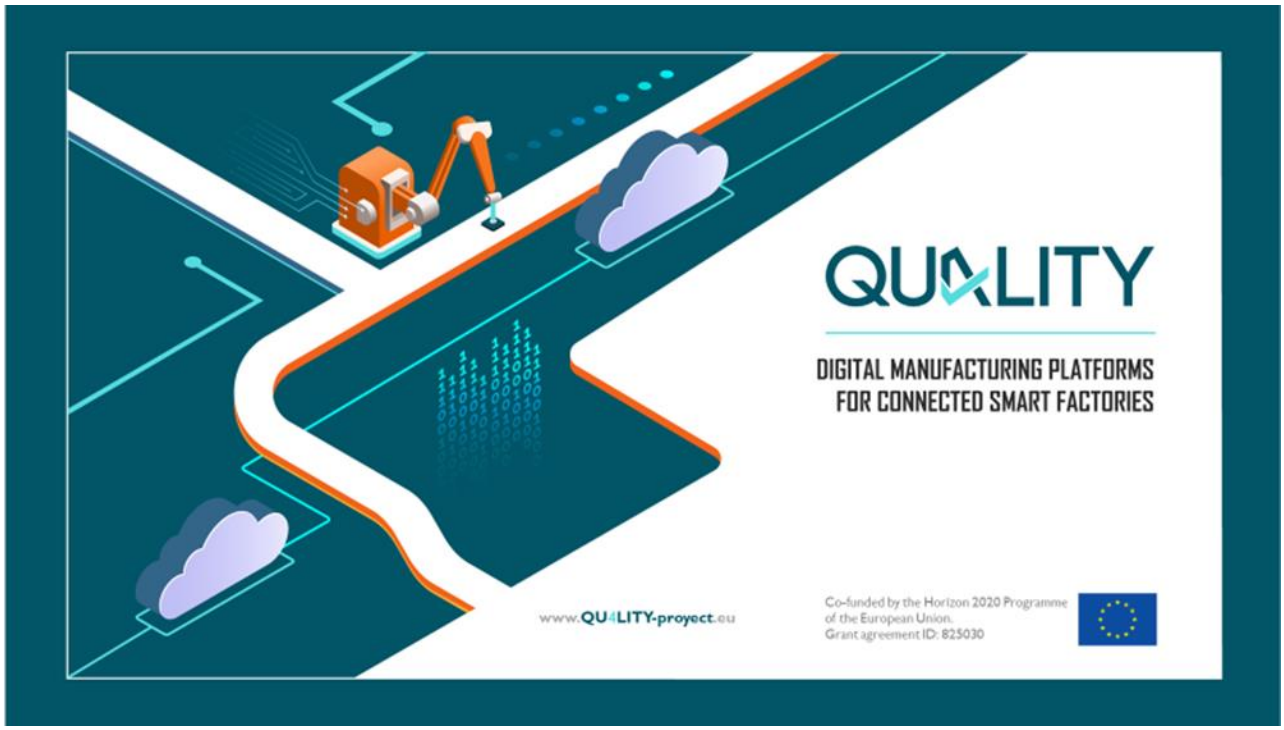



# QU4LITY 2nd Open Call

(Guidelines and Rules for Participation)

Co-funded by the Horizon 2020 Programme of the European Union

# 1 Table of Contents

# 1 Introduction

As part of the DT-ICT-07-2018-2019 (IA) call considerations, financial support to third parties is foreseen for the incorporation of third-parties (notably SMEs) that will take advantage of the platforms and pilots of the project and the Open APIs provided on top of them, towards enhancing the QU4LITY compliant systems (i.e. pilots/platforms) with additional functionalities and features. In particular, as listed in the call text, QU4LITY should address the following aspect: "*For large-scale piloting and ecosystem building activities, proposals may involve financial support to third parties, as explained in the introductory section 'Platforms and Pilots', to support SMEs in piloting and developing prototype applications on top of digital manufacturing platforms".*

QU4LITY will exploit this opportunity as a means of attracting SMEs in the project, as user and validators of the project's autonomous quality paradigm, but also as additional participants to the project's virtualized innovation hub and ecosystem. In particular, QU4LITY will provide financial support to SMEs that will engage in the following type of activities:

- ZDM Pilots for SME manufacturers, aiming at customizing and deploying the project's autonomous quality paradigm according to the needs of SMEs. In this direction, SMEs may take advantage of technologies developed in QU4LITY through their (Open) APIs (Application Programming Interfaces).

- Enhancements to QU4LITY digital platforms and pilots by SMEs, which will give SMEs the opportunity to further develop the project's systems using the Open APIs, the (AQ) Autonomous Quality concept and the reference architecture provided by the project.

SMEs participating in both of the above types of activities will also engage in the project's virtualized innovation hub and related market platform. Specifically, Open Call Winners will be asked to describe and make available the technologies that they will use in the project in the QU4LITY market platform. In this way the project will take advantage of the open calls processes to build its community (i.e. ecosystem building) and to establish a critical mass of participants in the project's ecosystem.

# 2 Objectives of the call

## 2.1 Context and Motivation

Any European manufacturing company has a constant need to strive for excellence. This requires producing top quality goods, being highly efficient in terms of costs and resources, while being extremely responsive to market and customer needs, and using and offering creative and innovative solutions. Moreover, there is an increasingly pressure on European industry to build sustainable, green and circular processes and products that ensure not just business goals but also societal and environmental ones for future generations – see European Green Deal[1].

However, due to increased product mass customization and the proliferation of global manufacturing networks, scalable first-time right manufacturing is becoming also increasingly complex. Products are increasingly complex, feature an increasing amount of electronics or micro-features and are increasing composed of advanced (multi-) materials - becoming stronger, lighter and smarter whilst remaining at least as safe or secure as previous versions. While a clear benefit for the end customer, such process variation is the enemy of competitiveness and profitability. It causes waste and inefficiency, leads to high quality costs and manning levels, and results in late deliveries and poor traceability. Hence, with new product features, new manufacturing processes and techniques will emerge, which in turn will call for evolution of quality control and quality assurance procedures capable to effectively deal with the inherent variability of Factory 4.0 manufacturing processes, ultimately reducing scrap levels and raising productivity.

Traditional quality control models such as TQC (Total Quality Control), end-of-line SPC (Statistical Process Control) or in-line multi-stage quality control solutions are not fully capable to deal with the dynamism of such new manufacturing scenarios, calling for effective support to control smart and connected excellent and responsive production processes that combine speed, precision, quality and reliability with flexibility and agility. Manufacturing companies need to produce from very small lot-sizes to big volumes and there is a growing need for the ability to quickly scale up from small to big lot-sizes whilst retaining the required quality. Traditional quality methods are rigid and still do not deliver learning and adaptation capabilities. In such connected production environments to determine the root causes or sources of variance of bad quality in supply chains is usually more difficult because multiple parties are involved in the current global manufacturing environment.

## 2.2 Vision

QU4LITY does not call for abandoning well established and sound quality control methods, but on the contrary calls for extending such methods with a multi-dimensional, multi-stage and systematic framework for cognitive collaborative

[1] https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal_en

quality assurance throughout an entire supply chain; i.e. autonomous quality control framework.

QU4LITY is leveraging on the modular and composable digital enablers to support the implementation of a **closed loop (feedback and feedforward) quality assurance and improvement framework to unlock the key to predictable, productive manufacturing** within which to anticipate and naturally control quality variation in the factory, backed by traceable, supply chain and process centric information view and information flow support and with innovative technology, proven methods and expert human-in the-loop support for cognitive manufacturing. Artificial Intelligence in QU4LITY is used to learn complex behaviours as perception, self-reasoning or action from experience (data acquired and simulated) in federated and privacy-preserving distributed manufacturing environments, barrier that conventional Artificial Intelligence used to overcome only with expert knowledge. QU4LITY is proposing to spread intelligence across the various levels of the smart connected factory (field, edge, factory and cloud) with suitable networking, computing and analytic enablers (including visualization) that are able to meet volume, variety, velocity of decisions in the shop floor.

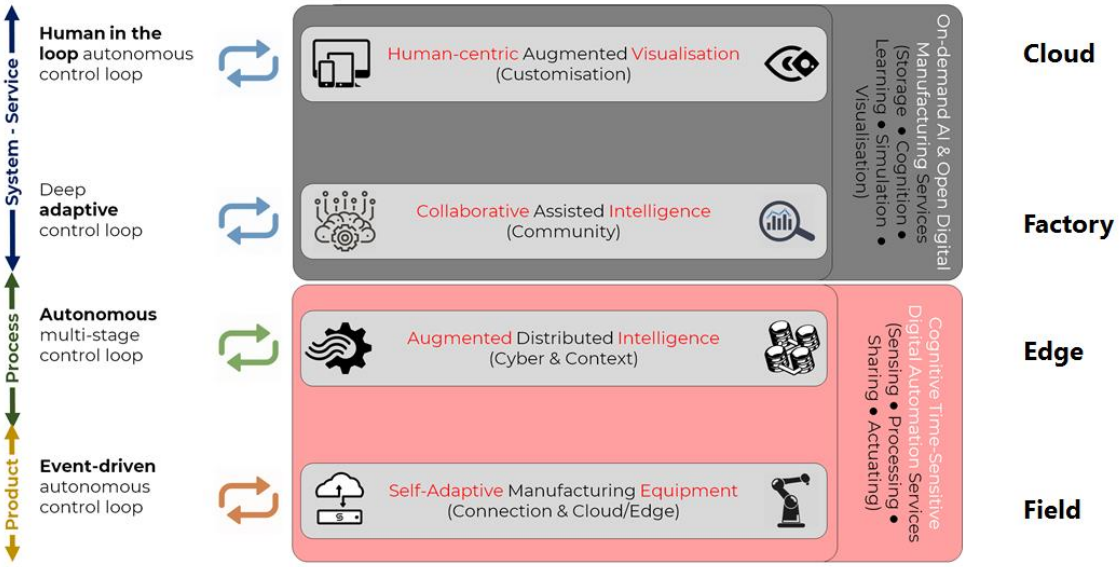
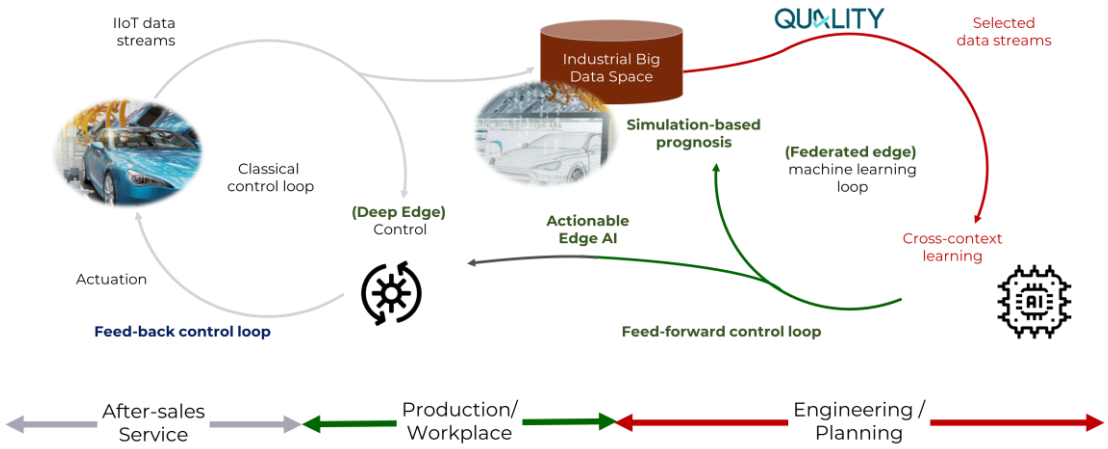



Figure 1 – QU4LITY AI distribution model and types of decision and control workflows,

**QU4LITY brings quality control to new levels of automation, adaptation, actuation, cognition and collaboration**. The goal is to get quick, comprehensive feedback about the whole production process, looking at both the production means, the part and all of the elements contributing to manufacturing in that final workpiece.




## 2.3 Types of Call and topics

According to the objectives denoted above, the main financing targets for additional third parties through the QU4LITY open calls will be:

### 2.3.1 TYPE A: New Autonomous Quality Pilot

Calls for new autonomous quality pilots. The call will invite candidates to propose novel pilots that align to the QU4LITY autonomous quality concept, notably pilots that implement features and functionalities that are not available as part of the large-scale pilots of the consortium partners.

**OBJECTIVES:**

Pilots should be aligned to one or both of the following two objectives/themes:

- **Validate the QU4LITY concept, digital enablers/technologies in areas beyond the pilots of the consortium partners**: Proposers should present novel pilots in-line with the QU4LITY concept of Autonomous Quality, the QU4LITY Reference Architecture for (Digital) Zero Defect Manufacturing (ZDM).
- **Demonstrate end-to-end Autonomous quality in a cross-border supply Chain pilot**: Proposers should present digital quality management across a supply chain i.e. beyond a single industrial plant.

All pilots should contribute to:

- **Attracting SME Manufacturers and Solution Providers to the project's multi-side platform and ecosystem**: The proposed pilot solutions should be integrated in the QU4LITY marketplace and virtual innovation hub.

**CONDITIONS:**

- Proposal must address one of the topics listed in 2.3.2
- Proposed pilots should align to the QU4LITY Reference Architecture and Autonomous Quality concept.

- Proposed pilots should use QU4LITY digital enablers/technologies listed in 2.3.3 such as Machine Learning Algorithms and Data Collection Platforms. Nevertheless, pilots may include technologies of the proposers as soon as they align to the QU4LITY ZDM architecture.
- Pilots and their technologies should be described and become integrated in the project's market platform and Virtualized Digital Innovation Hub, based on relevant specifications provided by the QU4LITY consortium. This does not imply or require any IP transfer to the QU4LITY consortium, but rather making accessible the pilot solution through the project's market platform.

### 2.3.2 Topics for applicants to the Type A call

QU4LITY Type A 1 targets the development of pilots that address advanced production process and systems which incorporate AI-based solution to implement the QU4LITY value chain. The open call aims at complementing existing pilots currently running in 14 industrial companies and to expand the scope of existing digital platforms and pilots will new functionalities and features. Applicants are required to apply one or more of the digital technologies mentioned in the topics, such as AI, robotics, edge computing and others to improve quality control in any of the points of the quality value chain.

QU4LITY is looking for SMEs to provide technologies and innovations that could help European manufacturing industry in a **faster recovery from COVID-19 pandemic** with a focus both on new digital solutions for zero defect manufacturing working practices taking advantage of Qu4LITY digital continuity enabling technologies and platforms. Solutions that help reduce defects, improve product quality and reduce ramp up times are particularly welcome.

QU4LITY is looking also for experiments supporting automation and autonomy in trusted and fair procurement and manufacturing of innovative treatment, testing, monitoring of progress and protecting people in the next phases of the COVID-19 pandemic. At the same time, QU4lity Open Call would like to contribute to the recovering of the European SMEs during the next months, providing support to and fostering the development of technologies to cover particularly new zero defect manufacturing strategies in the context of: manufacturing repurposing, cost reduction, good first time production, business to business collaboration, and, more in general, development of autonomous quality solutions as a service for key sectors of European activity such as Food, Logistics, Automotive, Aeronautics, Healthcare, Life Science.

- **Topic A1: Data Driven AI for pattern recognition in Zero Defect Manufacturing for high performance product**

Pattern recognition is the process of recognizing patterns by using an Artificial Intelligence algorithm, it can be defined as the classification of data based on knowledge already acquired or on statistical information extracted from patterns or their representation. Pattern recognition is able to detect arrangements of

characteristics or data that provide value information about a given system or data set.

Applicants to topic Q1 are required to design, implement and experiment data driven algorithms for pattern recognition related to Zero Defect Manufacturing for identification of defects, proactive quality control, reverse engineering for high performance products. The aim is to demonstrate the potential of this technology to improve the quality control in any of the critical point of their quality value chain and to analyse its connection and impact on the whole manufacturing process.

- **Topic A2: Data Driven AI in Human Machine Collaboration for Zero Defect manufacturing**

Partnering with machines is integral to the future of how we live and work. A new era of intelligent systems will be characterized by trust and understanding between humans and machine. This collaboration can provide many benefits. Machines or robot can assemble and consider more data points than humans, can incorporate and often provide a less biased support to decision and improve the productivity.

Applicants to topic Q2 are required to demonstrate the potential of the human machine collaboration for quality control in manufacturing, developing autonomous learning or decision-making algorithms to improve the quality in any of the critical point of their quality value chain and analyse its connection and impact on the whole manufacturing process.

- **Topic A3: Integration of Data driven inline Autonomous Quality in solutions for Zero Defect Manufacturing**

Traditional quality control models such as Total Quality Control, end-of-line Statistical process control or in-line multi-stage quality control solutions are not fully capable to deal with the dynamism of the Smart Factory Scenario scenarios, calling for effective support to control smart and connected production processes.

Data Driven inline Autonomous Quality solutions can deliver learning and adaptation capabilities to manufacturing companies that need to quickly scale up from small to big lot-sizes, or between different parts whilst retaining the required quality.

Applicants to topic Q3 are required to demonstrate the potential of the Data driven inline Autonomous Quality solution in highly flexible manufacturing scenarios to cover the whole quality value chain.

- **Topic A4: Edge and/or real time solutions for Zero defect Manufacturing**

Edge is how is known the computing infrastructure that exists close to the sources of data, such as industrial machines, industrial controllers e.g. SCADA systems, and databases aggregating data from a variety of equipment and sensors.

Applicants to topic Q4 are required to demonstrate the potential of the Data Driven edge computing enabled applications based on e.g. analytics, machine learning etc. to improve the quality in any of the critical point of their quality value chain and analyse its connection and impact on the whole manufacturing process.

- **Topic A5: Ensuring Quality Management in supply chain trough blockchain based technologies.**

Quality assurance in complex production systems is a difficult problem to tackle, given the number of parties involved in the sourcing of raw materials and parts and the extreme customization of products. Moreover, Zero Defect Manufacturing goals require that Autonomous Quality solutions are extended to the entire supply chain, possibly including logistics. This objective poses unique challenges, as it implies that some suppliers, although being autonomous businesses, are fully integrated into the control loop. Blockchain technology can help by providing a common, company-neutral data exchange infrastructure where key information can travel between all stakeholders of a process with top guarantees of provenance, integrity and transparency.

Applicants to topic Q5 are required to develop novel distributed applications to control the quality and traceability of materials and products along the supply chain and analyse their connections and impact on the whole manufacturing process.

**Reference Documents specific for the topic Q5**:

  - D3.11 Permissioned Blockchain for ZDM (Version 1)

- **Topic A6 Integrating ZDM solutions in Mass Customization and Lot Size One Manufacturing processes**

Mass customization as a strategy that allows the production of small lots (even as small as lot size one) is becoming more and more popular and is one of the main implementations of the concept of Industry 4.0. Mass customized products, though are complex, feature a significant amount of electronics or micro-features and are composed of advanced (multi-) materials - becoming stronger, lighter and smarter whilst remaining at least as safe or secure as previous versions.

Applicants to topic Q6 are required to develop novel applications for a Zero-Defect Manufacturing through the integration of Autonomous Quality (AQ) Control Loops into Mass Customization and Lot Size One processes, using data driven technologies.

### 2.3.3 Qu4lity Digital enablers

Pilots proposed by applicants must address at least one of the topics listed in the section 2.3.2 and make use of one of the digital enablers listed in the following table[2].

[2] The listo of enablers can be updated during the call, check the official documents on the submission site.

| Enabler | Description | IP Owner / Partner |
|---|---|---|
| RUL Prediction Solution | Deep Learning Systems for Remaining Useful Life Prediction | ATLANTIS |
| DLT Service: Quality Clearing House | Decentralized Workflow Management for Quality Management and ZDM scenarios in the supply chain | ENG |
| Interoperability converter platform | The Converters for Interoperability enables syntactic interoperability between heterogeneous systems (IoT-A events and Mimosa) by means of protocol and data format translation | MON-MGEP |
| IDS Connector | IDS Connectors are IoT gateways for data providers and consumers as described in the DIN Spec 27070. | IDSA |
| Edge Computing Enablers | Edge computing solutions enable data handling at the edge of the network, directly at the machines. | TTTech |
| FOOTPRINT | Edge computing solution that enables a high-level monitoring of the production quality, automatic detection and identification of problems or defects during manufacturing | UNPARALLEL |

Table 1 - QU4LITY Digital Enablers to be Packaged and Distributed

**RELEVANT DOCUMENTS:**

- QU4LITY Deliverable D2.11 Reference Architecture and Blueprints (Version 1)
- QU4LITY Deliverable D3.5 Big Data and Analytics Infrastructure (Version 1)
- QU4LITY DeliverableD3.13 Library of Integrated, Interoperable Digital Enablers (Version 1)
- QU4LITY D8.1 Market platform and Virtualized Digital Innovation Hub

Specific to topic Q5:

- QU4LITY Deliverable D3.11 Permissioned Blockchain for ZDM (Version 1)

**ALLOCATED BUDGET:** **EUU 300,000.00**.

**EUR 75,000.00** for single applicant

Each proposal must be submitted by a single applicant, consortia are not allowed.

### 2.3.4 TYPE B: Expansion of QU4LITY pilot systems

The objective of the TYPE B call is to expand the scope of existing digital platforms and pilots with new functionalities and features and address one or more challenges posed by Qu4lity pilots. The SMEs selected for funding will be given the opportunity to validate their solutions in the project's experimental infrastructures and testbeds.

**OBJECTIVES:**

Proposed solutions should align to one or both of the following two objectives/themes:

- **Validate the expandability of the QU4LITY digital platforms**: Proposers should propose and implement extensions to the QU4LITY technologies, notably to the QU4LITY platforms used in the project's pilots.
- **Complement existing pilots and platforms with added-value features and functionalities**: Proposer should propose extensions to existing pilot systems to address specific challenges posed by the pilot

Solutions should contribute to:

- **Expanding the QU4LITY ecosystem and broadening the solutions QU4LITY portfolio in the market platform**: Proposers should describe their solution and how it will be made available through the QU4LITY market platform and Virtualized Innovation Hub.

**CONDITIONS:**

- Solutions should align to the QU4LITY Reference Architecture.
- Solutions must address challenges raised by the Qu4lity extend existing QU4LITY Digital Platform or Pilots addressing challenges raised by the

**ALLOCATED BUDGET:** **EUU 375,000.00**.

**EUR 75,000.00** for single applicant.

Each proposal must be submitted by a single applicant, consortia are not allowed.

### 2.3.5 Challenges for applicants to the Type B call

- **Topic B1: AQL/ ZDM implementation in Ceramic stoneware production (RiaStone challenge 1)**

The Riastone Pilot framework in the Qu4lity Pilot enables multiple real-time interactions in-between different production systems, so that these processes can autonomously act in face of production defects by using the Qu4lity AQL ZDM analytical loop information and automatically analyze detected product defects and accordingly adjust their machine level production settings.

The AQL ZDM analytical loop automatic production machine adjustment, is based on artificial vision inspection performed on greenware/product as they exit each production gate/stage were the AQL´s are installed,

The Qu4lity AQL ZDM systems in fact introduce a new innovative holistic management system for the inline and in-real-time management of production quality which will integrate present and future systems.

- The Riastone trial framework for the Qu4lity Pilot enables multiple real-time interactions in-between different production systems, so that these processes can act using ZDM analytical loop information and automatically adjust their production settings.
- The ZDM analytical loop automatic adjustment is be based in the quality of outgoing produce data output from previous production stages, introducing a new innovative holistic management system for the management of produce Quality management which will integrate present and future systems.

During the fulfillment of the RiaStone Qu4lity Pilot Riastone has identified two Business Scenarios, each including a complete set of ZDM Business Processes:


With the introduction of the Qu4lity ZDM-AQL systems Riastone implements two effective product Quality Control Gates in the production line on the above Business Processes

Open Call Type "B" Challenge (The Challenge)

**The challenge being addressed by RiaStone for the present "OpenCall type B" is the necessity to expand coverage E2E of the Qu4lity AQL ZDM Control**

**Gates to the 3rd main qu4lity control point in the Single firing stoneware production process**

The RiaStone innovative Single Firing production process encompasses three main greenware transformation points into the final IKEA standard tableware products:

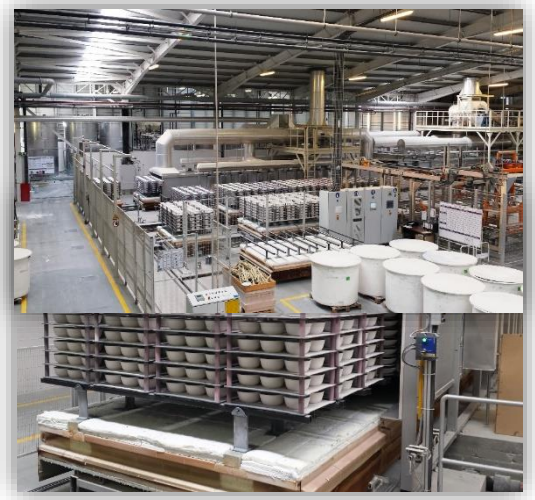
**1st Process - Greenware Conformation** made through the Isostatic Pressing process which, encompasses Stage 1(Greenware Conformation) & 2 (Greenware Fettling) of the conformed greenware. In this phase, the main ceramic structure (Greenware) is formed through the pressing of specific cerami paste raw matter deployed into the presses being physically formated into the IKEA designed tableware shapes.

*This process is already covered in the scope of the Qu4lity Project*

**2nd Process - Greenware Glazing** through the process of applying a shopfloor produced Glazing precipitate/suspension, to the conformed greenware incoming from the iso-static press lines. In this phase the conformed greenware receives an even layer application of Glaze that will give the conformed greenware, the IKEA designed Color, and after firing an even glass outer surface.

*This process is already covered in the scope of the Qu4lity Project*

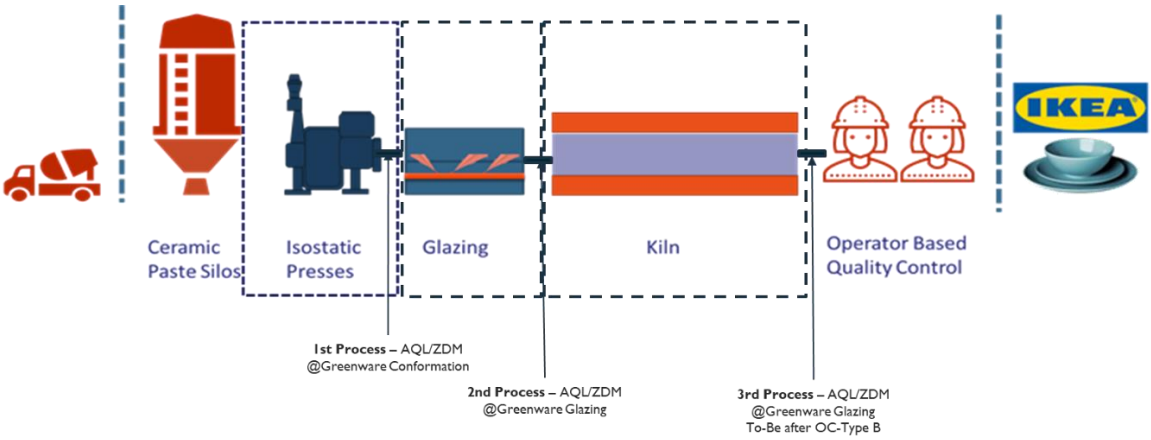
**3rd Process - Greenware Firing** through the process of an automated process of greenware grouping, greenware setting, and greenware inserting, the already conformed and glazed greenware goes into a 83m long high capacity Tunnel Oven were the greenware will run through an 8 hour firing cycle, that starts at shopfloor ambient temperature, going up to 1140Cº during a plateau of 6 hours, and exiting again at the oven tunnel end, at shopfloor ambient temperature.



During the firing process the greenware main physical components (Ceramics/Glaze) undergo extreme physical stress and transformation caused by the applied heat that will physically expand and

contract the tableware physical matter being fired as well as removing any solvents from the tableware. At this stage the greenware materials are taken to their physical limits, causing that any previously undetected defects will surface and cause additional production losses.

*This process currently not covered in the scope of the Qu4lity Project*




**With the "OpenCall type B" RiaStone will cover with the Qu4lity Systems and Data Tools the Greenware firing process thus expanding coverage E2E of the Qu4lity AQL ZDM Control Gates to the 3rd main qu4lity control point in the Single firing stoneware production process**

With the Open Call "B" the RiaStone Pilot will be able to expand coverage of the ZDM/AQL systems to the 3rd key business process, effectively the Single firing stoneware production process End-to-End, from raw matter to finished IKEA Goods

The Qu4lity tools and technologies to be deployed in the Open Call "B" challenge are:

a) Qu4lity Sensing technologies
b) Qu4lity - Edge Computing - FAR-EDGE Edge Analytics & Engine
c) Qu4lity Artificial Vision technologies – Dimensional inspection, and Sub-millimeter inspection
d) Qu4lity AI and Data Analytics
e) Qu4lity Decision Support ICT tools

The E2E Coverage of the complete RiaStone process will contribute towards the main business objectives of Riastone for Qu4lity implementation, namely in the axis of:

| Area | Description | Measuring Unit |
|---|---|---|
| **OPE** | Increase the overall OPE KPI from 92% to 95% | % OPE Algorithm |
| **Raw Material Reuse** | Product quality improvements achieved through the new ZDM technologies in the production lines, will have a reuse rate of 70% | Units |
| **Firing Oven efficiency** | Through the use of ZDM technologies, 100% of the produce introduced in the firing oven will present no defects | Units |

These are closely aligned with the main business objectives of Riastone aimed at becoming a carbon neutral Production facility, which are reflected in the three main objectives below:

1. Production cost Reduction, through the reduction of defective produce at Firing Oven Entrance
2. Product Carbon footprint reduction through diminished levels of quality rejections
3. Product Carbon footprint reduction through increased use ratio of incoming raw materials

- **Topic B2: AQL/ ZDM implementation in Ceramic stoneware production (RiaStone challenge 2)**

The Riastone Pilot framework in the Qu4lity Pilot enables multiple real-time interactions in-between different production systems, so that these processes can autonomously act in face of production defects by using the Qu4lity AQL ZDM analytical loop information and automatically analyze detected product defects and accordingly adjust their machine level production settings.

The AQL ZDM analytical loop automatic production machine adjustment, is based on artificial vision inspection performed on greenware/product as they exit each production gate/stage were the AQL´s are installed,

The Qu4lity AQL ZDM systems in fact introduce a new innovative holistic management system for the inline and in-real-time management of production quality which will integrate present and future systems.

- The Riastone trial framework for the Qu4lity Pilot enables multiple real-time interactions in-between different production systems, so that these processes can act using ZDM analytical loop information and automatically adjust their production settings.
- The ZDM analytical loop automatic adjustment is based in the quality of outgoing produce data output from previous production stages, introducing a new innovative holistic management system for the management of produce Quality management which will integrate present and future systems.

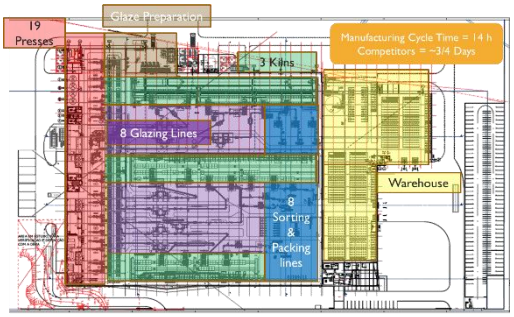
During the fulfillment of the RiaStone Qu4lity Pilot Riastone has identified two Business Scenarios, each including a complete set of ZDM Business Processes:

With the introduction of the Qu4lity ZDM-AQL systems Riastone implements two effective product Quality Control Gates in the production line on the above Business Processes

**The challenge being addressed by RiaStone for the present "OpenCall type B" is the necessity to introduce product traceability in the as-is Single firing stoneware production process**

RiaStone sees Traceability, as an indispensable system for the implementation of Total Quality Management in its Single Firing production process

**Present Situation (as-is)** the RiaStone Factory is a Greenfield in-line production facility built in 2014




The production process runs from left to right in the picture shown, this meaning from left (Raw Matter entrance), to right (final product warehousing) and the production facility employs the following number of production system elements:

- 10 x Silos for Ceramic raw Matter storage and dosing
- 19 x Iso-Static Presses for greenware conformation
- 1 x Intermediate Cure Warehouse
- 8 x Glazing Lines
- 3 x Tunnel Ovens (Kilns)
- 10 x final Quality Control Lines
- 4 x Semi-automated Packing Lines
- 1 x Storing Warehouse

The different number of shopfloor elements per each system type, is due to each system having different system cycle periods for product processing, this meaning that each one of the in-line shop floor systems has different processing cycle times per individual greenware unit.

The different numbers of each element, as well as normal daily production reprioritization, cause that the RiaStone Factory albeit being an inline factory, effectively makes that individual plate runs through the production line are made in a Divergent/Convergent mode.

The Convergent/Divergent nature of the product runs, in the production system, causes that each individual product cannot effectively be effectively traced through a traditional FIFO estimation.

**Data Integration in the Shopfloor**

Currently RiaStone has deployed and is deploying several different Factory data management systems, namely:

1. Industrial Big Data Systems deployed under BOOST4.0
2. Industrial AQL/ZDM Systems under Qu4lity
3. Shopfloor Manufacturing Execution Systems
4. Factory Management System

These individual systems collect, process, and analyse, massive volumes of shopfloor data resulting from the standard production processes in vertical data silos, although all separated per individual system

The introduction of an individual product traceability system at "plate" level would enable the already existing BOOST4.0 Big Data systems and Tools to perform a data integration of all systems around each individual plate as it runs through each system in the RiaStone Shopfloor until it integrates a Customer Sale Package.

**Traceability System Requirements**

Univocal Numbering Attribution Capability to support a continuous generation of (minimum) 21 digits per each marked plate

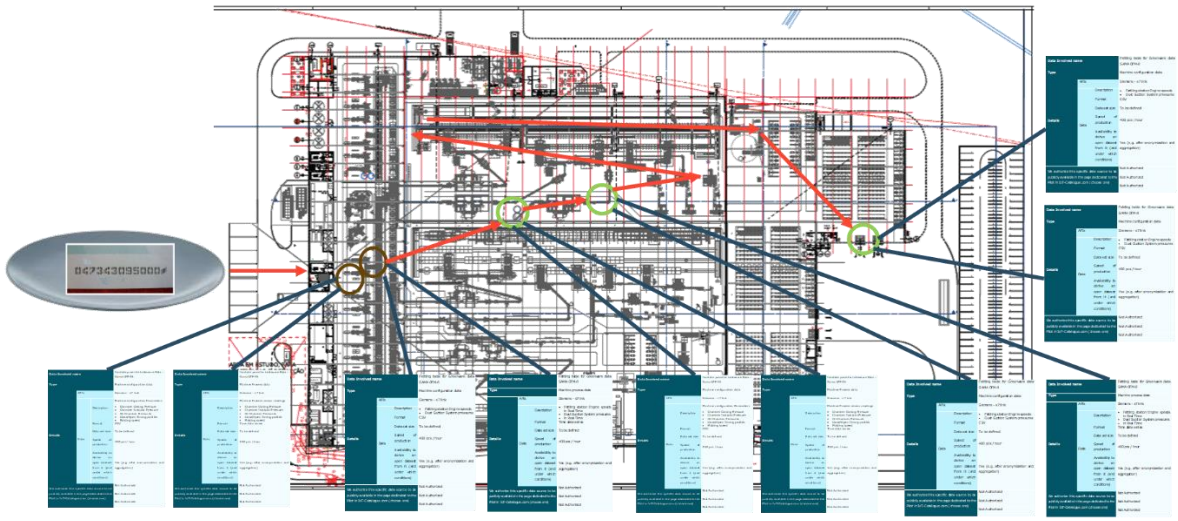
Numbering imprinting Capability to support the writing/imprint of a readable marking in Plate surface "C" (bottom center) of a 21 digits code per each marked plate, which is readable @ a minimum 5cm separation interval from plate to reader device

Numbering printing Capability of positioning, printing and releasing the greenware in a 1 second cycle.

Sightless Marking Capability to be able to effectively print the invisible marking in the plate surface, after the plate is formed in the iso-static presses, and below the applied glazing layer, assuring that at production EOL the plate has to be 100% conformant with the IKEA quality conformity standards

Extreme High Temperature Resilience to be able to survive the eight-hour oven firing cycle @1170 Cº without losing its permanent data readability features, neither becoming visible.

**Capabilities that Traceability will add to RiaStone**



With the implementation of Open Call "B" traceability project the RiaStone Pilot will be able to effectively integrate all systems vertical data silos around each @individual plate

The integration of all vertical data silos via the traceability project will result in:

a) Capability to perform *in the Shopfloor,* Data based defect Root Cause Analyses
b) Collect in-depth insights regarding shopfloor events @all system levels
c) Introduce in the IKEA Commercial system a complete novel feature for individual tableware pieces, IKEA traceability in Tableware is presently only performed @assembled package level
d) Incorporate new value into a mass-produced stoneware product

The introduction of Stoneware traceability @individual plate level will contribute towards the main business objectives of Riastone for Qu4lity implementation, namely in the axis of:

| Area | Description | Measuring Unit |
|---|---|---|
| **OPE** | Increase the overall OPE KPI from 92% to 95% | % OPE Algorithm |
| **Raw Material Reuse** | Product quality improvements achieved through the new ZDM technologies in the production lines, will have a reuse rate of 70% | Units |

| | | |
|---|---|---|
| **Firing Oven efficiency** | Through the use of ZDM technologies, 100% of the produce introduced in the firing oven will present no defects | Units |

These are closely aligned with the main business objectives of Riastone aimed at becoming a carbon neutral Production facility, which are reflected in the three main objectives below:

4. Production cost Reduction, through the reduction of defective produce at Firing Oven Entrance
5. Product Carbon footprint reduction through diminished levels of quality rejections
6. Product Carbon footprint reduction through increased use ratio of incoming raw materials

- **Topic B3: Dryer Factory Holistic Quality Platform (Whirlpool)**

The pilot carried out by Whirlpool will integrate the QU4LITY digital enablers and platforms and the AQ (Autonomous Quality) control loops. The main innovation will be represented by the introduction in production of MPFQ (Material Process Function Quality) model fused with AQ control loops: Functional Integration and Correlation between Material, Quality, Process and Appliance Functions. This innovative way to control quality and model data inherent to quality will be the fundamental approach that will lead to the vision of holistic Quality system. Also, it will deploy AQ reference implementations to address unresolved problems in the vertical integration of data management (from data gathering to visualization and decision making), enabling a holistic vision to be achieved.

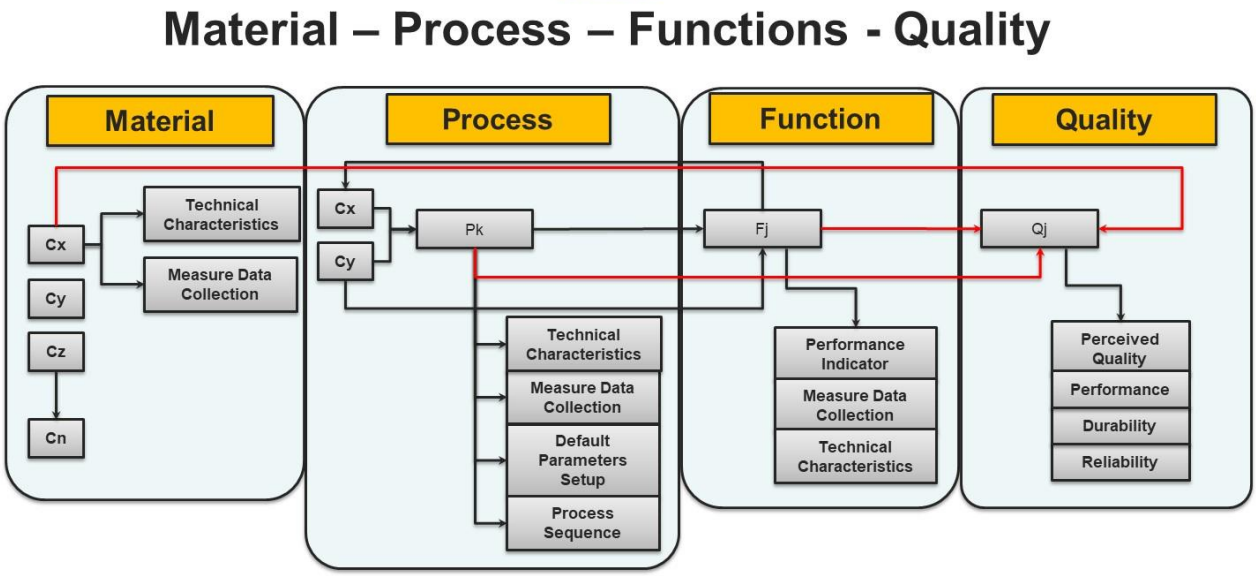
The White Good use case in QU4LITY is based on a complete production line for Dishwashing Machines and has the objectives of developing a Quality system characterized by these results:

- Common and holistic semantic model able to represent concepts at different stages of product lifecycle.
- Standard methods and tool to gather, store and share data, flexible and user-friendly.
- Analytical tools and a comprehensive way to share results to different management roles
- Addressing, at different management levels, the solution of appliance and production equipment issues, based on the analysis of the data coming from the production and testing equipment
- Automatic re-setting of the testing and production equipment parameters in order to compensate deviation in production quality

The basis of this holistic view is the semantic model which enable to create a cause – effect correlation between components, process and customer quality perception through the mediation of the physical interrelation occurring between the entities, namely the set of functions.

The basic syntax of this model, named MPFQ (Material, Process, Function and Quality) is represented by this diagram:

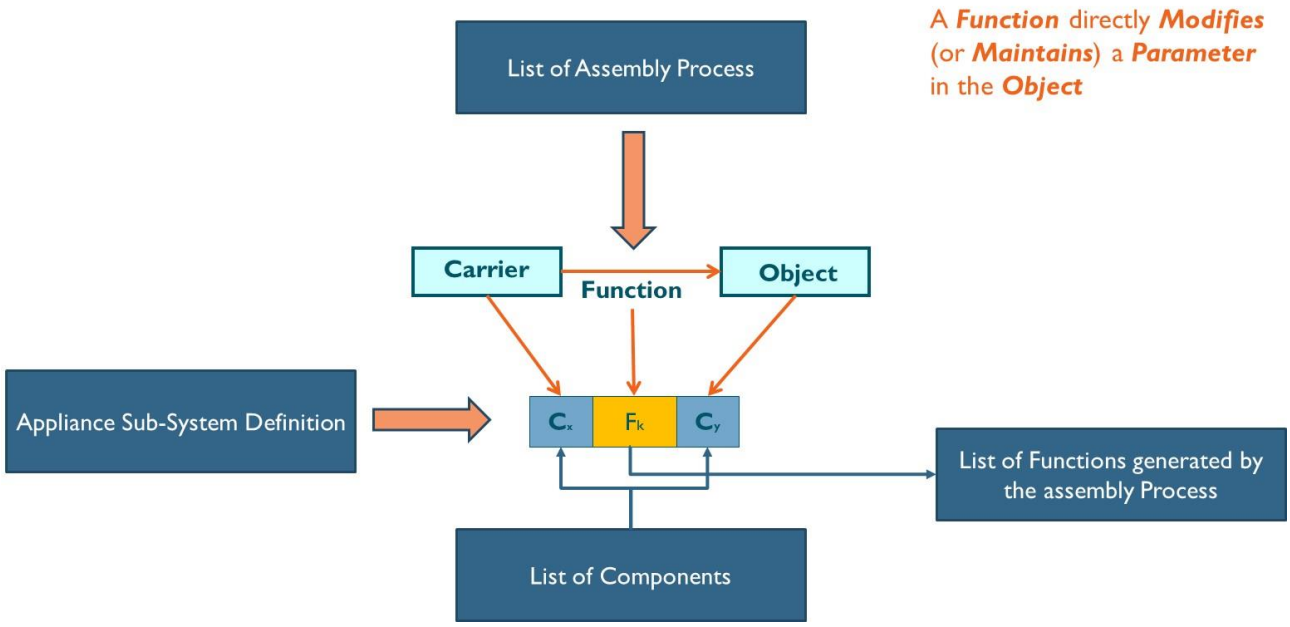
**The MPFQ Model is the integration in term of data and methodology of four different entities**




This model enables the possibility to correlate data gathered in the production (e.g results of component gauge systems, process sensors, production data, human generated data) with effective or simulated effect on Quality of the product.

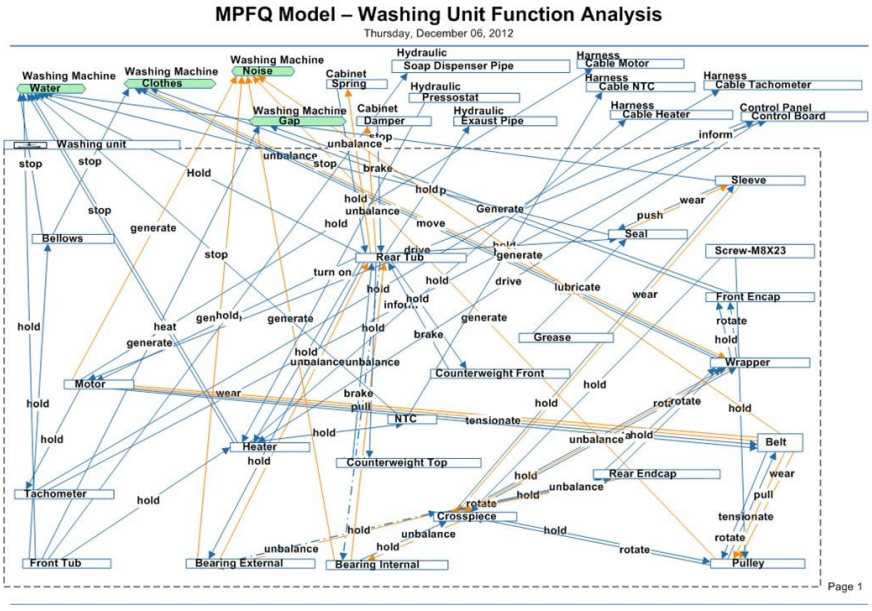
**<u>The challenge faced by the pilot that should be addressed by the applicant</u> is related with the absence on the market of <u>a graphical editor</u> tool allowing industrial engineers to:**

- Edit the functional model of a system of components and store the result of the graph in a machine-readable format. The graph consists in two type of elements: materials and external entities (represented by rectangles and hexagons) and functions, represented by named arrows.




- Edit the Process Map of a production system using IDEF-0 or other suitable standard representations
- Associate each Function mapped with a specific process step
- Define a set of Quality performances and associate them to a set of components, functions, process.

In the following picture a typical representation of a complex Functional model is reported:



# 3 Open Call Information

The announcement has been published on the portal of the European Commission and contains the main details of the topic.

**Project Acronym**: QU4LITY

**Project full name**: Digital Reality in Zero Defect Manufacturing

**Grant agreement number**: 825030

**Call Identifier**: QU4LITY OC2

**Call title**: Call for Proposals for pilots and digital platform in the field of Zero-Defect Manufacturing (ZDM) by SMEs and MidCaps

**Publication Date**: 15th April, 2021

**Open for submission**: 15th April, 2021

**Deadline**: 18th June, 2021

**Expected duration of the activities**: 9 Months

**Total budget**: € 675,000.00

**Maximum funding request per proposal Type A**: EUR 75,000.00 for single applicant

**Maximum funding request per proposal Type B**: EUR 75,000.00 for single applicant.

**Project web address**: https://qu4lity-project.eu/

**Submission site**: https://qu4lity.ems-innovalia.org/

**Mail**: qu4lity_opencall@innovalia.org

The submission site will be available from 21 April

A contact tool is available also inside the submission site.

# 4 Submission of proposals

## General information

***Submission deadline***: All submissions must be made by 18th June at 17:00 Brussels local time

***Electronic submission***: Proposal submission is exclusively in electronic form using the proposal submission tool accessible via the QU4LITY open call web-site: https://qu4lity.ems-innovalia.org/

The central component of proposal submission is the uploading of a PDF-document (whose size must not exceed 5.0 MB) compliant with the instructions on the proposal structure given below.

***Proposal format and structure***: Proposals must be submitted in English. The main section of the proposal must not exceed 10 pages in length (with text no smaller than 11-point Times New Roman font). Thus, with the inclusion of the cover page and administrative pages (discussed below), the maximum page count is 13 pages. **Proposals will be truncated to this page count and the independent expert evaluators will only be provided with the truncated version.**

The structure of the proposal (and indicative length per section) should be as follows:

1. Summary (0.5 pages)
2. Concept and innovation (2,5 pages)
3. Industrial relevance, potential impact and exploitation plans (3 pages)
4. Description of the workplan (1 page)
5. Background and qualification (1 page)
6. Justification of costs and resources (1 page)

As indicated above, the overall length of the above 5 sections must not exceed 10 pages.

In addition to the 10-page proposal description, a cover page and 2 pages of administrative data for statistics analysis, including, if already available, the Participant Identification Code (PIC) issued by the European Commission (http://ec.europa.eu/research/participants/portal/desktop/en/organisations/register.html).

# 5 Proposal Evaluation and selection

## 5.1 Eligibility criteria

The call for third-parties support will be addressed to SMEs and Mid-Caps, as defined in the EU law: (EC recommendation 2003/361/EC as published in the Official Journal of the European Union L 124, p. 36 of 20 May 2003). All SMEs and MidCaps eligible for Horizon 2020 will be eligible to submit proposals for the open calls, except for the consortium's partners and other parties that may have conflicts of interest.

The call for third-part support will be also open to SMEs and MidCaps outside the EU, which will however have to bear their project costs.

The criteria for financial support will include:

A. The Innovation of the application (i.e. in terms of its Scientific and Technological Excellence) to be implemented/integrated based on QU4LITY,
B. Its impact on the QU4LITY ecosystem and its contribution to meeting QU4LITY's goals and objectives. Alignment to the Conditions and Objectives outlined above in Section 2 will be considered as part of this Criterion.
C. The ability of the SME and MidCaps to implement the experiments and/or integrate its new services, based on the proposer's team and company profile, background infrastructures, experience, but also based on its proposed implementation plan.

The financial support will be given upon presentation of specific deliverables by the selected partners. Each proposal must be submitted by a single applicant, consortia are not allowed

## 5.2 Evaluation criteria

The ranking of selected projects will be created assessing the following criteria:

- **Excellence and innovation**: The Innovation of the application (i.e. in terms of its Scientific and Technological Excellence) to be implemented/integrated based on QU4LITY-

- **Impact including industrial relevance and business strategy**: Its impact on the QU4LITY ecosystem and its contribution to meeting QU4LITY's goals and objectives.

- **Implementation and deployment of resources**: The ability of the proposer to implement the experiments and/or integrate its new services, on the basis of the team and company profile, background infrastructures, experience, but also based on its proposed implementation plan.

Evaluation scores will be awarded for each of the criteria. Each criterion will be scored out of 5 and decimal numbers can be given. The second criterion, Impact and Industrial relevance, will have a threshold of 4, while for the first and last a threshold of 3 will apply. The overall threshold, applying to the sum of the four individual scores, will be 15. If two or more proposals are tied with the same overall score, priority will be given as illustrated in Table 2 below

| Criterion | Priority if ex aequo | Threshold |
|---|---|---|
| **Excellence and innovation** | 2 | 3/5 |
| **Impact including industrial relevance and business strategy** | 1 | 4/5 |
| **Implementation and deployment of resources** | 3 | 3/5 |

Table 2: Ranking in case of equal scoring and thresholds

## 5.3 Evaluation process

External experts who will be appointed and approved by the QU4LITY consortium will be in charge of selecting the third parties that will develop new solutions over the QU4LITY software and pilot infrastructure.
Each proposal will be assessed according to the three criteria presented in Section 5.2, through the usual 0 – 5 score scales for H2020:

- 0: The proposal fails to address the criterion under examination or cannot be judged due to missing or incomplete information;

- 1 (Poor): The criterion is addressed in an inadequate manner, or there are serious inherent weaknesses;

- 2 (Fair): While the proposal broadly addresses the criterion, there are significant weaknesses;

- 3 Good The proposal addresses the criterion well, although improvements would be necessary;

- 4 (Very good): The proposal addresses the criterion very well, although certain improvements are still possible;

- 5 (Excellent): The proposal successfully addresses all relevant aspects of the criterion in question.

The final approval of the selected third parties to receive financing will be done by the PCT, considering the best fit to the specific project objectives and possible conflict of interest issues.

# 6 Funding and reporting

## 6.1 Eligible costs

Eligible costs consist of

- Personnel Costs
- Equipment Costs
- Travel expenses
- Software licenses
- Subcontracting
- Indirect cost (25% of direct costs)

The funding of Third Parties must follow the same principles as used for existing project beneficiaries of Qu4liyt, which receives European Commission funding as an "Innovation Action". Thus, Third Parties will receive 70% funding of eligible costs arising.

## 6.2 Reporting and deliverables

The administrative tasks for the funded third parties including cost and activity reporting obligations and related templates will be provided during the negotiation and contracting phase. Qu4lity will apply the pilot maturity levels methodology in the implementation of the selected projects.
Funded third parties will be requested to submit several deliverables to demonstrate the reached maturity level according to Table 3.

| Status of development | Timing | TYPE A Deliverables | TYPE B Deliverables |
|---|---|---|---|
| **Pilot Maturity Level 1** | M2 | • Proof of concept<br>• Alignment with the reference architecture<br>• Alignment with the Qu4lity Autonomous Quality concept<br>• M2 cost statement | • Proof of concept<br>• Alignment with the Qu4lity Autonomous Quality concept<br>• Integration strategy in the reference pilot<br>• M2 cost statement |
| **Pilot Maturity Level 2** | M7 | • Complete development of the pilot<br>• Demo and dissemination material (video, ppt)<br>• Participation to demo event organized by the consortium | • Complete development and integration in the Q of the pilot<br>• Demo and dissemination material (video, ppt)<br>• Participation to demo event organized by the consortium |
| **Pilot Maturity Level 3** | M9 | • Business model<br>• Integration in the Quality marketplace<br>• Business Plan<br>• M9 cost statement | • Business model<br>• Integration in the Quality marketplace<br>• Business Plan<br>• M9 report |

Table 3 - Pilots Maturity level

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## 6.3 Funding Scheme

The following payment scheme will apply:

- Max 20% of the budget, according to cost statement, at M2, once the third party has produced all the relevant documentation specified in the contract, in particular cost statements for the period and deliverables, as indicated in Section 6.2 and the contractor (Innovalia), after discussion with the consortium, has accepted them
- Max 60% of the budget, according to cost statement, at the end of the project on M9, once the third party has produced all the relevant documentation specified in the contract, in particular cost statements, deliverables and material for dissemination, as indicated in Section 6.2 and the contractor (Innovalia), after discussion with the consortium, has accepted them. Moreover, the participation to an event for dissemination purpose is mandatory.
- Max 20% of the budget, according to cost statement, at the final installation approval of the pilots' outcomes by the Commission

## Partners