



D13.3 – EDF Lessons Learnt and Evaluation

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Executive Summary

FITMAN constitutes an FI-PPP phase II project aspiring to provide the FI-PPP with a set of industry-led use case trials in the Smart, Digital and Virtual Factories of the Future, in order to test and assess the suitability, openness and flexibility of FI-WARE Generic Enablers.

Within the project, the objective of WP13 is to extend the coverage of business requirements of the Digital Factories trials that are already partially covered by WP5 solutions; as part of this WP activities, a technical assessment is conducted by task T13.3 on the SEs and PCs provided by the IT partners of WP13, to measure how the selected workflows and requirements of the Digital Factory trials have been met by the integrated solutions developed in WP13 and if these solutions are ready to be finally deployed and validated in the existing trial platforms by WP5. The impact assessment deriving from the actual usage of these components in the real scenarios is beyond the scope of the document and will be performed as part of the overall business assessment of the trials, in WP5.

The D13.3 is a two-steps deliverable with a first and a final versions, that will report the initial and the final outcomes of the T13.3 activities. The first version of D13.3 (present document) describes the methodology adopted to perform the technical validation and provides some initial results of the measurements conducted in T13.3.

This document thoughtfully described those steps that have been identified to assess if and how the solutions from WP13 operate correctly and cover the identified business processes. These steps are described together with the expected outcomes and some initial results and measures. Additionally, some preliminary lessons learnt, are introduced in brief.

The integrated solutions that are here described and that have been validated addresses four different Digital Factories trials (namely, AIDIMA, Consulgal, VW and TRW). The reporting of the assessment activities for the Whirpool case will be included in the final version of this document, since the development of the solution is at a less mature stage, if compared to the other trials.

It is expected that a complete report of the evaluation, including the details about the fully integrated solutions and the overall lessons learnt will be provided in D13.5, to be issued at M30.

The methodology that has been applied for the assessment of WP13 solutions refers to the overall V&V methodology described in D2.1, providing an all-inclusive framework for verifying, validating and evaluating a software product from its conception to final release and implementation in real-life, trial settings. For the validation of WP13 results, a simplified version of the V&V methodology has been put in place, mostly focusing on a technical validation of the results provided by that WP, whereas a more business-oriented validation will be part of WP5 activities, where WP13 results are validated as part of the overall trial platforms.

The preliminary outcomes of the assessment are definitely positive: the customisation and integration of the SEs and PCs of WP13 for all the Digital Factory Pilots (AIDIMA, Consulgal, VW and TRW) have been completed and the assessment have been proved to be complete (i.e.: support the selected business processes and requirements) and correct (i.e.: the integration test performed also with real data from the Pilots have produced the expected outcomes). Now the solutions are available for the end user validation in the real scenarios.

In particular, the deliverable describes both how the SEs and PCs have been combined and integrated in each Pilot's solution, and how the functionalities resulting from this integration and customisation activities are now able to support the end users processes as expected. For all the 4 integrated solutions, it has been demonstrated that what will be offered by WP13 to the end users combines the new functionalities of the WP13 SEs and PCs with existing systems in an innovative way that perfectly supports what they have been asking for,

Since for all the 4 pilots the integration has been completed as well as the technical assessment, these pilots have now ready to be transferred to the end users, for the integration on their environment for the actual usage and validation as part of WP5 activities.

In addition to the pure technical validation, some preliminary consideration on non-functional properties of the solutions are reported; all the four pilots have been demonstrated to be easy to be configured and deployed , concerning the easiness to configure and use it and the added value for the end users.

The next version of the document will complete this analysis, with reporting on an additional pilot (Whirpool) which is currently at a less mature stage and on the last activities performed by the WP13 partners to solve any issues that could be detected and reported during the hands-on validation by the end users. Moreover, the lessons learnt analysis will be completed, not only by describing how these solutions could offer new benefits to the end users, but also to identify points for improvements of the SEs and PCs in the future.

1. Introduction

1.1. Purpose and Scope

WP13 encompasses all the activities aimed at offering solutions to the Digital Factory trials (Extended Digital Factory, shortly EDF) that complement those ones conducted in WP5, in order to fully cover the business processes described by the owners of these trials,

The workpackage is organized around three main tasks:

- T13.1 aimed at developing new EDF components and their customisation and integration with the conceptual architecture of the Digital Factory Platform
- T13.2 performs the testing and experimentation of the new components
- T13.3 is focused on the analysis and evaluation of the integrated solutions developed in D13.2 with the objective of identifying lessons learned (bottlenecks and opportunities) for a further improvements of the solutions

In this context, the activities of T13.3, which is a technical task, must be considered as complementary to WP5 ones, as for the assessment of Digital Factory solutions. T13.3 aim is to ensure that the technical solutions offered by WP13 are technically ready to be integrated and validated by WP5 in the Digital Factory trials.

To this direction, the purpose of this report is:

- To describe the business workflows and the real data that have been used to create the customised version of the SEs and PCs of each scenario
- To describe the status of activities to set up the integrated solutions and the preliminary results of their assessment
- To provide initial Lessons Learnt

1.2. Structure of the Document

The structure of the document is as follows:

- Section 2: presentation of the methodology to be executed in WP13 in order to perform a technical assessment of the results that are provided by this WP and that will be integrated in the AIDIMA, VW, Consulgal, TRW and Whirpool trials in WP5.
- Section 3: descriptions of the preparatory activities for the technical assessment in each pilot are here presented.
- In Section 4, the customised components that have been provided to the trials are here presented.
- Section 5 reports the preliminary results of the assessment, both in terms of measurement of how the results cover the expected requirements and (whenever possible) as preliminary results of the assessment of WP13 components performed by the end users.
- In section 6, the first elements collected as part of the lessons learnt are reported here.

2. Technical Validation Methodology

2.1. Presentation of the Tools

In this section, we briefly describe the WP13 results that have been integrated and validated in the trial scenarios:

SEMed SE

SEMed is a mature middleware layer for semantic, virtual interoperability and integration specifically of item-level product lifecycle data. It facilitates a standards-based access to PLM data, for example through its support for the Open Group QLM (recently renamed to Open Group IoT) Standard Open Messaging Interface (O-MI) and Open Data Format (O-DF). At the same time, it provides semantic interoperability for different kinds of common data sources like databases and file based repositories. SEMed is available as an Open Source SE in the FITMAN catalogue:

<http://catalogue.fitman.atosresearch.eu/enablers/semед>

SEMed has been customized and validated in the Consulgal, AIDIMA and VW digital factory trials.

C3DWV SE

The "Collaborative 3D Web Viewer" (C3DWV) is a standard HTML-5 application built on top of the XML3D GE from FIWARE to enable collaborative visualisation, sharing and annotation of 3D virtual scenes directly in the Browser. This enables 3D content to be accessible on a variety of devices, including Tablets and Smartphones. As a FITMAN specific enabler it is provided as an open source project in the FITMAN SE catalogue:

<http://catalogue.fitman.atosresearch.eu/enablers/collaborative-3d-web-viewer>

The Collaborative 3D Web Viewer is tested and experimented in the Volkswagen and AIDIMA digital factory trials.

3DScan SE

The 3DScan SE consists of two open source components for the storage and visualization of high density/high resolution files consisting of millions of points in the format of point clouds and mesh . For the visualization part, it could work with an optical 3D non-contact scanning sensor of which output are displayed in the web viewer offers comprehensive modules for 3D Visualisation of high density/high resolution files consisting of millions of points in the format of point clouds and Mesh. Additionally, it provides the management interface for 3D file storage with a relational database. There are two open source components provided by the Specific Enabler: storage and visualization. For the visualization part, it could work with an optical 3D non-contact scanning sensor of which output are displayed in the web viewer. Regarding the storage component, there are several options related with databases. The 3DScan SE is available in the FITMAN catalogue:

<http://catalogue.fitman.atosresearch.eu/enablers/3dscan>

The 3D Scan SE has been customised and experimented in the Whirpool and TRW trials.

i-Like PC

I-Like is a web-based solution usable with every common browser and thus easily accessible from personal computers, laptops and tablet devices. Dedicated interfaces and applications are available for the PDA. It runs within the Apache Tomcat, an open source web based server developed by Apache. The logic of the modules is implemented in Java and Java Servlet. The User Interface is a set of web pages developed using HTML and JavaScript on the client side,

whereas the server side uses the ZK Java framework. A set of Rest API allows to exchange information with third applications while the Application framework is used to interconnect together many modules providing security aspects, relations and logics with the stored data. The i-Like platform has been customised and validated in the Consulgal and AIDIMA digital factory trials.

3D Point Cloud Analysis Processing PC

3D Point Cloud Analysis Processing is the proprietary component (PC) used together with 3DScan to assure the processing of the data acquired. The 3D Point Cloud Analysis Processing operates once the scan sensor has captured the cloud of points and transforms all this information into real measures, executes analysis work and calculates the results that will later be shown.

The 3D Point Cloud Analysis Processing tool has been customised and experimented in the Whirpool and TRW digital factory trials.

Virtual Obeya PC

The Virtual Obeya is a dynamic environment that enables collaboration and information sharing between two or more actors that can be physically distributed in different locations. The Virtual Obeya is a web-based Java application, accessible through a browser, that allows the creation of virtual rooms (Obeyas) with/for dedicated topics. Each of these rooms can have specific participants, each with different access rights. Within each room, web based applications or web resources (e.g. web pages) can be embedded (as widgets) to provide a wide set of services. For instance, the work progress of a project can be monitored and controlled, documents and information shared, decisions made and documented, meeting minutes prepared, and so on.

The Virtual Obeya has been customised and validated in the AIDIMA and VW trials.

Other technologies used in the trials:

The Open Group Internet of Things Workgroup (the Work Group was formerly known as the QLM Work Group) is part of the Open Group. Their goal is producing a family of standards for the exchange of information among IoT (Internet of Things)-enabled systems, that is information retrieved and elaborated thanks to the capacity of “intelligent things” to connect among themselves and with the internet. In particular, the Physical Product extension of the Open Group Internet of Things (IoT) Standard is used for the exchange of Lifecycle information of physical objects. The Physical product standard is currently undergoing the official approval procedure by the Open Group Internet of Things Workgroup, before being released as part of the Open Group standards. This standard is renamed in O-MI and O-DF and is applied to realize the information exchange between SEmed and i-Like.

2.2. Validation steps

The preparation and execution of the technical validation for the solutions to be provided to the end users encompasses several steps, that are similar across the scenarios and that are shortly described below:

Step 1: Experimental Environment preparation

- Get a deep and shared understanding of the requirements to be met and the processes to be supported
- Collect information of existing data sources and legacy systems to be integrated
- Identify possible restrictions and obstacles for the solution deployment and usage by the end users
- Define the customization and Configuration of the SEs and PCs (Proprietary Components) provided by WP13

Step 2: Integration setup

- Connect the different components (tool/service chain) into an integrated solution
- Insert the initial data set
- Test and finalize the integration of SEs and PCs

Step 3: Assessment of the delivered functionalities

- Test that the functionalities operate correctly
- Test that all the data are provided as expected

Step 4: measurement of the workflows coverage

- Check that all the steps of the workflows and the requirements are covered by the integrated SEs and PCs
- Collect early feedbacks from the end users, from their first experimentation with the WP13 solutions, before the deployment and full validation in the trial architecture, as part of WP5

2.3. Preparation for the AIDIMA Pilot

The AIDIMA Pilot is focused on the validation of some solutions supporting the interior designers of furniture in the identification of trends and expectations of the consumers and consequent creation of prototypes of furniture pieces to be combined together into a project for furnishing interior environments. The WP13 support is primarily focused in creating the collaborative environment where multiple teams of designers can virtually meet and share information and ideas of the produced prototype.

The following business processes of AIDIMA have been identified as of interest for a support provided by the integration of some WP13 results.

Business Process 1 – Weak signals discovery:

AIDIMA's analysts perform a thorough analysis of industry market variables in order to determine trend signals that are related to the current furniture movements. From there, an extensive work is done to obtain the Annual Trends Report that is used by the companies in the sector as an indispensable guide to develop future products. This is a manual process based on internet searches, furniture fairs and events, media, etc.

Below are reported the Requirements elicited from this business process: the first two are supported by the SEMed SE of BIBA.

Table 1 Requirements of AIDIMA BP1 mapped to SE/PCs

ID	Requirements of Business Process 1 – Weak signals discovery	FITMAN SE /PC
RAF1	User should have standard way to access information regarding to semi structured or formulized data sources	SEMed, VO
RAF2	Analyst will be able to introduce and configure information sources where identification of weak signals will be done	SEMed, VO
RAF3	Analyst will be able to search references by search words	n.a. but will realized by NTNU SE Anlzer

Data sources which provide formulized information, primary data bases, will be connected by SEMed (RAF1, RAF2). In so doing, SEMed will provide a standard way to access the information by users or interested (RAF1).

Business Process 5 – Understanding customer requirements:

This Business Process is focused on the adoption of a collaborative platform to support the exchange of information and discussion involving all the interested stakeholders. Thus, all materials produced during all initial brainstorming sessions can be shared among all stakeholders involved. Product prototype descriptions, 3D models, components and materials archives, and decision making tools will be available in this platform that will make the product creation more innovative, collaborative and productive than ever before.

Where information about new trends or customer requirements is provided in a unique workspace where different designers can exchange information and get information of a new project for new pieces of furniture.

Table 2: Requirements of AIDIMA BP5 mapped to SE/PCs

ID	Requirements of Business Process 5 – Understanding customer requirements	FITMAN SE/PC
RAF10	Allow a fully collaborative and visual platform based on widgets	i-Like, VO, C3DWV

The VO is used to create cooperation spaces for brainstorming sessions, where all the members (mostly designers) involved in the creation group can share information by visualising external sources (social networkers etc..), reports, or widgets for the analysis of collected data.

Business Process 6 – Project management and functional design brief:

After identifying a segment of customers and the requirements that justify the launch of a new product, a multidisciplinary team of people (including designers) are exchanging information to lay out a new concept for a product.

Table 3 Requirements of AIDIMA BP6 mapped to SE/PCs

ID	Requirements of Business Process 6 – Project management and Functional design brief	FITMAN SE/PC
RAF11	Allow a fully collaborative and visual platform based on widgets	i-Like, VO, C3DWV

The VO is used to create working spaces for distributed teams of designers that can create together or visualise the prototypes of furniture pieces through a special widget that is connected with the underlying i-Like platform, add or change components and materials whose descriptions are stored in a separate repository and retrieved through the SEMed, visualise the 3D models with the C3DVW. All these WP13 components have been integrated to ensure synchronisation of the changes and exchange of data, as further described below.

2.3.1. Workflow description

As described above, some WP13 results (namely: the SEMed SE, the C3DWV SE and the VO and i-Like PCs) have been customised and integrated together to support the above described processes.

The workflow for the usage of these results in the AIDIMA Pilot consists of the following main steps:

[BP 1]

1. Creation of a virtual room in the VO for the analysts and other stakeholders involved in the weak signals discovery
2. Population of the virtual room with additional widgets of the weak signal elaboration created through the configurable SEMed interface. Advanced users and technical

administrators will have an option to access different data sources (including Anlzer SE, provided by WP5) through configuration of integration interfaces of SEMed.

[BP 5&6]

3. Creation of a second virtual room for the team of designers involved in the creation of the interior design project
4. Population of the virtual room with the widgets for the prototype creation and visualisation, for the 3D visualisation and other widgets for accessing and reporting the results of the discussions and for the management of the project
5. Opening of the collaborative working session by accessing the above created virtual room;
6. Collaborative creation of the prototypes through the widgets connected with i-Like; in this phase, it is possible to include in the prototype description the materials and components from the Materializa DB, thanks to the SEMed that makes these data available to i-Like.
7. Upload of the 3D model of the prototype and visualisation through the C3DWW widget.

2.3.2. Tools chain and information flow

The Figure 1 below represents the overall final architecture of the AIDIMA trial. WP13 results that are being validated in such trial are represented in the “Collaborative Work for Product Design” area, as they are expected to support the BP5 and BP6 processes mainly.

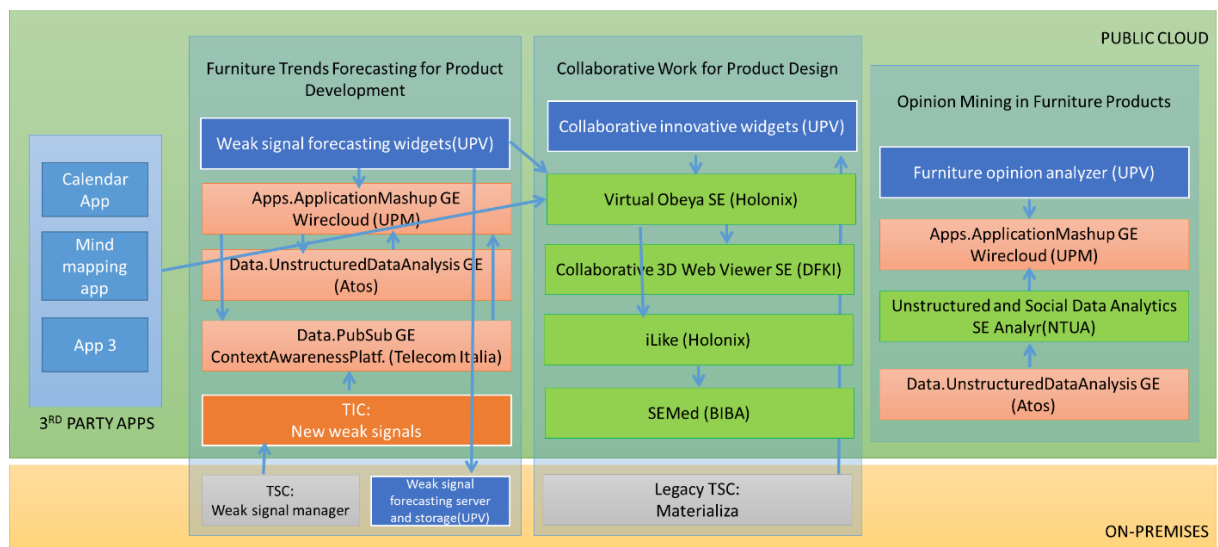


Figure 1: AIDIMA Trial Final Architecture

In more details, the connection among the WP13 results and the flow of information exchanged among them and with the end users are represented in Figure 2.

The actors who are involved in this phase are:

- Designers
- Project Manager (responsible of the whole internal design project)
- Customers

They are cumulatively also referred as “end users” (of the system), when no specific distinction is required.

The end users can access from different locations, using a web browser, a virtual room in the Virtual Obeya; within the room, they can find widgets for the creation of a new prototype description or for the visualization of existing ones. It is important to remark that users are assigned different roles (as per the categories described above) and have different access rights to the widgets. For example, consumers invited to judge the prototypes are not allowed

to see the widget for prototype management, but just the 3D visualization and possibly other information from other widgets.

The created prototypes are stored and managed by iLike, that is connected to the repository of existing materials (Materializa DB) through SEMed. The description of the technical features of the materials and their pictures are provide by iLike to the prototype widgets and thus made available to the end users that can choose the most appropriate materials for the components of the furniture piece they are designing. To complete the prototype description, the designer can upload an image, a sketch or even a 3D model of such prototype. The 3D model is passed to the C3DVW that elaborates it and visualize it in the C3WV widget within the virtual room, where it is visible to all the connected users.

End users can always access iLike directly (not only through the widget in the Virtual Obeya), for example for setting parameters or other advanced functionalities that are not provided by the iLike widgets (for example because of access restrictions to specific information).

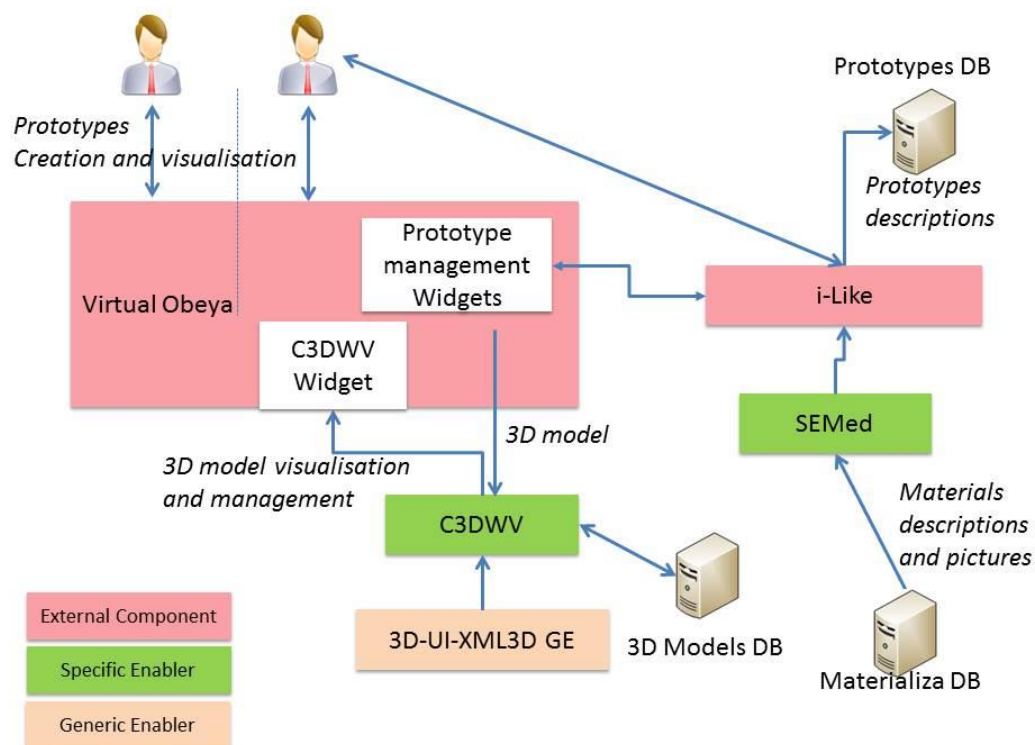


Figure 2: Tool chain and information flow for AIDIMA

2.3.3. The technical solution

i-Like – VO-C3DVW integration.

This integration, graphically represented in **Error! Reference source not found.**, is based on sets of REST web services exposed by the three involved components and exchange of information through XML files. From the end user point, the integration is between the widgets of the two applications (iLike and C3DVW), taking within the Virtual Obeya.

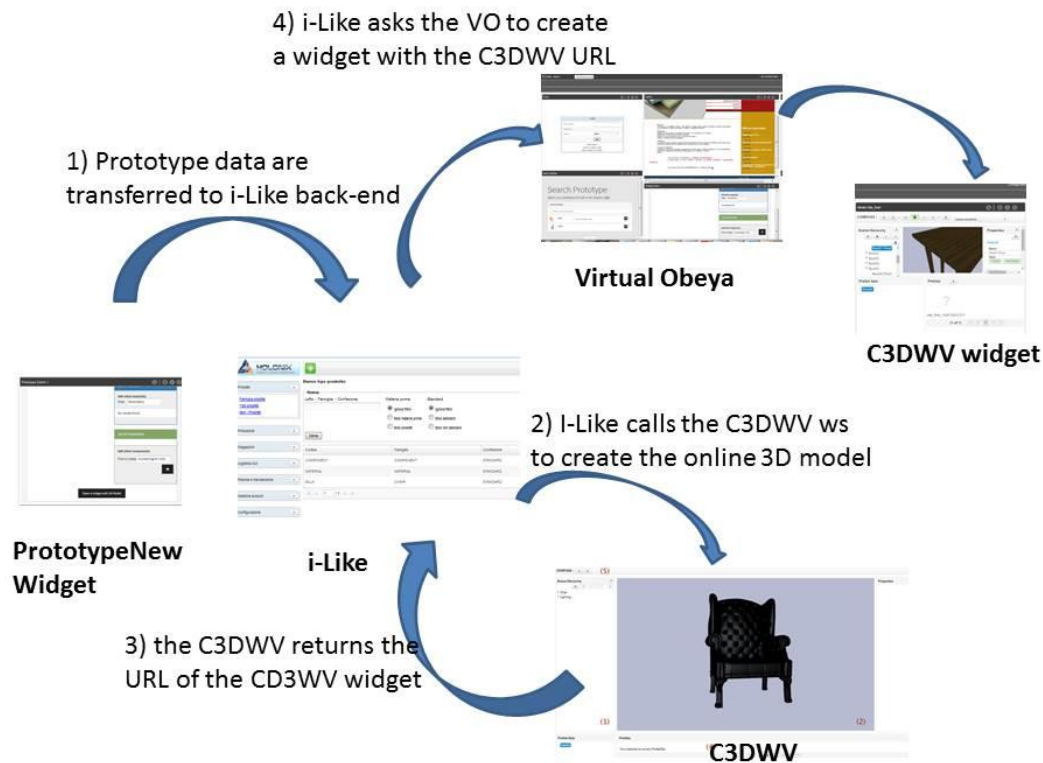


Figure 3: the i-Like/VO/C3DWV integration in AIDIMA

The integration of the i-Like widget with the C3DWV widget in the Virtual Obeya allows to visualize a 3D model uploaded by the user on the PrototypeNew widget using the C3DWV SE. It has been implemented as described in the following:

When a user uploads a Collada file in the PrototypeNew widget (see Figure 3), the widget invokes an i-Like web service to store all the prototype data and the file. This webservice starts a thread that communicates with the a web service of the Atlas module of the C3DWV and receives back the URL of the 3D Model that is stored back in i-Like

i-Like – SEmed integration.

The i-Like component invokes a SEmed web service to retrieve the descriptions and links to pictures for the materials in the Materializa Reporsitory. SEmed returns the information using an O-DM file that is parsed by iLike and the list of materials with descriptions and pictures is made available in the “New Prototype” widget (see Figure 4)

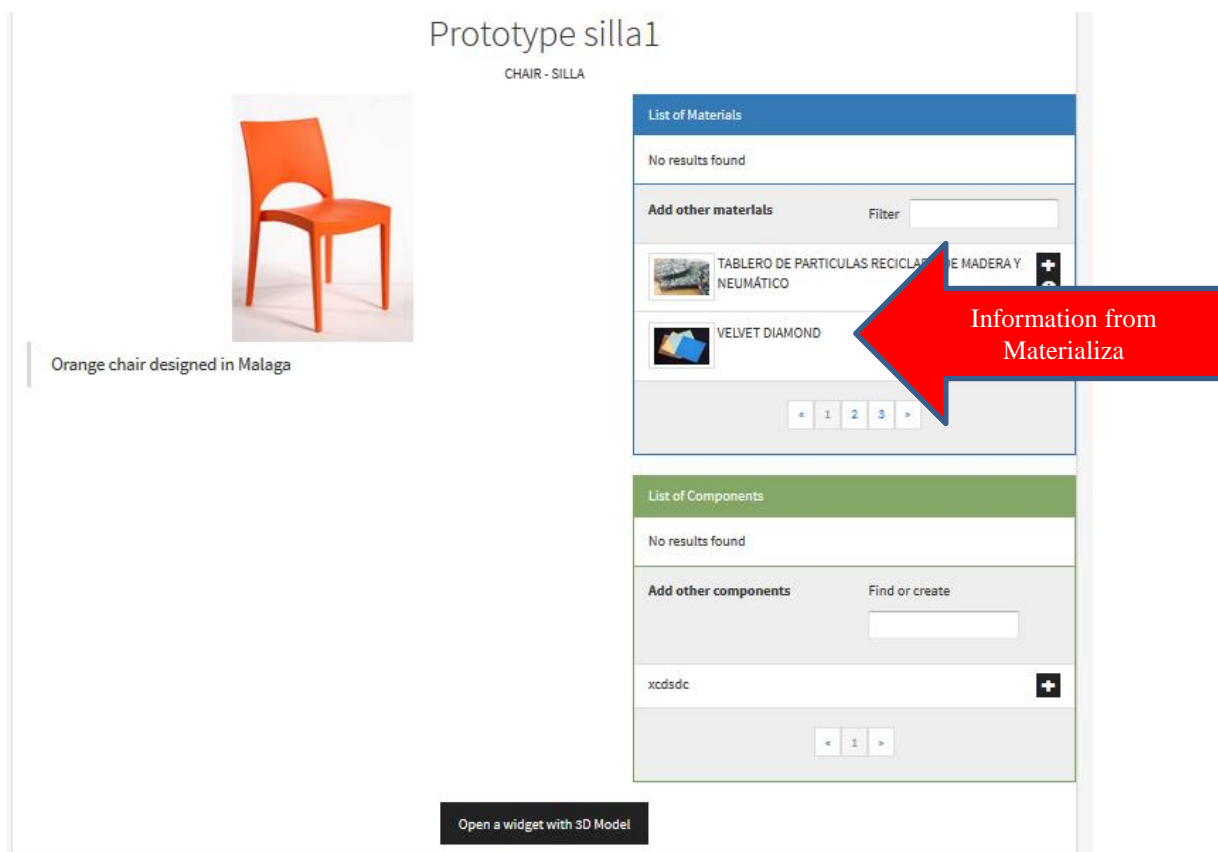


Figure 4: Result of the i-Like - SEMed integration for material information retrieval

2.3.4. Datasets to be used

The above described results and their integration have been tested using data provided by AIDIMA. The prototype creation and visualisation through the widgets in the Virtual Obeya has been assessed by creating the description of some chair prototypes, based on some reference models provided by AIDIMA (see Figure 5)



Figure 5: example of chair prototype from AIDIMA

The material descriptions and pictures are those ones already available in the Materializa DB for which access permissions have been provided by UPV to Holonix and BIBA. The flow of model data and the integration between the Prototype management widgets, the C3DWV widget and C3DWV SE has been tested using some Collada files representing examples of 3D models of chairs and sofa.

2.3.5. Identified barriers and restrictions

The current version of the integrated prototype offers a complete support to the processes and requirements described in section 3.2.1.

However, the technical realisation has some minor restrictions representing issues that have not been fully solved due to the limited time and effort available for the project.

Limitations in the integration of the results

Presently, the integration between iLike and the C3DWV allows to manage single prototypes and not yet to manage components of scenarios as prototypes within a complex project. Furthermore, possible modifications of a model performed within the C3DWV (e.g.: adding/removing components, textual annotations and other manipulations of the model) cannot be reported into the prototype representation managed by iLike.

As for the integration with MaterializaDB, some access restrictions to the pictures of the materials are preventing their visualisation within the prototype widgets.

Limitations in the usage of data and information

The C3DWV requires to upload 3D models in the Collada format; however, that is not a serious limitation since AIDIMA already uses a CAD tool exporting in Collada format. Moreover, it is easy to convert from other formats into Collada, using free tools.

2.3.6. Required customisations

Customisation of i-Like

The iLike platform has been customised for the AIDIMA specific trial in order to:

- Receiving from Materializa DB and giving the right interpretation to the material data provided by the SEMed, using the O-DF standard
- Integrating the iLike platform with the C3DWV to upload the 3D models of the prototypes in the ATLAS server for its visualisation
- Offering intuitive interfaces for the creation, search and visualisation of the prototypes: this has been done by implementing three types of widgets that are used in the Virtual Obeya environment to support the cooperation of designers. These widgets communicate with the iLike platform using the O-LM standard and offer a customised visualisation of the data managed by the platform, offering an intuitive yet simple interface that guides the user in creating a prototype description (see section 3.1 for more details)

Customisation of Virtual Obeya.

- The iLike widgets, the C3DWV widget, the Materializa DB widget have been include in the list of pre-defined widgets form which it is possible to select those that appear in a new Obeya (see Figure 6 below)

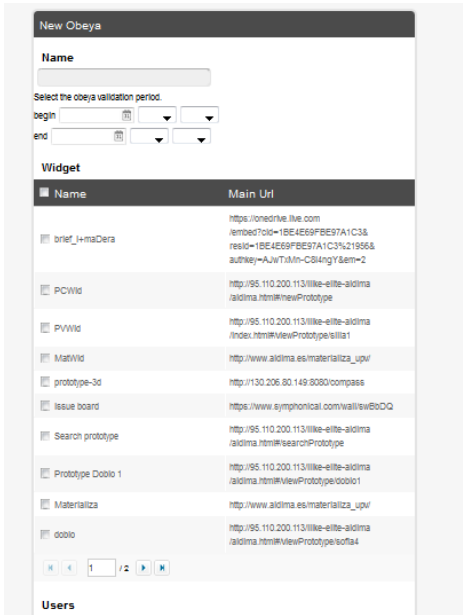


Figure 6: List of pre-defined widgets for VO in AIDIMA

Customisation of SEMed

The SEMed component has been configured in order to transfer the data about materials from the Materializa DB to iLike. For that purpose, SEMed functionality was enhanced in order to access MS SQL Databases.

Customisation of C3DWV

In order to provide a seamless integration with the toolchain used internally by AIDIMA the ATLAS server, which will be released in the future as an SE in FI-CONTENT2, has been integrated into C3DWV. This allows for an automatic conversion of 3D-Assets from the COLLADA format into the XML3D specific format that is used internally by the C3DWV to visualize the 3D virtual scene directly in the browser.

2.3.7. Deployment plans to offer the solution to the Trials

All the above described customised and integrated components have been made available to AIDIMA for a first experimentation through a Virtual Machine, downloadable from an FTP server. A short instruction manual has been prepared, with instructions for setting up the iLike and Virtual Obeya within the AIDIMA environment (see an extract of the manual in Figure 7)



Figure 7: Fragment of instruction manual for VO configuration

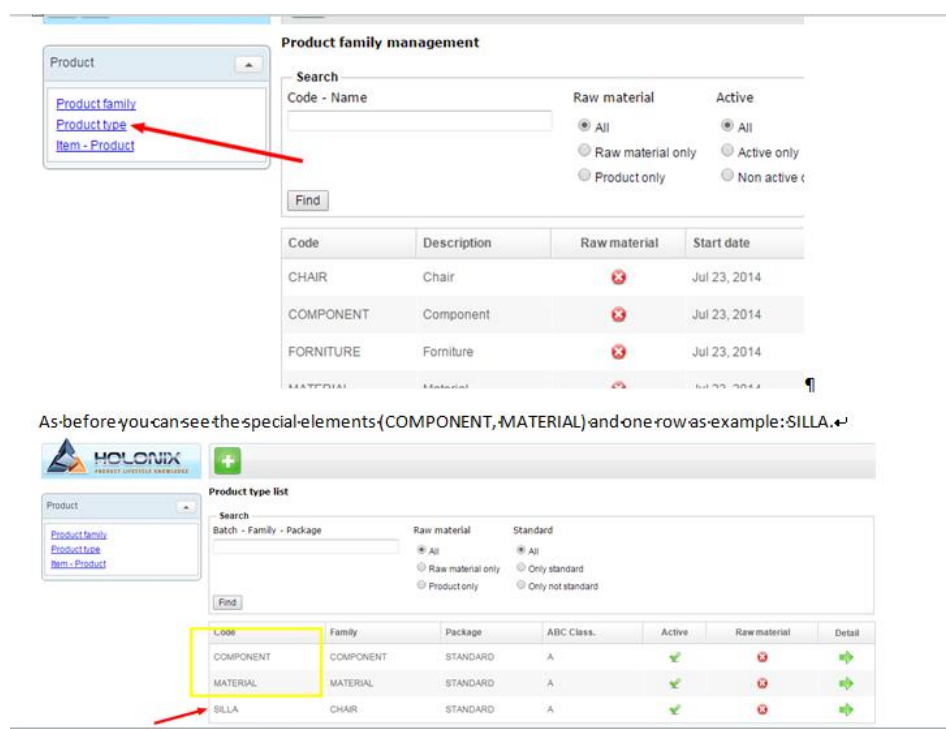


Figure 8: Instructions for the iLike Configuration

The next step will be to make the WP13 services available in the cloud, together with the other components of the AIDIMA trial. This will be done by deploying the Virtual Machine on a node of the FI-WARE cloud infrastructure.

2.4. Preparation for the Consulgal Pilot

The preparation for the Consulgal Trial includes several steps of the FITMAN WP13 participants Holonix and BIBA. Each of the participants brings a SE or PC to the Consulgal trial, which supplement the workflow of the given requirements. Section 3.3 gives a view in the workflow description, which leads to the validated tool chain and used datasets. Then the identified barriers were described, followed by the resulting customisations. Planned deployment work closes this chapter. In the FITMAN project, the Consulgal pilot case delivers three business processes

2.4.1. Workflow description

As mentioned, the workflow of the Consulgal trial results from the BP1, BP4 and BP5: These descriptions lead the workflow on the Consulgal facilities, which object to extract the information of a specific dam and the concrete of which this dam consists. To ensure the quality, the supervisor of the dam should be able to retrieve the information about a performed tests on the concrete from the Consulgal trial platform. The access to these information aims to support the decision making of the supervisor. For that purpose the information about:

- concreting zones of the dam: the concrete classes and consistency, stress values defined by the designer for each zone, compositions provided by contractors
- concreting operation: concrete compositions, extracted samples, results of slump tests and other tests

on mobile devices, PCs and/or Mac is provided to supervisors.

Restricted access to the platform ensures targeted access to information. Additional, non-workflow related description of requirements, such as performance and access improvements were described in the Assessment of the results section

To explain different decisions, assessments and implementation details made by WP13 consortium related to the Consulgal trial it is necessary to have the requirements for the

explained business processes in mind. The following table (Table 4) contains BP1 related requirements:

Table 4: Consulgal BP1 Requirements Mapped to SEs/PCs

ID	Requirements of Business Process 1 – Identification of concrete class and composition defined in the design	FITMAN SE/PC
RCI1	User should have standard way to store/access information regarding concreting zones	i-Like, SEMed
RCI2	Platform should have efficient way for data archival for future reference to regarding the concreting operation	i-Like
RCI3	Users should be trained to make use of the portal to store and retrieve information regarding the concreting zones	n.a.
RCI4	System should provide a well-defined methodology for information flow and inter-process (different sub activities of concreting activity) so as stakeholders responsible at each step can access information in on demand as the concreting activities are performed	n.a.
RCI5	Time for sharing of information between the stakeholders has to be reduced	i-Like
RCI6	Platform should make use of communication technologies for exchange of information rather than hard copies	i-Like , SEMed

Following table (Table 5) contains BP4 related requirements:

Table 5 Consulgal BP4 Requirements Mapped to SEs/PCs

ID	Requirements of Business Process 6 – Project management and Functional design brief	FITMAN SE/PC
RCI7	User should have standard way to store/access information regarding concreting zones	i-Like, SEMed
RCI8	Platform should have efficient way for data archival for future reference to regarding the concreting operation	i-Like
RCI9	Users should be trained to make use of the portal to store and retrieve information regarding the concreting zones	i-Like
RCI10	System should provide an well-defined methodology for information flow and inter-process (different subactivities of concreting activity) so as stakeholders responsible at each step can access information in on demand as the concreting activities are performed	i-Like, SEMed
RCI11	Time for sharing of information between the stakeholders has to be reduced	i-Like
RCI12	Platform should make use of communication technologies for exchange of information rather than hard copies	SEMed, i-Like
RCI13	Users should be trained to make efficient use of the platform and use hard copies only when very necessary	i-Like
RCI14	System should provide authentication based on the credentials of the users (can be users acting as various stakeholders)	i-Like
RCI15	System should provide authorization based on the roles and credentials of the user	i-Like
RCI16	Barcode, RFID	n.a.
RCI17	Stake holders should be able to have the visual proof of the test operations.	i-Like

RCI18	Supervisor should be able to view the status of the test operations and validate the results as soon as the test results are available.	i-Like
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Following table (Table 6) contains BP5 related requirements:

Table 6 Table 5 Consulgal BP5 Requirements Mapped to SEs/PCs

ID	Requirements of Business Process 5 – Slump tests results for each concreting operation	FITMAN SE / PC
RCI19	User should have standard way to store/access information regarding concreting zones	i-Like
RCI20	Platform should have efficient way for data archival for future reference to regarding the concreting operation	i-Like, SEMed (to access external data)
RCI21	System should provide an well-defined methodology for information flow and inter-process (different sub activities of concreting activity) so as stakeholders responsible at each step can access information in on demand as the concreting activities are performed	i-Like, SEMed
RCI22	Time for sharing of information between the stakeholders has to be reduced	i-Like
RCI23	Platform should make use of communication technologies for exchange of information rather than hard copies	i-Like, SEMed
RCI24	Users should be trained to make efficient use of the platform and use hard copies only when very necessary	RCI24
RCI25	The platform admin should be able to register users and assign roles	i-Like
RCI26	System should provide authentication based on the credentials of the users (can be users acting as various stakeholders)	i-Like
RCI27	System should provide authorization based on the roles and credentials of the user	i-Like
RCI28	Barcode, RFID	n.a.
RCI29	Stake holders should be able to have the visual proof of the test operations.	i-Like
RCI30	Supervisor should be able to view the status of the test operations and validate the results as soon as the test results are available.	i-Like

These requirements may recur in multiple business processes.

2.4.2. Tools chain and information flow

The tool chain to satisfy the business process and the resulting work flow provided by WP13 consists of two components: SEMed and i-Like. These components are integrated elements of the overall Consulgal trial architecture depicted in

The actors who are involved in this phase are:

- Designer
- Contractor
- Supervisor

- Lab worker
- On-site worker

These actors shall be supported by the components customized and integrated by the open call winners. These components are i-Like and SEMed.

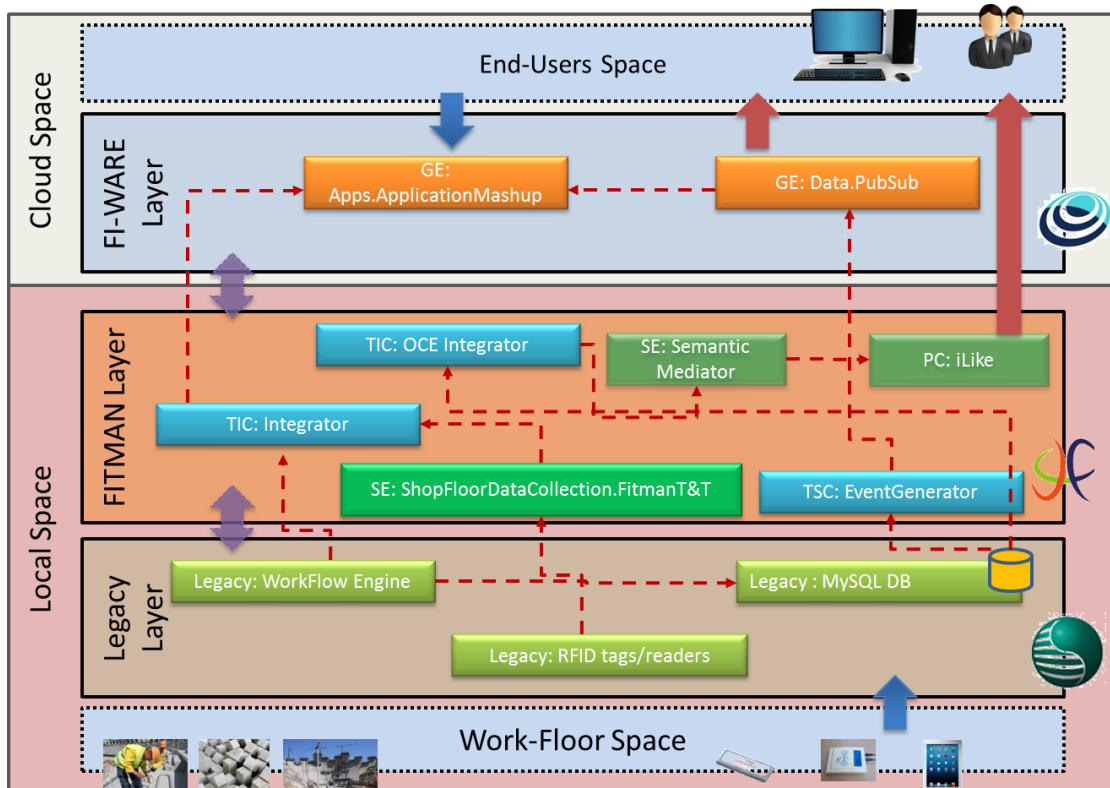


Figure 9: Consulgal Final Architecture

2.4.3. The technical solution

i-Like – SEMed integration.

In the Consulgal trial, i-Like represents the system for aggregating and visualising information through customised user interfaces for the required workflow resulting of BP1, BP4 and BP5.

SEMed is detached from the required workflow and provides the requested information extracted from the Consulgal portal on demand to the iLike, as a middleware in the data access layer.

The request for new data from i-Like to the SEMed is triggered each time an end user navigates a specific section of the user interface. If new data are found in the CONSUGAL platform, they are passed back to i-Like that updates the pages in the User Interface.

The integration activities according to the described workflow focused on the integration both of the last QLM (O-MI and O-DF) standard and the extension of the XML Wrapper to interpret the XML result of calling web service methods. Figure 10 depicts the described information flow.

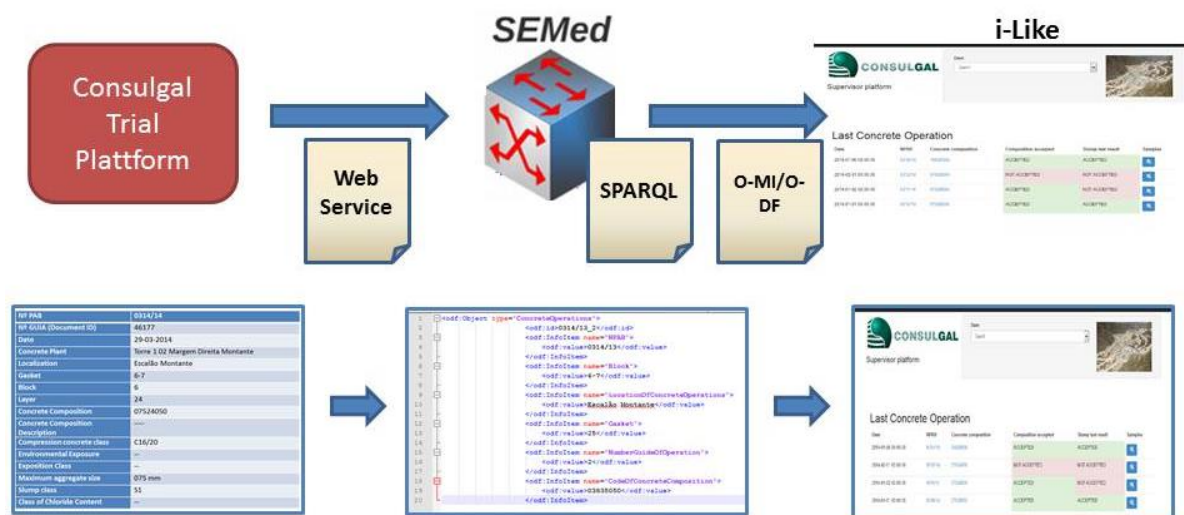


Figure 10: The integration solution for Consulgal

The original XML Wrapper had been implemented to extract information from XML files. In Consulgal, such XML is provided as the result of the invocation of a web service. For that purpose the XML wrapper had to be extended to be capable to call web services methods to gather all information.

A set of SPARQL queries are defined to request following information:

- BP1 -> Concrete class and composition
- BP4 -> Slump tests results for each concreting operation
- BP5 -> Testing and compression test results

2.4.4. Datasets to be used

2.4.5. Identified barriers and restrictions

As mentioned in the section before, the information from the Consulgal systems to SEMed will be transferred in XML format. These information will be routed in the mediator core in order to provide the tuple of the data to i-Like. The routing core of SEMed is able to provide only complete tuple. This means that data tuples with missing attributes cannot be provided to the querying system (i-Like).

2.4.6. Required customisations

Customisation of i-Like

The iLike platform has been customised for Consulgal specific trial in order to:

- Receive data from the Consulgal trial platform through the SEMed, using the O-DF standard
- Develop intuitive and mobile interfaces for the dam inspectors to access exactly the information they need to during the execution of their inspections, supporting searches and easy navigation across different sections of the user interface

Customisation of SEMed

- The SEMed component has been configured in order to transfer the data from the Consulgal trial platform to iLike. For that purpose, SEMed functionality was enhanced in order to call and expose web services.

2.4.7. Deployment plans to offer the solution to the Trials

The solution was deployed to the Consulgal trial in two separate ways. Firstly, the customized and ready configured current versions of i-Like and SEMed were deployed on the infrastructure of the solution providers Holonix and BIBA. Secondly, the solutions were

offered as a virtual machine image as a ready-to-deploy solution for the Consulgal IT infrastructure.

2.5. Preparation for the VW Pilot

The two Volkswagen (VW) business scenarios are divided into six business processes as outlined in Figure 11. The major focus of the business scenarios is on the estimation of the cost at early stages of a production development process. The decision if a product will be developed, however, is inevitably based on some level of uncertainty because factors, such as supply chain and production conditions, cannot be fully determined prior to the full production planning process. In the context of FITMAN, VW tries to increase the level of certainty for these decisions at this early step by developing a platform based on the FITMAN SEs and PCs that integrates the already available legacy TSC systems into a system to support experts during the evaluation and decision making process for new product developments. Detailed descriptions on each BP and the overall business cases can be found in D5.3.

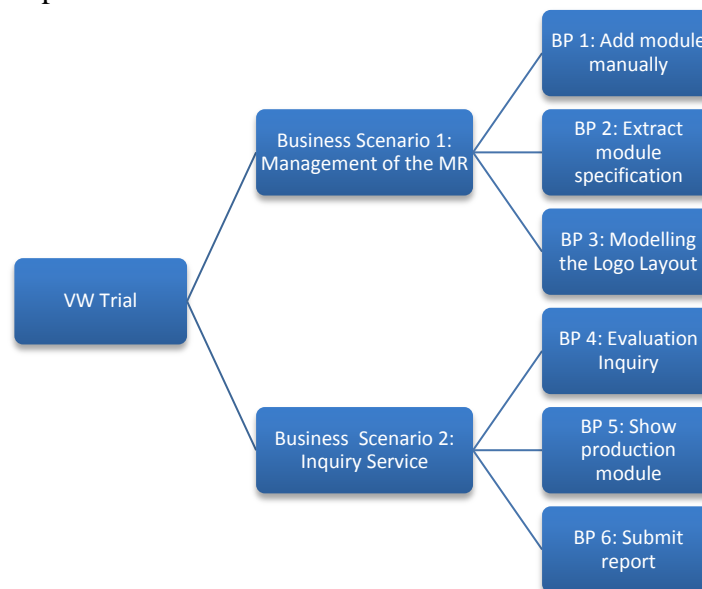


Figure 11: Hierarchical view of the Business Scenarios in the VW Trial

The platform developed in the FITMAN project is centered on the Machine Repository (MR) that provides high-level information about machinery and equipment required for the production planning. The end-user interacts with the WP13 PC vObeya which incorporates user roles management abilities. It is used in all business processes of the VW Trial to aggregate information from different sources using so-called “widgets”. In-between the MR and the vObeya, the SEs SEMed and C3DWV are used. The SEMed SE is used in BP 2, “Extract module specification”. It semantically maps and parses data from the production-planning database’s output and uses it to automatically fill the correct parts of the form with the data extracted. Afterwards the user can change the extracted information if necessary and commit the final form to the MR.

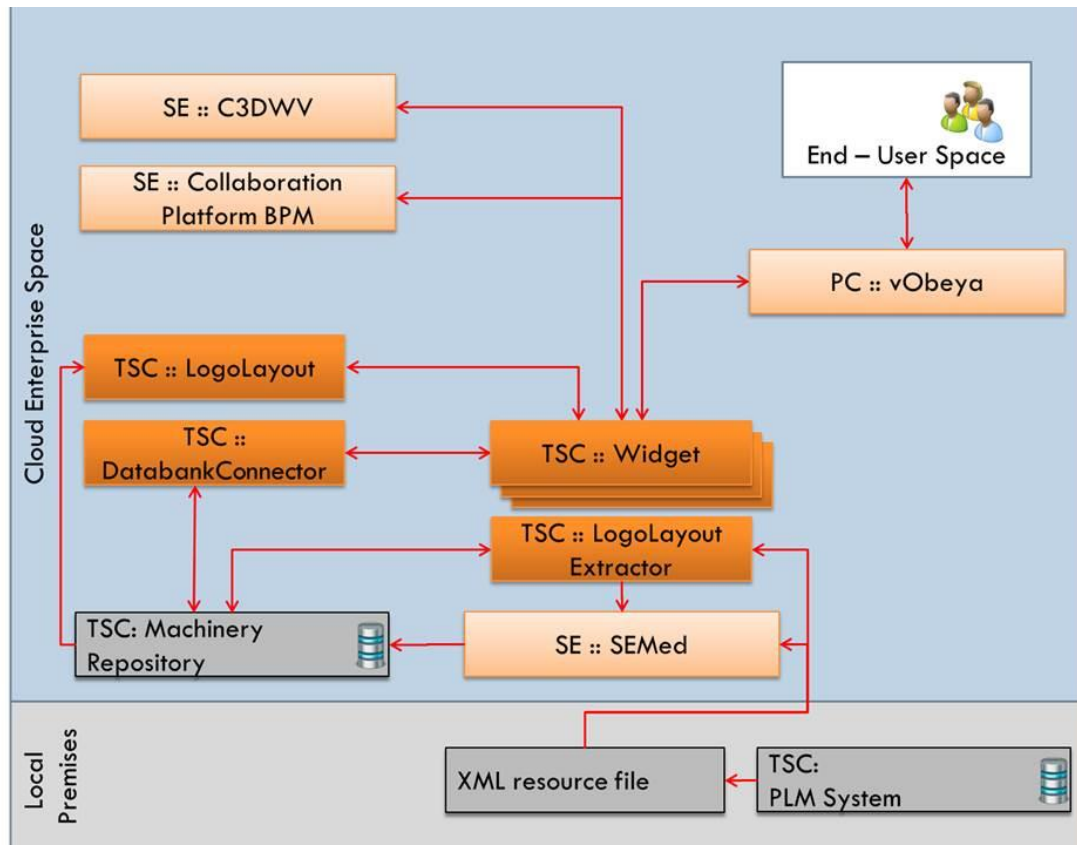


Figure 12: The FITMAN Digital Factory Instantiation in the VW Trial

The C3DWV SE is used in BP 5 in which the inquiry request from BP 4 is analyzed and evaluated. Before the C3DWV SE was integrated into the Trial platform a 2D image of the planned production line was provided to visualize the final production line. The C3DWV SE does not only improve the visual quality by using a 3D virtual model of the parts of the production line, but also provides the user with a more detailed visualization of the planned production line and a rich feature-set to modify the production line virtually. Because this BP may potentially involve more than one user it is important that all of them share a synchronized view on the data, which is the primary feature of the C3DWV SE. The current architecture of the VW FITMAN Digital Factory Instantiation is depicted in Figure 12

2.5.1. The Technical solution

The platform developed in the FITMAN project is centered on the Machine Repository (MR), a back-end system that provides high-level information about machinery and equipment required for the production planning. The front-end is a Web Application that is currently built on top of the Mashup GE from FIWARE. This GE, however, will be replaced by the WP13 PC vObeya because of its user roles management abilities and overall usability for the end-user. As part of the front-end, vObeya is used in all business processes of the VW Trial to aggregate information from different trial specific components and legacy systems using widgets. In-between the MR and the vObeya front-end, the SEs SEMed and C3DWV are used. The SEMed SE is used in BP 2, "Extract module specification" (see Figure 13 left hand side). This BP is an alternative to BP 1 to add a new production module to the MR. However, instead of filling out a form manually, BP 2 uses information already present in the production planning system's database - a legacy system in the VW infrastructure. The extraction of this data is the responsibility of the SEMed SE. In BP 5 (see **Error! Reference source not found.** right hand side) the C3DWV SE is used to visualize parts of the final assembly line. As an HTML-5 application, which is built on top of the mature XML3D GE from the FIWARE project, the integration as a vObeya widget is done by reading a URL from the MR.

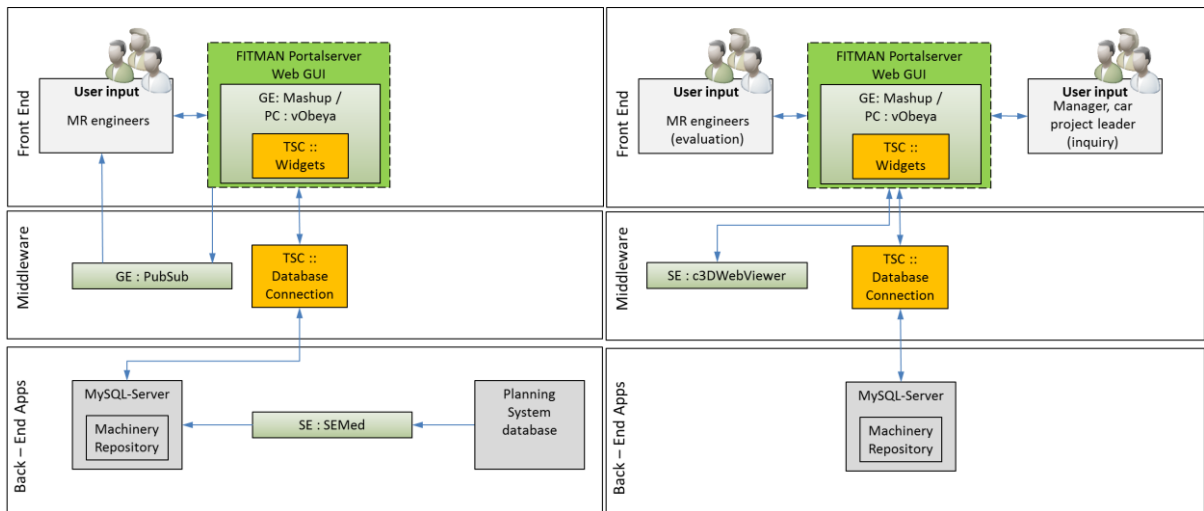


Figure 13: Technical solution for the covered business processes BP2 (left) and BP5 (right)

2.5.2. Datasets to be used

For the purpose of customization and testing of the integration of all components sample data was provided by VW. First a sample export from their planning system was used to customize and test SEMed. Second two sample OpenJT files with assembly line parts were provided to test the visualization inside the C3DWV SE (see Figure 14).

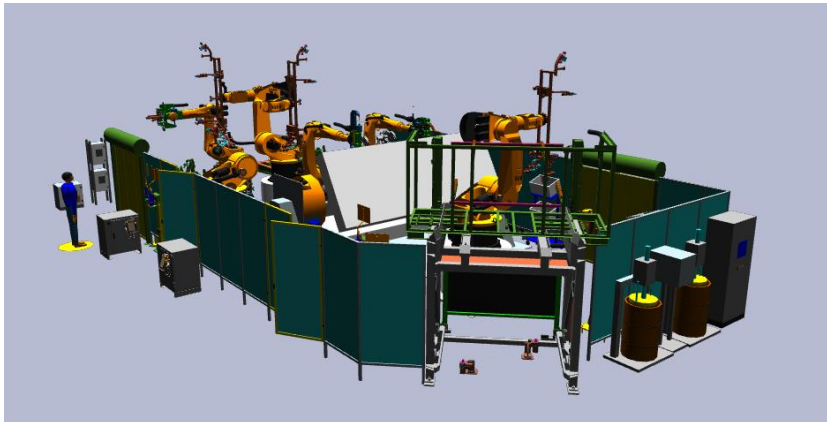


Figure 14: Visualization of one of the provided sample data sets.

2.5.3. Identified barriers and restrictions

The 3D data of the production line are only available in the OpenJT format. This would require the Collaborative 3D Web Viewer to work with data in that specific format. However, C3DWV uses the XML3D GE from FIWARE, which has its own format for 3D geometry and a conversion of the format is necessary. This conversion is currently done manually because the large specification and effort necessary to implement a conversion from OpenJT to XML3D and the proprietary nature of all existing library solutions make an automatic conversion step a huge undertaking that is out of scope of the FITMAN Trial integration. The C3DWV is thus integrated into the VW trial only for a small number of predefined production module parts, which are converted a priori by DFKI. The integration into the overall system is done by storing URLs in the MR that point to the visualization of each of the individual modules.

2.5.4. Required customizations

The integration of SEMed into the VW platform required two customizations. First, to read the output from production planning system the XML wrapper had to be extended to support string pre-processing in order to extract multiple values from a single XML attribute string.

Secondly an SQL wrapper had to be developed to interoperate with the MR to insert the extracted data from the production planning system's output XML.

The Collaborative 3D Web Viewer is a state-full and session driven web application. Therefore, it is always necessary that the user opens a project and a respective scenario. However, this behaviour is in stark contrast to the way C3DWV should be integrated. Therefore, so-called deep-links were implemented. These deep-links allow for URLs that directly point to a project and scenario without the user being required to open it. Any necessary session will be initialized thereafter.

2.5.5. Deployment plans to offer the solution to the Trials

The technical partner IPK hosts the VW Digital Factory Instantiation. The deployment of the new SEs and PCs from WP 13 is handled through the provisioning of one virtual machine for each individual component. The IPK deploys these virtual machines inside their cloud solution for the VW trial.

2.6. Preparation for the TRW Pilot

The TRW Pilot is focused on the dimensional quality control of components for the automotive industry produced by TRW in one of its industrial plants. In this trial the objective is to use the 3D Scan as a relevant tool to identify parts that do not meet the dimensional constraints and to advance move towards the Zero Defect Factory paradigm, where dimensional defective parts are identified with control system.

The following business processes of TRW have been identified as of interest for a support provided by the integration of some WP13 results.

Business Process 5 – 3D Point Cloud Visualization and Storage:

The TRW trial requirements are listed in the table below. As it can be seen they are all supported by the 3DScan Specific Enabler:

Table 7 TRW Requirements of BP5 mapped to FITMAN SEs/PCs

ID	Requirements of Business Process 5 – 3D Point Cloud Visualization and Storage	Fitman SE/PC
RTRW1	Manufactured parts will be digitalised through 3D scanning technologies	3DScan
RTRW2	Production & quality departments will access to the point clouds stored	3DScan
RTRW3	Production & quality departments will upload and retrieve the point clouds to the storage unit	3DScan
RTRW4	Production & quality departments will visualise the point clouds stored	3DScan
RTRW5	Production & quality departments will visualise the 3D results by means of colour mapping	3DScan
RTRW6	Production & quality departments will have an intuitive tool for evaluating if a part has defects or not	3DScan

The 3DScan SE together with the 3D Point Cloud Analysis Processing PC will allow to address the requirements of the TRW trial defined previously in the table. The main mission of the 3DScan SE is to store, upload and visualise both, the scanned surfaces and the results obtained from them. The 3D Point Cloud Analysis Processing PC will be focused on the processing of the dimensional information acquired and on the calculation of the dimensional quality results.

2.6.1. Workflow description,

The TRW trial is oriented to the dimensional quality control of metal components for the automotive industry. The objective of the trial is to implement a use case aligned with the Zero Defects Factory paradigm, which means that defective parts should be identified by quality control methods before leaving the production plant. The trial allows the final user to scan and, with the help of the 3Dscan SE, to store and visualise the information acquired. The 3D Point Cloud Analysis Processing unit (PC) is used to process and analyse the dimensional information previously obtained. The trial workflow is organized in the following steps:

1. The analysed part is scanned to acquire the dimensional data.
2. The acquired information is processed.
3. Comparison between the 3D design model and the scanned part (specifications vs real part).
4. 3D Results obtained, analysed from a dimensional quality control perspective. Visualisation.

All the steps are graphically summarized in the following scheme (trial workflow representation):

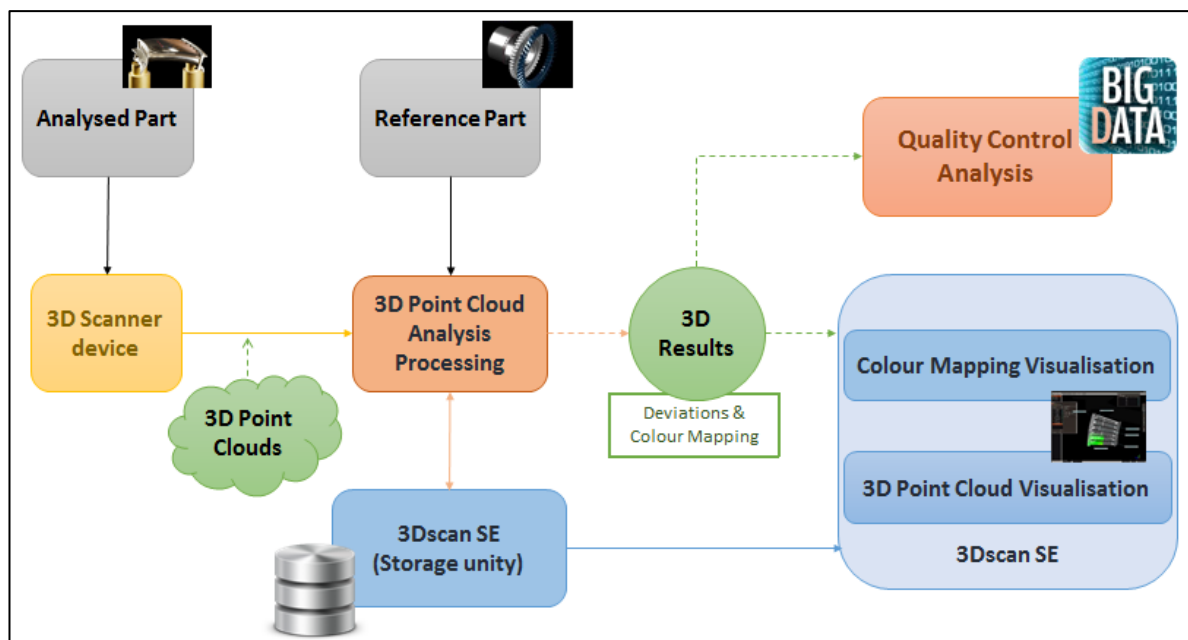


Figure 15: Workflow of the TRW Trial.

2.6.2. Tools chain and information flow

The tools used to tackle the different steps of the trial and to cover the information flows between them are listed and briefly explained below, taking into account the steps of the workflow previously explained.

Step 1: the analysed component is scanned to acquire the dimensional data:

The dimensional data acquisition from the TRW component is done with a **3D Scanner device**. This device captures information about the surface of the scanned part. This information is converted into a **3D Point Cloud** (discrete set of points, usually stored into a text file containing numeral data about the coordinates x, y, z).

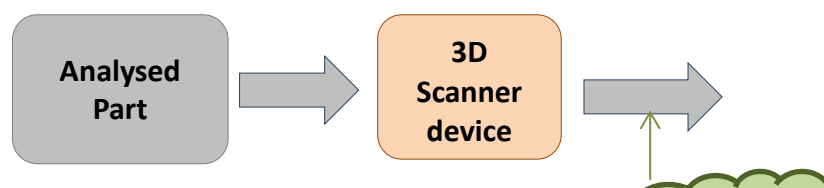
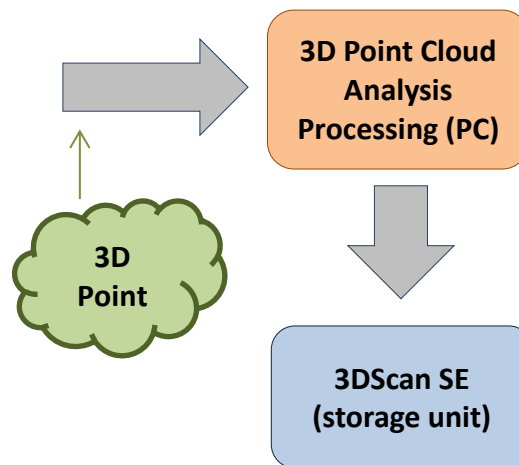


Figure 16: Scheme of scanning phase**Step 2: Information acquired is processed:**

The 3D Point Cloud acquired in the previous step is firstly processed and then analysed in the **3D Point Cloud Analysis Processing** unit (Private Component). The objective of this step is, in first place, to process the Point Cloud obtained, this means, for example, to delete some redundant or incorrect information obtained during the acquisition phase through different numerical processes.

The 3D Point Cloud, once has been processed, can be stored in the **Storage Unit** of the **3DScan SE** and can also be visualised using the **Visualisation Unit** of the **3DScan SE**.

**Figure 17: Scheme of the processing phase****Step 3: Comparison between the 3D design model and the scanned part (specifications vs real part):**

The main information input that the system has at this point is the **3D design model**. This can be obtained by the scanning of a **reference part**, through a **CAD model** (e.g. stl file) that works as a theoretical model or through numerical specifications. The objective of this step is to be able to compare the real produced part with a reference model, to establish the dimensional deviation and see if the real part meets the specifications. Also in this step the scanned part is measured and dimensionally analysed carefully. This step produces as main output the 3D Results.

The obtained results in this step are also stored in the **Storage Unit** of the **3DScan SE**.

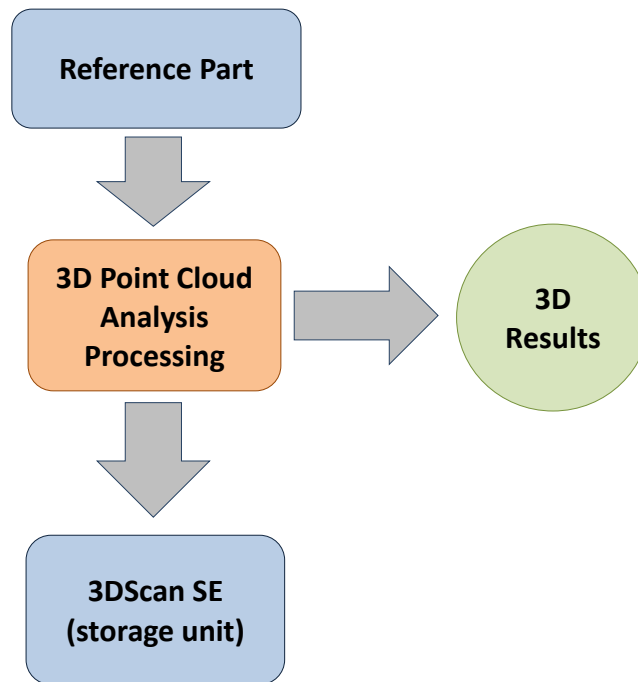


Figure 18: Scheme of the comparison phase.

Step 4: 3D Results obtained, analysed from a quality control perspective and visualised:

In this step the **3D Results** produced are stored in the **Storage Unit** of the **3DScan SE**. They are also analysed from a dimensional quality control perspective and they can be visualised in the **3DScan SE Visualisation Unit**. This component will allow the visualisation of a **colour mapping** graphical representation: a deviation map showing the comparison between the real scanned part and the reference model. This kind of representation uses a pre-defined colour scale to express the deviation, for example: red colours represent the regions that are out tolerance and green colours those that are closer to the nominal values.

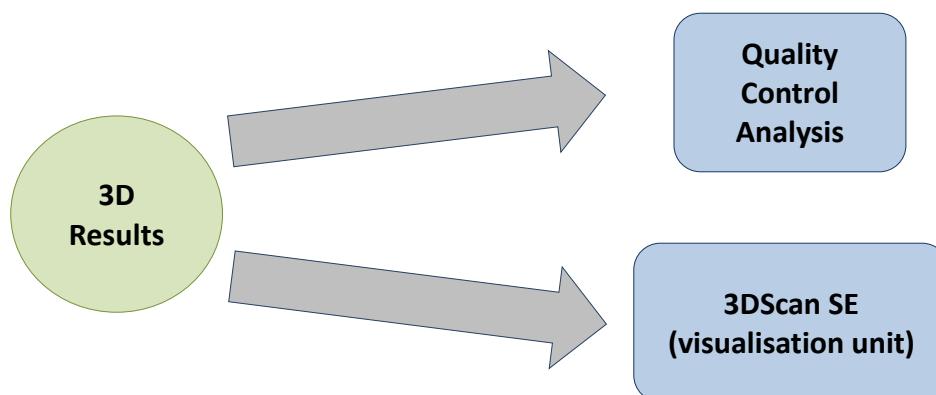


Figure 19: Scheme of the analysis and visualization phase.

2.6.3. Datasets to be used

The pilot of the TRW trial will be performed using a TRW metal component. The component analysed is a spindle used in an assembly mounted by TRW. A picture of the part can be seen in the figure below:

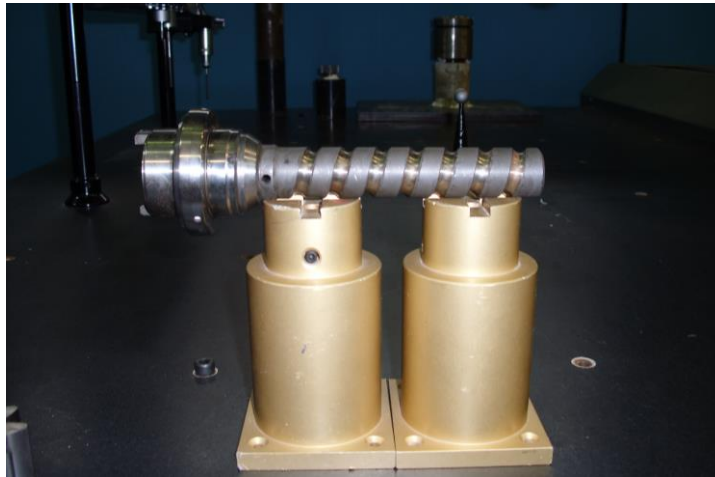


Figure 20: TRW spindle used in the trial.

2.6.4. Identified barriers and restrictions

During the deployment of the trial there were no main special barriers or restrictions to achieve the objectives previously defined. Datapixel and TRW agreed during the previous months the part that would be used during the trial. This part has been scanned and the cloud of points and results obtained (colour mapping representations, mainly) have been carefully analysed by TRW to see if it satisfies its requirements.

As it is usual in a very demanding manufacturing environment there are some requirements to achieve in terms of scanning time. TRW needs to control if possible the 100% of its production, in order avoid defective parts to leave the factory, and this requires an important scanning speed. From this point of view the technology deployed in the trial by Datapixel needs to be used efficiently but it is perfectly capable of meeting the requirements defined from this point of view.

2.6.5. Required customisations

The system deployed in TRW is very close to the standard applications of Datapixel technology. From this point of view, no specific customisations were necessary. The system has been deployed in TRW and this requires always of some minor customisations to adapt it to the IT environment and to the particular production line, but, from a functional point of view, there are no particular customisations.

2.6.6. Deployment plans to offer the solution to the Trials

In first place, the equipment has been installed in Datapixel's facilities, trying to replicate the production situation in TRW. Some tests were performed with this test Configuration, using different TRW parts and finally the selected sample to perform the trial.

Once these first tests have been performed successfully, Datapixel started to deploy the trial in TRW's facilities. This is the final stage of the use case. Now the trial is ready to execute some tests in the TRW manufacturing environment. The next steps include the necessary adjustments in the trial setup. In the following steps TRW and Datapixel will adapt the trial Configuration to the envisaged requirements and finally TRW will extract the conclusions about the solution implemented.

3. The validated results

This section describes the results that have been developed, customized and then integrated for the specific trials

3.1. Customised SEs and PCs for AIDIMA

Virtual Obeya

Since the Virtual Obeya is a very generic and flexible tool, it is possible to configure for each context in which it is used, through the back end functionalities offered by the platform. For example, it is possible to create users and roles:

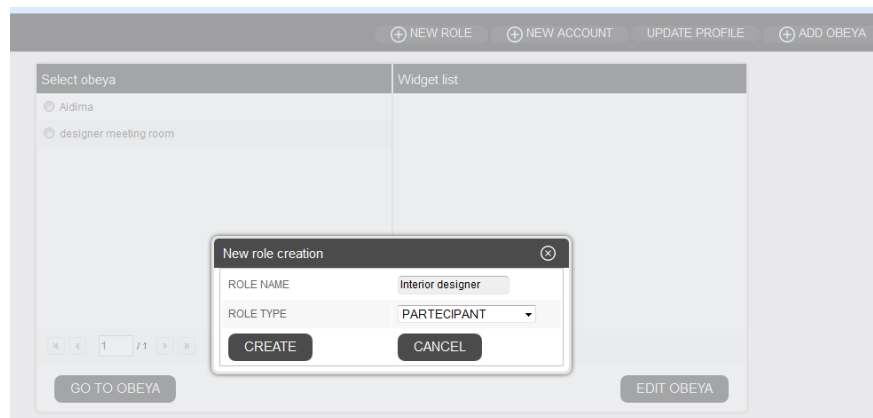


Figure 21: Creation of new roles in the VO

Virtual Obeyas (or virtual rooms) can be created by the administrator or by the Obeya Manager and populated with widgets selected from a list or created from scratch, providing their URL to the system

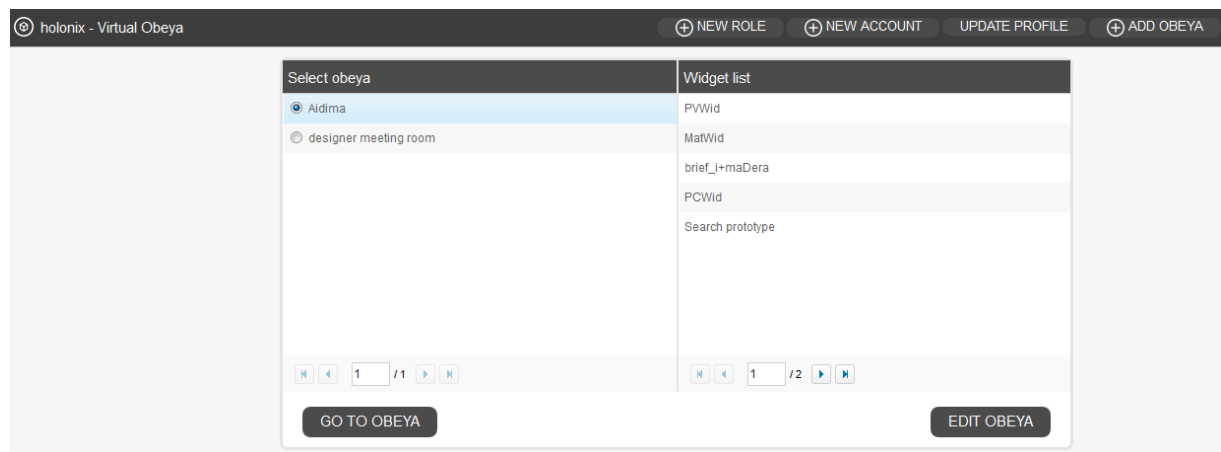


Figure 22: Obeyas created for AIDIMA

A Virtual Obeya specific for AIDIMA has been created in advance, to be used during the validation in the trial. Such Obeya contains the widgets that are expected to be used in BP5 and BP6, during the collaborative design of furniture prototypes. It contains the following widgets:

- Prototype creation widget: for the creation of a new prototype in iLike (see below)
- Prototype search widget: for the search of prototypes already available in iLike (see below)
- Prototype visualization widget: for the visualization and update of an already existing prototype
- C3DWV widget: for the visualisation of a 3D model of a prototype

- **Materializa widget:** offering access and visualization of information from the Materializa website

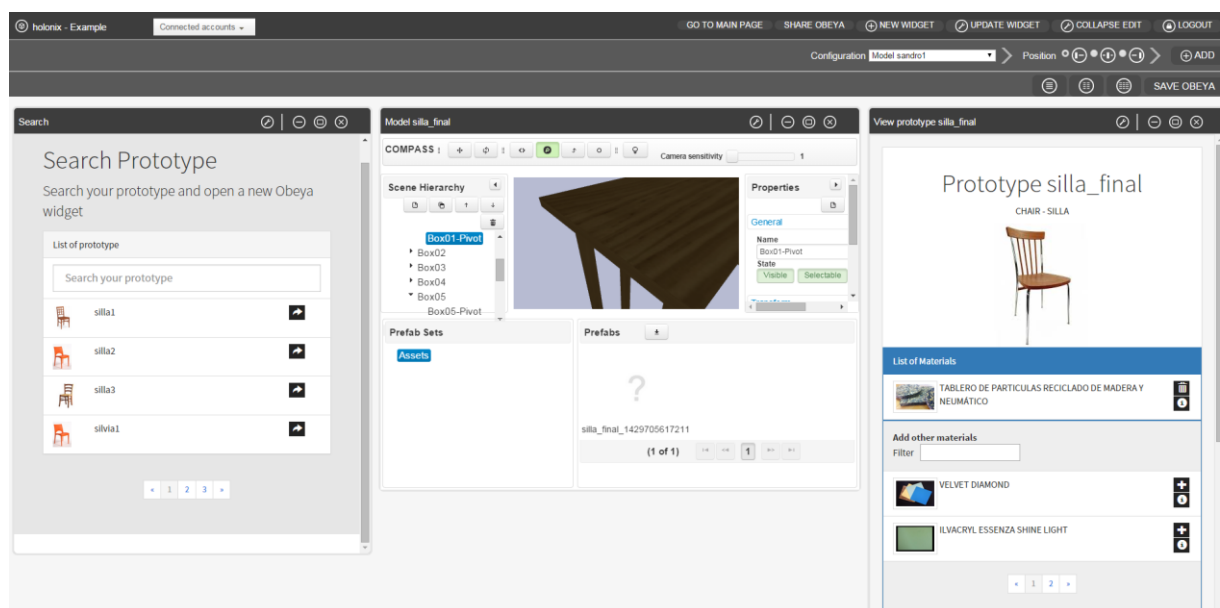
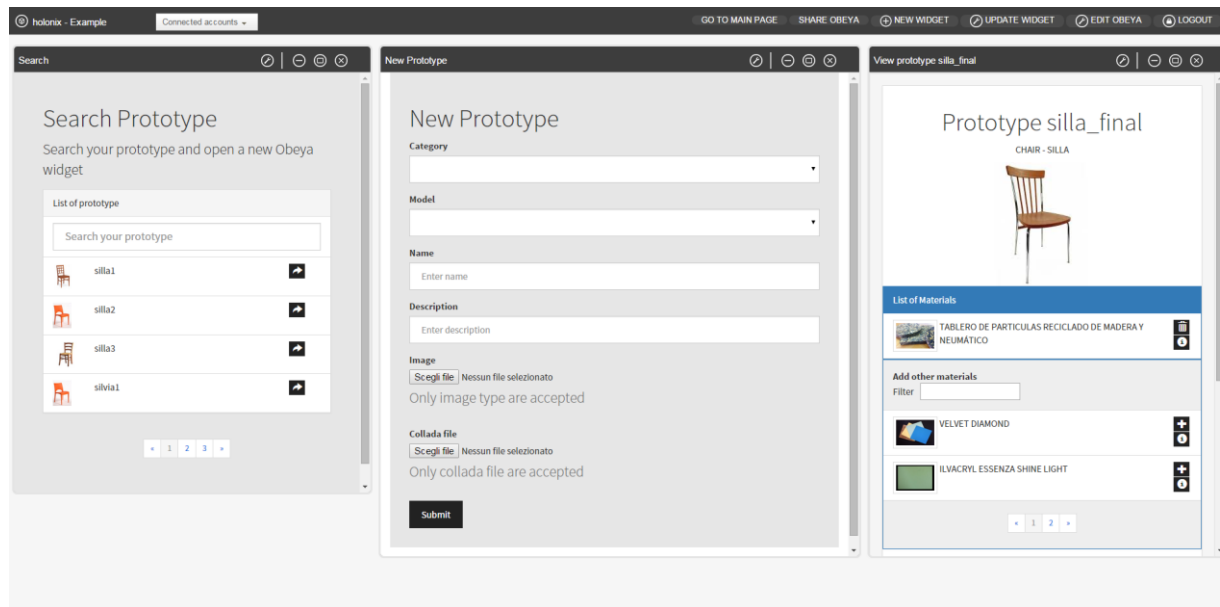


Figure 23: the iLike and C3DWV widgets of the VO created for AIDIMA

iLike Widgets

Three specific widgets have been created to easily access the information of the prototypes stored into the iLike platform:

- **newPrototype widget**
This widget allows to create a new prototype of a certain category of product, based on a reference model. The designer can add a short textual description and upload an image representing it. Such image can be a simple hand-made sketch or a 3D model in Collada format.

New Prototype

Category
Chair

Model
SILLA

Name
silla1

Description
this is the prototype designed in

Image
Sfoglia... Nessun file selezionato.
Only image type are accepted

Collada file
Sfoglia... Nessun file selezionato.
Only collada file are accepted

Submit

Figure 24: the NewPrototype widget

- **searchPrototype** widget





This widget offers the possibility to retrieve the list of prototypes already created in the i-Like platform. The full description of the returned prototype can be visualized in the viewPrototype widget by clicking on the specific button.

Search Prototype

Search your prototype and open a new Obeya widget

List of prototype

silla

	silla1	Orange chair designed in Malaga	
	silla 2		

1

Figure 25: the SearchPrototype widget

- **viewPrototype** widget

Visually presents the already available prototype information and also offers the possibility to add new components and materials; furthermore, through this widget it is possible to open the C3DWV and visualize the 3D model in such widget inside the Virtual Obeya

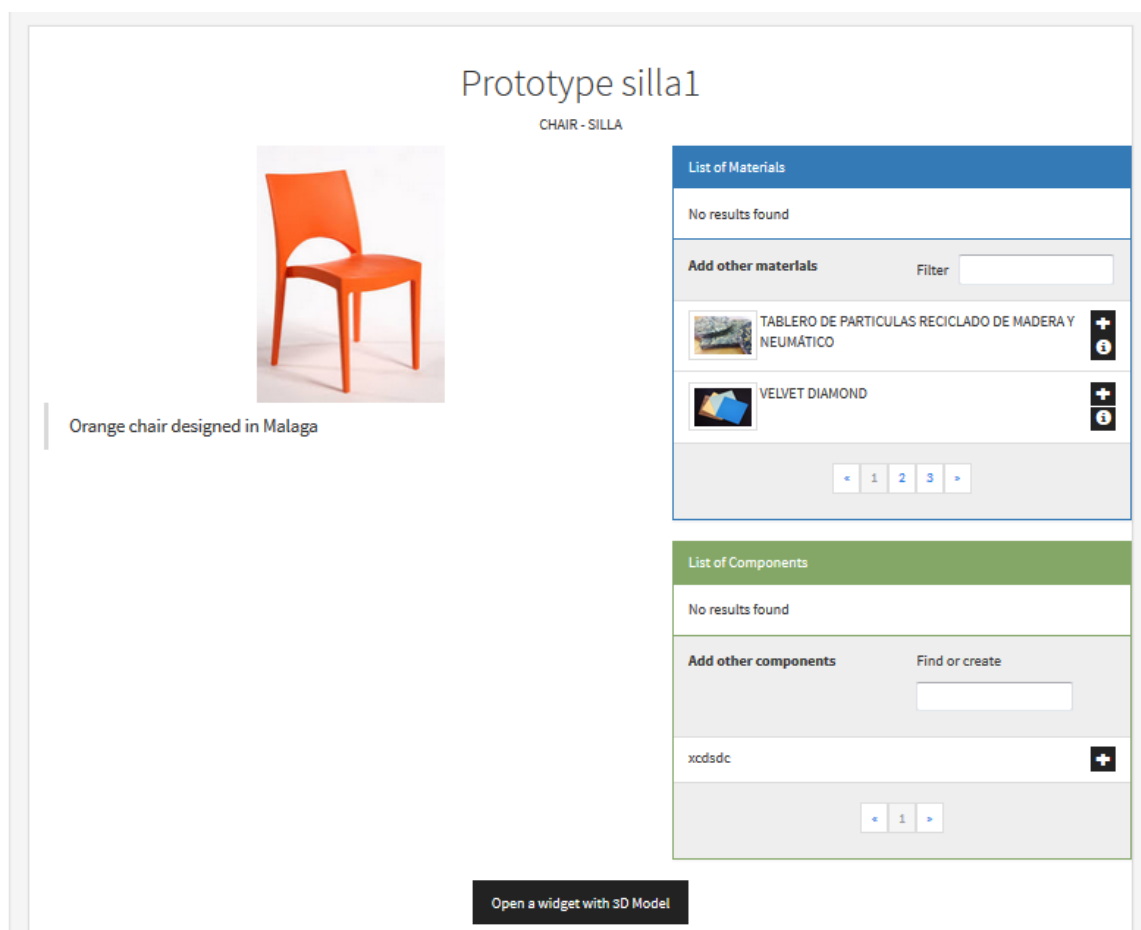


Figure 26: the ViewPrototype widget

In this widget it is possible to see how the integration of the iLike, SEMed and C3DWV has been accomplished: the list of materials in the blue rectangle is retrieved by iLike from MaterializaDB, through the SEMed SE.

The 3D Model uploaded in iLike during the prototype creation can be visualized by clicking on the black button in the bottom, thanks to the integration of iLike with the C3DWV.

3.2. Customised SEs and PCs for Consulgal

The customization for the Consulgal trial accomplished by Holonix and BIBA affect i-Like and SEMed. The customizations regarding these tools are described separately in the following:

i-Like

The customizations for i-Like are affecting the graphical user interface, the data model and the data querying mechanism. These customizations are due to the requirements resulting of the trial business processes.

In all three addressed business processes (BP1, BP4, BP5) the requirements "...authorization based on the roles and credentials" and "...authentication based on credentials...". The following screenshot shows the customized display of the authorization screen:

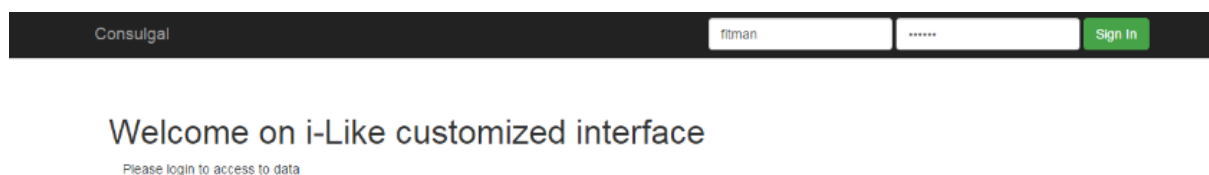


Figure 27: Customised interface of i-Like for Consulgal

Requirements:

- User should have standard way to access information regarding concreting zones,
- Platform should make use of communication technologies for exchange of information rather than hard copies and
- System should provide a well-defined methodology for information flow and inter-process so as stakeholders responsible at each step can access information in on demand as the concreting activities are performed

This requires an established information flow of trial specific data model to perform the displaying of dam and/or concrete information. For that purpose it was necessary to define and adapt in i-Like not only a trial specific data model, but to define a new structure of views in the application as well. This includes the entire naming of menu points as well as the structure and placement of the user interface objects. The following screenshots show the performed customization for the displaying of dam zones:

Consulgal

Signed in as fitman [Logout](#)

Dam zones

Localization

Gasket

Block

Escalão Montante

25

6-7

NPAB	Concrete composition	Location	Gasket	Block	Samples
0314/13	07526042	Escalão Montante	25	6-7	🔍
0314/13	0752405091	Escalão Montante	25	6-7	🔍
0314/13	07524050	Escalão Montante	25	6-7	🔍
0314/13	07526050B	Escalão Montante	25	6-7	🔍
0314/13	07526050B	Escalão Montante	25	6-7	🔍
0314/13	07526050B	Escalão Montante	25	6-7	🔍
0314/13	07526050B	Escalão Montante	25	6-7	🔍
0314/13	07526050B	Escalão Montante	25	6-7	🔍
0314/13	07526050B	Escalão Montante	25	6-7	🔍
0314/13	07526050B	Escalão Montante	25	6-7	🔍
0314/13	07526050B	Escalão Montante	25	6-7	🔍

[«](#)
[1](#)
[2](#)
[»](#)

Figure 28: List of concrete compositions

Similar to the already described customization activities according to the data model and user interface, the calling structure of the menus was customized as well. Consulgal trials requires to call a certain concrete composition and a sample depending on a location, dam zone etc. The concrete composition and a sample can be called by using a link in the columns concrete composition and samples.

The menu concrete composition appears if a call on the menu was performed. The appearance containing the Consulgal concrete composition data is shown in the following:

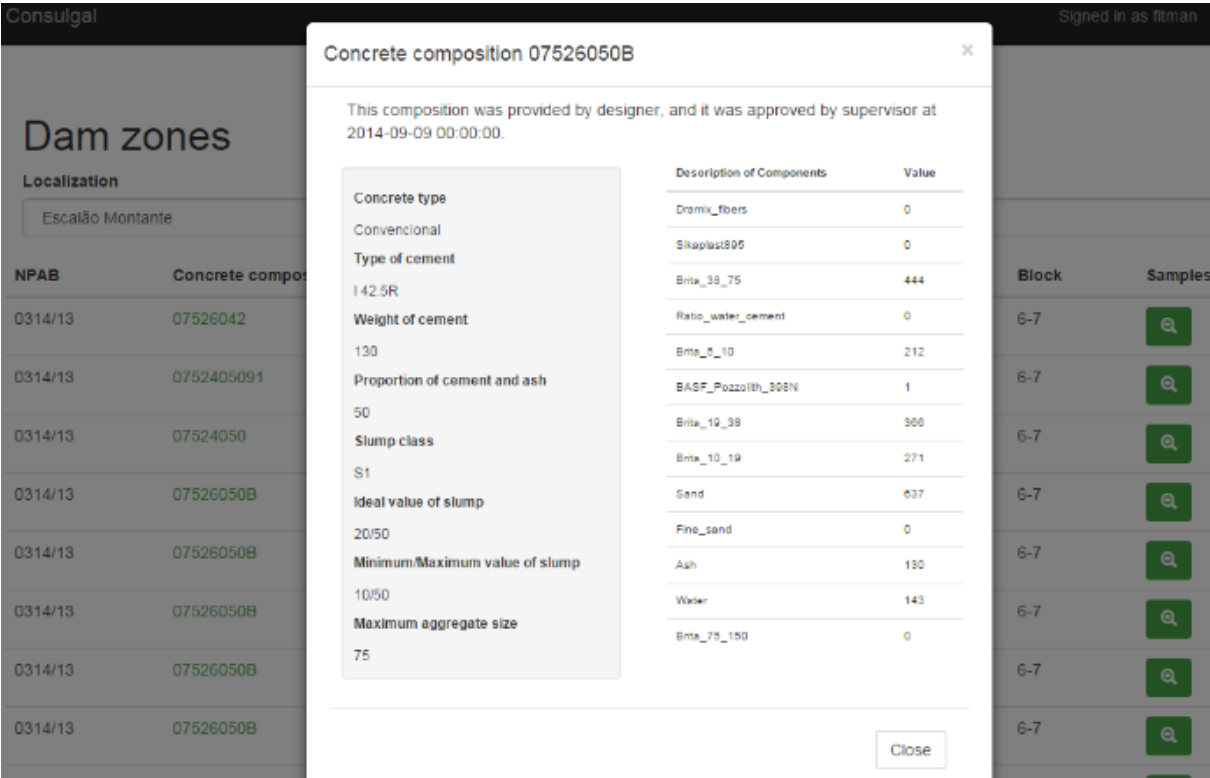


Figure 29: Example of data visualisation page for DAM composition data

Similar to that, the sample displaying window appears with according Consulgal data when it is called:

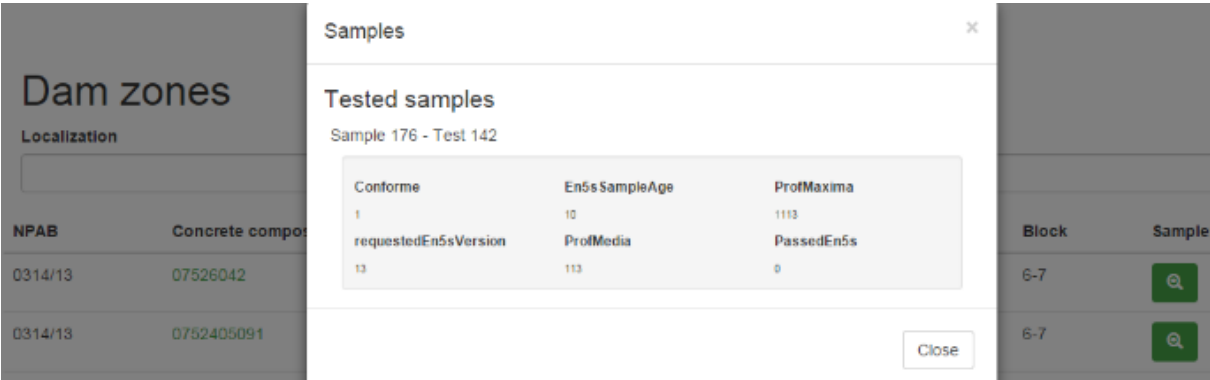


Figure 30: Example of visualisation of test results

SEMed

SEMed provides the necessary information from the trial legacy systems to i-Like. The following describes the functionality of SEMed before the customization for the Consulgal trial and after that.

At the beginning of FITMAN, SEMed consisted of four modules, which are summarized in

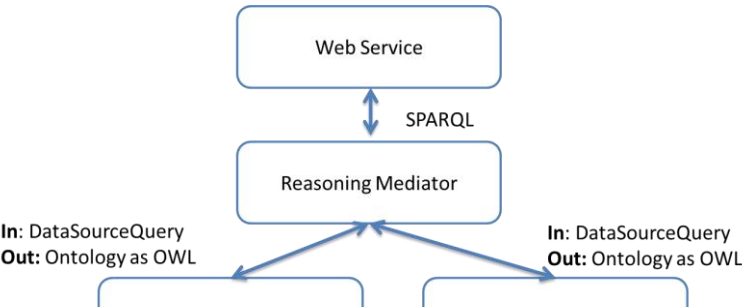


Figure 31: Architecture of SEMed before FITMAN

Figure 31 illustrates the architecture divided in three layers. The lowest layer concerns the linking of data sources. Each data source must be connected to an instance of a wrapper. Both trials need the XML Wrapper to request information of its specific data source (RVW9, RCI1, RCI7, RCI19). The implemented XML Wrapper didn't fulfil the requirements according to the functionality of pre-processing unstructured text (RVW9) and of the extraction of XML strings of a web service (RCI1, RCI7, RCI19). In consequence, the XML Wrapper was extended to fulfil these requirements.

Apart of the extension of the XML Wrapper, the trials required additional functionality of SEMed, which was included as additional modules in the SE SEMed. The current architecture is shown in **Error! Reference source not found..** For that, following customizations were accomplished:

- the XML Wrapper was extended,
- the last O-MI/O-DL standard was integrated and
- the SEMed was configured to extract information of Web Service of the Consulgal Trial platform

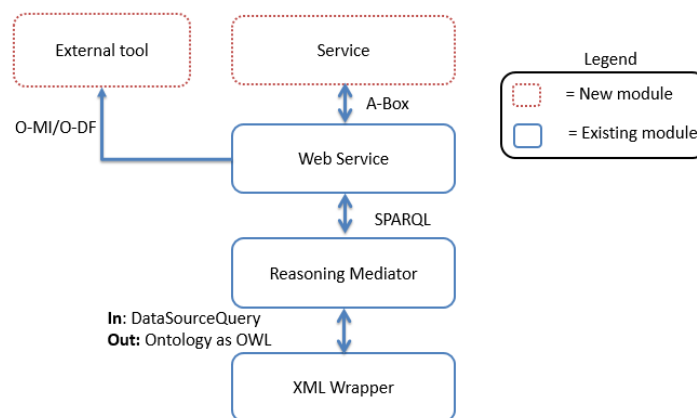


Figure 32: SEMed Architecture for Consulgal

3.3. Customised SEs and PCs for VW

The customizations to SEMed for the VW trial resulted in a new overall architecture of the software as shown in **Error! Reference source not found..** New modules are outlined in red. The SQL Output Wrapper is the important piece for the interoperability of the planning systems XML output and the machine repository.

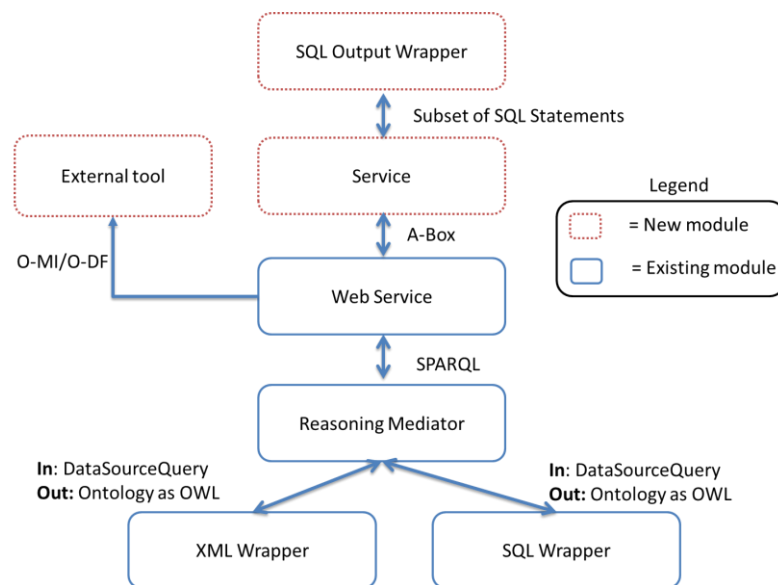


Figure 33: Customized Architecture of SEMed for the VW trial

The customized version of the C3DWV can be seen in Figure 34. Other images show real data from VW and provide the same interface that the end-user will have during business process 5 of the VW trial's business scenario. Inside the 3D view the user can freely navigate to explore all parts of the virtual 3D model.

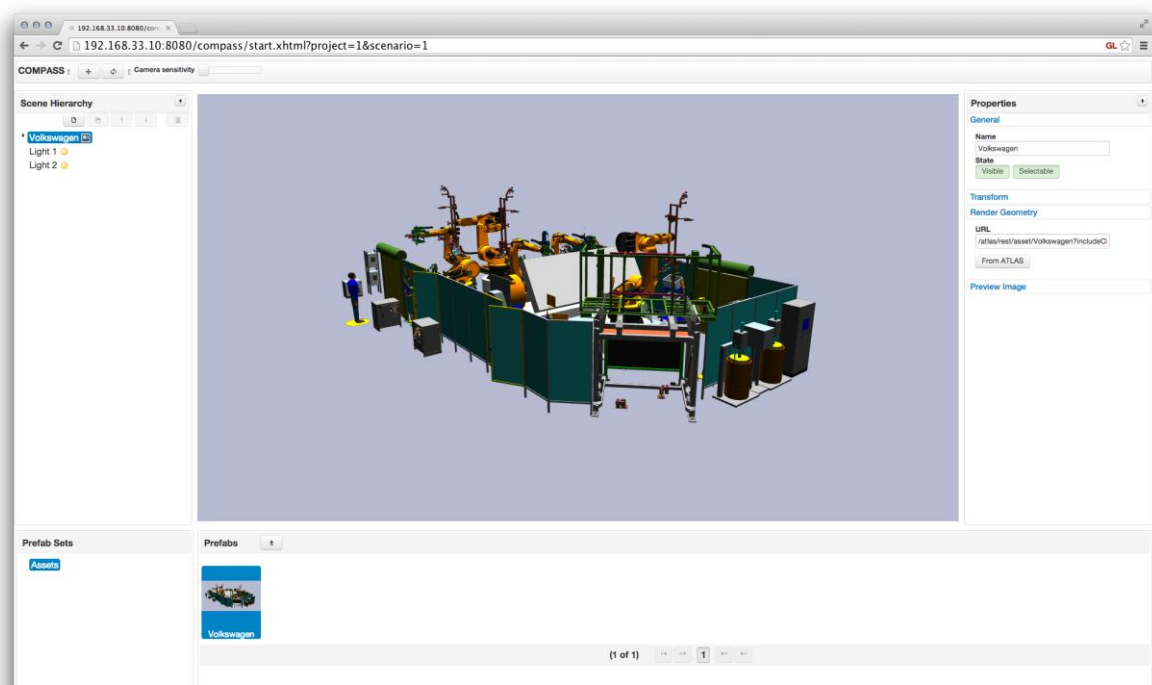


Figure 34: Visualizations of an assembly line part in the customized C3DWV for the VW trial

The integrated solution of the VW trial is shown in Figure 35. The widget on the left hand side shows information extracted by SEMed, while the widgets on the right hand side show the C3DWV visualizing an assembly line part.

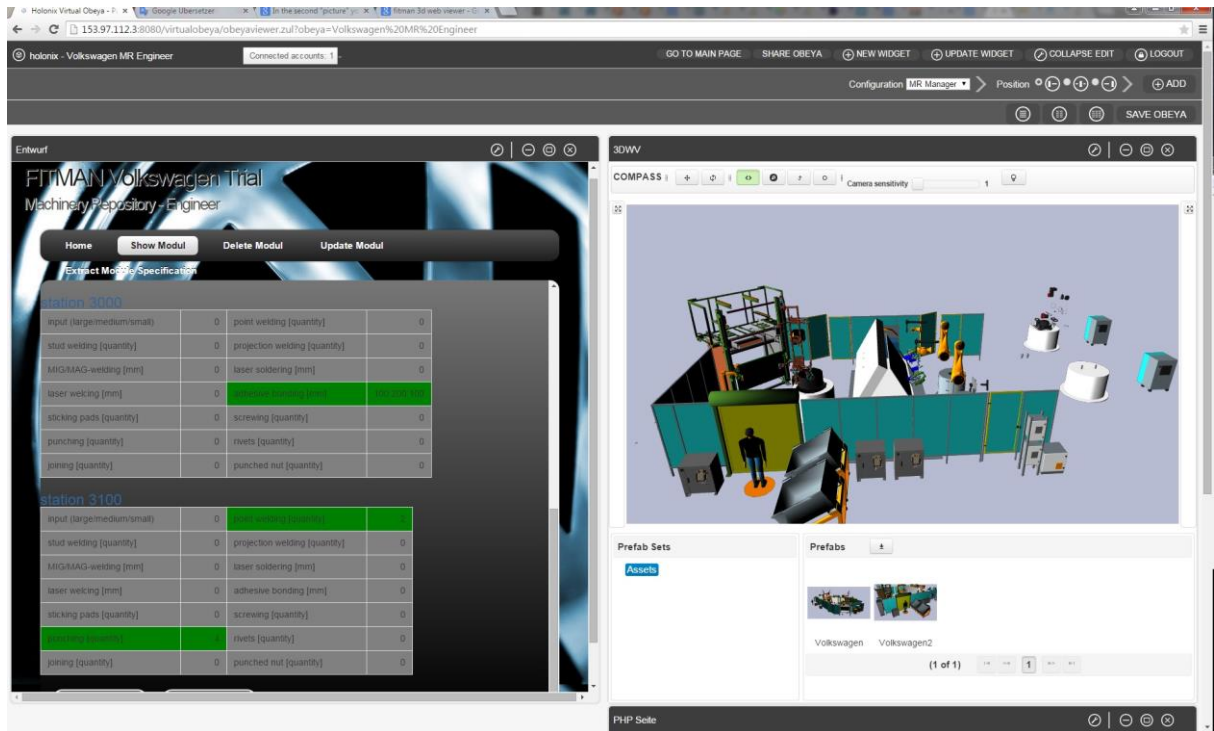


Figure 35: Screenshot of the integrated solution of the VW trial.

3.4. Customised SEs and PCs for TRW

The following points and images explain the process performed in the trial, once the tools have been customized, and show some of the preliminary results obtained after the integration. Images used show real preliminary results obtained after feeding the system with real data from the TRW sample:

1. Scanning phase:

The TRW component is scanned by the equipment installed in Datapixel. The figure shows how the 3D Scanner does the data acquisition.



Figure 36: Scanning process of the TRW component.

2. Visualisation of the 3D Point Cloud

The scanning phase produces as result the 3D Point Cloud of the TRW part. This file is a set of points, representing the x, y, z coordinates from the surface of the analysed component. This data can be stored in a binary or in a text file. The 3DScan SE Visualisation Unit allows the visualisation of this information in a 3D representation as the one that can be seen below:

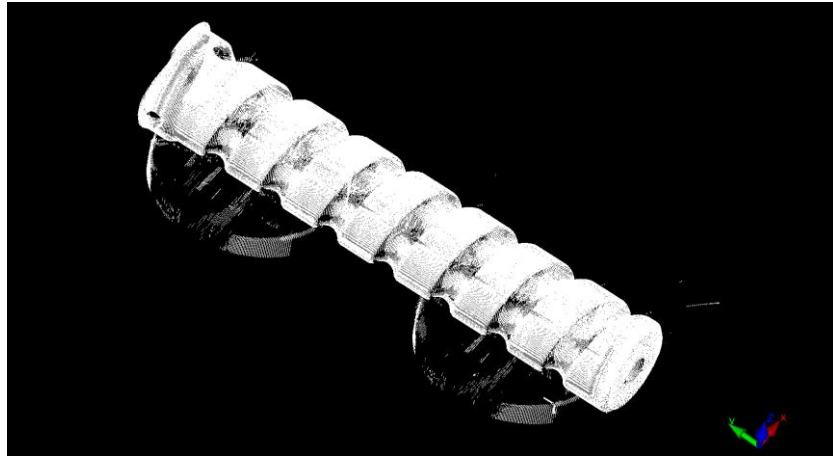


Figure 37: 3D Point Cloud visualisation in a 3D graphic representation.

3. Storage of the 3D Point Cloud:

In this stage the 3D Point Cloud is stored in the 3DScan Storage Unit. This feature allows the storage of all the information captured by the acquisition system, something that is actually very useful to perform production studies and analysis.

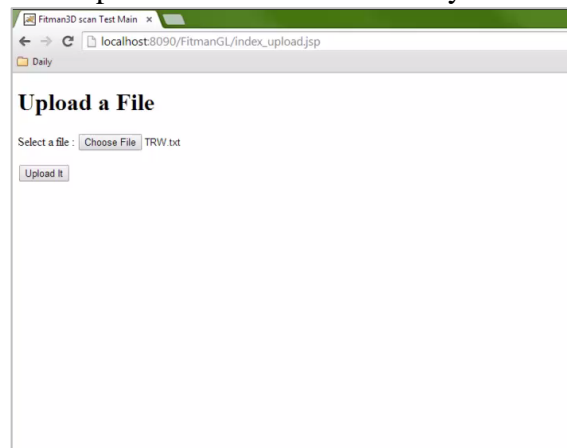


Figure 38: 3DScan Storage Unit interface after uploading a 3D Point Cloud.

4. Processing and analysis:

The information acquired in form of 3D Point Cloud is processed using numerical processes. This file can also be stored in the Storage Unit of the 3DScan and visualised in the Visualisation Unit. After processing the dimensional data an analysis is performed to obtain measures and compare the scanned part with the dimensional specifications, calculating the deviation map.

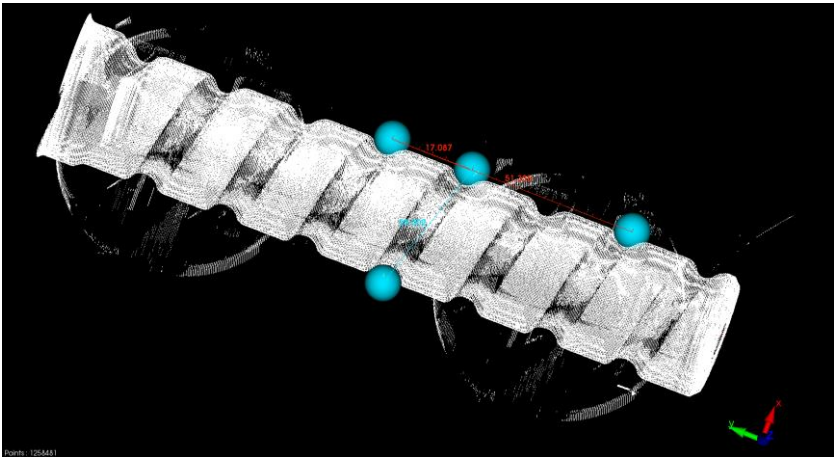


Figure 39: Processed 3D Point Cloud.

5. Visualisation of results:
Finally the results obtained can be visualised using a graphical representation. The figure below shows the 3DScan Visualisation Unit interface doing calculating to upload the graphical representation of the measuring results. The next image shows the results obtained from measuring the TRW part.

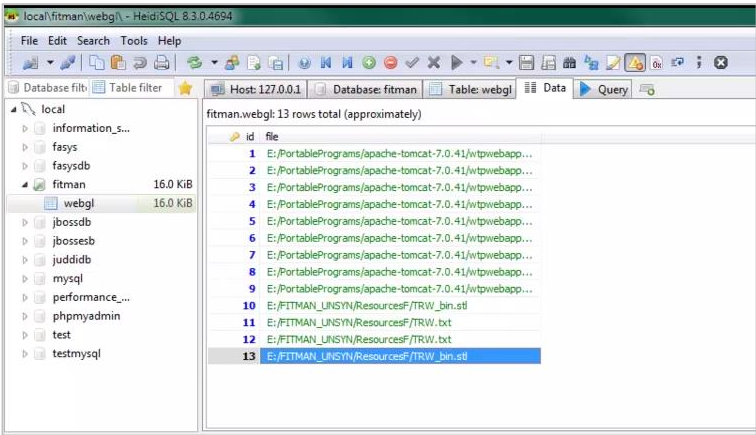


Figure 40: 3DScan Visualisation Unit interface calculating the Colour Mapping.

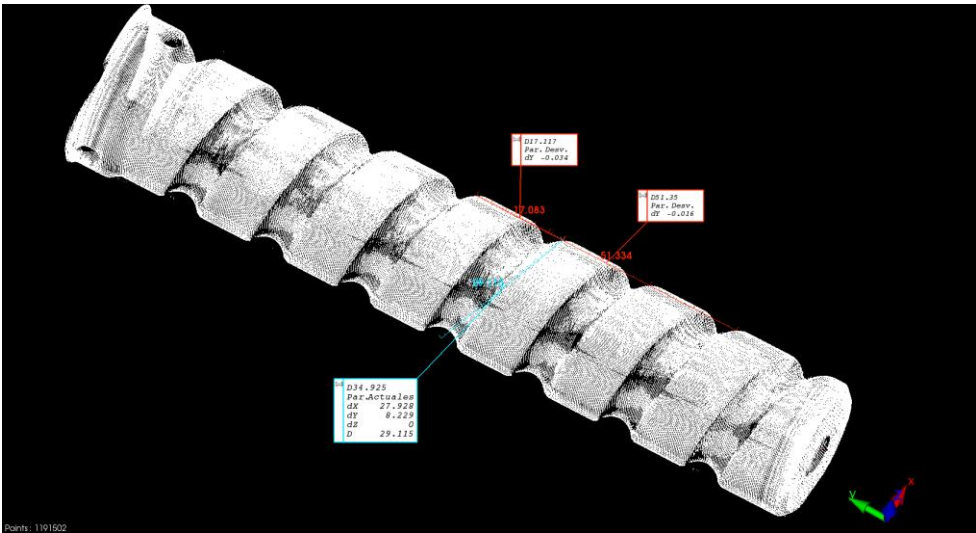


Figure 41: Preliminary results obtained from the measurement of the TRW component.

4. Assessment of the results

This section reports about the assessment activities already performed on each pilot solution by the WP13 partners. The main objectives are technical ones:

- to verify that, for each component:
 - All the functionalities are there and work correctly
 - Data are retrieved and generated correctly
- testing of the integration
 - Testing of integration functionalities (web services,...)
 - Testing that the information is transferred correctly along the tool chain

For some pilots, preliminary assessment of the acceptance from the end users has been done and shortly reported here as well.

4.1. Assessment of AIDIMA solution

4.1.1. Technical assessment of the solution

This section presents the outcomes of the technical assessment and how the provided solutions were able to meet the selected requirements.

Some meetings and interactions with AIDIMA and UPV people have been conducted to select and analyse the processes and requirements to be supported by WP13, checking that the correct interpretation has been given and that the planned implementation resulted in the expected outcomes.

Business Process BP1 - Weak signals discovery

User should have standard way to store/access information regarding semi structured or formulized data sources (RAF1)

This functionality is delivered by data access through the mediator SEMed. SEMed provides information regarding the materials of new designs. To have the data of materials the access to Materializa was provided. This goal was achieved by enhancing of the SQL wrapper of SEMed to give an access to Microsoft SQL data bases. This step opens the possibility to the designing stakeholder to have the design of a specific material and the information of its texture and further key indicators on one glance.

Analyst will be able to introduce and configure information sources where identification of weak signals will be done (RAF 2)

The possibility to configure another data sources such as NTUA Anlzer will deliver an access to identify weak signals. SEMed offers an interface to connect new data sources, which can be displayed as an additional widget in an Obeya.

Business Process 5 – Understanding customer requirements (see description on pag 38)

Business Process 6 – Project management and functional design brief

Allow a fully collaborative and visual platform based on widgets (RAF11)

These two business processes have been grouped together as they presents similar requirements

The Virtual Obeya offers the environment for the creation of shared, remotely accessible spaces where customised and intuitive interfaces to the WP13 enablers (C3DWV, I-Like) as well as to additional tools (document editors, issue trackers, ..) and websites (Materializa DB) are provided in the form of widgets.

Access mechanisms to the Obeya management and usage are natively offered by the Virtual Obeya; specific roles and users can be created by AIDIMA to give access to the platform to the selected persons.

The assessment has been done by testing the correctness of the functionalities offered by the Virtual Obeya to create Obeyas, include the above mentioned widgets inside them, to create new end users and roles and verify that they can receive different authorisation for accessing and managing obeyas, widgets and meeting within the obeya.

4.1.2. Preliminary validation by the end users

AIDIMA people have started experimenting the usage of the integrated solution. They have installed locally the VM provided by Holonix and reported some questions, doubts and issues through an online sheet, where the IT developers can provide explanations and suggestions.

So far, most of the collected feedback where questions that have been clarified. Few of them reports real bugs or requests of improvements concerning the VO per se or the overall functionalities of the solution. The most relevant ones are:

- **REQUEST 1:**

Add the possibility to remove and substitute a 3D model associated with a Prototype.
COMMENT: For the moment, the model file can be removed from the i-Like back end interface and not through the widget. That is a good suggestions for future improvement of the widget; there is no specific technical complexity preventing that.

- **REQUEST 2:**

Implement a bi-directional integration between i-Like and C3DWV so that any modification of the model performed on the C3DWV is synchronised with the prototype information in i-Like.

COMMENT: the C3DWV widget is expected to offer just visualisation support and it is not aimed to substitute the whole C3DWV application. Thus changes on the 3D model should be done on the back end side and the newly created model uploaded as a new model again through the iLike widget

- **REQUEST 3:**

In order to support specific typologies of collaborative meetings, a great improvement to facilitate the managers is to implement a mechanism to create Obeyas with pre-defined templates of the widget to be used, so that they can be instantiated with actual data about authorised people, time period when the Obeya is usable etc...without having to explicitly configure each widget from scratch,

COMMENT: Holonix is currently implementing that and it should be hopefully ready before the end of the project.

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8 sidro traduzione inglese - ...

2015 - ICE-Conference

UC3 - Collaborative Work f...

sidro traduzione inglese

https://docs.google.com/spreadsheets/d/1EGIs-KV-ePHULKNKKVDTK7id5jtH2omZ9AudIac/edit#gid=0

B		C		D	E	F	G	H	I
UC3 - Collaborative Work for Product Design									
1	Date	Description	Type	Solved	Date (solved)	Comments	By		
2	30/04/2015	When creating a new Prototype, if any category different from "Chair" is selected, the dropdown of "Models" appears empty. How is this information inserted?	Doubt	Yes		it is possible to add a Model from the "Product Type" page in the Like backend. You can find this step in the guide I've sent you at page 3	Silvia Crippa - Holonix		
3	30/04/2015	Users can be added to the Obeya environment, but they cannot be deleted or their roles updated.	Issue	In progress		role update and user deletion are not implemented yet	Weilan - Holonix		
4	30/04/2015	Which are the differences between the ROLE TYPES? - ADMIN - OBEYA_MANAGER - OBEYA_ASSISTANT - PARTICIPANT	Doubt	N/A		ADMIN roles can execute all the virtual obeya operations including	Weilan - Holonix		
5	30/04/2015	How is a DOC widget created?	Doubt	Yes		http://www.7tutorials.com/how-share-files-and-folders-using-one	Weilan - Holonix		
6	30/04/2015	Is there some PDF widget?	Doubt	No		Not that I know	Weilan - Holonix		
7	30/04/2015	Information about "materializa" appears integrated in the product widget. Is there some independent specific "materializa" widget?	Doubt	Yes		The Materializa web site can be visualised as an independent widget, simply by associating to	Weilan - Holonix		
8	30/04/2015	Is there some widget for information exchange between participants, such as a Skype widget or similar?	Doubt	Yes		the conference tool like https://appear.in/ can be embedded as a	Weilan - Holonix		
9	30/04/2015	Widgets seem to be non-resizable. This is very important issue in order to configure the workplace.	Issue	Yes		the height of widget can be updated with edit widget	Weilan - Holonix		
10	30/04/2015	In any new widget, the list of components appears empty. How are these components added in the environment?	Doubt	No		Could you provide a image for this problem? I can't localize the	Weilan - Holonix		
11	30/04/2015	After creating a new widget, all the closed widget closed in the workspace appear again	Issue	Yes		you need to click on the "save obeya" button to permanently s	Weilan - Holonix		
12	30/04/2015	"Open a widget with 3D Model" does not open anything (tested with .max format, attached as .max, .rar and .zip).	Issue	No		The right format is COLLADA compressed in ZIP archive. Is the	Silvia Crippa - Holonix		
13	30/04/2015	After creating a widget, some important features such as the 3D file, the image and the name cannot be updated.	Issue	No		Each instance of the widget for the C3DWV is created on the fly to visualise a specific model. It is no	Weilan - Holonix		
14	30/04/2015	The need to add the corresponding URL when creating a new widget is a bit annoying. This could be saved as a property of the workplace and retrieved each time a new widget is created.	Suggestion	In progress		A version of widget template has been developed to avoid this	Weilan - Holonix		
15	30/04/2015								
16									

Figure 42: Feedback from AIDIMA end users

4.2. Assessment of Consulgal solution

4.2.1. Technical assessment of the solution

In this section, description of the technical assessment and proved adherence of the integrated solution to the requirements. The components for the Consulgal trial were selected by both,

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process involved and solution providing persons. The customization for the trial was performed in consultation with process responsible persons. This process was used to minimize misunderstandings in the range of functions, appearance, functional possibilities of the involved solutions between the solution providing and business case partners in WP13. The following description delivers an overview over the combined requirements of the business processes 1, 4 and 5 and assess the impact them. The overview provides an assessment of the improvements and divides the requirements in two groups.

User should have standard way to store/access information regarding concreting zones (Group 1)

This functionality is delivered by data access through the mediator SEMed. SEMed provides information regarding concreting zones using the O-MI standard. This enables access to all relevant data sources in a standard way, without the necessity to change the data sources themselves. This ensures digital continuity applying product lifecycle standards both within the current solution architecture and for future developments in the Consulgal IT ecosystem. The concreting zone information is displayed in i-Like. Digital Factory stakeholders expect that the provided functionality and customization will satisfy the given requirement.

Platform should have efficient way for data archival for future reference to regarding the concreting operation (Group 2)

i-Like delivers a sufficient way to archive the concreting operation. The data amount in the assumed performance will be easily performed by the given technologies. The integration of SEMed with i-Like makes it easy for information from the different data sources to be transferred into to i-Like and thus archived.

System should provide an well-defined methodology for information flow and inter-process (different sub activities of concreting activity) so as stakeholders responsible at each step can access information in on demand as the concreting activities are performed (Group 2)

i-Like opens the possibility to provide the necessary information about the concreting process on demand to all relevant stakeholders. Through the easy access of the solution on mobile devices, the access to the relevant data can be also performed in production environment. The accessed data is provided by SEMed.

Time for sharing of information between the stakeholders has to be reduced (Group 2)

i-Like in combination with SEMed improves the time for sharing significantly. The exchange of hardcopies is no longer required. The information reaches their target immediately. Digital continuity between stakeholders is ensured by providing direct access to all relevant data sources through iLike via SEMed.

Platform should make use of communication technologies for exchange of information rather than hard copies (Group 1)

Hard copies are no longer necessary, because all relevant information can be accessed directly via SEMed. The integration of i-Like with SEMed ensures a common interface, archival and presentation layer where previously, print-outs would need to be exchanged. The information exchange for targeted business process will be established through i-Like.

Users should be trained to make efficient use of the platform and use hard copies only when very necessary (Group 1)

N.a.

The platform admin should be able to register users and assign roles (Group 1)

Ensured through the access rights functionality of i-Like.

System should provide authentication based on the credentials of the users (can be users acting as various stakeholders) (Group 1)

Ensured through i-Like authentication functionalities.

System should provide authorization based on the roles and credentials of the user (Group 1)

Ensured through rights and roles functionalities of i-Like.

Barcode, RFID (Group 1)

N.a.

Stake holders should be able to have the visual proof of the test operations. (Group 1)

Ensured through i-Like functionalities.

Supervisor should be able to view the status of the test operations and validate the results as soon as the test results are available. (Group 1)

The supervisor is empowered to view the status of the test operations through i-Like functionalities. The availability of the test results within i-Like is ensured by the integration of the relevant data sources with i-Like using SEMed.

The requirements in this section are not grouped to business scenarios. For the coming explanation BPs are not relevant. The requirements and their assessment for improvements can be divided to two groups. The first and much easier to assess group in advance are requirements which demand for certain functionality, as RFID, authorisation or digitalization of hard copies. The second group is more difficult to quantify. This group demands for improvements in time. For this groups of requirements WP13 stakeholder are awaiting a strong improvement, but the exact quantification will be measured in future work.

4.2.1. Preliminary validation by the end users

At this stage, the integrated solution has been provided to UNINOVA to be deployed and made available to Consulgal people for the extensive validation of their trial platform. However, some preliminary feedback have been provided by the end users during project meetings and web meetings in which intermediate versions of the WP13 solution have been presented with the objectives of validating the approach and the way in which the information are offered to the end users (mainly inspectors) through customised interfaces of i-Like for easy and quick consumption through mobile devices.

These feedback have guided the finalisation of the

4.3. Assessment of VW solution

4.3.1. Technical assessment of the solution

The individual components from WP13 were tested with real data provided by VW. The operational correctness of the provided functionality of SEMed was verified using the given test data and the expected result from VW. To verify the conversion of the OpenJT files into XML3D and the rendered output from the C3DWB the resulting images were compared to the output generated by the existing and well-known proprietary CAD tool “Autodesk Inventor”. The integrated solution was tested inside the VW cloud hosted by IPK as there is no direct interaction between the different SEs and PCs provided by WP13 only between provided components and existing legacy systems.

4.3.1. Preliminary validation by the end users

The involvement of the end users from VW in the validation of WP13 has not started yet. At this stage, the provided solution has been validated by IPK in behalf of VW in order to verify

that all identified requirements are met by the current integration. IPK is also cooperating with WP13 partners to study how to integrate the WP5 results with C3DWB and SEMed, End-user testing will be conducted in the next iteration.

4.4. Assessment of TRW solution

4.4.1. Technical assessment of the solution

Assessment of stand-alone customised components:

To test the individual components the assessment has been performed with test 3D Point Clouds and test CAD models to evaluate individually all the trial components. To accomplish with this objective the 3D Point Clouds acquired from TRW samples have been tested with different resolutions, obtaining a very wide range of them to test the 3DScan and the 3D Point Cloud Processing-Analysis Unit (PC). The trial components have been tested with 3D Point Clouds going from 10.000 points to 1.000.000 points.

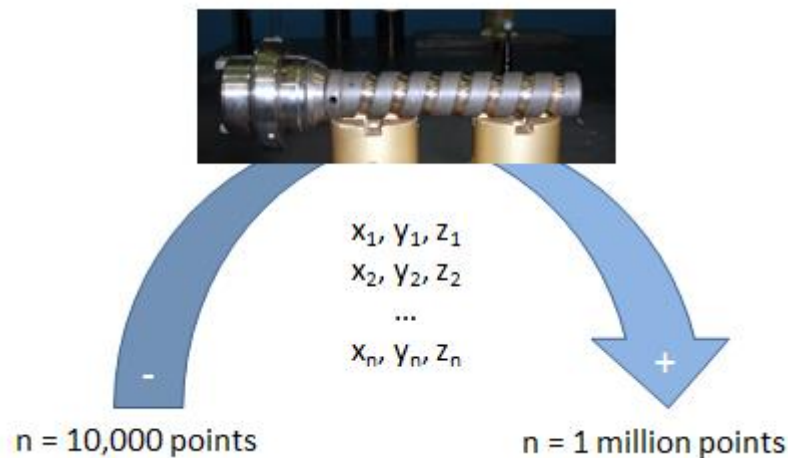


Figure 43: Diagram representing the tests performed with different resolutions.

The assessment explained has been obviously performed in all the components individually. So the 3DScan has proved its capacity to store and visualise 3D Point Clouds of all the analysed sizes. The 3D Point Cloud Analysis Processing Unit has also proved its capacity to process and analyse correctly 3D Point Clouds of all the mentioned sizes.

Integration assessment:

Integration of both components included in FITMAN (3DScan SE and 3D Point Cloud Analysis Processing PC) with the Datapixel's commercial components has worked correctly, as results in section 4.4 show (a real part is scanned and dimensional results are obtained and visualised and stored without problems). The information flow, starting from the 3D Scanner device to the PC and to the SE works fluently.

Testing of the integration:

Integration of the two components included in FITMAN (3DScan SE and 3D Point Cloud Analysis Processing PC) with the Datapixel's commercial components has worked correctly, as the results in section 4.4 show. The information flow, starting from the 3D Scanner device to the PC and to the SE works fluently.

The integration with the Dynamic CEP SE has forced to define a unified format to read the data transferred from one side to the other, as there are no standards universally defined to store these data. The agreed format is the ASCII code for the 3D Point Clouds, STEP or stl for the CAD models and stl for the deviation maps, where the deviation data has been added. This

integration is working for the moment, as the Dynamic CEP SE creators currently exploiting the data delivered by the 3D Point Cloud Analysis Processing PC.

4.4.2. Preliminary validation by the end users

TRW has started to analyse the results produced by the trial and to evaluate how the technology implemented can help them to solve their dimensional quality problems.

The collected feedback includes the following issues:

- **INTEGRATION:**
Integration in the TRW facilities has not yet been completed. The technologies that form the trial still need a more efficient integration with the TRW production plant technological environment and with the information systems used.
- **DIMENSIONAL QUALITY CONTROL:**
The trial seems to produce valuable information from a dimensional quality control, with enough resolution to decide whether the specified tolerances are respected or not. From the dimensional quality control point of view the solution, according to TRW feedback, seems to respond to which was expected. Results will be revised in a deeper way in the following periods to extract the final evaluation and conclusions of the trial.
- **SCANNING SPEED:**
From a scanning speed perspective, the solution implemented meets with the needs defined by TRW and does not slow the manufacturing process with the implemented controls.

5. Preliminary Lessons Learnt

Finally, the present report concludes with *preliminary lessons learnt from the validation activities conducted so far*.

Some indications and measures that could guide the improvement of the solution have been collected and analysed.

It is important to clarify again that these measures have been collected during the technical assessment of the integrated results performed by the WP13 partners, before making the solutions available in the Trial architecture. Therefore, no assessment of the acceptance and business impact by the end users has been conducted here, but will be done in the scope of WP5 activities.

5.1. Lessons Learnt in AIDIMA

The main preliminary lessons learned in the AIDIMA trial, taking into account the technical assessment conducted by WP13 partners and the preliminary feedback from AIDIMA, are listed below together with the expected improvements.

Easiness to configure the solution

The Virtual Obeya collaboration platform offers the integrated environment to access the services of the iLike, C3DWV and SEMed components. According also to the feedback collected so far through the Excel file, we can say that the Configuration of the virtual rooms is very intuitive and can be performed by the end users, through the back-end functionalities described in the previous section, provided some training and supporting material (online manual). New widgets can be included in the Obeyas with few simple steps. No technical background is necessary.

Expected improvement: offer more guidance and reduce time for Obeya creation, through templates of collaboration sessions, with pre-defined list of widgets to be shared by participants.

Expected acceptance by the end users in terms of usability and adoptability

The usability of the iLike platform has been improved through the development of specific widgets that offers intuitive and simplified interfaces for creating, searching and visualizing information on product prototypes.

We expect that the adoption by end users will be easy with some support and training from DFKI and Holonix.

Added value provided to the end users

The main added value of the solution is the availability of a platform for remote collaborative meeting that allows distributed and heterogeneous teams of designers to brainstorm and work together to the design of new products, sharing the same information sources and making the results of the discussion permanent thanks to the widgets for sorting information in the i-Like backend platform.

Integration

As already described above, the integration between i-Like, the C3DWV and Materializa DB (through the SEMed) simplifies life to the end users as it supports in a transparent way the exchange of information among these tools, making them available when and where necessary (e.g.: material information are accessible from the widget for the prototype creation; 3D models of a prototype are visualized through a simple click from the interface where a prototype is presented)

5.2. Lessons Learnt in Consulgal

The main preliminary lessons learned in the Consulgal trial, taking into account the validation activities conducted at this point, are listed below together with the expected improvements:

Easiness to configure the solution:

The introduced solutions were easy to configure and to install. The adaption to certain data sources as well as adaption of the appearance of the user interface were also easy to handle. Except that, both solutions needed time consuming implementation and improvement work described in the implementation section. However, once the solution was set up, additional adaptations to specific data sources as well as to the user interface were easy to implement via Configuration. The same goes for future integration of additional information sources.

Expected acceptance:

As already mentioned, the tool chain applied to the Consulgal trial does not require a time consuming effort for deployment are adaptations of the infrastructure. To have an easier understanding of the administration of the solutions, Holonix and BIBA are going to provide support.

The WP13 stakeholder are also awaiting an acceptance of the solution through the mentioned personnel in the Consulgal facilities. This acceptance will grow with an expecting training curve. I-Like is providing a strong improvement in terms of usability.

Added value:

The results obtained by the deployed solution have an important added value for the final user, as they deliver dimensional information about the production detailing if the analysed components accomplish with the specifications or not. The solution presents as well very relevant test data that has a great added value and allows the final user to identify trends in its manufacturing process and to control it.

Integration:

The integration was performed as mentioned in the appearance, data model and data access of the solutions. This integration tasks were accomplished without difficulties. The integration between SEMed and legacy systems and the access to their data were realized in a harmonized way. After the modification of SEMed's wrappers, legacy systems could be integrated by Configuration without additional implementation effort. The current limitation of excluding data with missing attributes may need a further discussion and could be reconsidered.

The usage of standard to access the legacy systems of Consulgal and the usage of OMI standard to access the mediator were an effort decreasing points for the integrating parties.

5.3. Lessons Learnt in VW

The preliminary lessons learned in the VW trial are listed below together with possible future improvements.

Easiness to configure the solution:

The solution does not present any great difficulties to be configured. Because all SEs are built using web technologies on top of Java their deployment and Configuration on the server is well known and documented. The SE owner, if necessary, provided Configuration files that were tested beforehand.

Annotation of parts of the 3D model:

Early tests have revealed that a 3D visualization of the assembly line parts is a major improvement to the existing 2D images. One feature that does not exist currently but would provide real value in terms of communication and collaboration, are annotation capabilities.

This would enable all users to “pin” information onto parts of the virtual 3D scene. DFKI expects to develop and integrate annotation capabilities in the next iteration of the development.

Diversity of graphics formats and the lack of a standard CAD file format:

File formats are always an obstacle for interoperability. Computer graphics especially suffers from a great diversity of formats, underlying data structures and the lack of a standard representation. In the specific case of the VW trial the OpenJT format is used to store 3D data produced in a CAD tool. Even though it is a widely used format in the automotive industry, conversion into other formats is hard and no non-commercial tool exists to handle the conversion process automatically. Implementing a conversion pipeline from OpenJT to XML3D is out of scope of the FITMAN project, but the VW trial shows again the necessity for a generally applicable data exchange format for 3D construction data. Moreover, it is evident that research in the area of format mapping and conversion is necessary in order to achieve better interoperability between different visualization and content creation solutions.

Expected acceptance and added value:

We expect the solution presented to be accepted by the end user mainly because it replaces many obstacles in the existing workflow and unifies the flow of information using the machine repository as the single source of information. Especially the 3D visualization through the C3DWV is expected to provide real value during the evaluation phase of an inquiry in comparison to the planar 2D image currently used

5.4. Lessons Learnt in TRW

The main preliminary lessons learned in the TRW trial, taking into account the validation activities conducted at this point, are listed below together with the expected improvements:

Easiness to configure the solution:

The solution does not present great difficulty to be configured. It's true that a first Configuration could require some specific know-how, but this can be easily learned by the IT personnel of the final user and be deployed for future Configurations or maintenance.

Expected acceptance:

The solution presented is expected to be accepted by the end user, mainly due to the added value of the information obtained combined with the fact that it is easy to use and to adopt. From this point of view, the solution is expected to be accepted in terms of usability and adoptability, as it does not present a significant learning curve for the quality experts of the final user. As well, it does not present a great challenge for the IT department in terms of infrastructure and deployment.

Added value:

The results obtained by the deployed solution have an important added value for the final user, as they deliver dimensional information about the production detailing if the analysed components accomplish with the specifications or not. This can be one of the key processes to advance to a Zero Defects Factory paradigm, where the whole production can be controlled and defective parts identified easily in the production plant.

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Traceability of the samples:

It would be interesting to connect the solution with a reliable traceability system, in order to improve the dimensional control quality system and the hypothetical action plans, once a quality problem has been detected.

6. Conclusions & Next Steps

This document is the first version of the deliverable reporting the results of the evaluation conducted in WP13 on the integrated solutions provide to the 5 pilots (AIDIMA, Consulgal, VW, TRW and WHIRPOOL). The assessment conducted in WP13 has been mainly done to measure the completeness of the provided solutions, the correctness of the integration among the SEs and PCs and the coverage of the selected business processes and requirements.

Once this assessment has been positively completed, the WP13 solutions are ready to be deployed and finally validated by the end users on their trial platforms, as part of WP5 activities.

In this version, the focus is on reporting the methodology adopted for conducting the assessment, on describing the integration solutions and on reporting the results of the technical assessment performed by WP13 partners to check that the solutions behave as expected.

Results, as documented in the previous sections, are highly encouraging both as for the progress of the work done so far, that is aligned with the planning, and as for the outcomes of the assessment.

At M24, all the activities aimed at producing the customised solutions for AIDIMA; Consulgal, VW and TRW have been completed. The integrated solutions have been successfully tested by the IT partners and made available for the deployment in the trial scenarios, so that the business validation can start.

For all the trials, it has been proved that the offered software is easy to be deployed and installed, an almost no additional Configuration has to be done. The presence of the SEMed

As for the acceptance by the final users, it is expected that the solutions will be easily adopted as a strong effort has been put on the development of ad-hoc interfaces (especially for AIDIMA and Consulgal where the i-Like and the C3DWV have been equipped with customised widgets), meeting the expectations of the stakeholders in terms of easiness of retrieving the expected information as well as simplicity of the interactions with the underlying systems.

The objective of the next version will be to report additional assessment activities performed on the Pilots, such as those ones conducted on the WP13 solution for Whirpool. Moreover, the final version will concentrate on the analysis of the feedback received from the end users and on more comprehensive lessons learnt for each pilot, to identify the weak and strong point of the delivered solutions, focusing on those areas that could be further improved.