ComVantage

284928

Collaborative Manufacturing Network for Competitive Advantage

D6.4.1 – Plant Engineering and Commissioning Adaption of Mobile Collaboration Concept (public)

SEVENTH FRAMEWORK PROGRAMME

Grant Agreement No.	284928
Project acronym	*ComVantage*
Project title	Collaborative Manufacturing Network for Competitive Advantage
Deliverable number	D6.4.1
Deliverable name	Adaption of Mobile Collaboration Concept
Version	V 1.0
Work package	WP 6 – Plant Engineering and Commissioning
Lead beneficiary	TUD
Authors	Johannes Pfeffer (TUD), Jens Ziegler (TUD), Gali Naveh (BGU), Steffen Buzin (SAP), Davide Grosso (COMAU)
Reviewers	Steffen Buzin (SAP), Frank Haferkorn (RST)
Nature	R – Report
Dissemination level	PU – Public
Delivery date	31/10/2012 (M14)

EXECUTIVE SUMMARY

Deliverable *D6.4.1* describes the procedure and the results of the adaptation of the concepts of intuitive and trustful mobile interaction introduced in work package 5. Based on deliverable *D6.1.1* the synchronisation of cycle times of a single line station as a step in the production line commissioning was chosen as an exemplary use case a first adaptation of the generic UI models and workflows. Both the user interface concepts and the generic software architecture have been extended and modified according to a software requirements specification provided by the application partner. All modifications and extensions are closely aligned with the results of the deliverables *D6.2.1* and *D6.3.1*. The Business Evaluation Framework introduced in work package 9 has been adapted to the given use case to allow a first evaluation. As a result of the adaptation process, the deliverable provides a set of recommendations for implementation of the first adapted mockup prototype in work package 11 and concept for the evaluation of the adapted prototype in work package 5.

Table of Contents

List of Figures

List of Tables

1 OVERVIEW

1.1 Introduction

As introduced in Deliverable *D5.3.1*, orchestration of mobile apps has its starting point in the selection of suitable generic apps for all involved tasks of a mobile app-supported workflow. As a second step, those generic apps have to be adapted to the requirements of the particular context of use. This adaptation guarantees best-possible suitability for the task and may require more or less effort, depending on this context and the quality of the generic apps. Part of this effort is to be automated, while others will remain manual labour. The concept of app orchestration is going to be realised in the *ComVantage* Industrial App Framework. While App orchestration is a rather universal concept the implementation needs to be adapted to specific use case needs.

1.2 Scope of this Document

The purpose and scope of this document is the description of the procedure and the results of the adaptation of the concepts of intuitive and trustful mobile interaction introduced in work package 5 to the first exemplary use case of work package 6 being the synchronisation of cycle times of a single line station as a step in the production line commissioning. The content of this document shall serve as foundation for the implementation of the mockup prototype, its validation and usability evaluation. It shall further advance the development of the Business Evaluation Model.

1.3 Related Documents

The software requirements specification is based on the Initial set of requirements based on exemplary use cases introduced in D2.1.1: *Functional and Technological Requirements* and the first selected use cases elaborated in D6.1.1: *Plant Engineering and Commissioning – Scenario Specification and Refinement*.

The evaluation concept is based on the preliminary version of the usability & trust metrics toolkit introduced in D5.1.1: *Metrics for Usability and Trust*. The use case specific adaptations of the User Interfaces mainly refer to the basic presentation and workflow models introduced in D5.2.1: *UI Presentation and Workflow Models*. The use case specific adaptations of the software architecture mainly refer to the generic concepts and the runtime framework introduced in D5.3.1: *UI Modelling and Generation Framework*.

All modifications and extensions have been closely aligned with the results of the deliverables D6.2.1: *Plant Engineering and Commissioning – Adaption of Secure Information Model Concept* and D6.3.1: *Plant Engineering and Commissioning – Adaption of Linked Data Integration Concept* which were created in parallel. Further, care was taken to preserve the greatest possible consistency with the deliverables D7.4.1: *Customer-oriented Production – Adaption of Mobile Collaboration Concept* and D8.4.1: *Mobile Maintenance – Adaption of Mobile Collaboration Concept*.

The use case specific adaptations of the Business Evaluation Framework are based on the conceptual evaluation framework introduced in D9.1: *Evaluation Framework* and mainly refer to the set of relevant metrics and their definitions for this framework that have been introduced in D9.2.2: *Multidimensional Metric Set*.

This deliverable will serve as a foundation for the implementation of the mockup prototype in D11.1.1: *Prototypical Implementation of Plant Engineering and Commissioning*, and for the usability evaluation of this prototype in D5.1.2: *Metrics for Usability and Trust*. It will further have direct impact on the development of the simulation model for comparing alternative *ComVantage* processes in D9.3.1: *Simulation Analysis Report*.

2 ADAPTATION OF THE GENERIC CONCEPTS OF MOBILE COLLABORATION

2.1 Software Requirements Specification

2.1.1 Purpose

This chapter goes deeper in the analysis of the software and application requirements.

The automotive environment has the final scope of producing vehicles in a predetermined quantity. The respect of this scheduled capacity in product delivery is the basic step to keep up the investments made by the car maker in the development of a new car model. To give a simple idea of the production capacity of a body welding plant, some numbers can help us in showing how much important is time. One working day is usually divided in three shifts, in order to hold the production line in a continuous activity phase and to avoid losses of energy, air consumption and so on. Each shift can realise 350 elements; this implies a cycle time of 50-60 seconds for every production process.

Cycle time is one of the most important objectives in Plant Commissioning, because if the supplier is able to comply with this time constraint it is able to complete the start up of the production line and to ramp up to the final target saving its own costs (personnel employed on customer site, travel of technicians) avoiding production losses with related objections and charges by the customer.

Actually, a platform that analyses and validates a cycle time is missing and the following specifications are oriented to the developers of the software, the data collection, communications interfaces, user interfaces, algorithm or formula of processes, etc.

2.1.2 Requirements

A lot of different people are involved during a commissioning activity. There is a team engaged in the customer's site and one in the supplier's offices.

The first one includes all the specialised technicians that work directly on the building of the production line, such as mechanics, that carry on the hardware implementation and assembly of the line frame. There are also electricians that provide the wiring, piping, and network installation. In addition, automation engineers are involved, that have to manage the commissioning of the software or rather the link between all the different parts that form the whole production line, giving life to the movement of the machine, its coordination, diagnostic and efficient productivity. This group is coordinated on high level by the Line Manager (LM).

The second team is mainly composed of Designers (Dsg). They project and deliver the documentation required in the commissioning phase, but their jobs do not stop when the commissioning starts. Moreover, they are involved in managing modifications and variations that come from the construction feedback or customer's requests. Designers refer to a Technical Leader (TL) who makes decisions, links the design with the commissioning and finally covers the role of customer interface.

The application considered in our intention, according to *D5.3.1* that starts from the point of view of an orchestration of mobile apps, requests specific requirements specified in *D6.1.1*.

Figure 1 shows that all the different actors working on the set up of a production line need to cooperate with a timing that is dictated by the growing of the same line. Step by step the line indicates which station is available for a deeper analysis related to its operating conditions and performance. Today, this close interaction between the machine and the persons that work to develop the production line is not properly supported by information and communication technology, so we are gradually introducing the information and the data coming from all the actors, human and not.

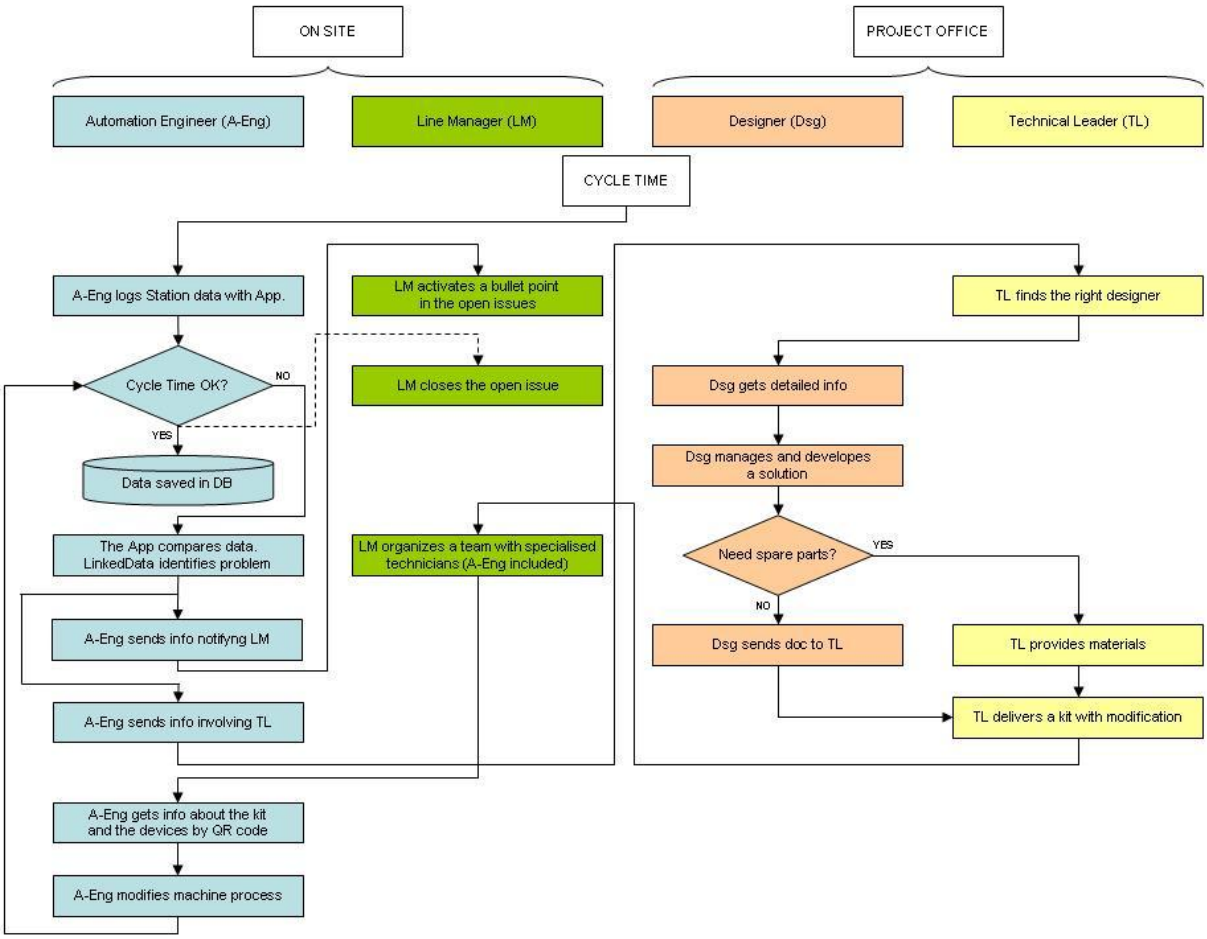

Figure 1: Flow Chart

Figure 2 describes the flow of information among the Automation Engineer (A-Eng), the engineering department and platform in between.

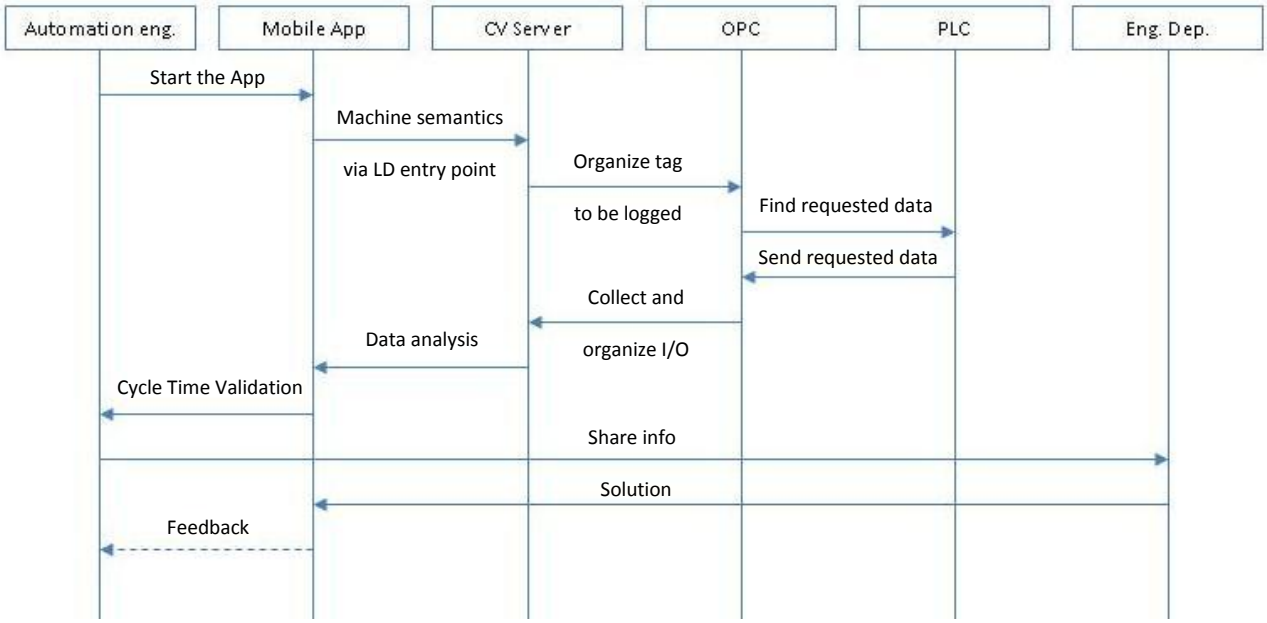

Figure 2: *ComVantage* dataflow

The A-Eng uses the mobile device and runs the app. A query interrogates the server to find the requested production line and the OPC (or any other standard) collects the data coming from PLC through the Data Harmonisation Middleware. The provided data are re-distributed to the engineer that is helped in understanding the machine sequences and time behaviour. The App Orchestration involves the engineering department and activates channels of communication in order to share the logged data and the related documents. When the recovery phase needs a new solution with a new engineering activity, the app starts a service request, and manages a kit with documents and materials organised and developed in order to solve the highlighted defects encountered in the cycle time validation.

The **high priority** software requirements in this context are listed below:

- ID 525: System has to be able to access detailed sensor and process data from machine
- ID 527: System has to be able to browse data
- ID 529: System has to be able to integrate picture or video of the machine/station
- ID 531: System has to be able to store the acquired data
- ID 533: System must have a configuration screen
- ID 536: System must have a data analysis screen
- ID 538: System must have a data analysis screen that allows users to compare cycle data and video
- ID 544: Graph tool has to be integrated on system for cycle time analysis

And **low priority** requirements:

- ID 503: System has to be able to interface system with Industrial Ethernet communication
- ID 526: Reaction time / polling rate to collect data from PLC
- ID 534: System must have a visualisation of communication status
- ID 567: System has to be able to find information related to a search key

2.2 Adaptation of the Conceptual Software Design

2.2.1 Use case specific adaptations of the User Interface

Scenario description for *Automation Engineer (A-Eng)*

The A-Eng is a software engineer from the supplier employed in the commissioning activities directly on the customer site.

His job needs a wide competence because he correlates all the devices installed in the production line, harmonising their movements, signals, I/O and so on, providing the final objective: to get a production line that respects customer parameters.

The first goal is to reach the production timing predetermined: CYCLE TIME.

For this scenario description see Figure 1: Flow Chart.

During the commissioning activity, A-Eng has to check the cycle time of each station that forms the whole production line. Depending on the work progress, the first station that is available and running will be checked.

Screen views shown in this deliverable are mainly provided to explain concepts and to address guidelines for future development of the User Interface design. They do not yet consider relevant design guidelines or *ComVantage* visualisation patterns, which is the main task for the subsequent prototype development in work package 11.

A-Eng, with his tablet PC, starts the App in order to collect data from the requested station (Figure 3).

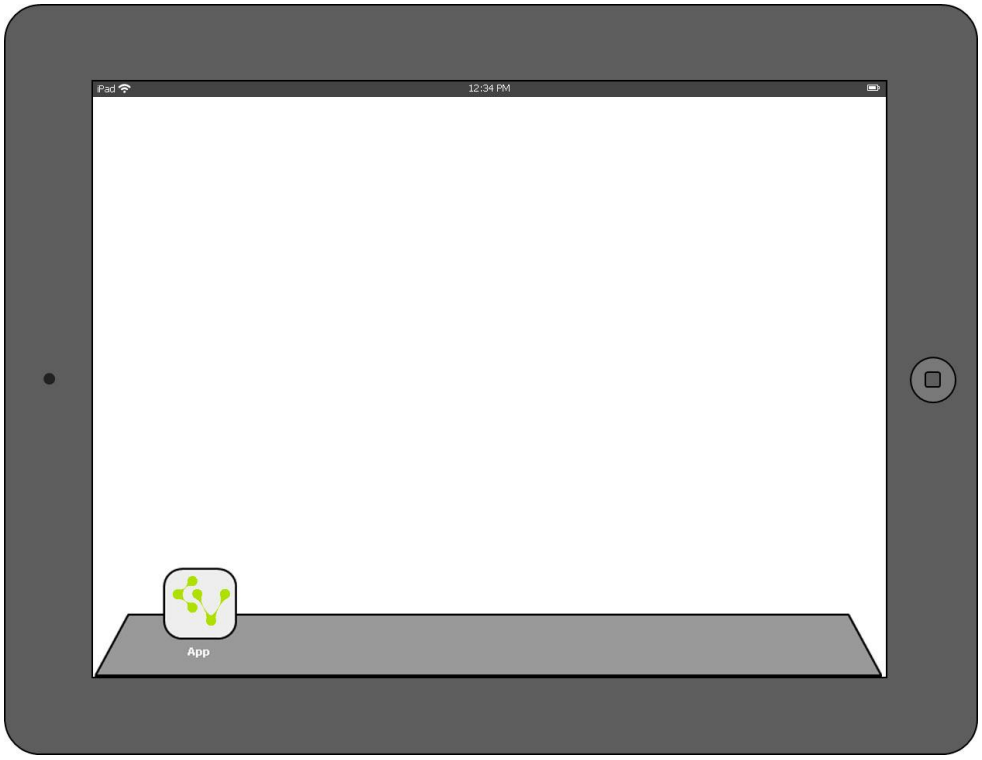

Figure 3: App selection

The **HostLogin** is the first interface that the app shows. The user completes the fields with his username and password. The application that provides the authentication filters the access according to the domain policies (Figure 4).

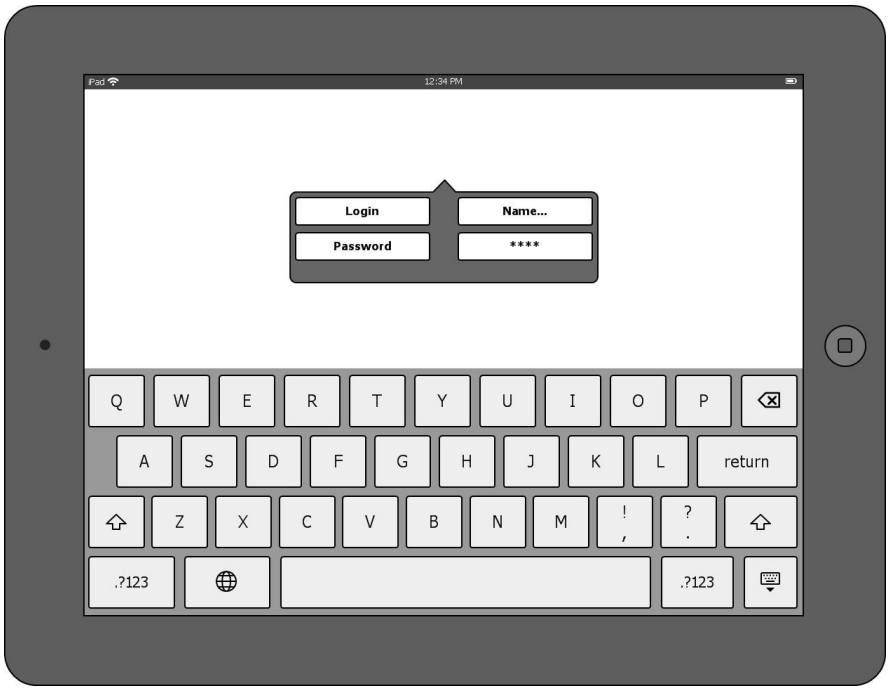

Figure 4: HostLogin

A-Eng can easily find the plant that he is looking for by selecting the proper one from a geographical map (Figure 5).

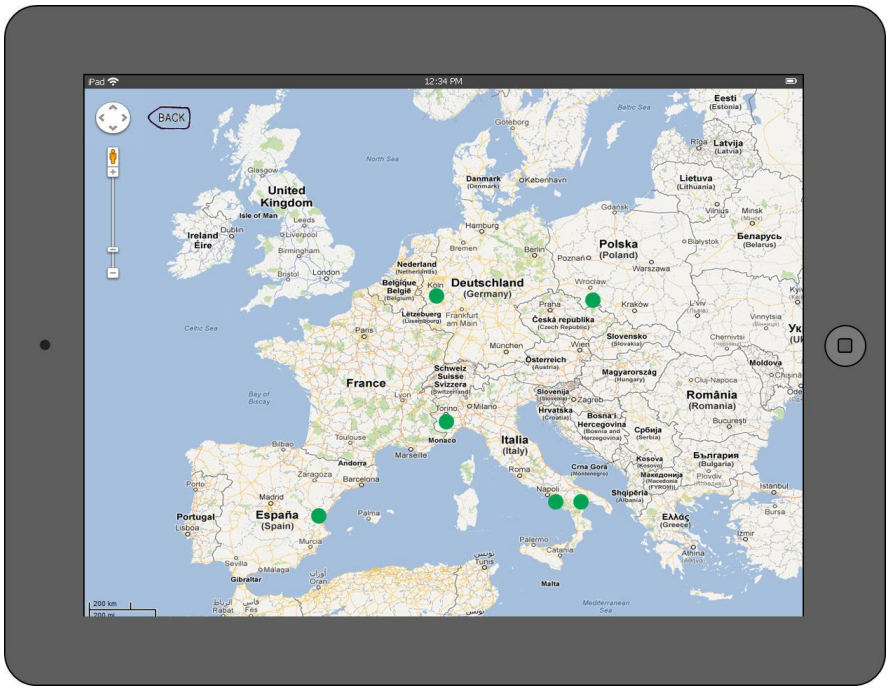

Figure 5: MapView

MapView highlight the available plants with a dot: one touch shows the name and, if the user has the necessary rights, the access button is displayed (Figure 6).

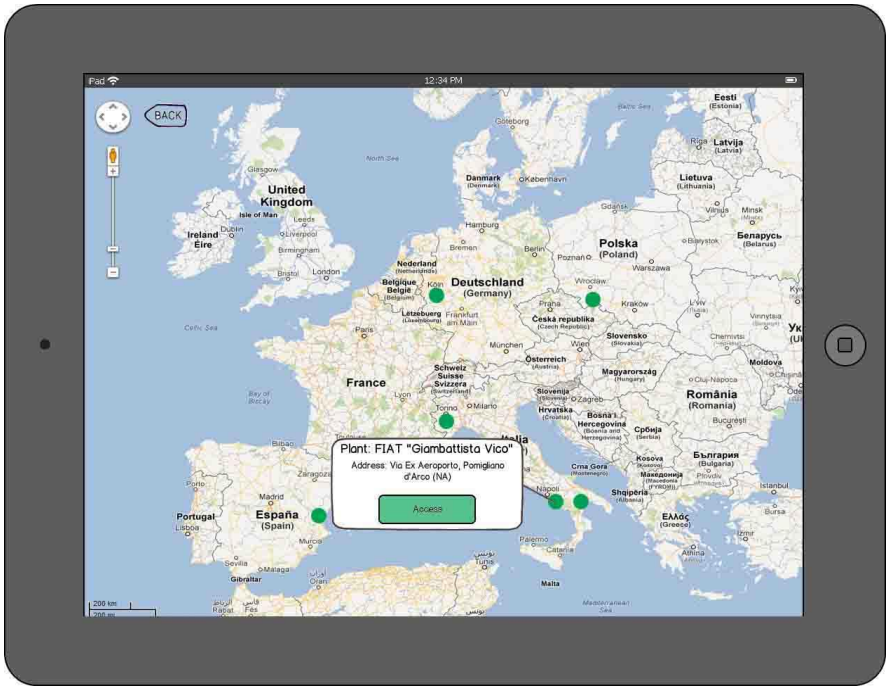

Figure 6: Plant details and Access

Following the same philosophy, **MapView** displays the production lines available in the selected plant. The layout of the whole plant highlight the link to required line: the green field is selectable by a touch on the panel. Production lines for which access is forbidden (like e.g. Rear Floor) are not highlighted by a

transparent green field. If the structure of the plant itself is confidential, an abstracted representation may be shown instead. In this use case, the A-Eng chooses the *Left Bodyside Subassembly* clicking on the green field (Figure 7).

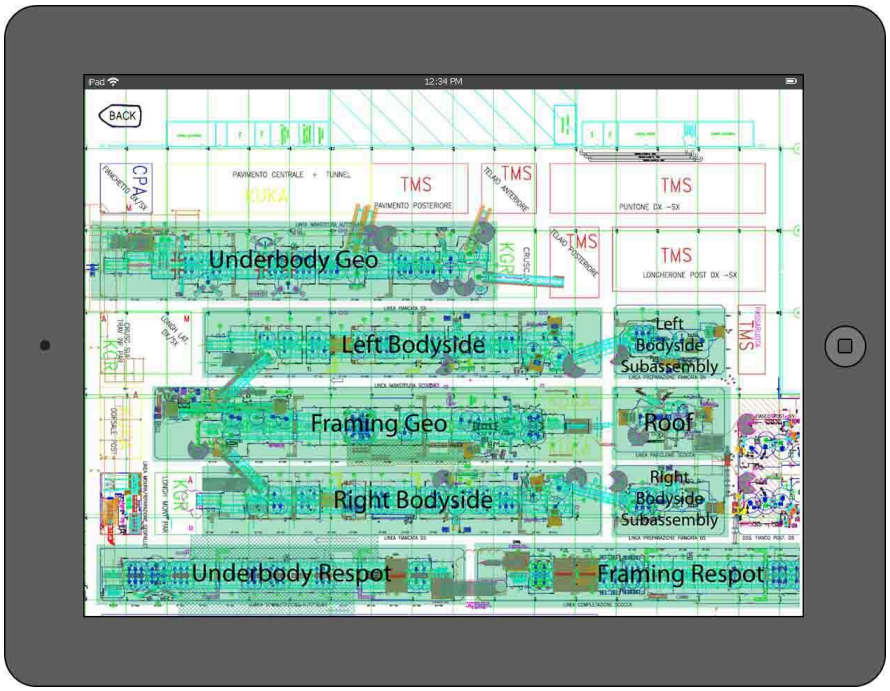

Figure 7: Production lines available

The last selection that the **MapView** allows is the station that is under analysis. The user touches the tablet screen in correspondence of the number that represents the station. The layout transparency helps the user to easily understand and recognise which station is under analysis (Figure 8). Further improvements may include the possibility to scan a specific code of the station using a QR-Code feature, which can save time and quickly detect the required station.
The maps for the progressive selections are simple images with green function buttons (made in different forms to cover the areas they represent) placed in correspondence of the requested access.

A query starts the Linked Data investigation: the user can choose the type of data to be logged from a ComboBox (input, output, marker, and database) that filters the list of the available tags. A mark next to the object indicates that it will be logged following the parameters set, according to *Time Base*, *Start Time*, *Length,* and so on.

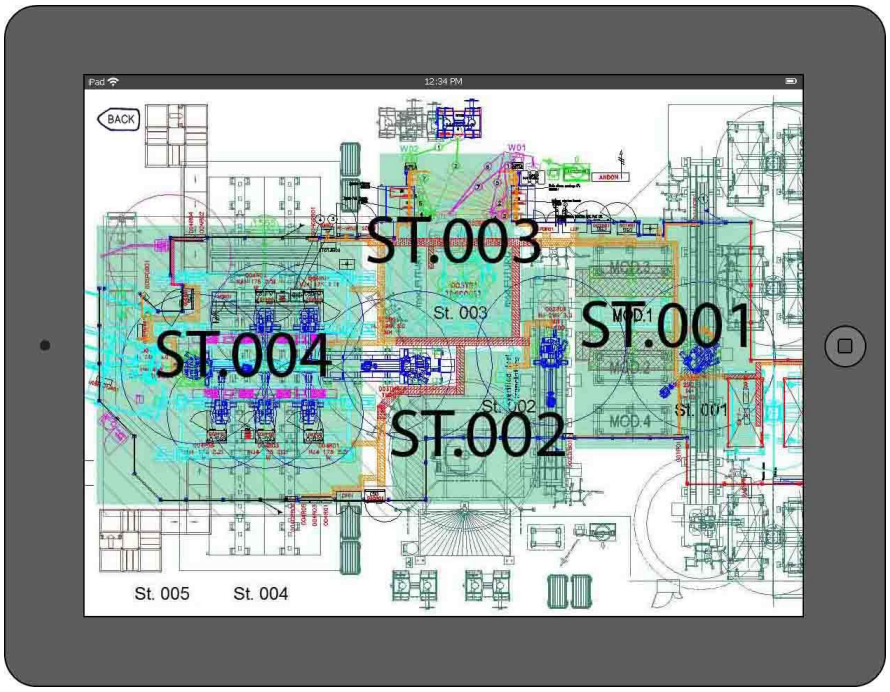

Figure 8: Stations

Multiple identification of the tags means that different parameters are set with the module **LogConfig** in order to detect those signals and data coming from the field that have to be analysed (Figure 9).

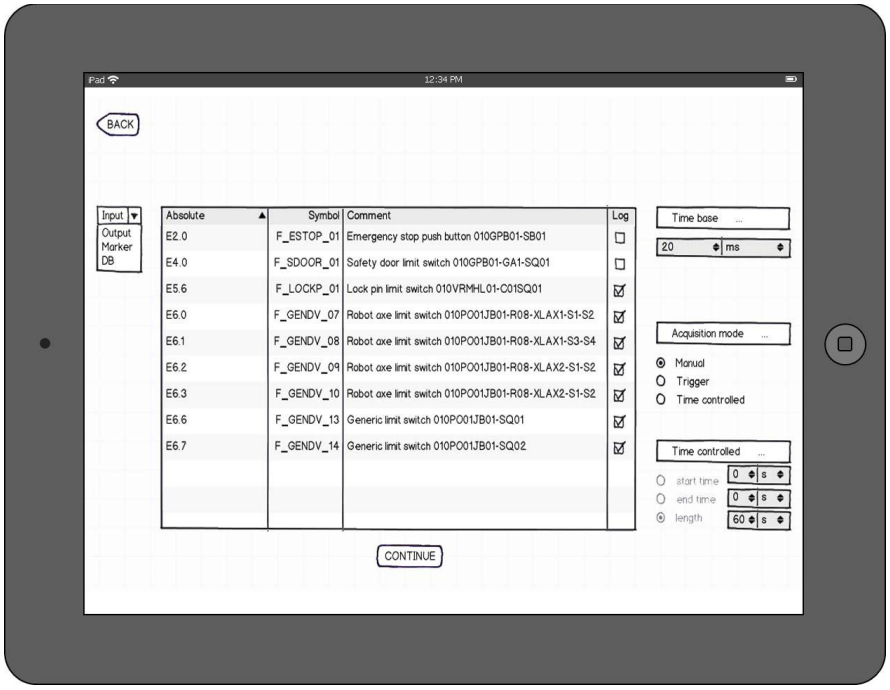

Figure 9: Log selection and configuration

Once the A-Eng has configured the app, he presses the “continue” button in order to acquire the data. Data Harmonisation Middleware (DHM) provides the interface and access to the data from the OPC Server. A manual acquisition is controlled with REC and STOP buttons (Figure 10).

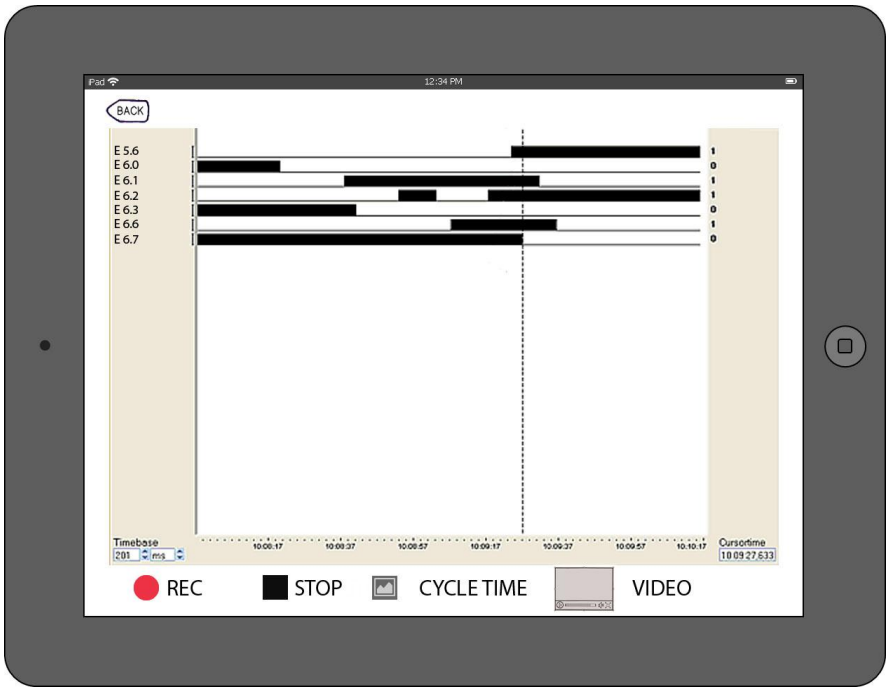

Figure 10: DataLog and graphical representation

The registered data are displayed in a graphical representation that shows the sequence of the signals in a timeline. Cycle Time button starts XLSConv that converts theoretical cycle diagram, an excel file, looking for the same tags used in the previous logging job. **Comp** is involved in graphical adaptation with the real data logged from the field and finally Analyzer highlights the differences between the two graphics (Figure 11).

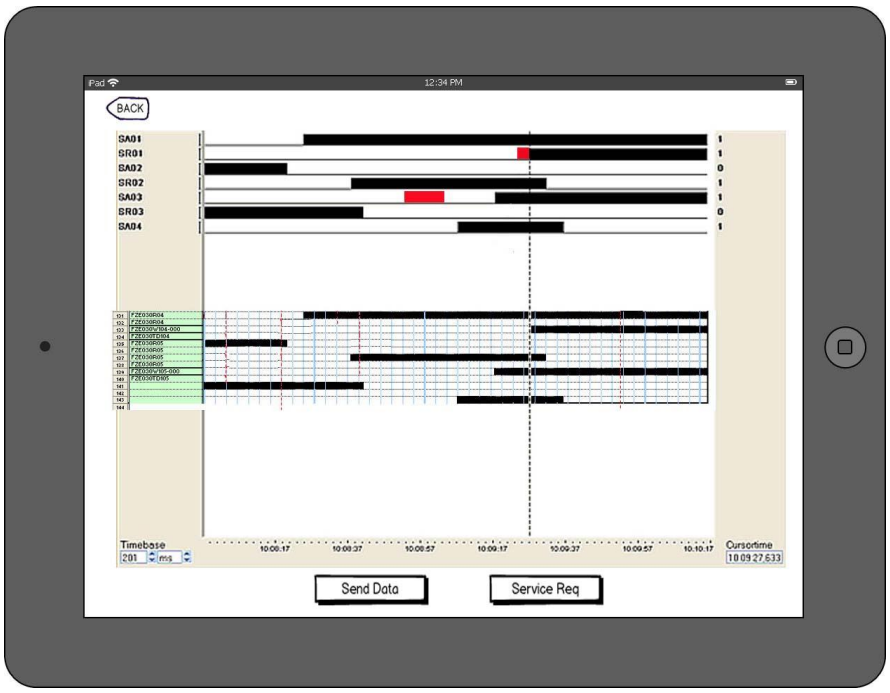

Figure 11: Cycle time validation

A useful tool to help A-Eng and Designer in further analysis of the machine behavior is the **VideoLog** that captures video of the station during the data log. A TimeLine can help in visualising images in specific temporal situation (Figure 12).

Figure 12: VideoLog

The evaluation of the process of the station under analysis returns a cycle time validation: is the station working in the planned conditions?

- YES -> data are stored in a database creating a historical situation map for further analysis
- NO -> the App underlines a graphical misalignment between real and theoretical timeline: this can help the identification of the problem

A-Eng shares information with TL, in order to get project solutions, and at the same time refers about the problem to his direct responsible (the Line Manager). This procedure is to be delivered by the app that fits Linked Data opening a service request or sending the results to the actors involved.

A-Eng receives feedback, documents and planning from LM (indirectly from TL) to solve the identified problem. A QR-Code assigned to the modification kit gives all the information for the right understanding of the corrective intervention (devices, spare parts, documents, designs, …).

A-Eng starts a new log of the station data with a recursive check.

A positive result, which indicates a process that works properly respecting time, sequences and criteria of reliability, is saved in order to improve the “best way of practice” and automatically closes the open issue listed in the document that manages the commissioning activities.

Related advantages

In the situation described above, the A-Eng is working close to the production line and far away from his office. The help of the mobile approach allows him to:

- quickly get information related to the cycle time of station under commissioning
- send detailed feedback to designer

- avoid cost of travel
- involve partners in solving problems
- find documents and suggestions facilitating his job

2.2.2 Candidates for Adapted Generic Apps

According to the scenario specification developed in the deliverable *D6.1.1*, we decided to evaluate in the first mockup a use case that covers the main objective in automotive commissioning: cycle time validation.

In order to design a mockup prototype, a set of applications will be defined with their activities, benefits, objectives and goals.

The main modules identified for the first *ComVantage* application development in the automotive manufacturing use case are the following:

- HostLogin
- MapView
- LogConfig
- DataLog
- Graph
- XLSConv
- Comp
- Analyzer
- VideoLog
- TimeLine

Cycle Time Validation

These modules might result in Adapted Apps for the Industrial App Framework (IAF) with the following purposes:

The first software module is the **HostLogin**. The user can access further functionalities only if he is enabled and according with policies (see documentation of Secure Access Control in *D6.2.1*). This can prevent non authorised access and data flows out of company.

Another application, **MapView**, provides a map visualisation to simply and quickly reach the site of the customer. Further choices let the user find the desired station.

The tool **LogConfig** shows an interface to select the type of data and signals required for cycle time analysis.

This routine runs in order to configure the data acquisition. **LogConfig** has an interface that allows multiple selection and personalised parameterisation of the logging configuration.

The software that gets access to PLC data, **DataLog**, starts the storage of the signals previously identified.

Cycle Time Validaton is one of the main tasks of the A-Eng to assure correct operation.

Graph is the one involved in the graphical representation of logged data.

XLSConv edits the excel file that contains the theoretical cycle time of the required station giving an output compatible with the output of Graph.

Comp has the objective to realise the alignment of the two graphical representations.

Analyzer runs the algorithms that are deputy to the identification of differences.

VideoLog starts the video acquisition related to the **LogConfig** and the **DataLog** while the **TimeLine** app gives the opportunity of visualising the image in a specific temporal situation.

2.2.3 Use case specific adaptations of the Software Architecture

From the Software Requirements Specification (section 2.1), the use case specific adaptations of the user interface (section 2.2.1), and the candidates for Adapted Apps (section 2.2.2), we have identified necessary adaptations of the IAF software architecture.

It has become clear that most of the requirements and UI elements can already be covered by the current state of the IAF architecture (as of M14). The remaining adaptations, including optional ones, are the following:

Identified adaptations:

A Regarding requirement *531: System has to be able to store the acquired data* a means for writing data back to the LD cloud needs to be implemented (SPARQL update query).

B According to requirement *503: System has to be able to interface system with Industrial Ethernet communication* there must be a way to communicate through Industrial Ethernet. This can either be done individually by each Generic/Adapted App or be provided by the management component of the IAF.

C Requirement *526: Reaction time / polling rate to collect data from PLC* calls for a polling mechanism for PlC calls. This can either be done individually by each Generic/Adapted App or be provided by the management component of the IAF.

2.2.4 Use case specific adaptations of the Business Evaluation Framework

In order to assess the business value of *ComVantage*, an evaluation framework has been proposed in deliverable *D9.2.1*. The framework is focused on the links between IT assets, collaborative capabilities and organisational performance.

The organisational performance construct serves as a basis for defining a multi-dimensional metric set. It is composed of two orthogonal dimensions: the operational effects dimension which includes six performance aspects (cost, efficiency, quality, flexibility, innovation and sustainability) and the business process dimension which describes the locus of impact in terms of generic supply chain processes (supplier, inbound logistics, operation, outbound logistics, marketing and sales). This process-oriented perspective facilitates insights regarding value creation.

A multi-dimensional generic metric set was composed based on an extensive literature review. The metrics were categorised according to both operational effects and business processes dimensions. This generic list was adapted to the related business processes of the plant commissioning use case, based on a high level analysis of its scenarios (detailed in *D6.1.1*). The main business processes in the plant commissioning scenarios include project planning, system engineering and internal commissioning.

The adapted metric set was validated using questionnaires and interviews of key stakeholders in the plant commissioning application partner, COMAU. In the questionnaire they were asked to assess, on a seven-point Likert scale, the extent to which each metric would reflect the expected change in business performance as a result of implementing *ComVantage*. In the interview, the interviewees were asked several general questions and their responses in the questionnaire were discussed. They were also asked to suggest further metrics, specific to the industry and the organisation in focus (for details see *D9.2.2*). The interviews revealed that the *ComVantage* platform is expected by the stakeholders to reduce the most important resource in plant commissioning, that is, commissioning time. This reduction will be enabled as machine data and expert information will be available “anytime and anyplace”. Consequently, the most

relevant operational effect indicated as reflective of the change introduced by the new platform, is cost, which is expected to decrease (Figure 13). For example, problems may be discovered in an earlier stage and the data required for their resolution will be accessible instantly by any authorised personnel. Innovation is also predicted to reflect the change introduced by *ComVantage* because the new capabilities are expected to facilitate new innovative processes.

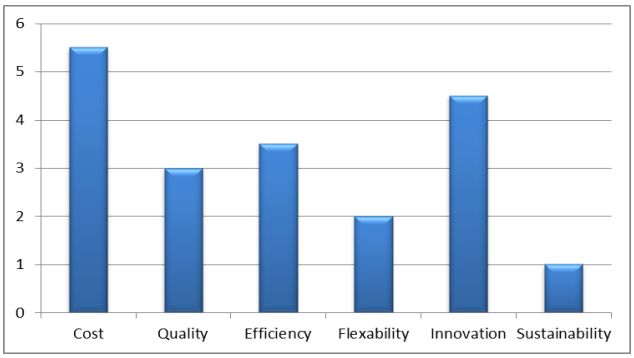

Figure 13: Expected impact on operational effects

The interviewees indicated that the supply chain stage expected to be mostly effected by the changes introduced, will be the internal processes (Figure 14). They expect the *ComVantage* platform to support better collaboration between the internal functions of the organisation. Other stages of the supply chain are expected to be effected in an indirect manner.

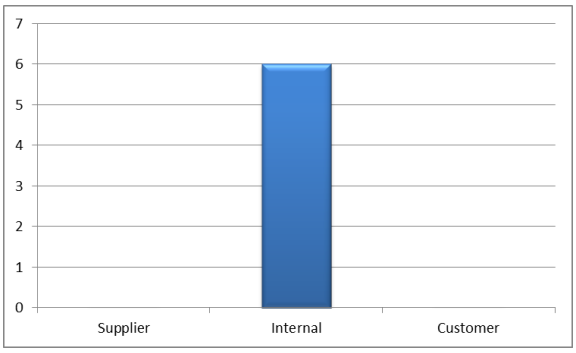

Figure 14: Expected direct impact on supply chain processes

Figure 15 summaries the adaptation process and presents the expected reflection level of the adapted metric set in the plant commissioning use case. Darker cells denote the existence of highly reflective metrics in the category, while lighter cells denote lower reflective metrics. White cells indicate there relevant metrics were not found. The results indicate that cost, efficiency, quality, and flexibility are the highly reflective operational effects, while innovation and sustainability include medium reflective metrics. This establishes that cost, efficiency, and innovation, which were found as value adding areas of *ComVantage* in this use case, will be suitably examined. Considering the business processes dimension, operation process and the following downstream activities - outbound logistics, and marketing and sales were found to be highly reflective.

Examples of highly reflective metrics in the efficiency-operation category suggested by the interviewees are Overall Efficiency (OEE) and Mean Time to Restore (MTTR). OEE refers to the actual performance relative to the designed capacity, during the periods when it is scheduled to run. MTTR refers to the average time to repair a failed component. The complete list of the adapted metric set can be found in *D9.2.2*, section 5.1.

Dimension	Supplier	Inbound	Operation	Outbound	Marketing and Sales
Cost			3		
Efficiency			3		2
Quality			3	2	3
Flexibility				3	2
Innovation			2		2
Sustainability			2		1

Legend: 1 Low reflection level 2 Medium reflection level 3 High reflection level

Figure 15: Reflection level of metrics

2.3 Validation of the adapted software design

Validation of the adapted software design will refer to IEEE Std. 1012-2009 with a documentation that analyses the achievement for all requested features.

In our first prototype we have performed no validation activities in mobile collaboration design, but future prototypes planned for months M24 and M33 will be implemented with specific requirements derived from the use cases of the plant commissioning. These levels of compliance of the mobile collaboration concept will be analysed during the implementation of the prototypes, growing together in a close iteration.

The final evaluation of the task will improve the development of the mobile collaboration concept.

2.4 Evaluation concept for the adapted software design

D5.1.1 has developed a set of metrics for usability and trust that will be applied when evaluating the adapted software design within the *ComVantage* User Centered Design (UCD) Lifecycle (see Figure 16). We will strive to evaluate the prototypes with a preliminary version of the collection of questionnaires, protocols and measures that will make up the *ComVantage* usability & trust metrics toolkit as early as possible.

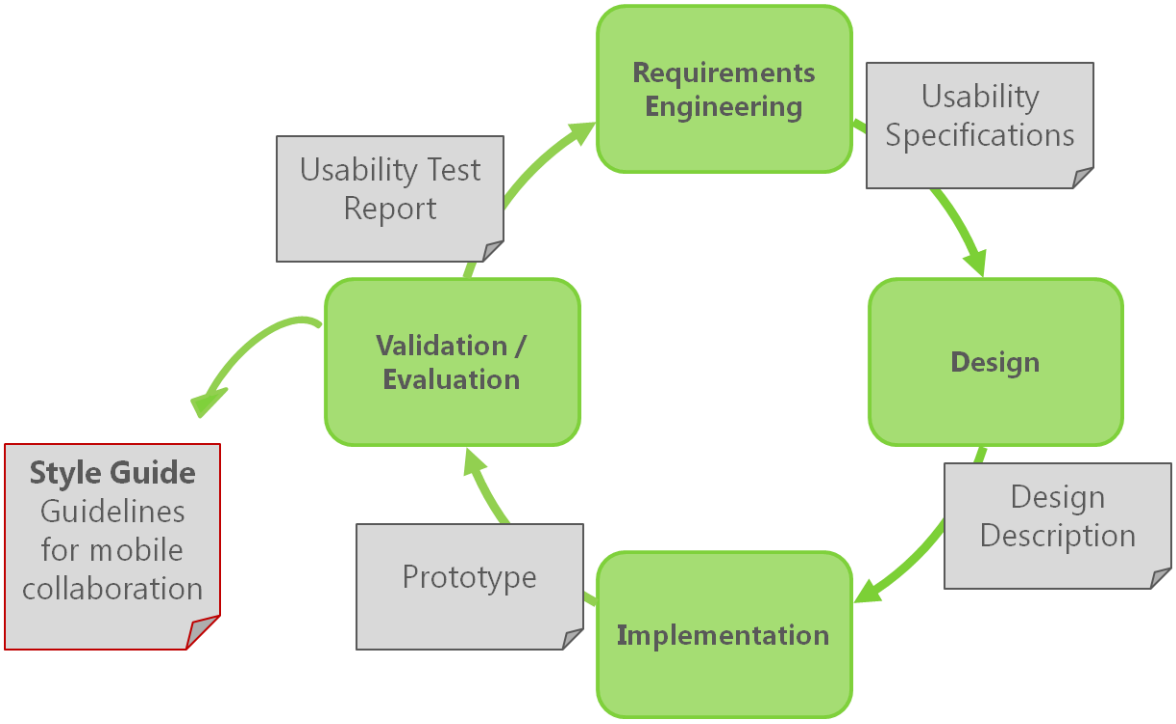

Figure 16: The *ComVantage* UCD Lifecycle (*D5.1.1*)

2.4.1 Scope of the planned evaluations of the adapted software design

The first iteration of the evaluations will be of a formative nature (see Table 1). We have selected heuristic evaluations and cognitive walkthroughs to evaluate the adapted software design. Heuristic evaluations are used in order to ensure the compliance of the prototypes to approved usability heuristics and principles. Cognitive walkthroughs by usability experts detect and eliminate remaining usability flaws.

Evaluation type	Definition
Formative evaluation	Main purpose of the evaluation is to contribute to the optimisation of an object being evaluated.
Summative evaluation	Main purpose of the evaluation is to make a (final) judgment on an object being evaluated.

Table 1: Different types of evaluation with respect to the evaluation target (*D5.1.1*)

2.4.2 Setting

The first evaluations will take place in laboratory environments such as the Future Factory Living Lab at SAP Research Dresden, or the Usability for Process Industries Lab at TU Dresden. The first iteration of the evaluations will be formative and of an explorative nature and thus may also contain expert-based methods carried out as interactive web conference.

2.4.3 Experiment design

The complete proposed experiment design can be found in the upcoming *D5.1.2.*

The general process of preparing the experiment, however, will be conducted as follows:

- Define objectives and criteria of the evaluation
  - Scope of the evaluation relevant usability goals
- Analysis of the context of use
  - Target user, environment, tasks and equipment
- Alignment with the state of development of the prototype
  - Suitability for the tasks w.r.t. level of refinement
- Specification of the experiment design
  - Selection of the evaluation methodology, the evaluators and the location of the execution

3 CONCLUSION AND OUTLOOK

In this deliverable, we have described the adaptation activities that were necessary to apply the generic concepts developed in the first year of the *ComVantage* project to design and evaluate an initial mockup prototype for the use case of plant commissioning introduced in Deliverable *D6.1.1* (Scenario specification and refinement). Based on these adaptations, we will now proceed with implementing a mockup and architectural prototype for a selected group of main use cases in the domain of plant commissioning. This prototype will be available by M14 and consist of a cycle time analysis tool for a line ramp up scenario which provides versatile and well defined workflows. This prototype will serve as foundation for the first usability evaluations.

4 GLOSSARY

Adapted App

Running on a table PC/smart phone (It is to cover both WP2's and WP5's perspective.). WP2's Perspective: Mobile Application within the Mobile Application Layer *D2.2.1*, WP5's Perspective: A member of the set of orchestrated apps (see Figure 4: Conceptual design-time data flow chart in *D5.3.1*)

A-Eng

The A-Eng is a software engineer from COMAU (or COMAU supplier) employed in the commissioning activities directly on the customer site.

App Orchestration

The process of selecting, adapting and managing a set of instances of generic apps to implement complex workflows. The result of App Orchestration is an Orchestrated App Ensemble.

BU

Business Unit is a profit center which focuses on product offering and market segment. COMAU has different BU in order to manage and develop technical solutions in Body Welding, Assembly, Powertrain and Aerospace.

DHM

Data Harmonisation Middleware is an intelligent data model that bridges traditional embedded development and the PLC-based approach facilitating easy development of distributed applications while the abstraction of underlying systems simplifies integration of I/O hardware and different network interfaces. It is a tool that allows to quickly and easily create distributed applications. The development effort is reduced to concentrating on the actual application code. The data model structures and organises the distributed data and with the middleware's abstraction layer different operating systems or underlying hardware platforms no longer pose an obstacle. This approach is well suited both to the development of new applications from scratch as well as upgrading existing installations that have to be restructured or expanded due to their "organic growth".

Dsg

Designer is a figure involved in COMAU project office. He/she has to analyse and to validate the advanced proposal. First goal of the job is to implement the constructive documentation from all the technical aspects concerning his/her area of knowledge: mechanic, electric, programming, plant layout, etc. ensuring technical solutions.

HR

Human Resources are the set of individuals who make up the workforce of an organisation, business sector or an economy. "Human capital" is sometimes used synonymously with human resources, although human capital typically refers to a more narrow view, i.e. the knowledge the individuals embody and can contribute to an organisation. The professional discipline and business function that oversees an organisation's human resources is called human resources management (or simply HR).

IAF

An abbreviation for Industrial App Framework. The IAF comprises a set of common design time and run time components that implement a specific App Orchestration process for industrial use in factories of the future. It includes all tools necessary for efficiently developing generic apps for orchestration and for deploying them to the target devices.

ICT

Information and Communication Technology is a term that stresses the role of unified communications and the integration of telecommunications (telephone lines and wireless signals), computers as well as necessary enterprise software, middleware, storage and audio-visual systems, which enable users to access, store, transmit and manipulate information.

LD

Linked Data describes a recommended best practice for exposing, sharing, and connecting pieces of data, information, and knowledge on the Semantic Web using URIs and RDF.

LM

Line Manager is the reference for the whole personnel involved in the commissioning of a production line. He manages the production activities and plans the proper team, promoting the application of policies and tools to solve problems, in order to achieve the acceptance by the customer, in compliance with the timelines, quality standards and economic objectives.

MTM

Methods-Time Measurements is a predetermined motion time system that is used primarily in industrial settings to analyse the methods used to perform any manual operation or task and, as a product of that analysis, set the standard time in which a worker should complete that task.

OEE

Overall Equipment Effectiveness is a hierarchy of metrics developed by Seiichi Nakajima in 1960's which evaluates and indicates how effectively a manufacturing operation is utilised. The results are stated in a generic form which allows comparison between manufacturing units in differing industries. It is used to identify scope for process performance improvement. It is also commonly used as a key performance indicator (KPI) in conjunction with lean manufacturing efforts to provide an indicator of success.

OPC

OLE for Process Control, which stands for Object Linking and Embedding (OLE) for Process Control, is the original name for a standards specification developed in 1996 by an industrial automation industry task force. The standard specifies the communication of real-time plant data between control devices from different manufacturers.

PLC

Programmable Logic Controller is a digital computer used for automation of electromechanical processes, such as control of machinery on factory assembly lines. The PLC is designed for multiple inputs and outputs arrangements, extended temperature ranges, immunity to electrical noise and resistance to vibration and impact. It is an example of a hard real time system since output results must be produced in response to input conditions within a limited time, otherwise unintended operation will result.

PM

Project Manager has the mission to manage, with the project team, order completion activities to assure quality, profitability and timing targets of the project. Scope management (WBS, the processes required to ensure that the project includes all the work required, and only the work required, to complete the project successfully), Cost Management (Budget), Time management (schedule), Managing/coordinating the project team (people assigned to the Project by the other departments), Customer satisfaction as regards the order completion, Claim and modification management, Risk management.

RSPP

Responsible for Services Prevention and Protection: person who has skill and professional requirement for preventive services and internal and external protection.

SReq

Service Request is part of a base workflow of the processes which enables an IT office or a request manager to keep the request reliable, oriented, validated, monitored and released. The service request starts a process that covers the life cycle of what has to be performed by the steps of delivery and follow-up.

TL

Technical Leader. As part of the Project Team, ensures the achievement of objectives in terms of respect of the timing and cost optimisation. He plans and coordinates technical activities within the contract (time, cost), ensures compliance with the customer's requirements, evaluating the use of standard business (products, processes, standards, etc.).

5 REFERENCES

IEEE 1012-2012, 2012. System and Software Verification and Validation Standard.

DISCLAIMER

The information in this document is provided "as is", and no guarantee or warranty is given that the information is fit for any particular purpose. The above referenced consortium members shall have no liability for damages of any kind including without limitation direct, special, indirect, or consequential damages that may result from the use of these materials subject to any liability which is mandatory due to applicable law.