



## *D8.2*

### *FITMAN expanded Trials proposition*

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## VERSION HISTORY

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## DELIVERABLE PEER REVIEW SUMMARY

ID	Comments	Addressed (✓) Answered (A)
1	Table numbering (AN1)	Adressed
2	Question internal comments (AN4, AN5)	Adressed
3	Core team comment title consistence (AN8 to AN20)	Adressed

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## Executive Summary

FITMAN Trials expansion from Small Scale experimentations to Larger Scale pilots is one of the most important pillars of FITMAN value proposition and exploitation to the Manufacturing Industry. This expansion aims at multiplying the positive benefits measured and reported in WP7 deliverables, building therefore a well-founded basis for the ten FITMAN Trials becoming Success Stories and Best Practices to be replicated by example in other Manufacturing sectors, domains or regions. Without an adequate expansion plan, the ten FITMAN Trials will remain successful, but isolated and limited experimentation cases of FIWARE technologies in Manufacturing. Such an expansion is therefore at the basis of FITMAN exploitation plan (the SHOWCASES section of the FITMANovation Lab FML) and could be implemented along different paths:

- one path is an expansion of the business processes covered (e.g. involving more processes, more departments, more products, more production sites, expanding the supply network, ...);
- another expansion is in the replication of experiences in different contexts (e.g. different but similar sectors and application domains, replication in EU and non-EU Regions not covered so far by FITMAN);
- a third possible case relies in the expansion of the IT platforms, tools and applications involved in the experimentation (e.g. extending existing ERP and PLM systems, integrating more and heterogeneous data sources, creating and developing innovative apps on top of the current IT open infrastructure and platforms). This last option and in particular the unprecedented opportunity offered by FI PPP Phase III to create a large scale community of developers operating and expanding the IT portfolio of the ten Trials is the focus of T8.2 in WP8.

The present deliverable D8.2 “FITMAN Expanded trials proposition” aimed at better analysing the ten Trials and assesses their suitability to be expanded in the above sense by an ecosystem of start-ups and Web Entrepreneurs using the FIWARE technologies adopted by the Trials themselves. Not all the ten Trials showed a similar suitability for this expansion and D8.2 carried out therefore the selection of the most suitable Trials for the FI-PPP Phase III mechanisms. Intuitively, it is quite clear that some FITMAN Trials, especially those carried out by large enterprises, where procurement processes need to follow precise and rigid qualification and certification procedures, as well as those Trials running in domains where data protection and confidentiality issues play a very important role, need more time and more intermediation effort (typically by IT solution providers such as TXT, ENGINEERING, ATOS and SOFTECO) to use and adopt new solutions developed by “unknown” subjects, such as the Phase III Open Calls winners.

This deliverable D8.2 aimed at finding a well-founded, scientifically valid method for this evaluation and further selection.

In fact, in order to perform the selection, a method has been defined using the following evaluations:

- The evaluation of the trials’ expansion scenario through the collection of information from the trials using a specific questionnaire,
- The collection of advices from the task T8.1 FITMAN Use Case Trials comparative evaluation,
- A Socio-Economic Impact Assessment of each trial for the **expansion scenario**.

A core team, composed of INTEROP-VLab, TXT, IT-INNOVATION, ENGINEERING, ATOS, INNOVALIA and POLIMI, has applied the method.

**Regarding the evaluation of the trials through the collection of information**, these steps were followed:

- The core team elaborated a questionnaire which was sent to the trials,
- The answer of the trials were analysed by the core team who formulated comments,
- Comments were sent to the trials which gave feedback,
- The core team has given a global evaluation taking in account all the information.

The main points that influenced the evaluation were the cost, the timescale and the availability of the data for external developers.

**Regarding the advice from the task T8.1**, three elements from the deliverable D8.1 were taken into account:

- The average progression of the Business Performance Indicators (BPIs). In such case we have used the last version of D 7.2 which supplies the progress including the value for TO BE 3 at M 27.
- The average value of the Technical Indicators (TIs) proposed in D 8.1,
- The Socio-Economic Impact Assessment based on the current scenario.

The core team has performed a global ranking of the trials by integrating the three results of the previous evaluation.

**Regarding the Socio-Economic Impact Assessment** of each trial for the expansion scenario, an advice is given for each scenario and a ranking is performed.

**For the final selection**, the T8.2 core team has merged the different inputs into a ranking using a weighted calculation. The results are presented in the table 1.

Six trials have been selected:

- i. TRW scenario which is centred on the implementation of the solution into different productions lines in the shop-floor, in order to demonstrate that the FITMAN technology is suitable for different lines.
- ii. CONSULGAL scenarios have a wide scope ranging from adding 3D representation of the project structure to localize the concrete data to the adaptation of the solution to other types of concrete structures.
- iii. PIACENZA scenario aims to develop a new instrument to physically localise the fabrics within its production areas.
- iv. WHIRLPOOL scenario is based on an extended measuring system, involving a new hardware (3D scanning system) and an enhanced mechanism to identify defects or process drifting and using an innovative approach to send 3D pictures to the users.
- v. TANet scenario is to implement marketplace capabilities to the SMECluster Platform and create a catalogue of GE's and SE's and make them available to resell on the Platform.
- vi. AIDIMA scenario is to expand the collaborative aspects and bring designers a common platform to stay «connected» in order to facilitate all brainstorming processes

(data exchange, product versioning, decision making tools, secured access, social media, etc.).

<b>Trial</b>	<b>Evaluation Based on questionnaire (Weighting: 2)</b>	<b>Advice from D8.1 (Weighting: 1)</b>	<b>Expansion SEIA (Weighting: 1)</b>	<b>Total</b>
TRW	9.8	10	10	39,6
CONSULGAL	8.9	9	10	36,8
PIACENZA	9.1	8	10	36,2
WHIRLPOOL	10	8	7	35
TANET	6.2	6	10	28,4
AIDIMA	5.8	5	7	23,6
AGUSTA WESTLAND	5.5	3	4	18
VOLKSWAGEN	5	4	4	18
APR	5.6	2	4	17,2
COMPLUS	6.1	1	4	17,2

**Table 1 Final evaluation**

After the final selection of the six FITMAN Trials, a second step in WP8 (T8.5) will be to match them to the offer currently in place in the FIWARE Acceleration program. A first analysis reported in previous WP8 deliverables also thanks to open webinars and interviews, showed that, although many acceleration projects mention Manufacturing as one of their objectives, just few of them manifested openly the intention to expand the industrial trials and just one of them (FABULOUS<sup>1</sup>, about 3D Printing) made concrete incentive actions to Open Calls applicants for using and adopting FITMAN technologies in their projects (e.g. by inserting detailed descriptions of FITMAN assets and trials in the text of their Open Call). In this perspective a shortlist of most interested FABULOUS projects is being created, the FITMAN platform for 3D Printing / Scanning adapted and extended, in order to allow for the end of the project an additional set of experimentations of FABULOUS projects using FITMAN platforms and addressing FITMAN Trials assets.

The interaction between the 6 FABULOUS short-listed projects and FITMAN is currently ongoing. One FABULOUS project, 3DQuality, has required a stronger and more intensive interaction with one of the FITMAN trials expansion: Whirlpool. Their experience of interaction will be reported in the FITMAN D8.8 deliverable at the end of the project.



<sup>1</sup> <http://fabulous-fi.eu/>

## 1. Introduction

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The expansion of the 10 Trials is a key element of the FITMAN exploitation plan regarding how to extend the business processes, stakeholders, enterprise systems, and users' base to create a "Large Scale" trial derived from the "Low Scale" trials currently under experimentation in FITMAN WP4-5-6 and WP12-13-14.

A FITMAN trial is a complex artefact with human / organisational resources, manufacturing / physical resources, IT software / hardware resources. In the context of T8.2 we just focus on the IT software part of this expansion. The rest of the expansion scenarios will be addressed in the exploitation reports in WP9.

This task T8.2 has been split in two parts:

- The objective of the **first part** of the task 8.2 performed between M18 and M24 is to select at M24 a subset of trials. To perform this selection the teamwork of 8.2 partners evaluates the capacity of the trial to participate to the expansion phase taking into account the situation of the trial, the interest of the proposed application expansion and the potential socio-economic impacts.
- The **second part** is performed between M24 and M30. The goal is to elaborate roadmap for the expansion applications proposed by the selected trials and to implement some of them in the frame of the Task T8.5 and its M30 deliverable (D8.8). It will include the following activities:
  - Determination of the Business requirements,
  - Elaboration of the IT requirements.

The expansion scenarios selected will be developed by the SMEs and Web Entrepreneurs (WE), chosen through the open calls launched by the A16 accelerators during the FI PPP phase III. The activities performed in this phase is:

- Selection of the external developers,
- Development and implementation of the selected expansion scenarios,
- Evaluation of the results,
- Generalisation of the solution.

This deliverable is structured as follows:

**Chapter 2** presents the methodology to select the most suitable expansion scenario

**Chapter 3 to 12** present the complementary information collected trial by trial with the evaluation and the Socio Economic Impact assessment for the trial's expansion scenario

**Chapter 13** presents the comparative evaluation of the trials (from D8.1 point of view)

**Chapter 14** presents a synthesis of the evaluation and the selection of the trials including the interaction with Phase III of FI/PPP

**Chapter 15** gives a conclusion on the deliverable.



## 2. Presentation of the method to select the trials

The method used in the task T8.2 in order to select the trial is described in this chapter.

The method is based on three types of activities:

- The evaluation of the trials' expansion scenario through the collection of information from the trials and an evaluation performed by the core team of the task T8.2: INTEROP-VLab, TXT, IT-INNOVATION, ENGINEERING, ATOS, INNOVALIA, POLIMI.
- The collection of advice from the task T8.1 FITMAN Use Case Trials comparative evaluation.
- A Socio-Economic Impact Assessment of each trial for the expansion scenario.

### 2.1. Process for the evaluation of the trials' expansion scenario based on a questionnaire

The first type of activity to evaluate the trial expansion scenarios was the collection of information sent by the trial directly.

Therefore the T8.2 core team elaborated a **questionnaire** to collect the information on the expansion scenarios. The same team then proceeded to the information evaluation.

To facilitate this evaluation, **a list of criteria was defined**. The interest of using criteria in the evaluation process is to ensure that the results are in line with the expected outcomes.

The following table presents the questions of the questionnaire and, the criteria associated for the evaluation purpose.

No.	Questions
1	Describe the scenario of the expansion you envisage starting from the existing solution
2	What are the reasons for which you propose an expansion of your trial? Why do you think you have the potentiality to develop the expansion?
Evaluation criterion for the questions No. 1 and 2: Coherence on the technical and business aspects of the expansion scenario with the initial developments.	
3	What existing scenarios would be impacted by the envisaged expansion?
4	What Business Processes would be impacted by the envisaged expansion?
Evaluation criteria for the questions No. 3 and 4: <ul style="list-style-type: none"> <li>• Number of new functionalities</li> <li>• Number of new processes</li> </ul>	
5	Do you intend to use the existing Platform and which one? Do you have an idea on which GEs/SEs you could need?
Evaluation criteria for the question No. 5: <ul style="list-style-type: none"> <li>• Number of new GEs</li> <li>• Number of new SEs</li> </ul>	
6	Are the data available for this expansion?
Evaluation criterion for the questions No. 6: Availability of the data is mandatory	
7	Which are the main technical-economic conditions for such expansion?

8	What are the consequences of this expansion on your organization?
9	Do you have an idea of the Costs and the benefits of this expansion?
10	Indicate the scope and timescale of the envisaged expansion
Evaluation criterion for the questions No. 7 & 10: A reasonable lead time compatible with the duration of the FI PPP programme (M24-M42)	
Evaluation criterion for the questions No. 8 & 9: Cost compatible with the potential financial support offered in the FI-PPP Phase 3 to the SMEs or WE (Web Entrepreneurship) in charge of the development.	

Table 2 list of question used to collect expansion scenarios

For the evaluation process, each T8.2 core team member received the questionnaire answers from each trial and performed a first evaluation. These evaluations were transmitted to the trials that then sent back comments.

## 2.2. Collection of the advice from the task T8.1 FITMAN Use Case Trials comparative evaluation

The deliverable D8.1, *Use Case Trials comparative evaluation*, is the second input that is used for the selection of the trial. D8.1 (FITMAN Use Case Trials Comparative Evaluation) aims to utilize data collected in T7.1 FITMAN Smart-Digital-Virtual Factory Trials Experiences utilizing the V&V Methodology to consolidate the lessons learned from different Trials. Moreover, as agreed after the Lyon Meeting on Feb 11 and as reported in the minutes of the meeting among WP8 partners: “D8.1 will be neutral in presenting the data: a comparative evaluation of the trials leading to a ranking of those trials, but no interpretation of that data or recommendations for expansion.”

Any punctual comment on each specific trial would be just a repetition of what is stated in D8.1 in sections of Chapter 5 - Synthesis of collected data and Conclusions. In this chapter the sections are addressing for each trial:

- The Business Aspects
- The Technical aspects (and their interconnection)
- The Socio-Economical aspects.

For such reasons the contribution from T8.1 to D8.2 is the ranking of the different trials according to the identified criteria (Business, Technical and Socio-Economical Impact).

An update has been performed taking in account the last evaluation at M27 reported in the deliverable D 7.2.

## 2.3. Socio-Economic Impact Assessment method (SEIA)

The Socio-economic impact assessment of the trials' expansion scenario is the third input that will be used in the selection of the trial.

A SEIA is performed on each expansion scenario. The aim is to assess the socio economic impact of the expansion scenario on the industrial sector.

The SEIA has been performed based on the analysis of the respective trial in their current state as reported in D9.3<sup>2</sup> and the comparative analysis conducted in D8.1<sup>3</sup>.

<sup>2</sup> Vega, et al. (2015). FITMAN exploitation action plan and implementation including socio-economic impact (2nd edition). Report number: D9.3. EC FP7-ICT FITMAN Project.

## 2.4. Process for the final selection of the trial

The selection of the most suitable trials' expansion scenarios to be supported by FITMAN is based on the three following inputs:

- The evaluation of the expansion scenario completed with the questionnaire
- The T8.1 outcomes updated with D7.2,
- The SEIA of the expansion results.

One of the difficulties of the final selection is to take into account the three inputs. The T8.2 core team have designed a ranking system attributing points in regards to the ranking of the trials for each of the three inputs. A weighted calculation is applied to each input and the final ranking is performed. In order to ensure that the ranking of the trial is consistent, a meeting has been organised among the T8.2 core team and the method has been agreed. The results of the T8.2 core team meeting along with the details of the evaluation for each input are presented in chapter 14.

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<sup>3</sup> Tavola, et al. (2015). FITMAN Use Case Trials Comparative Evaluation. Report number: D8.1. EC FP7-ICT FITMAN Project.

### 3. Expansion proposition analysis of the Trial No. 1 Volkswagen

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This section reports on the expansion proposition of the trial Volkswagen.

It is structured in three sections:

- First, the expansion scenario through the answers of the trial to the questionnaire.
- Second, the results of the evaluation.
- Finally, the SEIA of the expansion scenario.

#### 3.1. Answer of the trial to the questionnaire

The questionnaire was sent on August the 4<sup>th</sup>, 2014 the answer to the questionnaire was received on September the 25<sup>th</sup>, 2014.

The request for complementary information was sent on February the 23<sup>rd</sup>, 2015 the answer from the trial has been received on February the 25<sup>th</sup>, 2015.

On April the 28<sup>th</sup>, 2015 the last evaluation has been sent to the trials. Hereafter, we give the final answers, including the latest exchange of information from the trial.

**Question No. 1:** Describe the scenario of the expansion you envisage starting from the existing solution

The scenario is the same as the scenarios of the Volkswagen trial. As a starting point, the current system will be used.

A manager has an idea to change an existing car design. The manager uses the “MR-Service-Manager” view to describe and send the new request to the related persons in the machinery engineering department.

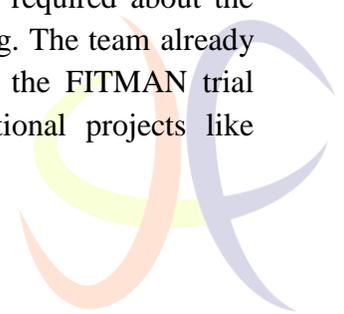
From this point, employees have been still intervening to answer the request of the manager. This is currently fully manual.

For the expansion a semi-automation of this process should be inspired. This will relate to the inquiry of the management board with the machinery. It might include specific templates to describe the query and related ontology.

**Question No. 2:** What are the reasons for which you propose an expansion of your trial? Why do you think you have the potentiality to develop the expansion?

In the current implementation, all reviews must be carried out by hand. This process requires resources of car engineering experts. The target is to reduce the required effort and to accelerate this process.

In case of this expansion of the current VW trial a deep knowledge is required about the industrial requirements, the ontology techniques and the system modelling. The team already has the knowledge in this area from former projects as well as from the FITMAN trial development. It belongs to EU projects like FITMAN but also national projects like ISYPROM as well as industrial projects.



**Question No. 3:** What existing scenarios would be impacted by the envisaged expansion?

Business Scenario 1: Inquiry Service

**Question No. 4:** What Business Processes would be impacted by the envisaged expansion?

Business process: Evaluation inquiry

Business process: Show production module

Business process: Submit report.

In fact the target is to have an effect on the car development process in terms of time reduction.

### Business Scenario : Inquiry Service (related to product changes)



Support processes

### Business Scenario: Management of the MR

Extract module specifications:



Add module manually



**Figure 1: Part of the car development process under consideration**

**Question No. 5:** Do you intend to use the existing Platform and which one? Do you have an idea on which GEs/SEs you could need?

We will use the Cloud Enterprise Space developed by IPK. We might need a knowledge management and reasoning component. A proportion could have the SE SEMed. This component can be responsible to search the inquiries for specific keywords. With these keywords an automatic evaluation might be performed. In fact the knowledge structure and especially the reasoning are an add-on which is required to support a semiautomatic decision process.

**Question No. 6:** Are the data available for this expansion?

VW is extremely restrictive regarding any information and not interested in providing data for a wide audience. The VW participation in any expansion has to be decided on the specific case and constraints. In fact new partners need to be checked by VW related to reliability because of potential data exchange. This is especially related to the knowledge analyses and management concepts.

**Question No. 7:** Which are the main technical-economic conditions for such expansion?

The expansion requires the cloud infrastructure as well as knowledge analysis related to the decision making in the production system planning. Additionally it needs the access and correlation across different data sources. However, the involvement of different experts from the domain as well as from knowledge and IT areas are required.

**Question No. 8:** What are the consequences of this expansion on your organization?

Related to automotive companies such as VW it will reduce the required effort for the preparation of decisions as well as the reduction of the time for decision making in the car design processes. For IPK it would allow to do further consultancy in automotive industry and also research.

**Question No. 9:** Do you have an idea of the cost and the Benefit of this expansion?

An approximation of the costs is a about 500k euro. This is a calculation on potential resources. It can be splinted in sub-projects such as “knowledge analysis”, “ontology development”, “development of the reasoning system”, “deployment” and “training”.

**Question No. 10:** Indicate the scope and timescale of the envisaged expansion

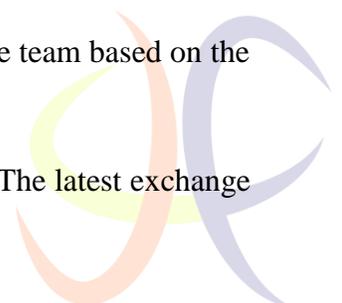
1. Knowledge analysis: ca. 9 Months
2. Ontology development ca. 10 Months
3. System configuration and adaptation: 10 Months
4. Training and motivation: 7 Months.

Point 3 covers the deployment of the system. Point 4 relates to training and motivation of the use of the system. Therefore it needs to be available in 19 months.

### 3.2. Evaluation based on the T8.2 defined criteria

This chapter reports the result of the evaluation performed by the T8.2 core team based on the first answers of the trial to the questionnaire.

Hereafter are the complete evaluations to the questionnaire from the trial. The latest exchange of information from the trial is included



**Criteria for the questions No. 1 and 2:**

Coherence on the technical and business aspects of the expansion scenario with the initial developments

**Evaluation result:**

The expansion scenario is fully consistent with the original one, as it simply leverages new technology with the goal of enhancing the overall automation of the process.

**Evaluation criteria for the questions No. 3 and 4:**

Number of new functionalities, Number of new processes

Evaluation result: One functionality has been introduced, impacting the three existing processes. No new processes have been implemented. Overall, the impact on the baseline scenario is moderate.

**Trial comments:**

Not clear at the moment if a knowledge acquisition process needs to be added.

**Evaluation criteria for the question No. 5:**

Number of new GEs, Number of new SEs

**Evaluation result:** The entire expansion will be based on a software asset owned by its direct IT partner (IPK). No information has been provided by the involved parties concerning the availability of such technology to Phase III members.

**Trial comment:**

Partner needs to be checked by VW related to reliability because of potential data exchange. This is especially related to the knowledge analyses and management concept.

**Evaluation criteria for the questions No. 6:**

Availability of the data is mandatory

**Evaluation result:** This Trial does not commit to make its data available to the public. Instead, a case by case evaluation of specific inquiries will be made.

**Evaluation criteria for the questions No. 7 & 10:**

A reasonable lead time compatible with the duration of the FI PPP programme (M24-M42)

**Evaluation result:** The expected schedule is still compatible with the programme, but leaves a very short time for Phase III third-party developments.

**Trial comments:**

Planning covers also deployment and training. The development is in the range of 19 Months.

**Evaluation criteria for the questions No. 8 & 9:**

Cost compatible with the potential financial support offered in the FI-PPP Phase 3 to the SMEs or WE (Web Entrepreneurship) in charge of the development.

**Evaluation result:** Expected costs (still to be confirmed) are in a different range with respect to the available funding (500k vs. 50-150k). However, this evaluation criterion seems ambiguous: judging from the Trial's answers, it seems like it is VW itself, possibly in cooperation with IPK, which is going to sustain these costs.

**Trial comments:**

In fact the challenge is the collection, analysis and formulisation (logical interrelations) of the knowledge as well as the final reasoning system. Therefore 3 main packages can be identified: "knowledge analysis", "ontology development", "the reasoning rule system" If we take only the first package: "knowledge analysis" will require about 120 TEuro.

**3.3. Result of the SEIA for the expansion scenario**

In terms of potential socio-economic impact, the Volkswagen trial in its current form is expected to primarily impact positively on economic growth as per the analysis in D9.3. In the proposed expansion, this economic growth can be expected to increase as the scenario outlined above by Volkswagen should improve the efficiency of a process that is currently manual by making it semi-automatic; thus freeing up valuable time from car engineering experts. However, as noted in both D9.3 and D8.1, Volkswagen is expected to have minimal impact on the industry sector as a whole, as the impacts are seen to only apply to Volkswagen themselves. As noted in the above scenario as well, Volkswagen is extremely restrictive with regards to information sharing, so the current situation as per the socio-economic impact assessment performed in D9.3 is not likely to change.

In terms of the comparative analysis of the FITMAN trials in D8.1 with respect to socio-economic impact, the Volkswagen trial receives the lowest score. This is mainly due to the point discussed above; that it is expected to have little impact on the industry sector as a whole. In D8.1, we also note that this is unlikely to be generally applicable to manufacturing as a whole and is expected to have low impact/relevance with respect to broader societal benefits. This situation is not expected to change in the trial expansion. Therefore, from a socio-economic perspective, this expansion scenario is not recommended.

Rating: 1/3



## 4. Expansion proposition analysis of the Trial No. 2 TRW

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This section reports on the expansion proposition of the trial TRW.

It is structured in three sections:

- First, the expansion scenario through the answers of the trial to the questionnaire.
- Second, the results of the evaluation.
- Finally, the SEIA of the expansion scenario.

### 4.1. Answer of the trial to the questionnaire

The questionnaire was sent on August the 4<sup>th</sup>, 2014 the answer to the questionnaire was received on September the 26<sup>th</sup>, 2014.

The request for complementary information was sent on February the 23<sup>rd</sup>, 2015 the answer from the trial has been received on February the 25<sup>th</sup>, 2015.

On April the 28<sup>th</sup>, 2015 the last evaluation has been sent to the trials. Hereafter, we give the final answers, including the latest exchange of information from the trial.

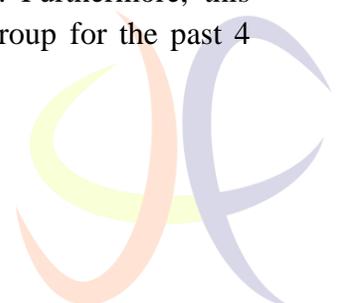
**Question No.1:** Describe the scenario of the expansion you envisage starting from the existing solution

The scenario of the expansion will be oriented to the H&S use case. Currently the FITMAN solution is deployed in a concrete production line of the factory of Pamplona. The expanded scenario will be oriented to the implementation of the solution into different productions lines in the shop-floor, in order to demonstrate that the FITMAN technology is suitable for different lines without a huge customisation. Additionally, not only the deployment in other lines in the factory of Pamplona, but also the expansion to different plants of the TRW Group in Europe will be considered.

**Question No.2:** What are the reasons for which you propose an expansion of your trial? Why do you think you have the potentiality to develop the expansion?

The expansion will allow us demonstrating that the FITMAN technology is suitable for different lines/plants without a huge customisation. Therefore, the system can be moved in the factory from one line to another, or among different locations, with minimum efforts and no costs.

The TRW factory of Pamplona has the potential to do the expansion. Furthermore, this factory has been the reference plant in Health & Safety across TRW Group for the past 4 years, having been awarded for the work they have performed in this area.



**Question No.3:** What existing scenarios would be impacted by the envisaged expansion?

The expansion of the trial has impact in the 2 business processes of the TRW trial related to H&S:

- BS1 Risk Modelling: if the system is tested in new lines/factories, new risks and preventive actions might be included due to the different factors of each of the lines
- BS2 Risk Detection and Information: the system should be extended in order to provide the possibility to use the system from different lines/locations.

It has to be taken into account that each of the production lines/factories are quite different, so a customised study about the concrete risks and preventive actions should be addressed before running and implementing the solution in the shopfloor, having a quite new scenario to work in.

**Question No.4:** What Business Processes would be impacted by the envisaged expansion?

We cannot be 100% sure about which processes will be impacted, since we should start working on the system in order to see if more modifications are needed, but in principle the expansion of the trial has impact in the following business processes of the TRW trial:

- From BS1, Risk Cataloguing (BP1)
- From BS2, Risk Intervention and Communication (BP4).

As mentioned in the previous section, the implementation of the solution in a different production line/factory needs a previous customisation to the new conditions and factors.

Currently, the system has included the concrete risks and actions related to the assembly line that is being used as demonstrator. Due to the expansion, new functionalities will be directly linked to more types of risks and preventive actions into the system, ensuring that the solution covers all the production lines/factories of TRW.

**Question No.5:** Do you intend to use the existing Platform and which one? Do you have an idea on which GEs/SEs you could need?

In the H&S use case, we will use the same Smart Factory Platform that we are currently implementing, with the final integration of the DyCEP and DyVisual SEs.

DyCEP extends the CEP statements (complex event patterns) with semantic information, and enables dynamic changes in the CEP engine in order to make the detection process. Nowadays the system gathers and processes punctual data in real-time, but no accumulative values can be calculated. With the integration of the DyCEP, the average levels of the last 5 minutes, the trends of the movements, predictions about the worst positions, etc. could be feasible.

DyVisual will be combined with the web-based user interface to provide 3D shop floor environment, in order to visualise:

- i) An avatar of the worker with the level of risk detected for each of the movement in a more easy-to-understand way. Currently the GUI shows some bars with colours, but the worker cannot perceive in an easy way the type of movements the system is referring to; and
- ii) An animation of the worker performing the movements because of the events and notifications filtered by the DyCEP, to facilitate training in the preventive actions.

The workers cannot only visualise how to perform a movement correctly, but also reproduce how badly they are moving.  
Anyway, maybe during the development of the expansion we notice that deeper modifications are needed.

**Question No.6:** Are the data available for this expansion?

For the H&S use case, the data will be obtained in real-time with the ergonomic monitoring system in the several production lines or different factories located in Europe.

**Question No.7:** Which are the main technical-economic conditions for such expansion?

New sensors and equipment are needed in order to test the system into different lines/locations and obtain the most accurate and reliable results in the risk prevention strategy.

The main investment will be devoted to the acquisition of 6 new Microsoft Kinect sensors that will be programmed in order to deploy more monitoring systems gathering data. Additionally, the capacities of the data center will be extended due to the higher volume of data to be processed.

**Question No.8:** What are the consequences of this expansion on your organization?

In the H&S use case, the results obtained from the expansion will confirm that the FITMAN system can be deployed in any of the production lines inside the factory of Pamplona, but also in any of the factories of TRW around the world. The results that we are obtaining in the project have been presented not only in the National meeting but also at European level, in the EMEA Assembly where managers of all the European factories meet in order to share their achievements that can be useful for other plants. Furthermore, TRW Automotive has been acquired by ZF Friedrichshafen, becoming the world's second largest automotive supplier. Therefore, the results of the expansion will have huge impact in the automotive sector.

**Question No.9:** Do you have an idea of the cost and the Benefit of this expansion?

The implementation of the TRW trial in a single production line provides at least a reduction of 10% the level of frequency and gravity of the accidents and incidents in the factory. The expansion will improve the decrease of these levels, estimating a reduction of an 18-20% in each of the factories. This will be translated into important savings, not only for the factory but also for the TRW Group, due to the reduction in the number of employees with lost days. The reduction of the economical wastes will depend on the country where the factory is located, since they are directly related to the salary of personnel.

**Question No.10:** Indicate the scope and timescale of the envisaged expansion

The objective of the trial expansion is to provide reliable solutions for getting safer and more secure workforce and highly-reliable quality control. The main scope is to deploy the FITMAN system into one or two more production lines in the factory of Pamplona, in order to prove the system into different location and ensure the efficiency and sustainability of the

solution. Additionally, the implementation of the solution into other European factories of TRW would be desirable. For that purpose, the expansion will last about 6-7 months.

**T8.2 core team question:**

Could you give details on the evaluation of the timescale for the development of the expansion?

The budget of the expansion is between 50k -150k €.

From now to M30, during the duration of the project, the pilot in the factory of Pamplona will be finished in order to provide a robust and complete solution. Additionally, the final planning of the expansion will be discussed with TRW in order to define the solutions that will be implemented, when, where, etc.

In the next 6-12 months after the project (until M42), the expansion already planned will be implemented in the production lines and factories selected.

**4.2. Evaluation based on the T8.2 defined criteria**

This chapter reports the result of the evaluation performed by the T8.2 core team based on the answers of the trial to the questionnaire.

**Evaluation criteria for the questions No. 1 and 2:**

Coherence on the technical and business aspects of the expansion scenario with the initial developments

**Evaluation result:** The expansion plan is perfectly consistent with the initial developments, as it aims to deploy the same technology and processes into different production lines and plants in the company.

**Evaluation criteria for the questions No. 3 and 4:**

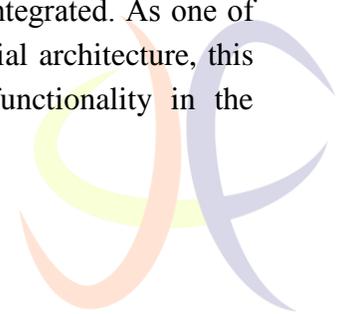
Number of new functionalities, Number of new processes

**Evaluation result:** No new functionalities and processes are planned: the existing ones are going to be contextualized differently (but see also evaluation of answer #5 below).

**Evaluation criteria for the question No. 5:**

Number of new GEs, Number of new SEs

**Evaluation result:** Two more SEs from FITMAN's Open Call will be integrated. As one of these is DyVisual, which has no functional counterpart in the current Trial architecture, this choice casts some doubts on the previous assertion (i.e., no new functionality in the expansion): some clarification is probably needed.



**Evaluation criteria for the questions No. 6:**

Availability of the data is mandatory

**Evaluation result:** Trial data will be made available online and in real time to the Phase III developers involved in the expansion.

**Evaluation criteria for the questions No. 7 & 10:**

A reasonable lead time compatible with the duration of the FI PPP programme (M24-M42)

**Evaluation result:** The expansion plan is fully compatible with the Phase III timing, leaving enough room for development and experimentation.

**Evaluation criteria for the questions No. 8 & 9:**

Cost compatible with the potential financial support offered in the FI-PPP Phase 3 to the SMEs or WE (Web Entrepreneurship) in charge of the development.

**Evaluation result:** The draft business plan for the expansion looks sound and reasonable. TRW seems to have a clear, perceived interest in pursuing these objectives and to provide full support to Phase III developers. No mentions of actual costs are found in the Trial's answers, but it seems likely the company is going to invest in this activity, so probably Phase III budget size will not be a problem.

**4.3. Result of the SEIA for the expansion scenario**

In terms of potential socio-economic impact, the TRW trial in its current form is expected to primarily impact positively on employment, economic growth and society as per the analysis in D9.3. This is only one of two FITMAN trials who are expected to have a positive impact on three socio-economic factors. The other trial is Consulgal, which will be discussed in Section 8.

In its current form, the TRW trial is ranked second in terms of potential socio-economic impact as per D8.1. The trial has received the maximum score on the three impact areas considered in D8.1, and we note here that the proposed expansion is expected to have a significant further positive impact in all areas. The expansion will demonstrate the wider applicability and generalisability of the technologies increase the chances of uptake and success within TRW, but also increasing the potential impact on the manufacturing industry as a whole.

For this reason, the TRW expansion is recommended from a socio-economic perspective.

Rating: 3/3



## 5. Expansion proposition analysis of the Trial No. 3 AgustaWestland

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This section reports on the expansion proposition of the trial AgustaWestland.

It is structured in three sections:

- First, the expansion scenario through the answers of the trial to the questionnaire.
- Second, the results of the evaluation.
- Finally, the SEIA of the expansion scenario.

### 5.1. Answer of the trial to the questionnaire

The questionnaire was sent on August the 4th, 2014 the answer to the questionnaire was received on July 2<sup>nd</sup>, 2015.

**Question No. 1:** Describe the scenario of the expansion you envisage starting from the existing solution

The AW use case aims with the management of documentation used during the production of helicopters in the Final Assembly Line (FAL). The circulation and manipulation of data among the different actors of the digital aeronautic scenario is a key to improve the efficiency of the daily work operations by several actors especially from the point of view of quality and configuration control. A possible extension to the scenario is correlated to the improvement of the visualization and manipulation of data. Information like 3D CAD of items (coming from CATIA system) can be visualized by 3D web based visualizer components, 3D items can be injected into a virtualized environment in which the user is immersed and can interact with objects, information about images can be visualized into picture slider, etc. In this way the components installed on the helicopter could be immediately associated with the digital data (part number and serial number) which identify them in the documents.

**Question No. 2:** What are the reasons for which you propose an expansion of your trial? Why do you think you have the potentiality to develop the expansion?

Management of information is quite a common topic on the IT sector. Aerospace can get beneficial from advanced interfaces developed for other domains. As well digital IT companies can test its own applications on dummy data from an important domain.

**Question No. 3:** What existing scenarios would be impacted by the envisaged expansion?

AW Trial has two main business scenarios:

*Business Scenario 1:* Support for monitoring and management of tools tracking in FAL/LiVo Safety is a must in all aeronautical activities also in Final Assembly Line where many complex operations are performed during the mounting of a helicopter. As a consequence to encourage workers to a positive attitude towards safety and to discourage unsafe behaviour and practices is a best practice. To achieve this goal, it is important to train workers on the procedures to be followed in carrying out his activities and on the aspects of human factors; knowledge of human factor helps to avoid potential risk situations.

In order to avoid FOD currently BCWs are required to attend periodically refresher courses relevant to Human Factor generic topics. The business objective is to improve the effectiveness of training of those courses.

### *Business Scenario 5: Digital Logbook Repository*

During FAL operations several different documents are produced linked to the Helicopter final delivery. The search of some of these documents or some single data is sometimes long and not so easy to be accessed from other departments that can need this information. The main functionality implemented by AW trial is a graphic user interface that aggregates and correlates data from different sources and display them to the user requiring them.

*Below is the impact of the expansion on each scenario:*

Both the two trials developed aims with management of digital data (documentations on helicopter production and report about use of tools) and the final results are shown in tables made up of numerals and letters (alpha-numeric form) aggregated according to different keys (part number, component producer, live time limit, tool error code, etc.) and visualized by means of a Client Graphic User Interface. The efficacy of the data visualization will be improved by means of graphics information, such as interactive 3D, pictures, schematics, etc., which facilitate the user in the understanding of information or the location of component on the helicopter.

**Question No. 4:** What Business Processes would be impacted by the envisaged expansion?

In the AW Trial we identified two main business processes:

*Business Process 1:* Support for monitoring and management of tools tracking in FAL/LiVo

Before starting his work the BCW takes the necessary tools from the smart tool box according to what is described in the work card. The smart tool box records different kinds of events linked to tool usage (who gets and who returns the tools, forgotten tools, etc.). The Manager queries the system through the Tools Statistic Monitor window, inserting the start date and the end date of the period he wants to monitor in order to highlight the wrong behavior occurred in the period. The information is viewed through the Event Administrator Graphic User Interface and is used to prepare a report to optimize training.

The process could be impacted by the envisaged expansion during the visualization of the data providing additional multimedia data (image of tool, toll location in the smart tool box, etc.).

### *Business Scenario 5: Digital Logbook Repository*

The Quality Production Manager queries the system inserting the tail number of a helicopter. The system queries the relevant data from different sources transparently for the user. Also in this case the process could be impacted by the envisaged expansion during the visualization of the data providing interactive 3D in order to have a better understanding of the component and his location in the helicopter by means of a virtualized environment in which the user is immersed and can interact with.

**Question No. 5:** Do you intend to use the existing Platform and which one? Do you have an idea on which GEs/SEs you could need?

The vision for extension will still use the Digital and Smart platforms developed for FITMAN providing them with capabilities to show multimedia information. Both the scenarios will require enablers with functionality for interactive visualization of 3D content on the Web. Candidate GE to achieve the expansion could be 3D-UI-XML3D.

**Question No. 6:** Are the data available for this expansion?

We should remember that, in the aerospace industry, the circulation of information is strongly limited for reasons of confidentiality. For example, source repository for 3D graphics is CATIA environment where graphic models are integrated with helicopter design data; as a consequence the models must be cleaned of sensitive data before made it available. The proposed expansion must address this issue before to be implemented.

**Question No. 7:** Which are the main technical-economic conditions for such expansion?

From the point of view of our internal process:

- In Digital trial we gain in terms of efficiency since information will be easier to understand;
- In Smart trial reports will be enriched with graphic information that will be used in preparation of training course.

**Question No. 8:** What are the consequences of this expansion on your organization?

The extended solutions provide scenarios to make use of interactive 3D graphics of helicopter component and the availability of a virtual world where locate them. This allows a quicker understanding of the information even if coming from different legacy systems. As the first result a reduction of misunderstandings due to the difficulties in reading alphanumeric data is expected. As a consequence the expansion scenarios will play an important role in optimizing quality control.

About economic conditions, at this moment, is only the monetary value needed to develop and put in place the news scenarios.

**Question No. 9:** Do you have an idea of the cost and the Benefit of this expansion?

At this time we have not made any study of cost-benefit related to the expansion in AW trials.

**Question No. 10:** Indicate the scope and timescale of the envisaged expansion

The main objective of the envisaged expansion is to improve the actual FITMAN platform with additional features to enrich the application with respect to 3D graphics visualization. Based on the scenarios presented and the brief analysis of the necessary enabler and technical challenges behind it, we estimate that the completion for development, integration, testing and roll out of the envisioned expansion scenario will take about a time of 6 months.

## 5.2. Evaluation based on the T8.2 defined criteria

This chapter reports the result of the evaluation performed by the T8.2 core team based on the answers of the trial to the questionnaire.

**Evaluation Criteria for the questions No. 1 and 2:**

Coherence on the technical and business aspects of the expansion scenario with the initial developments.

**Evaluation result:**

The focus of this expansion is on management of documentation used during the production. This expansion plan is consistent with early plans, since it seeks to integrate the ICT components more tightly with existing systems for data visualization and manipulation. The

motivation of both Aerospace and IT domains to collaborate on the subject of Management of information is mentioned.

**Evaluation criteria for the questions No. 3 and 4:**

Number of new functionalities, Number of new processes

**Evaluation result:**

Additional function is planned for management of digital data, but only within the context of incremental changes to existing functionality. BS1 (Support for monitoring and management of tools tracking in FAL/LiVo) will be improved, though it is recognised that there may well be some short-term detrimental impact. BS5 (Digital Logbook Repository) will contribute to improve BS1 by using a graphic user interface.

**Evaluation criteria for the question No. 5:**

Number of new GEs, Number of new SEs

**Evaluation result:**

The plan is to extend the existing Digital and Smart platforms with multimedia visualisation capabilities. A specific GE has been identified which may be a suitable basis for this work. However, it should be noted that such extension will require additional effort (resource and time) as well as testing (see Evaluation of Nos. 7 & 10 below). This implies some level of risk.

**Evaluation criteria for the questions No. 6:**

Availability of the data is mandatory

**Evaluation result:**

Trial data will only be made available to Phase III if Intellectual Property Right and confidentiality issues can be addressed.

**Evaluation criteria for the questions No. 7 & 10:**

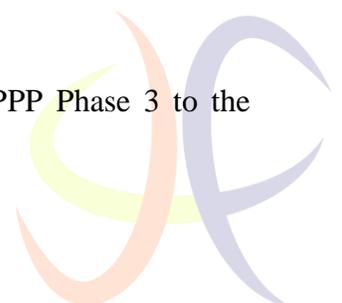
A reasonable lead time compatible with the duration of the FI PPP programme (M24-M42)

**Evaluation result:**

Apparently there is no difficulty for technical-economic conditions but it is not analysed in detail. The expansion plan envisages a development period of some 6 months; this would allow six months before the end of Phase III for exploitation.

**Evaluation criteria for the questions No. 8 & 9:**

Cost compatible with the potential financial support offered in the FI-PPP Phase 3 to the SMEs or WE (Web Entrepreneurship) in charge of the development.



**Evaluation result:**

As a consequence on the organization, the expansion scenarios will play an important role in optimizing quality control. No specific cost-benefit analysis has been carried out. Therefore, it is difficult, at this time, to estimate if potential costs could be supported under Phase III.

**5.3. Result of the SEIA for the expansion scenario**

In terms of potential socio-economic impact, the AW trial in its current form is expected to primarily impact positively on employment, and potentially on economic growth as per the analysis in D9.3. The difficulty for AW derives from the complexity of the manufacturing tasks to be completed: employees are constantly expected to update skills and keep abreast of technical changes, whilst customers demand ever increasing sophistication and safety. There is therefore technical benefit in the trial, but this tends to be inwardly focused only.

In its current form, the AW was given the lowest score across the three impact areas (1/5) mainly as a consequence of its specific relevance to this industry only and within this specialised area of data management and visualisation. Impact and expansion are hampered by this niche focus, as well as potential difficulty with IP and confidentiality issues.

For this reason, the AW expansion is not recommended from a socio-economic perspective.

Rating: 1/3



## 6. Expansion proposition analysis of the Trial No. 4 Whirlpool

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This section reports on the expansion proposition of the trial Whirlpool.

It is structured in three sections:

- First, the expansion scenario through the answers of the trial to the questionnaire.
- Second, the results of the evaluation.
- Finally, the SEIA of the expansion scenario.
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### 6.1. Answer of the trial to the questionnaire

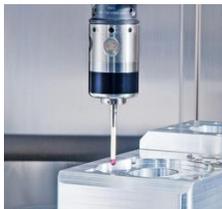
The questionnaire was sent on August the 4<sup>th</sup>, 2014 the answer to the questionnaire was received on September the 8<sup>th</sup>, 2014.

The request for complementary information was sent on February the 23<sup>rd</sup>, 2015 the answer from the trial has been received on February the 26<sup>th</sup>, 2015. An update has been received on the March 27<sup>th</sup>, 2015.

On April the 28<sup>th</sup>, 2015 the last evaluation has been sent to the trials. Hereafter, we give the final answers, including the latest exchange of information from the trial.

**Question No.1:** Describe the scenario of the expansion you envisage starting from the existing solution

The expanded scenario will be based on an extended measuring system, involving a new hardware (3D scanning system) and an enhanced mechanism to identify defects or process drifting and using an innovative approach to send 3D pictures to the users.



Currently the measurement of complex parts is carried out manually with physical or optical gauge system able to detect one measure a time. This operation is time consuming and, consequently, is carried out within a Statistical Process Control, based on sampling rate very low. Moreover, the more complex the part the more points need to be collected increasing both the operation time and the management of the data, with the consequence that those kind of quality controls are seldom made and only for very critical parts. In the expanded scenario, the scan 3D system will act as a potential IoT object and as a source of big data. The data measurement will be then treated by new DyCEP component in order to analyze data and generate events based on the deviations of the component versus its design. Events will then be treated as already experimented in BP2.

**Question No.2:** What are the reasons for which you propose an expansion of your trial? Why do you think you have the potentiality to develop the expansion?

The expansions allow integrating a completely new field of measuring and have a very important business rationale: currently Whirlpool has no capability to manage properly complex measurement (e.g. stamped parts, assemblies etc.) and thus the expected quality on

those parts has to be achieved through extra work. The expansion is furthermore completely integrated with the initial scope of the trial (i.e. using data to empower better decision making) and within the existing business processes. Whirlpool has been seeking such a system for a long time, although previous attempts were not completely brought to success mainly because of

- 1) Inconsistency of scan time (usually minutes) with take time (60 sec) made the old scan system relegated to metrology room, so very close from production line.
- 2) lack of integration between the gauge system (i.e. the equipment making the measurement) and the further data management.

The new scan system provided by Datapixel and the improved data elaboration capability provided by FITMAN system can actually change the game and allow Whirlpool to reconsider the adoption of 3D Scan system to make on-line measurement.

Whirlpool Operation Manufacturing Quality is involved in the evaluation of the system and will constantly provide support and feedback to its development.

**Question No.3:** What existing scenarios would be impacted by the envisaged expansion?

The expansion is impacting BS2, Big Data. The 3D scan system can be seen as a big data source: considering an online scan for a medium complexity part the amount of data generated could be very large and thus is perfectly adherent to Big Data Scenario.

Once properly analysed, the data can generate events (e.g. parts not in range, part defects etc.) that can be forced to mobile users to help them take decision.

**Question No.4:** What Business Processes would be impacted by the envisaged expansion?

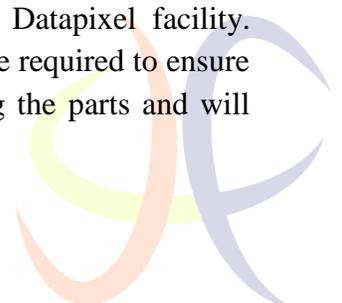
Both Business Processes will be impacted: BP1, Event Generation, will be enhanced by a new source of data able to generate Events; and BP2, Event Delivery, will be enhanced by an improved way to visualize the event related to a 3D measurement.

**Question No.5:** Do you intend to use the existing Platform and which one? Do you have an idea on which GEs/SEs you could need?

The Expanded Smart Factory platform will be used. It is also planned to add the 3D scan system SE provided by Datapixel and currently integrated in Digital Platform.

**Question No.6:** Are the data available for this expansion?

Data will be generated by a 3D scan system currently in use in the Datapixel facility. Whirlpool is going to provide the requested number of samples that will be required to ensure a proper design of experiment. Datapixel will generate data by scanning the parts and will provide datasets to FITMAN platform for further processing.



**Question No.7:** Which are the main technical-economic conditions for such expansion?

It is fundamental that a 3D scan system is made available to generate scans. This is implying a step condition both from the economical point of view related to the investment cost to acquire and set up the system, and from the technical point of view, since a robust competence is needed to run and maintain such a system. For the trial expansion both of the two pre-conditions will be satisfied by using Datapixel's internal resources.

**Question No.8:** What are the consequences of this expansion on your organization?

It would be a cornerstone to implement complex measurement on-line. The demonstration that a 3D measurement is capable of being placed in a production line and integrated in the MES system will allow, once exploited, to dramatically improve quality. Current approach to gauging system is limited to mechanical measurement or single point laser measurement usually requiring a complex structure (jigs, heads etc.) and limited in number of points, flexibility, accuracy and maintainability. A 3D system will solve all those drawbacks by its nature (measure every point). An improved capacity of measuring complex parts in line has a direct consequence on product quality and performances and transforms to evident benefits for both the consumer and for the company.

**Question No.9:** Do you have an idea of the cost and the Benefit of this expansion?

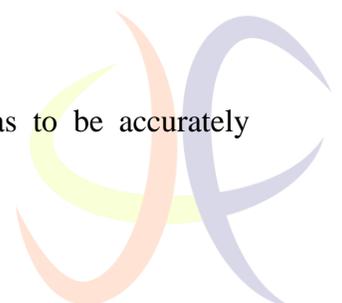
Whirlpool standard cost/benefit evaluation is conducted through a complex business case simulation requiring a lot of data input. For this specific experiment among the direct benefits we can list:

- 1) reduction of TCQ, Total Cost of Quality, represented by:
  - a. reduction of service calls during warranty period
  - b. reduction of parts needed to be replaced during warranty period
  - c. reduction of cost of factory quality operation in case a gauge tool is substituted by this new technology
- 2) improvement of Equipment Efficiency in case the part could be measured just after its production

The cost side has to take into account:

- 1) Total Cost of Ownership
  - a. Equipment acquisition cost
  - b. Installation and start-up cost
  - c. Operating cost (energy, consumable, etc.)
  - d. Maintenance cost
  - e. Labour cost
  - f. Dismissal (EOL) costs.

According to this schema it is quite clear that a cost/benefit ratio has to be accurately computed for each specific case.



Based on the hypothesis of the application to a production line having a production volume of 500kpcs a year these are our rough estimation:

Description of the cost	Costs (k€)
Equipment acquisition cost	150000
Installation and start-up cost	10000
Operating cost (energy, consumable, etc.)	5000
Maintenance cost	25000
Labour cost	40000
Dismissal (EOL) costs	5000
<b>Total cost of Ownership cumulated on 5 years</b>	<b>235000</b>

Description of the benefits	benefits (k€)
4% reduction of service calls	100000
4% reduction of parts replaced	40000
Reduction cost of factory quality operation	125000
Reduction of TCQ cumulated on 5 years	265000
Improvement of Equipment Efficiency	50000
<b>Total Benefit cumulated on 5 years</b>	<b>315000</b>

Of course the real capacity of the system to influence positively the improvement of Quality figures reflecting in a reduction of 4% of the service calls is strongly dependant on the matching between chosen components and gauging capability.

**Question No.10:** Indicate the scope and timescale of the envisaged expansion

The expansion will be focused on the production of microwave ovens which is currently located in Biandronno (Italy) limiting the scope to the measurement of a specific part (a small plastic fan) chosen among a group of components Whirlpool is not currently able to measure, taking into account the size, the complexity and relevance. The parts will be sampled in the production line and sent to Datapixel for measurement. The analysis results will be then examined by WHR Quality experts. The experimentation will last 6 to 8 months.



## 6.2. Evaluation based on the T8.2 defined criteria

This chapter reports the result of the evaluation performed by the T8.2 core team based on the answers of the trial to the questionnaire.

### **Evaluation criteria for the questions No. 1 and 2:**

Coherence on the technical and business aspects of the expansion scenario with the initial developments.

**Evaluation result:** The extension will be based on the extended BP (BP2), and in principle, it seems that there is no new functionalities. Basically Whirlpool wants to extend the measuring system in order to use this data for events to be treated as a source of real-time data in the Whirlpool platform.

**Evaluation criteria for the questions No. 3 and 4:** Number of new functionalities, Number of new processes

**Evaluation result:** Basically the extension will provide more data and with more accuracy, and once analysed will give the user a more realistic view of what is happening in the production line and will allow them to take better decisions.

### **Evaluation criteria for the question No. 5:**

Number of new GEs, Number of new SEs

**Evaluation result:** Whirlpool will use the 3D scan system SE in the trial expansion.

### **Evaluation criteria for the questions No. 6:**

Availability of the data is mandatory

**Evaluation result:** It is not clear initially the amount of data and the availability of this data, due to the fact that the scan system is located outside of Whirlpool premises.

### **Evaluation criteria for the questions No. 7 & 10:**

A reasonable lead time compatible with the duration of the FI PPP programme (M24-M42)

**Evaluation result:** The time frame for the expansion plan is 6-8 months, therefore it is compatible with the Phase III timing, contemplating both, development and experimentation.

### **Evaluation criteria for the questions No. 8 & 9:**

Cost compatible with the potential financial support offered in the FI-PPP Phase 3 to the SMEs or WE (Web Entrepreneurship) in charge of the development.

**Evaluation result:** The most important cost of the expansion would be the 3D scan system. The benefits will come from the improvement of quality, principally. Whirlpool describes an estimation of cost and benefits reasonable based on a business case simulation.

### 6.3. Result of the SEIA for the expansion scenario

In terms of potential socio-economic impact, the Whirlpool trial in its current form is expected to primarily impact positively on the environment and society (with potential economic growth) as per the analysis in D9.3. Like Volkswagen, Whirlpool are increasing their efficiency and competitiveness with the current trial, but the wider impacts are expected to be minimal. However, the trial is expected to have a significant positive impact on the environment and society due to improving the products (e.g., energy reduction and less waste), and customers benefit from more efficient, safe and better quality products.

In the proposed expansion, introducing an extended measuring system at Whirlpool, involving 3D scanning that allows current manual processes to be automated, is expected to increase the societal and environmental impacts as the detection of defects and process driving is increased. Not only is the quality of the products expected to increase as a result of the expansion, but the automation will allow process efficiency to be increased. This will allow a greater impact on economic growth as well.

The measurement system proposed in the expansion has got a wider appeal to the manufacturing section, especially as it is dealing with big data and 3D scanning. As noted in D8.1, the general applicability of the trial outcomes in pre-expansion is indeed possible, but Whirlpool are unlikely to encourage this in order to retain their own competitive advantage.

Due to the expected socio-economic improvements of the Whirlpool expansion, it is indeed recommended from this perspective.

Rating: 2/3



## 7. Expansion proposition analysis of the Trial No. 5 Piacenza

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This section reports on the expansion proposition of the trial Piacenza.

It is structured in three sections:

- First, the expansion scenario through the answers of the trial to the questionnaire.
- Second, the results of the evaluation.
- Finally, the SEIA of the expansion scenario.

### 7.1. Answer of the trial to the questionnaire

The questionnaire was sent on August the 4<sup>th</sup>, 2014 the answer to the questionnaire was received on August the 25<sup>th</sup>, 2014.

On April the 28<sup>th</sup>, 2015 the last evaluation has been sent to the trials. Hereafter, we give the final answers, including the latest exchange of information from the trial.

**Question No. 1:** Describe the scenario of the expansion you envisage starting from the existing solution

The FITMAN project introduces into the company a new advanced monitoring system of the machine. To implement it, it is necessary to add a RDIF tag to fabrics and to trace it. With the same tag and with the support of different sensors and software, FITMAN expansion of Piacenza SF trial can implement a new business scenario, based on physical and geographical localisation of pieces of fabrics. This localisation is set up for Piacenza premises but it can be expanded to logistics and multiple production site localisation, in an integrated and extended IoT scenario which can cope the needs of large and complex industrial architectures.

This application allows the geolocation of the product and it will be settled up to be applied to any industrial reality. Using the experience gained with the FITMAN project, Piacenza aims at a new instrument to physically localise the fabrics within its production areas. This activity is critical to support operators because of 2 main reasons. The first one is that Piacenza IT architecture is based on serial numbers, therefore it is necessary to manage the specific piece and not the general item. The second is that it is very cost consuming to locate specific pieces during production transits, since the production cycle (in particular wet finishing, dyeing and dry finishing) include tens of production passages and it is not possible to store fabrics in warehouses after each passage. Therefore fabrics are, for the major part, stored in carts located in free spaces in the production shop floor. By geo-localisation operators will be able to locate them quickly and without any error. The added information can help identify and reduce “idle times” in the search for merchandise, as well as monitor the path of each piece during its production and study its production path. This information can allow the management of the goods and to locate the progress in the production area.

**Question No. 2:** What are the reasons for which you propose an expansion of your trial? Why do you think you have the potentiality to develop the expansion?

Piacenza believes that the expansion of its FITMAN trial can lead to the opening of new production opportunities. An expansion of the project is needed to enrich the results obtained

by FITMAN pilots towards this new development. For example, if we can have well organized warehouses with positions, it's very difficult to set up the same situation in a production areas, where pieces are in a continuous movements. This geo-localisation tool is aimed at covering this gap by determining the positioning of the pieces of fabric within the company.

In peak periods of the year, when the production is very intensive, a quick localization of pieces is critical to grant a quick production flow, but with the present organization operators are not supported by a proper instrument to physically locate the specified pieces in the production shop floor. On top of this Piacenza operators are used to follow new best practice in order to improve a new solution but a technical third party tool development is needed, aware of hardware and software of Piacenza legacy systems.

**Question No. 3:** What existing scenarios would be impacted by the envisaged expansion?

A wide impact could be considered in the actual trial scenario, since the expected interaction with external production vendors and acquirers implemented within FITMAN textile trial will increase the pressure on production and the potential confusion occasion for operators, who will manage internal pieces and third party ones. The expansion aims at covering this issues and at opening the extended application of this solution to other similar companies of textile sectors of other ones. With this expansion it is possible to create new markets for the application, within and beyond textile boundaries.

**Question No. 4:** What Business Processes would be impacted by the envisaged expansion?

Starting from the current situation in the trial the only business process that could be touched will be the smart factory application, and more specifically the monitoring system. But we guess that any business process should be directly involved.

The work of Piacenza pilot is mandatory to support the future implementation of this expansion into the same production area, and its potentialities can reach a new extended exploitation. Finishing and dyeing flow is non-linear, and its scheduling is constantly evolving, according to production situation. FITMAN proposed expansion will support operators to locate the pieces with specific serial numbers quickly and precisely. Geo-localisation can be applied also in other related sectors, such as yarn and clothing productions, and in different ones with similar issues.

**Question No. 5:** Do you intend to use the existing Platform and which one? Do you have an idea on which GEs/SEs you could need?

FITMAN trial proposed expansion depicts the implementation in the finishing and dyeing departments, where to localize one or more production orders. The usual idea of geo-localization is represented by devices able to define their positions (i.e. GPS) and to transmit them, accompanied by their serial numbers, to an external monitoring system. In the proposed trial the production order is applied only to a RFID tag, so the only information is the serial number saved in it. To localize it requires an external network of devices, able to exploit the information available on the tag.

Some commercial solution are available in the market but they are proprietary and work in close connection with specific hardware. They can ensure that the technology needed to achieve the goal of our idea is available.

Why is the Fi-ware platform important? Because it needs a Network (not only of sensors), which is expandable and can be delocalized in different locations, open to different contemporary end users and under a unique architecture.

As front-end we propose an administrative application and an app for tablet/mobile as navigation system in order to find the target object required.

GE and SE used in the proposed expansion trial are:

- The whole family of the N2ND to discover, connect and manage each node.
- The IoT to acquire, filter and route the information.
- From FITMAN project a Shop floor Data Collection.
- From ENVIROFI the SE useful to create the navigation system.

Not excluding the other ones, Piacenza trial expansion is potentially closely linked with the following FI PPP Phase III accelerators

- **FI-ADOPT**<sup>4</sup>: FITMAN partner: ATOS. It focused on mobile app that is part of the expansion regarding the user interface.
- **Creatifi**<sup>5</sup>: no FITMAN partners. It's regional and the North Italy is included. It focused on the app and wearable technology;
- **FrontierCities**<sup>6</sup>: FITMAN partner: Engineering. It focused on INSTANT MOBILITY, so localization.

**Question No. 6:** Are the data available for this expansion?

The data are available and provided by Piacenza pilot.

**Question No. 7:** Which are the main technical-economic conditions for such expansion?

It is a prerequisite condition for Piacenza as a Pilot of FITMAN to implement the proposed expansion, which is based on RF-ID technology application to fabrics. It is expected to be implemented in key machineries of humid and dry finishing, and will be extended during the expansion to all production process. The exploitation in related external test beds, like yarn and clothing production, will be explored with the expansion phase.

**Question No. 8:** What are the consequences of this expansion on your organization?

The expansion phase will lead to a precise localization of fabric pieces within all Piacenza premises to support operators and to trace the production path of each one, creating the

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<sup>4</sup> <http://fiadopt-project.eu/>

<sup>5</sup> <http://www.creatifi.eu/>

<sup>6</sup> <http://www.fi-frontiercities.eu/>

information needed for an accurate feedback and management of production scheduling, including lead times and physical flows, actually not managed.

**Question No. 9:** Do you have an idea of the cost and the Benefit of this expansion?

The total costs of the potential expansion trial must be evaluated in detail with the SME in charge of its implementation, and cannot be very accurate in this phase. In relation with the final design of software and hardware architecture they can be expected between 140.000 and 185.000 Euros:

- Hardware: 30.000,00 euro
- Software development: 30 Person/Month + 4500 euro/month = 135.000,00 euro
- Consumables: 5.000,00 euro

### **T8.2 core team comment:**

The budget of the expansion is between 50k -150k € so, perhaps you have to reduce a little the scope.

**Question No. 10:** Indicate the scope and timescale of the envisaged expansion

The proposed expansion can be implemented within and horizon between 12 and 18 months.

## **7.2. Evaluation based on the T8.2 defined criteria**

This chapter reports the result of the evaluation performed by the T8.2 core team based on the answers of the trial to the questionnaire.

### **Criteria for the questions No. 1 and 2:**

Coherence on the technical and business aspects of the expansion scenario with the initial developments.

**Evaluation result:** In the envisaged expansion scenario, new functionalities are contemplated, specifically, new GEs and SEs from other FI PPP projects.

### **Evaluation criteria for the questions No. 3 and 4:**

Number of new functionalities, Number of new processes

**Evaluation result:** This new business scenario implies an internal extension of the trial consisting of the implementation of new tools for the physical and geographical localization of pieces of fabric.

### **Evaluation criteria for the question No. 5:**

Number of new GEs, Number of new SEs

**Evaluation result:** New GEs coming from the N2ND chapter will be used to discover, manage and connect the different nodes; also some of the IoT chapter in order to acquire, filter and route information. A specific SE coming from ENVIROVI project will also be part of the trial expansion in order to create a navigation system. In any case it is not clear the exact number of new GEs/SEs that will be part of the trial expansion. Some more details are needed.

**Evaluation criteria for the questions No. 6:**

Availability of the data is mandatory

**Evaluation result:** Trial data will be provided by Piacenza pilot and will be made available for phase III developers.

**Evaluation criteria for the questions No. 7 & 10:**

A reasonable lead time compatible with the duration of the FI PPP programme (M24-M42)

**Evaluation result:** The time frame for the expansion plan is 12-18 months, therefore it is compatible with the Phase III timing, contemplating both, development and experimentation.

**Evaluation criteria for the questions No. 8 & 9:**

Cost compatible with the potential financial support offered in the FI-PPP Phase 3 to the SMEs or WE (Web Entrepreneurship) in charge of the development.

**Evaluation result:** The total costs are not precise, but taking into account the HW, SW and consumables could be around the 130K – 140K, then is at the limit of the maximum stipulated for the budget for the expansion.

**7.3. Result of the SEIA for the expansion scenario**

In terms of potential socio-economic impact, the Piacenza trial in its current form is expected to primarily impact positively on the environment and economic growth as per the analysis in D9.3. In particular, as noted in both D9.3 and D8.1, the Piacenza trial has got a very high potential benefit to the industry sector as a whole, especially as Piacenza are intending to promote the FITMAN technologies widely. This is expected to remain the case in the proposed expansion as well.

In the proposed extension, the economic growth is expected to increase as a result of improving product management, especially being able to deal with peak workloads, and opening new production opportunities. However, not only is efficiency expected to increase, but the general applicability of the technologies in the trial expansion is likely to increase as well. Not only within the textile industry, but also beyond, as Piacenza expects to create new markets with the application due to its generic nature and benefits.

In the comparative analysis in D8.1, Piacenza was ranked 4 in terms of potential socio-economic impact. The general applicability was scored 3 out of 5, and is the area that the trial expansion is likely to impact the most on. Therefore, from a socio-economic perspective, this trial expansion is recommended.

Rating: 3/3



## 8. Expansion proposition analysis of the Trial No. 6 A.P.R.

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This section reports on the expansion proposition of the trial A.P.R.

It is structured in three sections:

- First, the expansion scenario through the answers of the trial to the questionnaire.
- Second, the results of the evaluation.
- Finally, the SEIA of the expansion scenario.

### 8.1. Answer of the trial to the questionnaire

The questionnaire was sent on August the 4<sup>th</sup>, 2014 the answer to the questionnaire was received on September the 8<sup>th</sup>, 2014.

The request for complementary information was sent on February the 23<sup>rd</sup>, 2015 the answer from the trial has been received on March the 9<sup>th</sup>, 2015.

On April the 28<sup>th</sup>, 2015 the last evaluation has been sent to the trials. Hereafter, we give the final answers, including the latest exchange of information from the trial.

#### Question No. 1: Description of the expansion scenario

For more than thirteen years, the main APR business slogan was “improve the way of doing before doing more”. In this perspective, APR limits the number of its customers and focuses more on the quality of the provided services. Therefore, APR promotes its business activity and supports its customers in finalizing the development and the industrialization of their product. This strategy builds a high valuable sub-contracting collaboration.

Through the proposed FITMAN trial, APR aims to extend the existing IT infrastructure by fully formalizing the specificities of the main collaborative business processes. The targeted FI-based collaboration system will reduce the existing gaps of interoperability when supporting the entire data flow during collaboration. As results, APR targets to:

- Enhance data reliability: when ensuring the traceability of all the collaboration steps. This objective will ensure the compliance of new collaborative projects with appropriate customer’s commitments.
- Efficiency of the collaboration: APR will support its customers more in the optimization of their projects (choice of material composition, transformation scenario, industrialization steps, etc.) than in spending time collecting data.

#### T8.2 core team comment:

We understand that the expansion scenario proposes enriched ways of using the platform, for example, the development and formalization of new collaborative processes. Could you confirm?

#### Trial answer:

The business strategy of APR through the improvement of the collaboration processes can be summarized in the following steps:

1. Improve the existing collaboration processes by integrating new FI capabilities from FITMAN
2. Enhance the efficiency of these processes and measure internally the benefit (time, data quality, productivity, etc.)
3. Assess the satisfaction of customers (customer survey deployed each year)
4. Deploy more the developed collaboration processes with new customers
5. Adapt more (new versions, new releases, etc.) the deployed collaborative process to new customer requirements.

APR management team will drive the evaluation criteria to go through these steps after the analysis of internal (workers, designers, managers) and external (customers, suppliers) surveys.

**Question No. 2:** What are the reasons for which you propose an expansion of your trial? Why do you think you have the potentiality to develop the expansion?

The development of IT architecture is mainly covered by the Enterprise Architecture (EA) vision helping to validate each new IT project at the business, applicative and technical levels. The choice of the ERP system (core IT) or the acquisition of any other IT solution (3D CAD, CAM, etc.) is subject to EA validation by all APR stakeholders in terms of business capabilities and ROI.

Today, the need to support the formalization of the collaborative business processes is validated at the business level: each customer develops specific projects with specific products and collaboration conditions.

At the applicative level, the composition of FI-Ware and FITMAN enablers is targeted to cover the requirement of the targeted collaboration infrastructure. In fact, the APR IT vision analyses already the integration of agile solutions as support for their collaboration processes. The extension of the existing ERP (CRM module) or the integration of an external CRM solution are not retained as solutions due to: the cost of these solutions, their requirements of mandatory data to be deployable, their adaptability to the specific context of an SME, etc. After collecting the business requirement, analysing and testing the selected enables, we can conclude that the successful development of this trial expansion remains in the quality of its detailed specifications at the collaboration patterns.

**Question No. 3:** What existing scenarios would be impacted by the envisaged expansion?

By the development of new collaboration processes, the interaction with customers and suppliers will be formalized through the targeted platform or EDI. The targeted evolution should take into account the main purpose of an SME (doing business to maintain its sustainability). Therefore, the targeted deployment schema integrates progressively customers and suppliers that accept to go through the new collaboration facilities.

The targeted system will cover the interaction with customers and suppliers and will affect the quality of the collaboration. In this context, the new collaboration facilities should be validated as better than the traditional collaboration ways (scan, emails, etc.).

**T8.2 core team comment:** It is unclear if there is new business or not. Could you detail the internal scope of the expansion?

**Answer:**

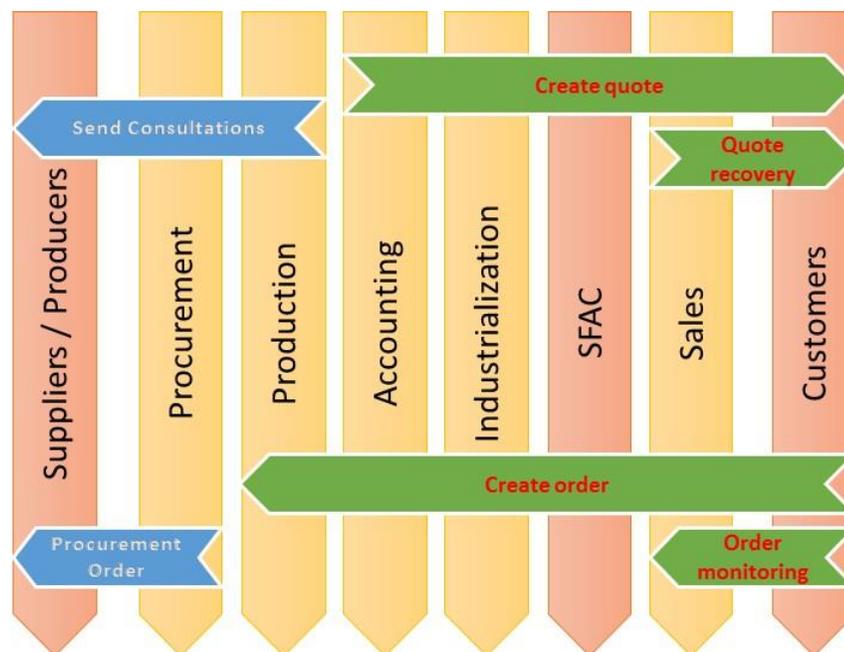
Collaborative business processes are defined in connection with existing business processes. By formalizing interaction steps, several internal processes are impacted and improved:

- The data collection of customer project: the collaboration platform offers structured steps to collect all necessary documents and related data. The structure of the customer project package is enhanced in order to preserve all necessary data and related meta-data. The project searching process becomes structured and fully IT based.
- The generation of project raw material requirements is now traced.
- The correlation between customer class (VIP, B or C), product category (Premium, standard or basic), the treatment flow and the commercial coefficient is now managed through formal business rules.
- The tracking of raw material orders by category: project/production, manufacturing/resource tools, etc.

These processes are partially supported by the implementation of the selected generic and specific enablers as well as the trial specific components.

**Question No. 4:** What Business Processes would be impacted by the envisaged expansion?

The targeted collaboration business processes covers the main interaction gateways of the APR Company: the customer relationship management. The following figure illustrates the overlapping between the core business processes (laid out vertically) and the six collaboration ones (laid out horizontally).

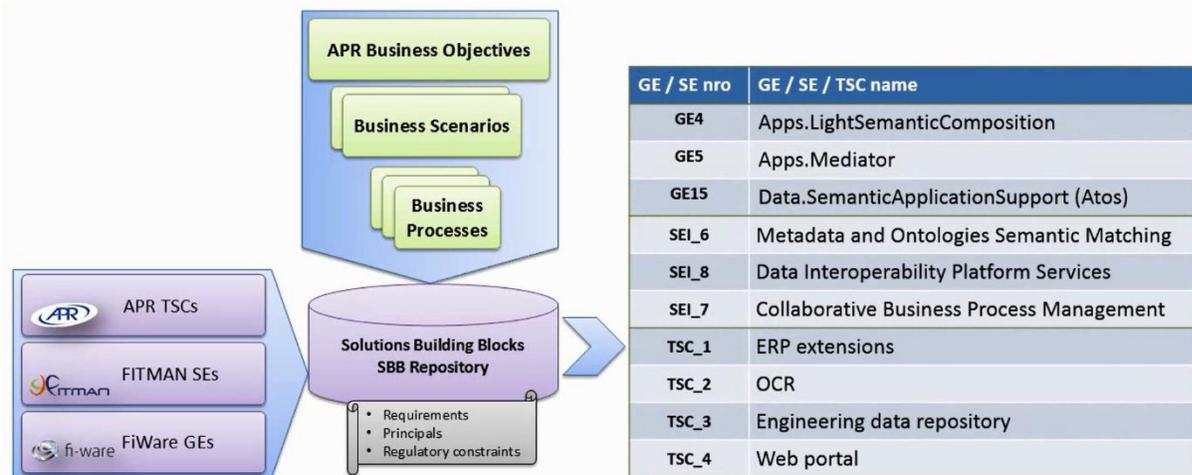


**Figure 2** overlap between collaborative and core business processes

Each one of the listed collaboration business process is modelled with BPMN at the different abstraction levels in order to identify the associated actors and their related business sector.

**Question No. 5:** Do you intend to use the existing Platform and which one? Do you have an idea on which GEs/SEs you could need?

The FITMAN project provides platform specification for virtual factories. This expansion platform concerns a set of enablers helping to compose trial platforms. Regarding the specificities of the targeted collaborative processes and the existing solutions in APR, the following figure illustrates the retained generic and specific enablers as well as trial specific components.



**Figure 3 GE/SE selection**

**T8.2 core team comment:** Could you detail the technical extensions to the IT platform (e.g., new components, new functionality)?

**Trial answer:**

Through the integration of the new IT platform, we extend the capabilities of the new collaborative business processes with new functionalities, such as:

- The collection of customer project packages in one structure repository (engineering data repository) through the integration of alfresco (as TSC) in project submission sub-process.
- The automatic analysis of customer documents through OCR in order to identify project details. Collected data is validated with customer details already structured in their profiles.

These functionalities help to reduce information treatment time and improve its quality.

**Question No. 6:** Are the data available for this expansion?

The main sources to support the targeted business processes are the ERP system and the engineering data repository. In fact, the ERP is the support to collect customer orders in order to generate manufacturing and procurement orders. During the collaboration processes, we implement CRUD services helping to fetch data at the right stage of each order lifecycle. Additionally, the data repository preserves all customer project packages (collection of documents), regulatory contracts, etc.

We plan to use the both systems in order to ensure the integration and the interoperability of the new collaboration solution with existing systems.

**Question No. 7:** Which are the main technical-economic conditions for such expansion?

From the technical perspective, the targeted collaboration platform should be able to support all the specificities of the existing collaborative business processes and ensure the reliability of data treatment. Additionally, the new system should be interoperable with existing legacy ones and the governance issues should be analysed and resolved in order to ensure the sustainability of this new platform.

From the economic perspective, the new collaborative platform should guide customers and suppliers when submitting their projects. It should not present a barrier with complex interfaces or long submission and consultation sub-steps. The same objective is to be considered with APR stakeholders in order to accelerate the adoption of the new solution. The key issue is to fetch in the front-end the data when exist in APR systems and ask end-users for validation or updates, only when required.

**Question No. 8:** What are the consequences of this expansion on your organization?

This expansion aims to support APR stakeholders (sales management, account management, production, etc.) in the optimization of their collaborative processes. In order to ensure the human friendly aspect of the targeted system, APR collaborators are invited to participate in the definition of different front-end layouts. Also, by the end of the optimization phase and before the release of these new processes, we plan to create some quality procedures and work instructions structuring the interaction sub-steps with the collaboration system.

**T8.2 core team comment:** Could you detail the extension of the experimentation's scope (i.e. involve new enterprises). We understand that there is an expansion but limited to the APR network.

**Trial answer:** After the internal validation of APR stakeholder's, each business process is approved by selected APR partners (PILOTE) in order to validate the interaction sequence and its dependencies. After the final release of the new processes, customers are invited to join the platform when they do not have any technical constraint. For the 2015 customer satisfaction survey, the new platform is presented as new accelerator for business collaboration.

**Question No. 9:** Do you have an idea of the cost and the Benefit of this expansion?

At this stage, we can consider the expansion cost as the resulting cost from the trial partners in the FITMAN project. For the benefits, APR targets more the customer satisfaction by providing more collaboration time in the optimization of the customer projects. This satisfaction can be analysed in the future by comparing the evolution of customer projects before and after the implementation of the new collaboration facilities. However, these results can be correlated with several parameters such as 3D prototyping capabilities, fully design subcontracting, etc.

For the cost dimension, the development and the integration of the APR platform is supported by the FITMAN project. The reorganization of APR stakeholders' activities needs to be revised at the perimeter of the platform. The cost of this operation will be seen from quality management side. The calculation model may concern the number of revised procedures or instructions.

For the benefits, the formalization of the collaboration processes details can be seen as a first benefit for the moment. The economic benefit from the proposed platform needs more time and exploitation of APR collaboration capabilities in order to assess it. The assessment of the proposed Business Indicators provides good tendency, but it is difficult to link this tendency to the new platform due to the limited numbers of connected customers and suppliers at this stage of the project.

**Question No. 10:** Indicate the scope and timescale of the envisaged expansion

By the end of FITMAN project, APR aims to test and validate the proposed collaborative processes with two selected partners: one customer (LM Realisations) and one supplier (NetShape). These partners will participate to the assessment of the proposed processes and their interaction interfaces.

After validation, APR plans to communicate about the platform during the annual satisfaction surveys (for customers and suppliers) and organize more specific communication sessions for the partners for whom the integration with the platform is the less costly. After that, APR will continue inviting its partners to test and adopt the solution continuously. There are no issue to impose the platform to APR partners.

## 8.2. Evaluation based on the T8.2 defined criteria

This chapter reports the result of the evaluation performed by the T8.2 core team based on the answers of the trial to the questionnaire.

### Criteria questions No. 1 and 2:

Coherence on the technical and business aspects of the expansion scenario with the initial developments.

#### Evaluation results:

The expansion scenario is aligned with the initial development of APR's IT infrastructure. At the business level, the expansion scenario contributes to the enhancement of information quality and collaboration efficiency. At the technical level, the integration of the selected enablers is coherent with the identified requirements of APR infrastructure and allows to complete the support of the expansion scenario.

### Criteria for the questions No. 3 and 4:

Number of new functionalities, Number of new processes

#### Evaluation results:

The new 6 business processes cover the interaction with customers and suppliers. The new proposed functionalities are:

- Data collection and consistency validation
- Traceability of the generation of project raw material and data
- Improvement of business processes formal business rules
- Tracking of raw material orders by category: project/production, manufacturing/resource tools, etc.



**Criteria for the question No. 5:**

Number of new GEs, Number of new SEs

**Evaluation results:**

In order to support the new business processes, we select, implement, integrate and deploy the list of enablers proposed in the following table:

GE / SE nro	GE / SE / TSC name
GE4	Apps.LightSemanticComposition
GE5	Apps.Mediator
GE15	Data.SemanticApplicationSupport (Atos)
SEI_6	Metadata and Ontologies Semantic Matching
SEI_8	Data Interoperability Platform Services
SEI_7	Collaborative Business Process Management
TSC_1	ERP extensions
TSC_2	OCR
TSC_3	Engineering data repository
TSC_4	Web portal

**Criteria for the questions No. 6:**

Availability of the data is mandatory

**Evaluation results:**

The data is available in the ERP and in the engineering repository but it is not stated if the data will be available to external developers.

The new collaborative platform allows APR to collect customers/suppliers related projects data. This data is manipulated by the different business processes in order to ensure quotes, orders and raw materials lifecycles. All related data are critical and confidential. These data can't be open for external use. For example, a project information package contains several engineering documents (CAD, etc.) and can't be anonymized for external use.

APR proposes to share the business, functional and applicative specifications of the collaborative business processes as well as some best practices and lessons learned regarding the integration of the selected enablers.

**Criteria for the questions No. 7 & 10:**

A reasonable lead time compatible with the duration of the FI PPP programme (M24-M42)

**Evaluation results:**

The lead time to implement the new collaboration processes after the end of FITMAN is not mentioned.

Within the FI-PPP programme, the 6 collaborative business processes are already implemented and tested. The rollout management of each business process is decided with a specific scope of partners that agree to switch to the new collaboration capabilities. APR will continue to improve the business process and integrate new partners after the end the FITMAN project.

**Criteria for the questions No. 8 & 9:**

Cost compatible with the potential financial support offered in the FI-PPP Phase 3 to the SMEs or WE (Web Entrepreneurship) in charge of the development.

**Evaluation results:**

An estimation of the development cost after the end of FITMAN is not proposed.

As APR is not participating in the Phase III, the cost of the development is covered by the FITMAN project. The integrated TSC are mainly open solutions. Only the OCR server is paid and costs an average of 1000 dollars per year.

**8.3. Result of the SEIA for the expansion scenario**

In terms of potential socio-economic impact, the APR trial in its current form is expected to primarily impact positively on employment, with possible societal benefits, as per the analysis in D9.3. However, it may also have a negative impact on the environment due to an increase in plastic and rubber work (emissions, land contamination, noise and water pollution, and waste disposal). This aspect is not likely to change in the trial expansion.

The trial does have a potential for economic growth in the trial expansion, as the technical changes are likely to improve on the collaboration management, allowing APR to support more clients more efficiently. Moreover, the quality of service is expected to increase, so the improvements in customer relationship management may lead to financial increase.

However, the positive impacts that the expansion is likely to have does not have a significant general applicability (as is the current state as discussed in D8.1), nor is it likely to have any wider benefits beyond APR. Compared to the other trials, as discussed in D8.1, this trial expansion is not recommended from a socio-economic perspective, for these reasons.

Rating: 1/3



## 9. Expansion proposition analysis of the Trial No. 7 Consulgal

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This section reports on the expansion proposition of the trial Consulgal.

It is structured in three sections:

- First, the expansion scenario through the answers of the trial to the questionnaire.
- Second, the results of the evaluation.
- Finally, the SEIA of the expansion scenario.

### 9.1. Answer of the trial to the questionnaire

The questionnaire was sent on August the 4<sup>th</sup>, 2014 the answer to the questionnaire was received on August the 20<sup>th</sup>, 2014.

The request for complementary information was sent on February the 23<sup>rd</sup>, 2015 the answer from the trial has been received on March the 6<sup>th</sup>, 2015.

On April the 28<sup>th</sup>, 2015 the last evaluation has been sent to the trials. Hereafter, we give the final answers, including the latest exchange of information from the trial.

**Question No. 1:** Describe the scenario of the expansion you envisage starting from the existing solution

In the construction industry, the Concrete Control Process is the process by which the properties of concrete are measured and monitored from the point of production to the point of delivery to ensure they are compliant with design specifications. Concrete handling and testing is an essential part of any construction project, as concrete is one of the components that ensures resistance and durability of any constructed item.

Concrete testing aims at ensuring that the design characteristics set for this component and for the item in which it will be applied are met by each load arriving at the work site. These design characteristics are related to structural resistance and durability, structural safety, resistance to environmental conditions, etc.

Concrete testing involves the collection of several samples from each truck load arriving at the work site. In complex works, involving a large number of concreting operations, the number of test results generated is significant and can be in the order of thousands, in some cases.

Currently, the trial platform allows (1) concrete class, concrete characteristics and concreting plan to be specified and made available to the stakeholders, (2) to track samples collected and record test results (3) test results to be compiled, analysed and turned into valuable data to assess the compliance of concrete with specifications and to assess that the structure's expected performance is as defined in the design.

In order to optimise the operations and logistics of concrete production we have envisaged some possible expansion scenarios, in order of priority:

- The current application was designed specifically for our case study on the dam. However, the platform must be able to work with any type of structure: bridges, buildings, stadia, etc. It will also need to be adapted to different regulations, depending on the country where the project will be taking place. This will require more flexibility in terms of functionality and in terms of configurability of the system.

- A 3D representation of the project structure indicating where the situations of non-conformity occur.
- Concrete production plants employ computer aided control to assist in fast, accurate measurement of components or ingredients used in the production. The platform should be able to interface in an automated way to obtain the results of the characteristics of manufactured concrete.
- Concrete anomalies usually arise from the concreting operations or from the curing phase. The application should be able to record anomalies as they occur, categorize them and properly associate them with concreting zones. Also the application may include repair measure, if applicable.
- Recommendations from designer, contractor and supervisors regarding service life.
- Integration with a BIM methodology, through a Works Supervision dimension (dimension 6), through which concrete data are inserted and handled by the design application, allowing a more immediate assessment and visualisation of the impact on the project of the concrete loads received. In practice, this is the integration of the previous 5 scenarios with a BIM methodology. This would allow an eventual integration of FITMAN results with the outcomes of Connect&Construct, the sixth demonstration action launched by DG Enterprise and Industry of the European Commission as part of its European e-Business Support Network for SMEs initiative. Nevertheless, this is just a possibility that may eventually be explored in the long term.

**Question No. 2:** What are the reasons for which you propose an expansion of your trial? Why do you think you have the potentiality to develop the expansion?

Concrete works occupy a significant part of the execution phase in construction projects.

Execution of concrete structures is a complex process that includes activities undertaken for the completion of a construction: planning of the entire process, control and monitoring of the concrete production and the concreting process, and documenting the process.

Concrete structures must also comply with national acts, rules, regulations and standards that are essential for concrete structures design, execution and concrete production.

This implies that not only is it important to automate the control of concreting process, but even more important is the flow of communication that must exist between the different stakeholders: contractor, designer and supervisor.

Construction projects must have a functional system to keep the process in control, quickly determine when the process goes out of control, and respond adequately to bring the process back into control.

The expansion of FITMAN solution can help in several ways:

- Control the entire process and determination of the effectiveness and accountability;
- Analysis of sources that can cause failing deadlines, exceed costs and poor quality in construction projects;
- Document the whole process.

The amount of money involved in construction projects of rehabilitation is huge which leads us to implement new projects with a focus more on durability, minimizing possible problems in concreting with a faster decision making when problems occur. The consequence of this is a stronger confidence by the client and a positive impact in the community.

**Question No. 3:** What existing scenarios would be impacted by the envisaged expansion?

Consulgal Trial has three business scenarios:

- Identification of concrete characteristics and Concreting Plan;
- Samples collection and testing;
- Test results treatment and evaluation.

The expected impact of the expansion on each scenario is as follows:

- The first scenario of the expansion affects the three business scenarios because it is an improvement to the existing process.
- The second scenario of the expansion is a new feature and it is an improvement of business scenario 3.
- The third scenario of the expansion affects basically business scenario 2.
- The fourth and fifth scenarios are an extension of the application. We can consider them as a part of a documenting system.
- The sixth expansion does not have a direct impact on the business scenarios, because they are not fundamentally altered by the expansion. However, the approach to each scenario and the way information is used for decision making in the three scenarios may change significantly, due to a more integrated information flow.

It is important to consider that the expansion scenarios will have a big impact in terms of improvement regarding the currently existing functionality. This improvement is not only in the actual business scenarios, but in the new business scenarios that appear as a result of taking into account new aspects of the construction process.

**Question No. 4:** What Business Processes would be impacted by the envisaged expansion?

In the Consulgal Trial we identified seven business processes:

**BS1:** Identification of Concrete characteristics and concreting plan.

BP1. Identification of concrete class and concrete composition process

BP2. Concreting plan process

BP3. Identification, collection and classification of concrete samples process

**BS2:** Samples collection and testing.

BP4. Slump tests results for each concreting operation

BP5. Testing and test results of samples

**BS3:** Test results treatment and evaluation.

BP6. Test results treatment

BP7. Test results evaluation



Below is the impact of the expansion on each business process:

- The first scenario of the expansion affects the seven business process because it is an improvement to the existing process.
- The second scenario of the expansion is an improvement of BP7.
- The third scenario of the expansion affects BP4.

The fourth, fifth and sixth scenarios are an extension of the application. They are new features of the system and do not affect any BPs but complement them.

**Question No. 5:** Do you intend to use the existing Platform and which one? Do you have an idea on which GEs/SEs you could need?

The vision for extension will still use the platform developed for FITMAN. Consulgal FITMAN trial platform provides the solution for the specified business scenarios by integration of legacy systems with FI-WARE GEs (Application Mashup – Wirecloud and Publish/Subscribe Context Broker - Orion Context Broker) and FITMAN SE (Shopfloor Data Collection). The scenarios for extension provide added value over the FITMAN business scenarios, so the extended scenarios will continue to make use of these GEs and SEs.

The extended scenarios are dedicated to provide more functionality for project supervision with faster access to data and interactive display of available data with holistic view of the construction work undergoing at the site. One important aspect which the expansion scenarios want to explore is working towards 3D visualization of the construction project to provide holistic information regarding concreting process and for better decision making to the involved stakeholders by providing automated detection of anomalies with mitigation measures. In addition to those GEs and SEs, the extended scenarios will require the use of some more enablers. Scenario 1 needs to incorporate the workflow and data models for different types of construction project, thus requiring enablers for dynamic workflow engines and model transformation. Scenario 2 will require enablers with functionality for interactive visualization of 3D content on the Web. Scenario 3 will require enabler for integration with the existing legacy system so as to synchronize the data collected from the design and field allowing automated generation of the characteristics of produced concrete and map them with the design requirements. Scenario 4, 5 and 6 will play an important role in decision making, thus requiring enablers for decision support based on the domain of the project and applicable rules and regulations.

Some of the enablers for the extended scenario can be achieved by integration with FI-WARE/ FITMAN enablers with the research implementations being developed at UNINOVA.

**Question No. 6:** Are the data available for this expansion?

Consulgal will ensure the availability of information regarding the different expansion scenarios. Data availability will depend on the existence of ongoing construction contracts; alternatively, it is possible to use historical data from finished construction contracts.

On the other hand, with subsidiaries in Brazil, Macau, Romania, Hungary, Bulgaria, Angola, Mozambique and Libya, Consulgal has the possibility to bring data from different construction projects. These will allow the test of the application with information from various types of construction projects and to expand the experience to other countries.

Additionally, Consulgal is also involved in the project Connect&Construct as an advisory party for Works Supervision and Operation & Maintenance, intended to be BIM's 6th and 7th dimension. This involvement is a great opportunity to have a good idea about the information necessary to allow the integration between FITMAN and BIM.

**Question No. 7:** Which are the main technical-economic conditions for such expansion?

The biggest challenge of the current scenario is the involvement of different external stakeholders. Each improvement of the application determines the involvement of new external stakeholders. This can represent a big constraint for the project. This adds up the technical challenge to design robust access control and workflow engine so as to achieve a stable collaborative platform. In addition the technology transfer and integration with the legacy systems of each of the stakeholders is also seen as a technical challenge.

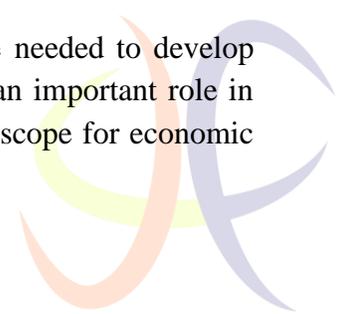
The extension of the project outside the scope of dam construction, increases the complexity of the workflow engine by having to deal with different procedures. At the same time the types of data collected at various phases will become of diverse nature. This poses the technical challenge for the platform to be able to manipulate different task and data models. The extended scenarios require integration of various legacy systems, thus adding up the challenges for interoperability.

Since, the extended solutions provide scenarios to make use of 3D visualization of the project site with almost real-time data, integration of existing 3D modelling tools poses a huge technical challenge. At the same time, various solutions for 3D visualization in the web are not mature enough, thus posing the challenge for integration; testing and validation and improvements. The automated recommendation system will be added values to the proposed business scenarios to reduce efforts in frequently occurring anomalies. This poses the challenge to process and interpret huge amount of data from historical events.

Thus, in general the extended scenarios possess technical challenge for interoperability, 3D visualization and learning systems.

The integration with a BIM methodology may be straightforward on what ICT is concerned. However, there may be issues concerning the Designer's willingness to make the design model available to the Works Supervisor. The main difficulty with this integration may be the clarification of the role of the parties involved (Designer, Contractor and Works Supervisor) under the scope of a BIM methodology.

About economic conditions, at this moment, is only the monetary value needed to develop and put in place the news scenarios. The expansion scenarios will play an important role in optimizing the operations of the construction process, thus having wider scope for economic benefits for the industry.



**Question No. 8:** What are the consequences of this expansion on your organization?

From the point of view of our business opportunities, we can provide a better service to our clients in the following aspects:

- Faster decision making;
- Availability and faster access to information for our stakeholders;
- More flexibility in the process;
- Availability of a tool that has impact on the infrastructure's lifecycle even after construction ends.

From the point of view of our internal process:

- We gain in terms of efficiency since what is now done manually will be done automatically, thus saving time that will impact costs;
- In the long term it will have a positive impact on the company's image, giving the perception of an innovating company.

**T8.2 core team comment:**

Could you details the External extension of the experimentation's scope (i.e., involve new enterprises)?

**Trial answer:**

The solution being developed is a collaborative one: the Designer, the Works contractor and the Works Supervisor (Consulgal) all interact with the application. The solution was developed based on a specific construction project, i.e., the Baixo Sabor Dam, for which there was a specific Designer, a specific Works Contractor and a specific Works Supervisor (Consulgal).

When transferring the application to other construction projects, considering that Consulgal will retain the position of Works Supervisor, the role of Designer and Works Contractor will be carried out by other companies. Additionally, a completely new entity may have to be introduced: the Laboratory. In fact, the situation at the Baixo Sabor Dam, in which the Laboratory was the same entity as the Works Contractor, is not the most typical situation in a construction project; usually, these are two different entities.

Therefore, the expansion of the application to other construction sites will involve other companies in the positions of Designer, Works Contractor and Laboratory. The Contracting Authority (the Client) will also be different, but its interaction with the application is, so far, limited.

**Question No. 9:** Do you have an idea of the cost and the Benefit of this expansion?

At this time we have not made any study of cost-benefit related to the implementation of these new scenarios.

In the first scenario of the expansion, the main idea is to extend the actual FITMAN benefits to other projects.

**T8.2 core team comment:**

Can you propose a calculation of the costs and the benefits?

**Trial Answer:**

It is expected that the costs and benefits will be calculated based essentially on the same factors as those that were used for the current trial (example: reduction of time, reduction of the use of paper, etc.)

**Question No. 10:** Indicate the scope and timescale of the envisaged expansion

The main objective of the envisaged expansion is to extend the actual FITMAN platform to other projects adding more flexibility to the current platform, create new features to enrich the application and create the environment to improve project's service life. We have been identifying six scenarios of expansion:

- The platform must be able to work with any type of structure bridges, buildings, stadia and will be adapted to different regulations depending on the country where the project will be taking place. This will require more flexibility in terms of functionality and in terms of configurability of the system.
- A 3D representation of the project structure indicating where the situations of non-conformity occur.
- Concrete batch plants employ computer aided control to assist in fast, accurate measurement of input constituents or ingredients, the platform will be able to interface in an automated way to obtain the results of the characteristics of concrete manufactured.
- Concrete elements anomalies. Concrete anomalies usually arise from the concreting operations or for the curing phase. The application will be able to record anomalies as they occur, categorize them and properly associate them with zones. Also the application may include repair measure if applicable.
- Recommendations from designer, contractor and supervisors regarding service life.
- Integration with a BIM methodology

Based on the scenarios presented and the brief analysis of the necessary enablers and technical challenges behind it, we estimate that the completion for development, integration, testing and roll out of the first 5 envisioned expansion scenarios will take about a time frame of 3 years. But, each of the scenarios that have been proposed for expansion is self-contained within their own scope and provides added functionalities over the FITMAN solution for Consulgal. This allows a flexible project timespan and continuous integration making it possible to integrate and test enablers in business scenarios independently. The exact estimation of the schedule can be made only after the analysis of the availability of the enablers and maturity of other technologies. The scenarios can be developed as discrete solutions and integrated to the existing platform via continuous integration thus allowing testing of solutions by various Web Entrepreneurs or SME independently.

The timeframe for the sixth scenario is expected to be longer, if it gets to be considered at all; we estimate it at around 5 years. The main difficulty is to clarify how the Works Supervision procedures will change under a BIM methodology scope and how the parties' roles will change under this new frame. This will require a considerable reassessment of works management, even at a European level, before any sort of technical integration is attempted.

**T8.2 core team comment:**

The envisaged time frame a priori is 3 years, but it is noted in the questionnaire that the times depend on the availability and maturity of the enablers and other technologies.

Could you detail as it is obvious three years is too long for this extension, so please reduce the scope. The budget of the expansion is between 50k -150k €

**Answer of the trial:**

This is not an easy exercise. We can eventually say the following:

- First scenario - Expansion to other types of projects: high priority, 6 months;
- Second scenario – 3D representation of structure: very low priority, 1 year;
- Third scenario – connection to concrete producers systems: medium priority; 2 years;
- Fourth scenario – analysis and classification of anomalies: medium priority; 1 year;
- Fifth scenario – impact on service life: low priority; 2 years;
- Sixth scenario – integration with BIM: medium priority; 5 years.

**9.2. Evaluation based on the T8.2 defined criteria**

This chapter reports the result of the evaluation performed by the T8.2 core team based on the answers of the trial to the questionnaire.

**Criteria for the questions No. 1 and 2:** Coherence on the technical and business aspects of the expansion scenario with the initial developments.

**Evaluation result:** The expansion scenario is perfectly consistent with the initial developments of the trial. However, there are different possibilities for the expansion, so it would be better to choose one of the options in order to provide detailed information on it.

**Trial comment:** It is obviously difficult to select one single option, as the document's purpose was to list expansion scenarios. However, intuitively, the scenarios were listed in order of priority; therefore, if we were asked to choose a scenario to start exploring first, we would choose the one listed first, i.e., to adapt the application to other types of infrastructures.

**Evaluation criteria for the questions No. 3 and 4:**

Number of new functionalities, Number of new processes

**Evaluation result:** Some of the possible scenarios provide new functionalities to the current scenarios, and some of them provide an extension of current processes. It has to be highlighted that the impact of all the possibilities seems high, providing relevant functionalities and processes to the original status.

**Evaluation criteria for the question No. 5:**

Number of new GEs, Number of new SEs

**Evaluation result:** In the different extended scenarios new GEs and SEs will be integrated in the current Consulgal FITMAN trial platform. The specific components to be used in each of the options are indicated, as well as the possibility to use research implementations developed at UNINOVA. Therefore, there is a clear idea about the architecture of the expansion.

**Evaluation criteria for the questions No. 6:**

Availability of the data is mandatory

**Evaluation result:** It is mentioned the possible clients and/or subsidiaries to expand the trial, but there is not a clear answer to the data availability.

**Evaluation criteria for the questions No. 7 & 10:**

A reasonable lead time compatible with the duration of the FI PPP programme (M24-M42)

**Evaluation result:** There is a clear estimation about the duration of the integration of the different extension options, very related to the technical and business constrains. Based on the priority and possibilities of the scenarios, the most suitable one should be chosen in order to provide enough time to Phase III partners for the development and experimentation.

**Trial comment:**

Our first priority is estimated to last 6 months, thus in line with the Phase III timeframe.

**Evaluation criteria for the questions No. 8 & 9:**

Cost compatible with the potential financial support offered in the FI-PPP Phase 3 to the SMEs or WE (Web Entrepreneurship) in charge of the development.

**Evaluation result:** the cost compatibility will highly depend on the extended scenario chosen, so an evaluation cannot be done at this point.

**Trial comment:**

We believe our first priority is compatible with Phase III's cost and time frame.

**9.3. Result of the SEIA for the expansion scenario**

The analysis presented in D9.3 shows that the Consulgal trial is expected to have positive impacts in three of four possible areas: environment, economy and societal impact. Alongside TRW, discussed in Section 4, this is one of only two trials to have such broad positive impacts. As described in the analysis of D8.1, the Consulgal trial is expected to have a very high impact both in its industrial sector and more widely, in fact being the top-rated trial according to the metrics used in D8.1.

The Consulgal vision for expansion involves six different scenarios, as described above. Among other things, these will broaden the current scenario to account for other types of structure beyond dams (i.e. bridges, buildings, and stadia), as well as incorporating technologies such as 3D representations and computer-aided control for measurement. Further, the expansion scenarios introduce additional entities, including the Laboratory, widening the network of stakeholders.

Overall, the additional scenarios both broaden the scope of the current scenario but also complement it with additional features. The expansion scenarios stand to improve the already high impact of the trial. Considering the above factors and the ranking of this trial by D8.1, this expansion scenario is recommended.

Rating: 3/3

## 10. Expansion proposition analysis of the Trial No. 8 TANet

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This section reports on the expansion proposition of the trial TANet.

It is structured in three sections:

- First, the expansion scenario through the answers of the trial to the questionnaire.
- Second, the results of the evaluation.
- Finally, the SEIA of the expansion scenario.

### 10.1. Answer of the trial to the questionnaire

The questionnaire was sent on August the 4<sup>th</sup>, 2014 the answer to the questionnaire was received on February 10<sup>th</sup>, 2015.

The request for complementary information was sent on March the 2<sup>nd</sup>, 2015 the answer from the trial has been received on March the 4<sup>th</sup>, 2015.

On April the 28<sup>th</sup>, 2015 the last evaluation has been sent to the trials. Hereafter, we give the final answers, including the latest exchange of information from the trial.

**Question No.1:** Describe the scenario of the expansion you envisage starting from the existing solution

Virtual Factory – SMECluster

The SMECluster platform within the trial is concerned with the selection of business opportunities and their associated matching to SMECluster member's profiles aiming to ensure maximum relevancy. The facilitator role within SMECluster is responsible for overall management of opportunities and the addition of new opportunities. The impact of the facilitator and the tools they use to carry out their roles impacts on the nature of the service delivered. The legal framework with which this service provision operates is covered by the standard agreements specified on application for membership.

Legal framework considerations include the following:

- The way in which members are selected in relation to business opportunities and the suitability and accuracy of results generated by the system
- Multiple members may select to operate collaboratively on an opportunity, how their combined capability profiles are matched against the resulting consortium can have a significant legal impact
- Once members accept a business opportunity the characteristics and performance of the tools offered with the framework to assist in conducting the opportunity and those that mediate their collaboration with partner companies affect the service provided
- How information and interests of competing members and collaborative groups are stored and handled within the framework is a consideration.

One of the continuation plans is to create a catalogue of GE's and SE's and make them available to resell on SMECluster Platform.

The expansion scenario now includes added features provided by the trial expansion partners DITF and STI. These features are provided by their SE's called MoVA and GeToVA which bring new functionality to the SMECluster platform. MoVA allows the management and definition of Assets by additional tools for the facilitator. By defining a domain and linking suppliers and assets together, the portal is now able to pull together new clusters that could deliver the required tender.

The GeToVA SE allows data to be imported into SMECluster by mapping supplier databases and pulling them through with the required format. This feature makes the management of tender opportunities more automated and opens up the platform to new business domains.

**Question No.2:** What are the reasons for which you propose an expansion of your trial? Why do you think you have the potentiality to develop the expansion?

The work started in FITMAN was just the beginning of the process to delivering resalable bites of software in the form of GE's and SE's. If the licensing issues are now cleared up then the re-use or re-sale of the software become much easier. SMECluster is set up as a business portal and of course it needs to offer products and services relevant to business. The GE and SE resale opportunities need to make business sense regarding the overall value proposition.

T8.2 core team question: Do you want to add new justification for potential expansion?

TANet is a beneficiary of a new project called CREMA (Horizon 2020 – FoF 1 – 2014: Process optimisation for manufacturing assets) in which the concepts developed in FITMAN can be brought into Cloud-based Rapid Elastic Manufacturing. This can be achieved through the development of the FITMAN Innovation Lab to provide additional plugins and functionality to CREMA via the SMECluster platform. This offers a new marketplace for FITMAN GE's and SE's.

**Question No.3:** What existing scenarios would be impacted by the envisaged expansion?

The Tenders opportunity facilities would be made more robust. Additional functionality could be added so that the user gains more features from the same software. The expansion of the trials have already enhanced the offering of the cluster but of course much of the work is conceptual as you would expect from an EU project and therefore much more work will need to be done and potential investments need to be considered to look at a more robust solution.

A new feature to sell services and not just business opportunities will now be considered as SMECluster becomes a reseller of FIWARE GE's and SE's provided through the FITMAN Innovation Lab.

i.e. the link through of FIWARE > FITMAN Innovation Lab > SMECluster.



**Question No.4:** What Business Processes would be impacted by the envisaged expansion?

Although SMECluster exists and is active, it is still not performing the role that it was set up to do. It is meant to enable the member SME's to concentrate on their core offerings without worrying about the bureaucratic nightmare of filling in numerous repetitive forms and business to meet the criteria that larger private companies and public bodies demand from business today. Since there are no automated services available currently, members are no better off by joining SMECluster as they are still required to do repetitive paperwork.

**Question No.5:** Do you intend to use the existing Platform and which one? Do you have an idea on which GEs/SEs you could need?

The GE's and SE's have been incorporated within the SMECluster platform. All the standard GE's and SE's that are used in the trial would be renewed with additional one being considered and demonstrated in the existing platform.

**T8.2 core team comment:** Do you intend to add new GE/SEs?**Trial answer:**

The SMECluster platform may be able to offer new GE/SE's depending on what terms are agreed to resell the initial GE/SE's. Control 2K who provide the technical and IT services to SMECluster are more than capable of creating new GE's and SE's and have already got a number of products that fit the requirements on many manufacturing companies.

**Question No.6:** Are the data available for this expansion?

Yes we have access to the Welsh Automotive forum network of companies (200+) and in addition TANet / Control 2K / Sematronix already have their own database of companies that they offer services to which is in excess of 2000 Clients so as long as the security of the data can be assured, the would not be a problem in targeting this data base.

**Question No.7:** Which are the main technical-economic conditions for such expansion?

Many SME's are always looking to find new business and the way that SAAS is developing, it is the way that future business will be conducted.

**T8.2 core team question:** Do you want to add information? Can you justify more precisely?**Trial answer:**

Clearly there is a move from product based businesses (creating or reselling products that are typically licensed and supported individually) to service based businesses who offer a complete turnkey operation so that the customer has a single point contact and is typically paying for use of the service but has no ownership of it. Clearly with the development of the FITMAN Innovation Lab, new opportunities will open up to expand the portfolio of SMECluster to look at new marketing opportunities and provide additional technical consultancy either directly or as official resellers of the FIWARE product range.

**Question No.8:** What are the consequences of this expansion on your organization?

We could end up employing more people. The idea scenario would be that SMECluster becomes the UK hub for FIWARE enablers via the FITMAN Innovation Lab and create a community of developers that would use the portal to share and enhance ideas. SMECluster could be a delivery platform and service provider for SaaS developments based on the current FIWARE model.

**Question No.9:** Do you have an idea of the cost and the Benefit of this expansion?

We are assuming that we should be able to save on Employee costs (i.e. using existing staff without the need to expand immediately) by working more effectively and so we can utilize the current staff to more profitable business. One of the problems with the current model is that SMECluster is too manual effort intensive so it is important to automate as much of the offering from the cluster as possible.

**T8.2 core team question:** Can you propose a calculation of the benefits?

**Trial answer:** It would be difficult to create a precise calculation matrix as each technology company has a completely different way of operating and producing software as any other. What is clear is that by using re-usable code as provided by the GE/SE's, clearly there is a time saving and therefore a cost benefit. The only way to evaluate this would be to challenge two or more Technology providers to write a piece of software for a defined functionality with one provider writing the code from scratch and the other(s) using FIWARE Enablers.

**Question No.10:** Indicate the scope and timescale of the envisaged expansion

It will take place over the next 3 years. There is much work to develop the exploitable elements of the FIWARE GE's and SE's and the issue of licensing is assumed that if you enhance the functionality of the GE's or SE's then you have the right to jointly own the enhanced GE's and SE's

**T8.2 core team question:** Could you give more information on the timescale with the development and implementation times because 3 years is a long time for this type of project. What is the minimum of time to get some results?

**Trial answer:** The FITMAN project is only really designed to test the GE's coming from FIWARE with the supplementary SE's provided by the FITMAN technical partners. The tests have concluded that the GE's coming from FIWARE are in a very diverse state of operation. Some GE's work and can be integrated into existing systems with minimal work. Others either don't work as they are supposed to and need much more time to decode and modify/interface with existing systems. Whilst individual functionalities are potentially deployable immediately, the process of pulling together several GE's and SE's and providing additional code for features not covered by the FIWARE catalogue can take a long time to test, evaluate and validate. Hence the realistic timeline to have a working product or service with a wide variety of features fit for use in industry is at least 3 Years.

## **10.2. Evaluation based on the T8.2 defined criteria**

This chapter reports the result of the evaluation performed by the T8.2 core team based on the answers of the trial to the questionnaire.

### **Criteria questions No. 1 and 2:**

Coherence on the technical and business aspects of the expansion scenario with the initial developments.

#### **Evaluation results:**

The expansion scenario is aligned with the initial development. It aims to bring additional functionalities to the SME Cluster platform. The key feature in terms of adding functionality to the portal without rewriting customized code was the big attraction to using the GE's and SE's.

### **Criteria for the questions No. 3 and 4:**

Number of new functionalities, Number of new processes

#### **Evaluation results:**

New functionalities to improve the Tenders opportunity facilities was the key objective of the trial. If FITMAN could bring more functionalities to the portal for reselling Tender opportunities to members, then Sematronix could extend the capabilities of the SMECluster portal to resell software and services to individuals who could use the GE's / SE's in their own portals as well as their clients. So this would be the new proposed facet of the SME Cluster as a reseller of FIWARE GE's and SE's which may be provided through the FITMANovation Lab.

### **Criteria for the question No. 5:**

Number of new GEs, Number of new SEs

#### **Evaluation results:**

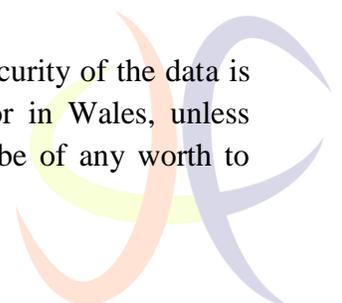
It is unclear if new GEs and SEs are part of the expansion scenario development.

### **Criteria for the questions No. 6:**

Availability of the data is mandatory

#### **Evaluation results:**

The data is available and can be available to external developers if the security of the data is assured. Since the data is very much focused on the automotive sector in Wales, unless someone specifically needs to know about this sector, it is unlikely to be of any worth to anyone else.



**Criteria for the questions No. 7 & 10:**

A reasonable lead time compatible with the duration of the FI PPP programme (M24-M42)

**Evaluation results:**

The time needed for the expansion of the platform seems to exceed the period of FI PPP Phase III and aims to be at least three years. The reason TANet is interested via its members Control 2K and Sematronix is that the platform needs to have a wide variety of features fit for use in industry. We assume that some of the functionalities could be developed during the FI-PPP Phase III timeframe. It would be interesting to give some indications.

**Criteria for the questions No. 8 & 9:**

Cost compatible with the potential financial support offered in the FI-PPP Phase 3 to the SMEs or WE (Web Entrepreneurship) in charge of the development.

**Evaluation results:**

No estimation of the development costs has been provided.

**10.3. Result of the SEIA for the expansion scenario**

As described in D9.3, the TANet trial is expected to impact positively on both employment and economic growth, particularly by more effectively linking actors in the relevant networks. The network-oriented nature of this trial means that it stands to impact on a broad range of actors in its current form. For this reason, it is rated highly in D8.1 in terms of potential benefits to the immediate industrial sector and to industry more widely: D8.1 ranks TANet's trial as the third most impactful trial.

The expansion scenario described here involves improvements to the trial by which better management and definition of assets is enabled (allowing new clusters to be formed) as well as better mapping and formatting of supplier databases (providing greater automation and opening the platform to new business domains). The trial owners anticipate a broad impact of the expansion scenario, with access to the Welsh automotive forum (200+ companies) as well as an internal database of over 2000 companies. As such, it is recommended that the expansion scenario will continue to increase the impact of this trial on the local industry.

Rating: 3/3



## 11. Expansion proposition analysis of the Trial No. 9 COMPLUS

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This section reports on the expansion proposition of the trial COMPLUS.

It is structured in three sections:

- First, the expansion scenario through the answers of the trial to the questionnaire.
- Second, the results of the evaluation.
- Finally, the SEIA of the expansion scenario.

### 11.1. Answer of the trial to the questionnaire

The questionnaire was sent on August the 4<sup>th</sup>, 2014 the answer to the questionnaire was received on July the 10<sup>th</sup>, 2015.

**Question No. 1:** Describe the scenario of the expansion you envisage starting from the existing solution

The expansion of this use case will enable further development of the scenario and the capability to be established in other similar networks of interlinked suppliers. The scenario will include further enrichment of the knowledge base for other sources of data and information. The network manager will be able to search for suppliers and develop alternative configurations of the supply network for a specific product.

**Question No. 2:** What are the reasons for which you propose an expansion of your trial? Why do you think you have the potentiality to develop the expansion?

The present developments will be used further development of additional functionalities for an advanced configurations and transparency of supply networks. This will add value for the network manager in the provision for more complete services

**Question No. 3:** What existing scenarios would be impacted by the envisaged expansion?

The expansion of this trial will have mainly impact on the trial for an improved transparency and configuration of the supply networks.

**Question No. 4:** What Business Processes would be impacted by the envisaged expansion?

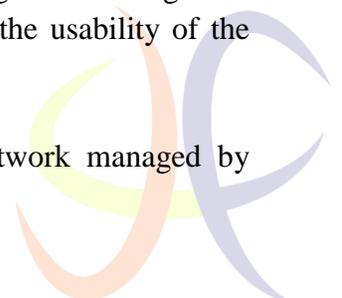
Bothe business processes form the scenario for (1) an improved transparency and configuration of supply networks as well as (2) supplier search will be improved from the envisaged expansion.

**Question No. 5:** Do you intend to use the existing Platform and which one? Do you have an idea on which GEs/SEs you could need?

For this scenario we will use the platform for Virtual Factories, using the existing GEs enriched with the FITMAN SEs and newly developed GEs to improve the usability of the platform.

**Question No. 6:** Are the data available for this expansion?

The expansion will be based on the data from the LED Lighting network managed by COMplus



**Question No. 7:** Which are the main technical-economic conditions for such expansion?

The main condition will be the functionalities of the platform for virtual factories and the support for the used GEs and SEs.

**Question No. 8:** What are the consequences of this expansion on your organization?

Fraunhofer IPK will further develop its methodologies and capabilities for configuration and transparency of supply networks.

**Question No. 9:** Do you have an idea of the cost and the Benefit of this expansion?

The expansion will engage about 34 PM.

**Question No. 10:** Indicate the scope and timescale of the envisaged expansion.

The expansion should be developed and tested within 18 months.

## 11.2. Evaluation based on the T8.2 defined criteria

This chapter reports the result of the evaluation performed by the T8.2 core team based on the answers of the trial to the questionnaire.

### Criteria questions No. 1 and 2:

Coherence on the technical and business aspects of the expansion scenario with the initial developments.

### Evaluation results:

The expansion scenario is aligned with the initial development, targeting expansion on two axes: (i) extension of the existing network to include more participants and more data; and (ii) inclusion of additional function, in support of more services and solutions. This will add value for the network manager since he will be able to search for suppliers and develop alternative configurations of the supply network for a specific product. However, it could be interesting to indicate the difficulty to find other sources and also to indicate the potentiality to develop the expansion.

### Criteria for the questions No. 3 and 4:

Number of new functionalities, Number of new processes

### Evaluation results:

For the scenario, new functionalities are required to improve transparency and configuration of the supply networks. Two business processes are impacted: configuration of supply networks and supplier search.

### Criteria for the question No. 5:

Number of new GEs, Number of new SEs

### Evaluation results:

The trial intends to use the platform for Virtual Factories, existing GEs and FITMAN SEs but no precise information is provided on the newly developed GEs.



**Criteria for the questions No. 6:**

Availability of the data is mandatory

**Evaluation results:**

The data is available from the LED Lighting network managed by COMplus but it is not indicated if the data could be used by external developers.

**Criteria for the questions No. 7 & 10:**

A reasonable lead time compatible with the duration of the FI PPP programme (M24-M42)

**Evaluation results:**

The time needed for the expansion of the platform (18 month) seems to be compatible with the period of FI PPP Phase III (with some probable adjustments). The technical condition for the expansion depends on the functionalities of the platform for virtual factories and the provided support.

**Criteria for the questions No. 8 & 9:**

Cost compatible with the potential financial support offered in the FI-PPP Phase 3 to the SMEs or WE (Web Entrepreneurship) in charge of the development.

**Evaluation results:**

The impact on the organisation depends on the relation with Fraunhofer IPK which is in charge of development. 34 PM is mentioned but no estimation of the development costs and benefits is provided.

**11.3. Result of the SEIA for the expansion scenario**

In terms of potential socio-economic impact, the COMPlus trial in its current form is tentatively expected to have impact on employment, the environment and on economic growth as per the analysis in D9.3. The main challenge for COMPlus lies with the already disparate and fragmented industry landscape, with many very small manufacturers who may not necessarily wish to collaborate and work together effectively. This will compromise any positive benefits the trial may have.

In its current form, the COMPlus was assumed to have some impact in two areas (scoring 2/5), but unlikely to have impact in the third (1/5: for General Applicability). As such, continued investment may not achieve any substantial impacts or benefits longer-term. The fragmentation of the sector would also introduce additional challenges and may compromise even the modest impacts envisaged.

For this reason, the COMPlus expansion is not recommended from a socio-economic perspective.

Rating: 1/3



## 12. Expansion proposition analysis of the Trial No. 11 AIDIMA

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This section reports on the expansion proposition of the trial AIDIMA.

It is structured in three sections:

- First, the expansion scenario through the answers of the trial to the questionnaire.
- Second, the results of the evaluation.
- Finally, the SEIA of the expansion scenario.

### 12.1. Answer of the trial to the questionnaire

The questionnaire was sent on August the 4<sup>th</sup>, 2014 the answer to the questionnaire was received on August the 26<sup>th</sup>, 2014.

The request for complementary information was sent on March the 2<sup>nd</sup>, 2015 the answer from the trial has been received on March the 4<sup>th</sup>, 2015.

On April the 28<sup>th</sup>, 2015 the last evaluation has been sent to the trials. Hereafter, we give the final answers, including the latest exchange of information from the trial.

**Question No. 1:** Describe the scenario of the expansion you envisage starting from the existing solution

BS1 is mainly focused on Product Development (Research) and Marketing Departments that want to know what the future market trends and customer demands will be in, for example, furniture. Mainly all these departments do this manually, that is, they get on the internet and manually search for these pieces of information named *weak signals* that if repeated, could potentially become trends. It is a very long process that lasts nearly a full year of reviewing hundreds of sources and copying examples for further group discussions.

FITMAN can seriously shorten this. AIDIMA's scenario is geared towards the furniture market and technological institutes, mainly, in traditional sectors like textile, tiles ... related to home decoration (inside & outside) or even any other sector. The use of this solution can be extended to have the information organized to understand how the information is affecting my product development processes.

BS2 focuses on designers that must get inspired by end users in order to develop new products. The question is how to find out what my clients like. Again, today this is done mainly through fairs, consumer polls and feedback from clients at store level, previous designs, etc. But this marketing landscape has changed. At present, consumers' opinions and discussions are located in several Internet platforms such as blogs, social media, forums, etc. mainly in casual text messages and even through symbolic elements (i.e. the Like symbol in Facebook or the emotional icons accompanying text messages). Hence, it is necessary to create new tools for identifying and measuring critical customer sentiment toward brands and products. This trend will even rise in next years as portable widgets use will spread among consumers.

In FITMAN, designers and decision making people such as marketing managers and upper management will have tools to access customer opinions and sentiment analysis to get first-hand information about companies, brands and products. Expansion is a logical next-step as this is an extremely powerful tool that any company would want to get. The solution will be for any manufacturing company in furniture sector and any other sector. The coveted question: “is there a way I can find out what my buyers want?” has already been answered. Difficult to expand.

BS3 deals with the need to connect designers’ work, with manufacturing. Today manual processes and traditional methods using phone, email, to exchange ideas, sketches, are used when developing new ideas for product development and when connecting key decision making people.

FITMAN will bring designers a common platform to stay «connected» in order to facilitate all brainstorming processes (data exchange, product versioning, decision making tools, secured access, etc.).

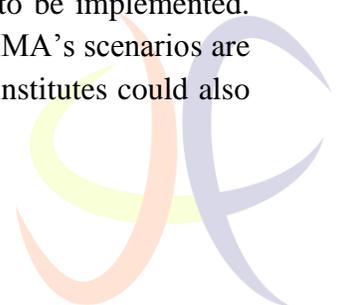
Expansion is also desirable since collaborative tools like these are much wanted in any kind of designing process, or decision making process; It is necessary to provide intelligent tools that will expand product design, with sales and marketing, production and logistics, because design is not only about aesthetics. Basically in any kind of process where two or more people must get together to come up with ideas, decisions, interchange of opinions, and so forth. In this way, BS3 could extend current PLMs, and ERPs with complex decisional systems, where time to market is reduced, considering needs coming from social trends. The Production managers can be involved in the extension of the platform having an organize repository for:

- Good Practices to share my experiences
- Legislation about all kind of products, countries, rules for exporting/importing,
- Risks Prevention
- New alternatives for packaging based in specific requirements
- Maintenance of Machineries

**T8.2 core team comment:** Apparently, the extension would consist of an external extension of the Business Scenarios both inside and outside furniture sector, but it is not contemplated new business scenarios for AIDIMA. Did we understand correctly?

**Trial answer:**

The three business scenarios have not changed since they were originally envisioned. It is just BS3 that had to wait for the open call to get the necessary components to be implemented. The solutions proposed can be extrapolated to other sectors although AIDIMA’s scenarios are mainly focused to the wood and furniture industry. Other technological institutes could also benefit as other manufacturing companies.



**Question No. 2:** What are the reasons for which you propose an expansion of your trial? Why do you think you have the potentiality to develop the expansion?

The big potential of BS3 makes the whole scenario a great candidate for expansion. Although, currently they are mainly related to the furniture sector, they can be easily thought for other sectors. To have the possibility of exchanging ideas, documents, to classify relevant information coming directly from production managers is a great deal.

Migration to other companies / sectors should not be a major task since the core of the solution and the business processes involved do not vary. Therefore, developing an expansion does not necessary have to mean undergoing a huge task, but understanding the business idea and how the business processes are aligned is key to ease all expansion efforts.

Basically, any of the business cases can be easily thought outside furniture since the needs obtained from all of them are common to any company that want to make money. For instance, all companies want to know what their clients are thinking, what they like and what they think of the competition. This is just an example but the scenarios are subject to many more industries.

**Question No. 3:** What existing scenarios would be impacted by the envisaged expansion?

Initially the three scenarios will have a big impact when expanded to other sectors or companies. The transition can be easily done just by following the core business processes of each BS involved. Starting from the current manual processes that are common today in these companies, implementing FITMAN should be “easy” to expand.

**Question No. 4:** What Business Processes would be impacted by the envisaged expansion?

The defined BSs in AIDIMA’s Trial must be maintained as they are and there is no need to change them. Manual processes exist today in those companies, and the BS is thought to aid those processes, i.e. automate them.

Anyway, for sure, there will affect product design, marketing channels, production and shipment planning.

**Question No. 5:** Do you intend to use the existing Platform and which one? Do you have an idea on which GEs/SEs you could need?

When thinking to expand to other companies or sectors, the initial platform holds true as it is right now. It was thought to address the needs of each use case, and a potential expansion initially would need the same components such as GE/SE. Currently these components are:

- GE Unstructure Data Analysis by ATOS: This GE is the primary software component for our BS1. It will analyse automatically the already existing sources of information (textual and if possible, also multimedia content) and will (i) generate a list of weak signals (words, adjectives, pronominal sentences) with statistics about its relevance and (ii) for each term submitted, a number of references (sentences where the word appears) will be returned.
- GE Wirecloud Application Mashup by UPM: It will integrate heterogeneous data, application logic, and UI components (widgets/gadgets) sourced from the Web to

create new coherent and value-adding composite applications. It will serve as front-end “window” for BS1 specifically.

- **GE Data Public Subscriber by TIM:** It implements interface and functionality supporting context data acquisition from context sources or providers by application, services or end-users. It also allows to the context providers to be registered in the systems with their specific context information and entities they are serving. Then any "external" entity needed certain or all available context of a certain entity can obtain required information by requesting or subscribing to the instantiated Publish/Subscribe GE instance.
- **SE Unstructure and Social Data Analytics by NTUA:** This SE will serve as primary component for BS2. It will make use of the widely available social media cloud, in the form of blogs, forums, twitter, Facebook that has been previously targeted by analysts and designers. Furniture concepts, brands, hashtags, trends, etc., from social media platforms will be obtained as well as a customized opinion mining analysis in order to identify topics, sentiments and trends that will facilitate actors their work with the goal of attending more in detail to the final customer real needs.
- **SE Collaborative 3D Web Viewer by DFKI:** this open call SE is intended to provide designers of a tool to view CAD/CAM designs collaboratively, adding to BS3 more functionality.
- **EC Virtual Obeya by Holonix:** this open call SE will be the key component of BS3 as it tries to automate the process of design by building a fully collaborative platform in order to orchestrate all the different processes involving all actors. Thus, all materials produced during all initial brainstorming sessions can be shared among all stakeholders involved. Product versioning, secured access, orchestration algorithms and decision making tools will be present in this platform that will make the product creation more innovative, collaborative and productive.

### **T8.2 core team comment:**

Do you intend to add new GE/SEs? Are you willing to use the current platform in all 3 business scenarios (BS)?

### **Trial answer:**

The GE/SE don't change. Current modification and improvements to them are currently being done as testing progresses.

### **Questio No. 6:** Are the data available for this expansion?

Regarding BS1, data are available and volume increases each year, as it is based on thematic Internet sites about furniture and home trends. BS1 tools are needed for managing such a huge volume of data that at present can be hardly gathered and analysed by trend experts.

On the other hand, data for BS2 depends on the notoriety and brand positioning of each company that is going to be assessed. The more well-known a brand is, the more consumers input will be available in Internet sites. In this case data is formed by consumers' comments or any other symbolic information about preferences towards products and brands. Data may be available in two kinds of sources: 1) Internet sites owned by the firm or brand where users

may interact (i.e. own blog, forum, etc.); 2) third-parties collaborative Internet sites (i.e. home trends blogs, design forums, decoration social media, etc.). Currently BS2 is extracting data only from Facebook pages and Twitter accounts.

Finally, for BS3 data are available within the companies that would take part in the expansion. In this case, design files are intellectual property of the firms or their designers, so data would be used only under their permission and for internal purposes. It is expected that data formats will need to be homogenized for an appropriate interaction amongst users (as each designer may be prone to use particular design software, not always interchangeable with other formats). All type of relevant documents will be shared following the IPR rules.

**Question No.7:** Which are the main technical-economic conditions for such expansion?

There are no expected difficulties for the expansion, but only possible if FITMAN partners support the hosting and upgrading. Technically, the only troubles may arise for BS3, as it depends on the design flowchart within each firm: it will depend on the number and user profiles of people interacting in the new product design process and the internal network features.

**Question No.8:** What are the consequences of this expansion on your organization?

Expanding BS1 to other national technology centres will reinforce AIDIMA's leadership in strategic alliances for trends research with ceramics (tiles) and textile centres.

Expansion of BS2 will serve as benchmarking of new services for retailing and design brands in the furniture sector, as well as improving user-centred innovation internal processes for identifying latent needs for further R+D projects.

Expansion of BS3 with real firms will update our understanding of current new product development processes, identifying needs for further solutions in the industry. Eventually, interaction amongst designers and managers through a FITMAN-based tool could be extended to the integration of real users in the process. If FITMAN is able to engage also production managers, the success is assured.

**Question No.9:** Do you have an idea of the cost and the Benefit of this expansion?

Regarding BS1 expansion should be low cost, implementation in other centres would be always guided and monitored by AIDIMA, with highly expected productivity benefits for trends analysis and communication to companies.

BS2 benefits are expected to be in the marketing field, through a better understanding of user satisfaction/dissatisfaction issues. Associated costs for firms would be the fee for using the FITMAN tool.

BS3 benefits are expected mainly for private firms, as it would ease and accelerate the exchange of relevant information for product development decisions. Expected costs would be hiring the FITMAN solutions to AIDIMA and the cost of adapt internal networks for the implementation of BS3.

**T8.2 core team comment:**

Can you propose a calculation of the cost and the Benefit?

**Trial answer:**

Not at the moment.

**Question No.10:** Indicate the scope and timescale of the envisaged expansion

At this moment, we can only estimate the expansion of the actual solutions. In the short-term (2014 and 2015) the expansion of BS1 could be implemented in two more technology institutes (ceramics and textiles). In the long- run (beyond 2015), AIDIMA could offer the tool to other centres as AIDIMA is part of REDIT (network of technological institutes in Valencia Region) and FEDIT (network of technological institutes all over Spain). In this sense, several industries could adopt the FITMAN-based solution for trends research in other industrial areas (food, plastics, energy...).

On the other hand, BS2 and BS3 could be easily implemented for private firms starting in 2015. Scope would reach both furniture manufacturers and retailers, in the extent they have a corporate strategy based on added-value in design and promotion of own brand.

We have to analyse the requirements for technical extension in BS3 for production information very deeply.

**T8.2 core team overall recommendations:**

AIDIMA should use the present tense (instead of the future one) when talking about what the current FITMAN platform is providing.

The dimension of the expansion seems important and should be reduced. It might be necessary to choose among the 3 business scenarios. The budget of the expansion is between 50k -150k €



## 12.2. Evaluation based on the T8.2 defined criteria

This chapter reports the result of the evaluation performed by the T8.2 core team based on the answers of the trial to the questionnaire.

### **Evaluation criteria for the questions No. 1 and 2:**

Coherence on the technical and business aspects of the expansion scenario with the initial developments.

**Evaluation result:** The expansion scenario is consistent with the original one, since it focused on the extension of the original developments and processes (collaborative tools, trend analysis tools, etc.) to other sectors (out of the furniture sector) or companies. Anyway, it would be desirable to have more details about concrete sectors or companies to perform this expansion phase, and maybe to reduce the scope and choose one of the scenarios, defining more specific actions.

**Trial comment:** In order to decide which scenario to choose from the trial three, full testing must be performed on each of them, something that has been impossible so far, due to delays, bugs, and lack of support (discontinued sometimes) of some of the components.

### **Evaluation criteria for the questions No. 3 and 4:**

Number of new functionalities, Number of new processes

**Evaluation result:** There are not new functionalities and business processes in the expansion scenario. There is not a need for them in the AIDIMA extension, since the same capabilities and processes developed in the original scenario can be transferred to a new company or sector.

**Trial comment:** Exactly, all business processes can be easily extrapolated to other sectors since they coincide with the business needs of many of the companies.

### **Evaluation criteria for the question No. 5:**

Number of new GEs, Number of new SEs

**Evaluation result:** Apparently, there is no intention to implement new GEs or SEs, so the same components and platform will be used. Anyway, deeper information of this point is needed to complete the evaluation.

**Trial comment:** See comment to criteria for the questions 1 & 2.

### **Evaluation criteria for the questions No. 6:**

Availability of the data is mandatory



Evaluation result: Most of trial data will be made available, coming from very different sources and users. Data coming from Internet sites and social networks will be open to Phase III developers, but design files or other company's documents will be shared following the IPR rules.

**Evaluation criteria for the questions No. 7 & 10:**

A reasonable lead time compatible with the duration of the FI PPP programme (M24-M42)

**Evaluation result:** The scope of the expansion is oriented to the 3 scenarios are involved. Due to the time available for the expansion, it would be better to focus on one of the scenarios, in order to leave time to the Phase III partners for development and experimentation.

**Trial comment:** See comment to criteria for the questions 1 & 2.

**Evaluation criteria for the questions No. 8 & 9:**

Cost compatible with the potential financial support offered in the FI-PPP Phase 3 to the SMEs or WE (Web Entrepreneurship) in charge of the development.

**Evaluation result:** Even if the three scenarios are good option for the extension, due to time and budget restrictions, the target of the expansion should be defined at a Business Scenario level.

**12.3. Result of the SEIA for the expansion scenario**

According to the analysis in D9.3, the AIDIMA trial is expected to impact positively in the area of economic growth. The D8.1 analysis of impact shows reasonable benefits from the AIDIMA trial within its own industrial sector as well as some applicability within manufacturing as a whole, and for that reason it is ranked reasonably well in D8.1 (6/10).

The AIDIMA expansion scenario involves extension to other companies and sectors, as well as improved understanding of user satisfaction and the extension of current systems with complex decisional systems. AIDIMA have identified specified technology institutes and centres that could benefit from the expansion, including technology institutes and other centres.

Given the expected positive impacts and wider applicability of the current and the expansion scenario, this expansion scenario is recommended.

Rating: 2/3



### 13. Comparative evaluation of the trials: results of the D8.1

This chapter presents the D8.1 outcomes and focuses on the current situation of the trials in three domains:

- The business aspects measured with the progression of the Business Performance Indicators (BPIs). In fact, we have used the evaluation of BPIs at M27 provided in D7.2.
- The technical aspects measured by the Technical Indicators (TIs) provided by D8.1.
- The Socio-economic impact of the solution provided by D8.1.

Business aspect evaluation given by D7.2:

Trial no	Trial Name	Progress TOBE3 / Target of all the PIs per trial
2	TRW	179.10%
7	CONSULGAL	139.00%
4	WHIRLPOOL	107.90%
11	AIDIMA	102.40%
5	PIACENZA	100.40%
3	AGUSTA WESTLAND	100.00%
8	TANET	90.60%
1	VOLKSWAGEN	85.80%
6	APR	74.60%
9	COMPLUS	66.80%

Table 3 D8.1 Trial Progression ranking taking in account TOBE3 values

For the Technical Indicators, the following figure displays the Average value of the 7 Technical Indicators (see section 4.2 Technical Aspects and Indicators in D8.1) for adopted GEs by each trial.

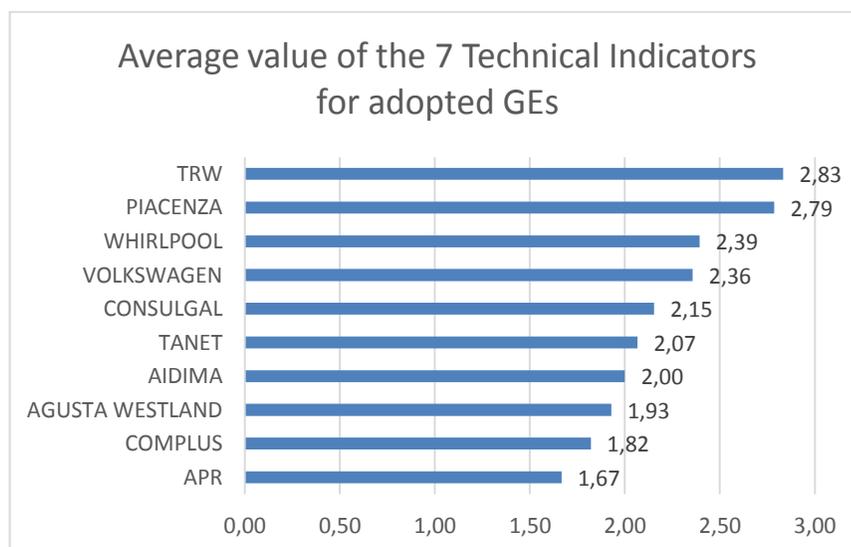
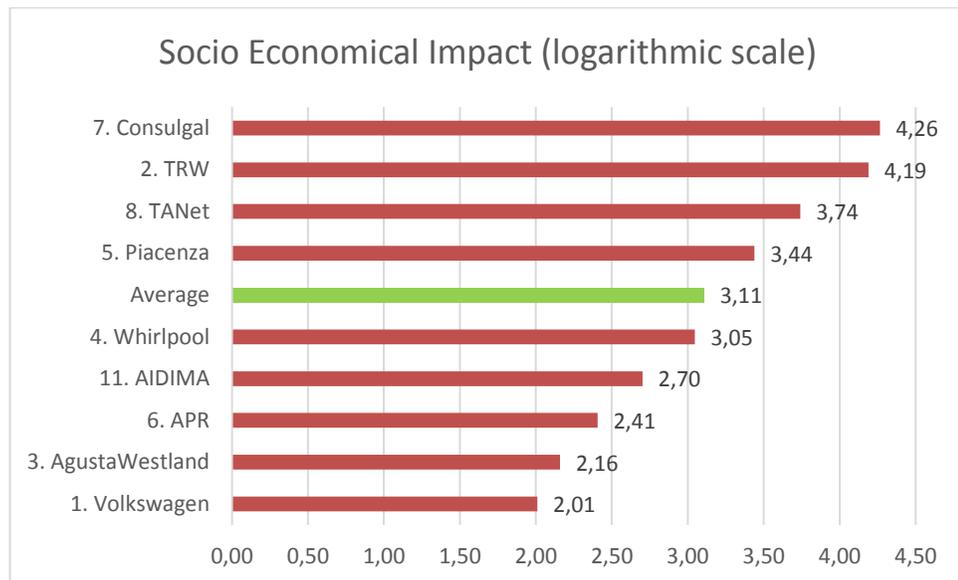


Figure 4 D8.1 Average value of the 7 Technical Indicators

Another important element to consider is the estimated Socio Economical impact that the implementation of the FITMAN platforms in different Trials could bring. In the following chart the ranking of the envisaged impact for the Trials is represented (please consider that the exercise to date is not complete for COMPLUS).



**Figure 5 D8.1 Socio Economical Impact ranking**

Please note the index is in logarithmic scale to allow a readable plotting and the aim of the chart is to display the relative ranks.



## 14. Evaluation and selection of the trials

The selection of the trials has been performed by the core team of T8.2 using the three points of view:

- The evaluation of the trials' expansion scenario based on the collect of information,
- The analysis from the deliverable D8.1 that encompasses the current performance of the trials based on their business, technical and socio economic aspects (see chapter 13),
- The Socio Economic Impact Analysis for the expansion of each trial.

The following subchapters present a synthesis of each point of view and the results of the final selection.

### 14.1. Synthesis of the evaluation based on the collect of information

Based on the answers of the trials to the questionnaire, a list of criteria was determined. For each of the criteria, we asked the T8.2 core team to evaluate the trials' answers.

The results of the qualitative evaluation are given in the appropriate section of each trials' chapter.

In order to rank the trials, based on the evaluation of the questionnaire, we need to convert the qualitative evaluation into a numeric value.

For each criterion a score is given using the following scale:

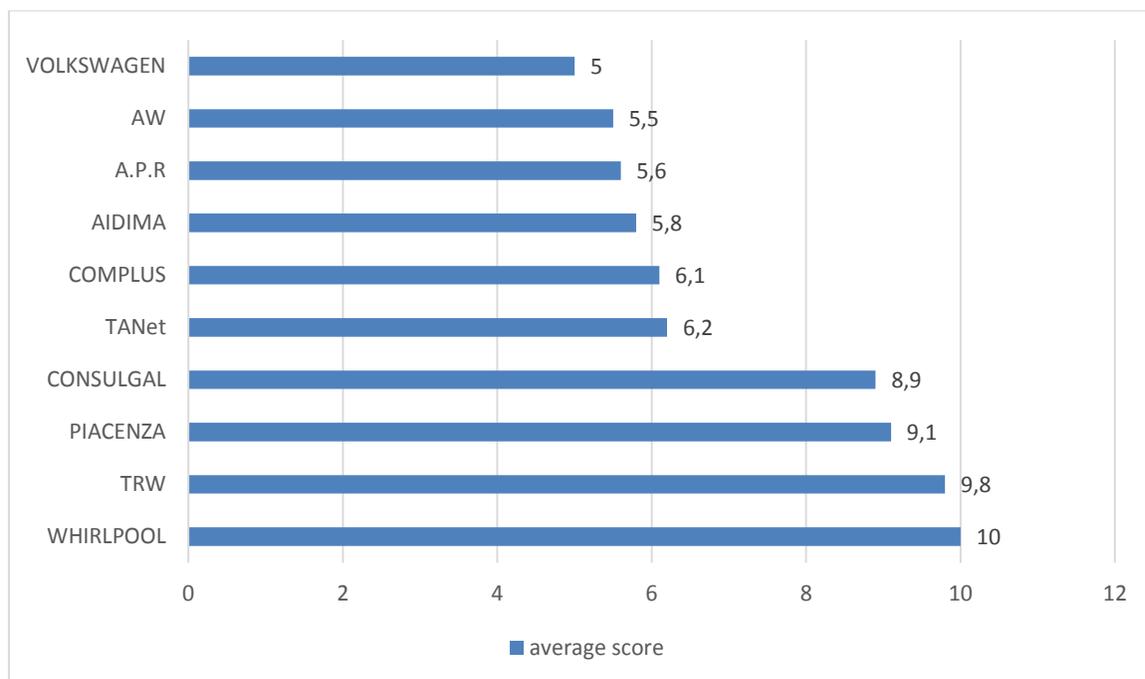
- The answer of the trial does not fulfil the criteria or is insufficient: score 0 point.
- The answer of the trial meets the criteria with some reserve: score 1 point.
- The answer of the trial fully meets the criteria: score 3 points.

The scores determined by the T8.2 core team trial per trial are reported in the appendix of the document.

Trial	Total score by Innovavia	Total score by ENG	Total score by I-VLab	Total score by Polimi	Average score per trial	Unified scoring for the final selection on 10pts
WHIRLPOOL	16	16	16	18	16.5	10
TRW	16	16	15	18	16.25	9.8
PIACENZA	16	14	18	12	15	9.1
CONSULGAL	14	12	16	17	14.75	8.9
TANet	10	-	9	12	10.33	6.2
COMPLUS	-	-	10	?	10	6.1
AIDIMA	7	-	8	14	9.66	5.8
A.P.R.	8	-	10	10	9.33	5.6
AW	-	-	9	?	9	5.5
VOLKSWAGEN	10	5	11	7	8.25	5

Table 4 synthesis ranking of the results of the evaluations based on the questionnaire

Final ranking of the trials from the evaluation based on the questionnaire:



#### 14.2. Synthesis of the evaluation of the D8.1

In order to perform a ranking of the D8.1 outcomes, the ranking of the different points of views of the trials in their business, technical and socio economic aspects have been converted to points.

The converted values are reported in the table below according to the result of D8.1 presented in chapter 13.

trial no.	trial Name	From D8.1			TOTAL
		Trial Progress (BPI)	Average TI for adopted GEs	Initial Socio Economic Impact	
2	TRW	10	10	9	29
7	CONSULGAL	9	6	10	25
5	PIACENZA	6	9	7	22
4	WHIRLPOOL	8	8	6	22
8	TANET	4	5	8	17
11	AIDIMA	7	4	5	16
1	VOLKSWAGEN	3	7	2	12
3	AGUSTA WESTLAND	5	3	3	11
6	APR	2	1	4	7
9	COMPLUS	1	2	1	4

Table 5 Synthesis and ranking from the D8.1 point of view

For the final selection, a score is attributed corresponding to the final rank ranging from 1 to 10 points in descending order (i.e. the rank 1 is awarded 10 points, the rank 10 is awarded 1 points).

### 14.3. Synthesis of the SEIA for the expansion scenario

This chapter presents a synthesis of the SEIA results for the trials expansions, performed by IT-Innovation.

IT-Innovation has supplied an evaluation using 3 values. I-VLab has transformed these evaluations from 1 to 10 in order to be coherent with the two other evaluations.

**Table 6. Synthesis and ranking of the SEIA of the expansion scenarios**

<b>Trial</b>	<b>Socio-economic impact rating of expansion scenario</b>	<b>Unified scoring for the final selection on 10 points</b>
APR	1	4
Volkswagen	1	4
Whirlpool	2	7
AIDIMA	2	7
TRW	3	10
Piacenza	3	10
Consulgal	3	10
TANet	3	10
AW	1	4
Complus	1	4

### 14.4. Final selection

For each trial, a summary of the three inputs is provided; the selection encompasses the evaluations performed by the T8.2 core team, the T8.1 advice and finally the SEIA for the expansion results.

With a similar method to the one applied to D8.1 outcomes (see section 14.2), points are given to the three final inputs based on their ranks and the total of each expansion scenario is calculated in order to get a final selection. The results are reported in the table below. The ranking has been calculated by applying a weighted calculation to each input:

- Weight 2 for the evaluation based on the questionnaire because it concerns directly the expansion,
- Weight 1 for the deliverable D8.1 outcomes,
- Weight 1 for the socio-economic impact analysis of the expansion scenario.



<b>Trial</b>	<b>Evaluation Based on questionnaire (Weighting: 2)</b>	<b>Advice from D8.1 (Weighting: 1)</b>	<b>Expansion SEIA (Weighing: 1)</b>	<b>Total</b>
TRW	9.8	10	10	39,6
CONSULGAL	8.9	9	10	36,8
PIACENZA	9.1	8	10	36,2
WHIRLPOOL	10	8	7	35
TANET	6.2	6	10	28,4
AIDIMA	5.8	5	7	23,6
AGUSTA WESTLAND	5.5	3	4	18
VOLKSWAGEN	5	4	4	18
APR	5.6	2	4	17,2
COMPLUS	6.1	1	4	17,2

**Table 7 Aggregation of the 3 point of views and final ranking**

Six scenario have been selected which are presented in the next section.

#### **14.5. FABulous winner projects and the 6 FITMAN selected trials**

The work reported in this deliverable has allowed ranking the FITMAN ten trials in order to select 6 of them for the expansion phase:

- TRW scenario which is centred on the implementation of the solution into different productions lines in the shop-floor, in order to demonstrate that the FITMAN technology is suitable for different lines.
- CONSULGAL scenarios have a wide scope ranging from adding 3D representation of the project structure to localize the concrete data to the adaptation of the solution to other types of concrete structures.
- PIACENZA scenario aims to develop a new instrument to physically localise the fabrics within its production areas.
- WHIRLPOOL scenario is based on an extended measuring system, involving a new hardware (3D scanning system) and an enhanced mechanism to identify defects or process drifting and using an innovative approach to send 3D pictures to the users.
- TANet scenario is to implement marketplace capabilities to the SMECluster Platform and create a catalogue of GE's and SE's and make them available to resell on the Platform.

- AIDIMA scenario is to expand the collaborative aspects and bring designers a common platform to stay «connected» in order to facilitate all brainstorming processes (data exchange, product versioning, decision making tools, secured access, social media, etc.).

In order to determine the offer for FITMAN Trials IT expansion and according to its Phase III Strategy, FITMAN has developed collaboration with the FABulous accelerator, selected by EC as one of the 16 accelerator projects.

FABulous FI accelerator is organised following a funnel approach, whereby a large number of start-ups and SMEs are invited to build prototype mock-ups of the Future Internet services they want to develop (service maturity level 1) and then a reduced number of those will be invited to progress to the following phases to pilot their service in cooperation with an industrial partner (service maturity level 2) and finally launch a commercial service to the general public (service maturity level 3).

The FABulous awarded, in its “wave 1”, 53 projects for the development of Future Internet services for 3D printing. The projects have been clustered in four main areas and business topics:

- Advanced content management
- Crowd-sourced and cloud-based services
- Manufacturing & logistics
- Mobile apps

On the basis of the interest expressed by the FABULOUS “wave 1” winning projects to FITMAN solutions, measurable by their attendance to FITMAN webinars and their participation in FITMAN support functional mailing list, FABulous selected 7 of them for further investigation. FITMAN could offer to those projects access to specific platforms, useful industrial data and coaching on the development of FIWARE for Industry services (sharing lessons learned and best practices).

Based on this approach, the trial expansion offer, made by FITMAN, is of particular interest to those projects going into SML2 of the FABulous acceleration programme. In this respect, we can now say that six out of the seven selected FABULOUS projects passed to SML2 and therefore are now suitable to participate in the FITMAN Trials expansion programme.

Here below, we have listed the 6 projects that have been selected as candidates for FITMAN expansion support: 3DQuality, 3DSquare, GnB, KAZZATA, PRINTELIZE, 3DLive. The seventh project (COProdDev) did not pass the SML2 selection.

These projects have been classified in 4 topics: “Manufacturing & Logistics”, “Crowd-sourced and Cloud-based Design & Services for 3D Printing”, “Mobile Apps and Services for 3D Printing” and “Advanced Content Management Related to 3D Printing”.



## **TOPIC 1 - Manufacturing & Logistics**

**3D Quality by Nissatech (SRB):** In many industries (Aerospace, F1), it is important that a manufacturer can ensure that the parts it 3-D prints are free from any defects. In this proposal we present an integrated approach for quality control in additive manufacturing (3D printing) that relies on 3D scanning. Parts are inspected using the 3D scanning equipment to determine their accuracy or more general to calculate the so called deviation map between the model and the produced part. [www.nissatech.com](http://www.nissatech.com)

**3DSQUARE by TRIMEK (ES):** 3DSquare points directly to the sectors (automotive, consumer products, medical...) that in the coming years will be introducing 3D printing and will need robust and traceable processes to assure the dimensional quality of their manufactured goods. 3DSquare project, aims to open a new service to the 3D printing sector integrating 3D optical scanning and certified measuring software with FI based enablers to continuously increase the printing quality reducing the machining phase. [www.trimek.com/en](http://www.trimek.com/en)

## **TOPIC 2 - Crowd-sourced and Cloud-based Design & Services for 3D Printing**

**Knowledgebiz (PT) – CoProdDev:** In the most recent time 3D printing has been mostly being used for smaller individual test product development. But to integrate the technology into the product development process of a manufacturing industry, it is required to bring together different stakeholders involved in product development. CoProDev platform address the need for disparate working environments for the transactional and collaborative processes, according to companies' requirements, markets, or projects, the approach is to virtualize" the e-marketplace.

**3DLIVE by Fabrikáció Laboratórium Kft. (HU):** We will develop a network based collaborative manufacturing service and community for 3D printing of large individual objects to support art, design architecture, industry, NGO's and social programs. This printing community can be seen as a virtual factory. Our aim is to create a bottom up network of owners of the 3D printers to team up to create a real creative industrial community.

**PRINTELIZE by PRINTELIZE (PL):** We bring the 3D printing industry to the e-commerce world by supplying a platform that caters for customers and 3D printing service providers. For customers Printify is a first central place for their 3D printing needs. It is where all suppliers are, quotes are received immediately and orders can be placed without hassle. For 3D printing service providers Printify is an e-commerce platform and additional sales channel. It helps them acquire new customers and, what is more important, automates quotations and sales processes. [www.Printelize.com](http://www.Printelize.com)

### **TOPIC 3 - Mobile Apps and Services for 3D Printing**

**GnB by HOPU (ES):** Glue & Blue (GnB) proposes a mobile-oriented marketplace to bring the opportunities of the 3D printing and the IoT to the consumers market. GnB comes from: “Glue” to merge multiple 3D printed parts of the encapsulation, and “Blue” to enable with a Bluetooth Smart chipset the product, in order to provide functionality, intelligence and communication capabilities. Therefore, GnB is a product composed of a 3D printed encapsulations with a Bluetooth Smart IoT-enabled chipset.

### **TOPIC 4 - Advanced Content Management Related to 3D Printing**

**KAZZATA by KAZZATA (ISR):** Kazzata intends to revolutionize the enormous spare parts supply-chain, by building the world’s most comprehensive online repository of CAD spare part files for 3D printers. The site will be a marketplace, bringing together end customers (consumers and businesses) and file contributors (Manufacturers and 3D designers) to provide unlimited access to many types of spare parts, simply by printing them in a local 3D printer. <http://kazzata.com>

### **Conclusion on section 14.5:**

The interaction between the 6 FABULOUS short-listed projects and FITMAN is currently ongoing and will contribute to the completion of Stage II of FABULOUS projects development. One FABULOUS project (3DQuality) has collaborated with one of the FITMAN trials expansion: Whirlpool. Therefore, they have been selected as success stories. Their experience of interaction is reported in the FITMAN D8.8 deliverable.



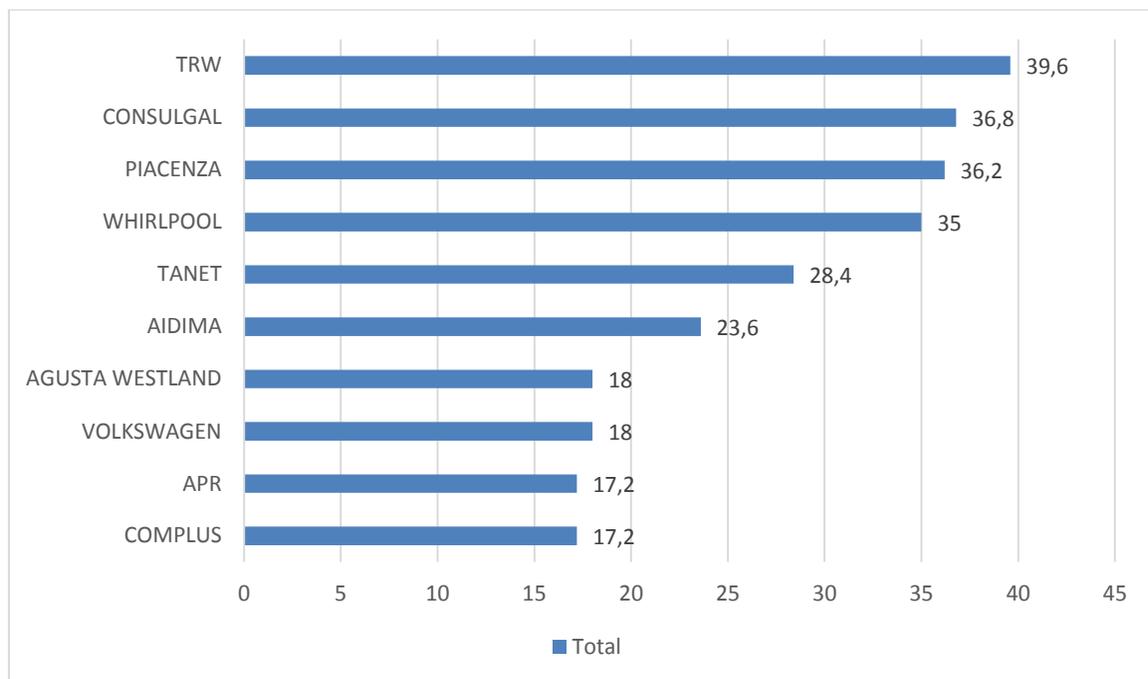
## 15. Conclusion

In the framework of task T8.2 (M12 to M24) the following activities have been carried out:

- collect of the expansion scenarios
- collect of the advice from deliverable D8.1
- Assessment of the socio-economic impact of the expansion scenario

Based on the three points of views, an evaluation method have been described and applied in order to perform a selection of expansion scenarios.

The final ranking of the expansion scenario is available and shown in the figure below:



**Figure 6 Final ranking of the expansion scenarios**

We must underline the excellent results obtained by the trials. The choice among the ten trials was quite difficult and was obtained through an intensive cooperation between the core team members of T8.2 and the trials.

The interaction between the FABulous project (3DQuality) and Whirlpool expansion scenario will be reported in the FITMAN D8.8 deliverable.



## 16. Appendix - collection of the scores for the evaluation of the trials' expansion scenario based on a questionnaire

The evaluation of the trial situation concerning expansion scenarios has been performed by the T8.2 partners and reported in each trial section (look on paragraph 2.1 to 8.1).

According to the agreement of T8.2 partners, we propose that you fulfil the table below using the following scale:

- The answer of the trial does not fulfil the criteria or is insufficient: score 0 point.
- The answer of the trial meet the criteria with some reserve: score 1 point.
- The answer of the trial fully meets the criteria: score 3 points.

The tables below summarize the scoring performed by the T8.2 partners.

**Table 8 Summary of the scores (Polimi)**

Trial	Score Question 1/2	Score Question 3/4	Score Question 5	Score Question 6	Score Question 7/10	Score Question 8/9	Total score per trial
TRW	3	3	3	3	3	3	18
WHIRLPOOL	3	3	3	3	3	3	18
CONSULGAL	3	3	3	3	1	3	16
AIDIMA	3	1	3	3	3	1	14
PIACENZA	3	1	3	1	1	3	12
TANet	3	1	3	3	1	1	12
A.P.R.	3	1	1	3	1	1	10
VOLKSWAGEN	3	3	1	0	0	0	7



**Table 9 Summary of the scores (Innovalia)**

Trial	Score Question 1/2	Score Question 3/4	Score Question 5	Score Question 6	Score Question 7/10	Score Question 8/9	Total score per trial
TRW	3	1	3	3	3	3	16
WHIRLPOOL	3	3	3	1	3	3	16
PIACENZA	3	1	3	3	3	3	16
CONSULGAL	3	3	3	1	3	1	14
VOLKSWAGEN	3	3	1	1	1	1	10
TANet	3	3	0	3	1	0	10
A.P.R.	3	1	1	1	1	1	8
AIDIMA	1	1	0	3	1	1	7

**Table 10 Summary of the scores (Engineering)**

Trial	Score Question 1/2	Score Question 3/4	Score Question 5	Score Question 6	Score Question 7/10	Score Question 8/9	Total score per trial
TRW	3	1	3	3	3	3	16
WHIRLPOOL	3	3	3	3	3	1	16
PIACENZA	3	3	3	3	1	1	14
CONSULGAL	3	3	1	3	1	1	12
VOLKSWAGEN	3	1	1	0	0	0	5
A.P.R.	?	?	?	?	?	?	?
TANet	?	?	?	?	?	?	?
AIDIMA	1	1	0	3	1	?	?

**Comments:** I was not able to assess APR's and TANet's proposals. Reading their answers to the questionnaire, my feeling is that they didn't get the point, and that they are actually talking about extending the scope of their current platform instead of "expansion" in the technical sense. Regarding AIDIMA, the assessment is incomplete as some key information is missing.



**Table 11 Summary of the scores (I-VLab)**

Trial	Score Question 1/2	Score Question 3/4	Score Question 5	Score Question 6	Score Question 7/10	Score Question 8/9	Total score per trial
PIACENZA	3	3	3	3	3	3	18
CONSULGAL	3	3	3	3	3	1	16
WHIRLPOOL	3	3	3	1	3	3	16
TRW	3	0	3	3	3	3	15
VOLKSWAGEN	3	1	0	1	3	3	11
A.P.R.	3	1	1	3	1	1	10
COMPLUS	3	1	1	1	3	1	10
TANet	3	1	1	3	1	0	9
AW	3	1	1	1	3	0	9
AIDIMA	1	1	1	3	1	1	8

