Deliverable 4.4

ZDM Data and Management Environment –Interfaces

Explanatory Notes

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Revision History

REVISION	DATE	INVOLVED PARTNERS	DESCRIPTION
0.1	28/06/2018	BOC	Reviews to prototype to accomplish MAS integration, specification of interfaces
0.2	27/07/2018	BOC, NISSA, LOC, UNINOVA,	Integration testing and verification of interfaces
0.3	24/08/2018	BOC	Extension and laboratory evaluation of interfaces (robotic experiments) Code freeze for review version, documentation and deployment infrastructure for demonstration ready
0.4	14/09/2018	BOC	Draft version of explanatory notes as commented table-of-content Content and documentation
0.5	26/09/2018	LOC	Review
0.6	28/09/2018	BOC	Finalisation of explanatory note

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Executive Summary

This document summarizes as **explanatory notes** for D4.4 "ZDM Data and Management Environment Interfaces" the results of T4.4 "Development of ZDM Knowledge Management - Interaction". As such it provides information on the ZDM-KM prototypes as the 2nd iteration of demonstrators.

The demonstrator builds upon the results from D4.2 and enhances/elevates the functionality with interaction and integration functionality in the context of the GO0D MAN conceptual architecture. The components as presented in the first iterations are extended to cope with the specifics of internal and external system components, including technical/machine interaction (formats, standards and protocols) as well as human interaction flows with the ZDM system. The human aspect is motivated by the ZDM strategies identified and discussed in D1.3 ZDM Management Strategies and Rules [2], operationalized on tool level for selected streams of interaction.

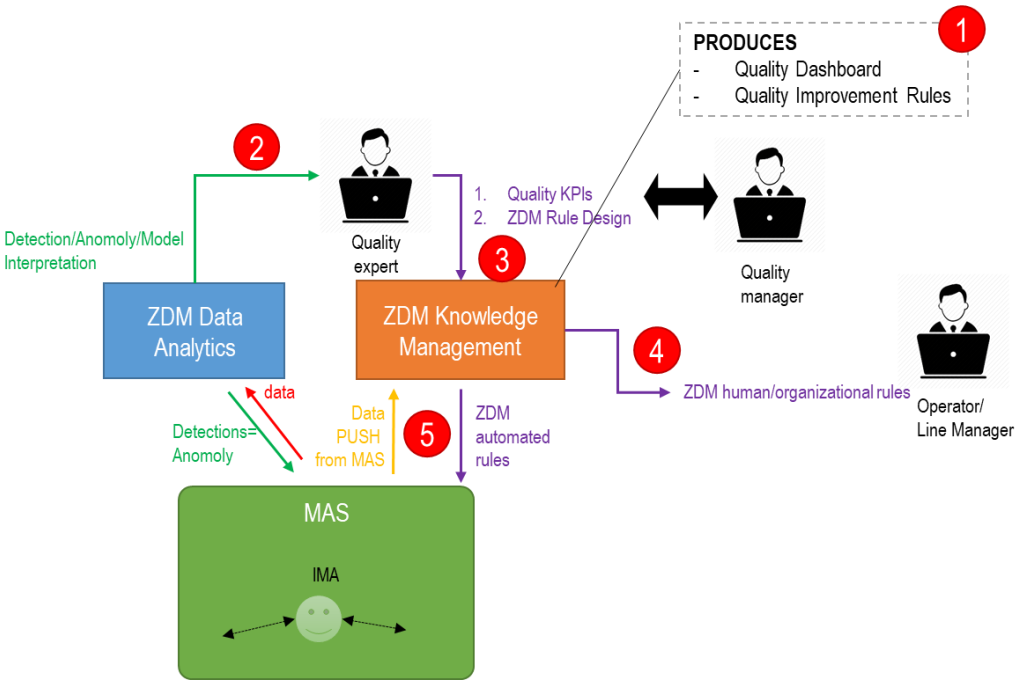

Figure 1 ZDM-KM Environment: Interaction and Integration

In line with these objectives, the second iteration of the ZDM-KM prototype provides the following extensions concerning integration/interaction

1) *Quality Dashboards and Quality Improvement Rules:* the dashboard component has been further extended to enable the visualization of anomaly detection from the data analytics environment. Ad-hoc dashboards are available, that can be customized and extended in the pilot WPs to provide an adequate representation. With respect to Quality Improvement Rules, the implementation of the meta-model for quality issue <-> mitigation action has been extended based on the input for pilot feedback.

   The metamodel is now capable to capture quality issues dynamically (accessible from external systems via ReST API) and provide user interaction to trigger improvement cycles. The results of improvement cycles are related to issues and can be proposed as lessons learned to the quality manager and provided as support artefacts for the operator/line manager

2) *Interaction with Data Analytics Environment:* within the initial version, raw data from MAS has been processed only. With the availability of the DA environment, this logic has been extended and PUSH web-services are available to consume results from data analytics. The results are stored in a temporal cache for time-series assessment and visualization (see element 1)

3) Quality KPIs and Quality Rules: the design environment of the knowledge management system has been stabilized and simplified to enable quality managers to define rules (formally described in DMN) using a simplified user interface. Rules are proposed/suggested based on previous cases and the quality manager can easily correlate actions with quality issues detected

4) ZDM Human/Organisational Rules: the rule engine is available in the second prototype as a micro-services that supports to trigger actions. It exposes a webservice interface (SOAP, ReST) that can be integrated in production systems.

5) ZDM Automated Rules: this interaction stream covers the communication from the ZDM-KM system with the MAS. Rules are communicated (in case of an update to the MAS environment), the effectiveness is made available directly from MAS to ZDM-KM or via ZDM-DA. Both interaction streams are available.

Figure 1 shows the scope of D4.4 graphically on the abstract architecture of ZDM-KM.

The approach for realising these extensions builds on the introduced microservice framework as part of the ADOxx [1] metamodeling platform. Further investigation and implementation effort has been put on the framework itself to enable a smooth integration at the pilot sites in the upcoming project period. This includes a dynamic environment for microservice binding, visualisation engine upgrades and performance enhancement in the snap-shot database provided.

For validation and verification purposes, the prototype has been tested in a laboratory setting using robot technologies to understand the requirements from CPS systems on the modelling level. These experiments are available for review at the BOC Digital Innovation Laboratory, providing the resources online at https://git.boc-group.eu/boc-innovation-lab.

Similar as for D4.2, these explanatory notes provide background information on the implementation results by introducing the approach to realize the prototype and discuss each component in detail in line with the conceptual architecture of the specification.