BE in CPPS

Innovation Action Project

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With contributions from all partners

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0.1	02/05/2016	Publication of the support material for the open call on the BEinCPPS website and on I4MS channels

Executive summary

This deliverable gathers all the documents issued by the BEinCPPS consortium for the 1st Call for Proposals for IT Applications Experiments. The call for proposal opened on May 2nd 2016 and closed on June 15th 2016.

The information provided to the applicants is included in the following documents

1. BEinCPPS Call-1 Introduction

   This document presents information about BEinCPPS project, the topics of the call, the available budget and general information about the call

2. BEinCPPS Proposal guide

   This document presents submission details, eligibility and evaluation criteria.

3. BEinCPPS Experimental facilities

   This document presents details on the experimental facilities available to test the applications.

4. BEinCPPS Call 1 template

   This document is a template of the proposal

These documents have been published on May 2nd on the BEinCPPS website, on the EMS, Evaluation management system, and on the I4MS channels. POLIMI and INNO, with the collaboration of I4MS, organized a webinar with interested applicants on May 19th. The video of the webinar is available on:

https://www.youtube.com/watch?v=mKWTL3bcpJk

BEinCPPS Business Experiments in Cyber Physical Production Systems

HORIZON 2020 – project 680633 www.beincpps.eu

Contact through the digital submission tool on:
https://beincpps.ems-innovalia.org

Contact email: opencall1@beincpps.eu

Call for Proposals for IT Applications Experiments

BEinCPPS is funded under the European Commission's Horizon 2020 Framework Programme for Research and Innovation through the Factories of the Future Call for Proposals (H2020-FoF-2015) addressing the Topic "ICT Innovation for Manufacturing SMEs (I4MS)" (topic identifier: FoF- 09-2015).

BEinCPPS is an Innovation Action that contributes to the following technology area as expressed in the Call work programme:

Integration of Cyber-Physical-System modules in manufacturing processes and process chains (application or equipment assessment experiments) to increase sophistication and automation in production SMEs and to create novel value added services linked to process surveillance and maintenance

BEinCPPS is including 5 industrial facilities where experiments will be located and conducted:

1. Lombardia "Washing Machines: Statistical Zero Defect Quality Control system"
2. Euskadi "Plastic Components: Manufacturing Processes for New Automotive Components"
3. Baden Wuerttenberg "Agriculture Technologies: highly personalized cabin manufacturing, final assembly"
4. Norte Portugal "Footwear Manufacturing: High Speed Shoe Factory automation and control"
5. Rhone Alpes "Moulds Manufacturer: high precision moulding"

Other two Smart Factories will be offered to experiments by DFKI (Smart Factory Kaiserslautern) and POLIMI (FoFLab in Milano, starting from January 2017). A short description of the 5+2 BEinCPPS experimental facilities is reported in a separate public document entitled "BEinCPPS experimental facilities" available on line, on beincpps.eu and I4MS.eu in the section dedicated to the open calls.

BeinCPPS Call-1 targets the development of IT application experiments that address advanced added value production process and systems, which incorporate Cyber Physical Systems. The open call aims at complementing existing experiments currently running in the BEinCPPS 5 Industrial Hubs under the 8 categories listed here below. Experimentation datasets as well as open APIs to provide access to the BEinCPPS platform installed in the Industrial facilities will be made available to Open Calls winners for testing and evaluation. In case of need, additional datasets and open APIs could be provided by the Smart

Factories experimental facilities in Kaiserslautern (Germany, under DFKI supervision) and in Milano (Italy FoFLab, under POLIMI supervision, but just from January 2017)

1. **CPS-based Big Data Analytics for production planning and optimisation**. The availability of CPPS at shopfloor level implies the generation of huge amounts of data. New data intensive IT applications can be developed on top of these datasets especially in the field of production management and optimisations. Applicants can propose their own IT application and experimental facility or rely on BEinCPPS Norte / Euskadi industrial champions in the footwear / plastic industries.
    a. **Norte** (Portugal). The HighSpeedShoeFactory comprises two major systems: the Stitching Logistic System, implementing the activities of stitching and pre-assembly, and the Assembly Logistic System, implementing the final assembly and finishing activities of the final product. The HighSpeedShoeFactory constitutes the most recent generation of production system implanted at KYAIA and in the footwear sector. This experiment aims to process historical and near real-time sensor-based data related to the working posts within the High Speed Shoe Factory in order to detect the actual occurrence of physical problems and to estimate their possible occurrence in the near/medium term future. These advanced data analytics will support maintenance actions in the Stitching Logistic System. Technology to adapt and deploy comprises the FIWARE COSMOS and FITMAN DyCEP components. These components will gather data from the NOSQL database and will be hidden by an open service, that will get the results of the data analysis. Access to the HSSF / SmartSL through its API will allow the data analytics service to contextualize the analysis. Besides human workplaces, the High Speed Shoe Factory comprises robotic manipulators and motor based conveyors that require extensive maintenance actions. These physical components have sensors that, by using the approach defined in the previous experiment, will support the maintenance of the entire production system. This is a possible extension of the experiment.
    b. **Euskadi** (Spain). MAIER produces plastic parts for most of the automotive OEMs based in Europe. They are mainly aesthetic plastic parts with a very high visual and perception performance. MAIER's core technologies are thermoplastic injection, parts painting and chrome plating, so all the products produced are based on thermoplastic injection molding. The experiment aims at the digitalization of both control fixtures and parts with the objective of cyber-physical simulation of the profile of the car where it is placed, including all the holes and fixtures. The experiment objective is the development of a cyber-physical gauging system based on 3D digitalisation technologies and 3D point cloud analytics to reduce the need of complex physical control fixtures. One of the main issues in high performance plastic components analysis is the classification and characterization of aesthetic aspects in plastic components (orange peels, etc…). The experiment extensions based on big data analytics could address the classification, pattern recognition and defect detection of aesthetic features in plastic components based on the 3D point cloud information and 3D information analysis. The experimenters will have access to data from reference parts but should budget some resources for the use of digitalization equipment made available by the hub and digitalization tasks.
2. **CPS-based Production Process Ramp-up and Commissioning.** Thanks to advanced monitoring, diagnosis and simulation IT applications, CPPS technology will also improve the design, prototyping

and ramp-up phase for new production plants and systems. Applicants can propose their own IT application and experimental facility or rely on BEinCPPS Euskadi industrial champion in the plastic industry.

   a. **Euskadi** (Spain). The experiment performed among Trimek, Innovalia, MTC and Maier in the laboratories of Euskadi DIH aim at digitalize the prototyping process in order to support decision and engineering in the factory and improve timing and cost in the ramp up phase. This experiment considers the development of Cyber-Physical equivalents that will allow the development of suitable models and manipulation of critical events and raw data being made available through the Cyber-Physical Gates, into the Cyber production domain.
   Additionally, the Euskadi regional digital manufacturing innovation hub will make available to open call participants different 3D digitalization CPS equipment and BEinCPPS platforms for the development of their experiments. Open call participants are invited to integrate BEinCPPS deterministic Ethernet and Wireless Sensor Network CPPS control modules in shop-floor experiments, aiming to provide a hybrid wired-wireless communication infrastructure that allows real time critical communication and the versatility of deployment of a robust wireless communication network for flexible process monitoring and control. Open call participants could provide innovative applications based on deterministic and wireless sensor monitoring and control combined with BeinCPPS open platform and FIWARE COSMOS and DyCEP technology for the fast (real-time) detection of manufacturing process drifting, maintenance or monitoring events. Participants could also consider the use and application of BEinCPPS Industrial Physical web technologies, as part of advanced human-shop-floor machine interactions.

3. **CPS-based Energy Efficient Manufacturing**. Resources (e.g. Energy, Water) and Waste management IT applications are enabled by the presence of CPPS in the production systems. Applicants can propose their own IT application and experimental facility or rely on BEinCPPS Smart Factories in Kaiserslautern (DFKI) and Milano (POLIMI available from January 2017).

4. **CPS-based Zero Defect Manufacturing**. Innovative product quality assessment IT applications are now enabled by CPS-based intelligent metrology and production systems. Applicants can propose their own IT application and experimental facility or rely on BEinCPPS Baden Wuerttenberg and Lombardia industrial champions in the agro machinery and white goods industries.
   a. **Lombardia** (Italy). Statistical Quality Controls still play a crucial role in white good manufacturers industries toward the Zero defect goal, and imply a sophisticated organization in which humans, machines and computers have to cooperate in perfect way. These controls allow to infer potential problems by examining a subset of the production output (2-3%) using a deeper analysis of the product as built. At Whirlpool, statistical quality controls are implemented in the so called Zero Hours Quality department, ZHQ, where workers do deep tests to products sampled in statistical way from production in order to verify features, performances, and other topics typically not verifiable during normal on line test. The overall objective of this experiment is twofold:
      - To measure the Quality level of the product in delivery from aesthetic, functional and normative point of view;
      - To measure the efficacy of the process control systems, procedures and activities actuated during production.

ZHQ is equipped with a Cyber Physical System (CPS) in order to provide operations a structured, repeatable, flexible and cost effective approach.

- Guided operations: operators are instructed in real time to perform sequence of tasks to check and measure products (Rule Editor)
- Programmability: sequence of tests can be programmed by Quality managers using a programming tool (Rule Editor)
- Automatic I/O: the product under test is interfaced both in input (actuators) and output (sensors) to automatically change state of product and gather data (Box Handler)
- Data management: data are stored and available for immediate or historical analysis (Display Result)

b. **Baden Wuerttenberg** (Germany). The use case selected by BW ecosystem's champion (John Deere) is focused on the manual assembly of hydraulic line kits that includes the picking of the parts based on the current order information, the assembly of the parts and providing the assembly for the main assembly line. Because of the high number of varieties as well as the high similarity of parts it is necessary to introduce proactive control applications to reduce defects caused by this process. During the first period of the BEinCPPS project the following sources of error were detected:

- Storing the parts at the wrong place
- Picking the wrong parts
- Doing mistakes during assembly process

Reducing defects in this domain is important because the faulty assembly will be attached to the tractor subsequently at the main assembly line and the error will be visible late in the ongoing production sequence in most cases. The later the error is recognized the higher is the debugging effort because it is necessary to do more and more re-assembly work. At the moment, based on internal studies, the financial damage of those errors has been rated medium but with the increasing number of products and configuration it is very important for John Deere to find new ways of handling the complexity of their products. So it is very important to introduce new proactive control applications for a zero defect manufacturing.

5. **CPS-based Factory Logistics Management**. CPPS play a fundamental role in the factory internal logistics: innovative IT applications need to be developed specifically for planning, scheduling and monitoring raw materials and finite products inside the production system. Applicants can propose their own IT application and experimental facility or rely on BEinCPPS Norte industrial champion in the shoes industry.

a. **Norte** (Portugal). The HighSpeedShoeFactory Logistic systems are essentially electro-mechanical systems that transport work-in-progress elements within container boxes from work station to work station in the production system. As such, the elements comprising the system (e.g. working posts, motor-based conveyors, robotic manipulators) are subject to mechanical stress that often cause their sensors and actuators to lose their alignment and position in the mechanical structure. As consequence, parts of the logistic system and, in some cases, the entire logistic system, must be stopped to develop maintenance actions on the mechanical structure. However, some of the physical problems may be diagnosed by analysing the stream of values that the sensors are generating. This **experiment** aims to allow sensor-based data to be stored in a persistent data repository and to be published in the network in near real-time fashion, thus allowing field level data to be accessible at cloud (enterprise) and factory levels. This will be achieved by deploying and adapting a publish subscribe broker and by a NOSQL database. Adapters will be developed to 1) gather sensor-based data from the controlling PLC and 2) to subscribe all sensor-based data and store it in the NOSQL data base. Apache Cassandra, REDIS and RabbitMQ message brokers comprise the major technology to adapt and deploy. In this context, major APIs are the ones of Apache Cassandra, REDIS and RabbitMQ, accompanied by the format of the sensor-based events (published by the message broker) and by the schema of the NOSQL database.

6. **CPS-based Workplace, Training and Human Machine Interaction**. Human-centric manufacturing operations are also challenged by the presence of CPS-based automation systems: workplaces need to become more interactive, flexible and agile, while the usage of mobile, wearable devices is encouraged. Applicants can propose their own IT application and experimental facility or rely on BEinCPPS BW industrial champion in the agro-machinery.
   a. **Baden Wuerttenberg** (Germany). Manual work is a key factor of the selected use case. By now, workers are just supported with paper-based work instructions and order information. The effort for creating and maintaining the work instructions is pretty high and subsequently it is not possible to keep the instructions up to date all the time as well as to create work instructions for all of the assembly processes. Consequently, a worker still needs a minimal knowledge level to understand the work instructions correctly. In order to shorten the ramp-up time of new workers and to give a better support for manual work, advanced visualisation technologies have to be used. Those technologies could be introduced at the storage place of parts/assemblies, at the work stations and could be worn by the workers. The goal of introducing those technologies is to support the worker with picking the parts, assembling and putting the assembly at the right place. After collecting and evaluating different ideas the following technologies were found feasible:
      - Digital picking list shown on smart device (tablet, smartphone, smart glasses)
      - Using projector to illuminate parts to be picked/show or show work process/result of assembly
      - Show parts to be picked by pick by light / pick by vision
      - Display automatic generated step-by-step work instructions on display at the work station
      - Use augmented reality applications to guide worker along the work process
7. **CPS-based Product Lifecycle and End-of-Life Management**. The Cyber and the Physical components of a CPPS artefact are characterised by quite different lifecycles, especially in the End of Life phase where the huge investments in CPPS could be partially recovered. Applicants can propose their own IT application and experimental facility or rely on BEinCPPS Rhone Alpes industrial champion in the moulds industry.
   a. **Rhone-Alpes** (France). The objective for Pernoud Company through those experiments is to add intelligence on plastic injection mold to transform this mechanical system in a CPS one, with an expectation of improving cost quality and delays of the part produced. To reach this goal we need a feedback from the mold to know what happened during the

production. So to access to this information we need to instrument the mold with different embedded devices on it but also to directly have a look on that information any time it could be needed. Our current experimentations are focussing on:

- Data acquisition with thermocouple (Category: CPS equipment development): Monitoring environment conditions using a smart system based on the BeagleBone Black platform, and thermocouple sensors. We are also performing experiments driving the electrical actuators which handle the mechanical parts of the mold and performing the data acquisition to be sent on the cloud.
- Driving electrical actuators (Category: CPS equipment development): Thanks to the smart system, the movement of the mold can be performed by electrical actuator. Those actuators will be driven by the Beaglebone Black and will offer to us flexibility which cannot be reached with standard hydraulic actuators.
- Cloud data monitoring (Category: CPS equipment development): To store the data acquired during the utilization of the smart tool, the smart system is linked to a cloud and this cloud will allow an access to the entire life cycle of the tool from anywhere and at any time. A cloud application implemented as user-interface widget will allow visualizing the real-time data.

The proposed experiment is about managing mold end of life. When a mold reaches the stage of end-of-life, it is normally recycled as any other piece of steel; however, in the case of the smart mold, it will be equipped with the smart system, which can still be used in another mold. Therefore, a modularity mechanism should be developed which will allow reusing and redeploying the smart system onto another mold.

8. **CPS-based sensors data acquisition and management**. The presence of CPPS in production enable the development of smart products-artefacts which could interact with them: advanced sensorised production systems support the development of innovative IT application experiments in the field of production management and optimisation. Applicants can propose their own IT application and experimental facility or rely on BEinCPPS Rhone Alpes industrial champion in the moulds industry.

   a. **Rhone-Alpes** (France). The objective for Pernoud Company through those experiments is to add intelligence on plastic injection mold to transform this mechanical system in a CPS one, with an expectation of improving cost quality and delays of the part produced. To reach this goal we need a feedback from the mold to know what happened during the production. So to access to this information we need to instrument the mold with different embedded devices on it but also to directly have a look on that information any time it could be needed. In this category we envisage two different experimentations:

      - **Experimentation with additional types of sensors (Thermoflux and Constraint gauge)**: Carry out experiments with other types of sensors, which will enrich the environment data acquired by our smart system. This will include sensors less easy to implement like thermoflux, which is used for sensing the injection temperature and pressure sensing or constraint gauge, which are used to analyze and measure distortion.
      - **Dashboard cloud 3D visualization**: Our current experiments will allow us to visualize the real time data of the temperature sensors, the monitored alerts, as well as to mimic the inputs and outputs of the injection machine. However, we would like to experiment with enriching this visualization with a more advanced visualization, including a real-

time 3D representation of the smart mold with the real-time conditions, which will provide a visual overview of the different sensors deployed in the mold.

In the online Open Call management tool, applicants should firstly select one of the 8 categories and then express their preference about supporting existing industrial cases or providing their own industrial facilities and experimental datasets. **The participants to the open call will have to position their solutions and the added value of their CPS-based manufacturing applications and processes in the above thematic area.**

The open call seeks for teams of CPS-based **IT application providers** and optionally **manufacturing SMEs and mid-caps**, which on one hand, contribute to the **extension of tools and equipment** that support the BeinCPPS blueprint and on the other hand **integrate at various levels BeinCPPS advanced CPS assets** as part of their advanced manufacturing process solutions.

Priority will be given to experiments driven by the requirements of existing BEinCPPS users that reinforce simultaneously the capabilities of the BeinCPPS ecosystems from technology offer's and advanced manufacturing experimentation's perspectives.

The business-relevance of the application experiment is essential, as BeinCPPS places considerable emphasis on exploitation opportunities and integration of CPPS at all levels from field and shopfloor equipment, sensors or control solution providers up to software tool vendors, solution integrators, cloud infrastructure providers and manufacturing process engineering companies.

Experiments should also consider how they can apply BeinCPPS architecture components and modelling tools; develop CPPS services and products compliant with the BeinCPPS architecture, which can subsequently be used by other end-users. A Public version of Deliverable D2.1 BEinCPPS architecture will be also available for consultation and downloading.

In the context of the 5 Digital Innovation Hubs, the expected business impact and commercial exploitation possibilities of the targeted results should be explained and substantiated by market figures (target markets, market sizes, competitors, competing solutions, ...). The alignment of the proposed experiments with the objectives of BeinCPPS Call-1 should be explained.

The core objective of BEinCPPS is to dramatically improve the adoption of CPPSs all over Europe by means of the creation, nurturing and flourishing of CPS-driven regional innovation ecosystems, made of competence centers, manufacturing enterprises and IT SMEs. There is also a need for breaking the silos between Future Internet, Internet of Things and Cyber Physical Systems architectures and platforms, development environments, delivery and business models, so that seamless interoperability at various levels based on open standards and solutions could lower the entry barriers to the market by SMEs and minimize the risk of vendors' lock-in. BEinCPPS aims at increasing the interaction between existing ecosystems within Europe (CPS, Factories of the Future, Future Internet, IoT) and fostering the emergence of new CPPS products for the manufacturing domain.

BEinCPPS will organise a second call for proposal for additional equipment assessment experiments.

Call 1, covered by this document, addresses IT application experiments executing for a 12-month period commencing in October 2016. "Call-2" is expected to be launched in November 2016, leading to another set of 15-month-long experiments starting in April 2017.

The additional experiments from Call-2 are equipment assessment experiments, the extended platform will be instantiated and deployed in at least 10 additional manufacturing SMEs facilities, via equipment experiments' projects, which will replicate tests and experimentations in very different locations, sectors and application domains.

Expectations for the new experiments

As discussed above, BEinCPPS Call-1 targets the augmentation of the current set of application developers and additional experiments.

The expectations for the proposed experiments are that they should:

- be complementary to those already included in BEinCPPS
- contain all those actors in the value chain necessary for the realisation of services meeting the end-users' engineering and manufacturing needs, and
- be inspired by our 5+2 industrial and experimental facilities
- use datasets and open APIs made available by BEinCPPS industrial cases and IT platform

Proposal submission

Detailed instructions for proposal submission, together with information about the evaluation criteria to be applied, are provided online on http://www.beincpps.eu/index.php?id=429 and on www.i4ms.eu. A direct link to the proper section is hosted on the homepage.

The digital submission tool is available on: https://beincpps.ems-innovalia.org

BEinCPPS will make use of the new H2020 Third Parties method to enable the inclusion of new experiment partners. The indicative funding budget for Third Parties for BEinCPPS Call-1 is 800,000€

The funding of Third Parties must follow the same principles as used for existing project beneficiaries of BEinCPPS, which receives European Commission funding as an "Innovation Action". Thus, Third Parties will receive 70% funding of eligible costs arising (except for non- profit organisations which receive 100% funding).

The funding for an individual experiment may not exceed 80,000 € (covering all participants, both 3rd Parties and existing BEinCPPS beneficiaries). Proposers should consider their actual needs and not mandatorily target this upper limit of funding. The evaluation will take into account the appropriateness of the requested resources.

Erroneous budget data included in accepted proposals will not result in final corrected budgets that exceed the upper requested limit for funding of the experiment as a whole or of individual participants: BEinCPPS reserves the right to make the appropriate and necessary effort and budget cuts.

BEinCPPS Business Experiments in Cyber Physical Production Systems

HORIZON 2020 – project 680633 www.beincpps.eu

Call for Proposals for IT Applications Experiments

Guide for Proposers: Proposal submission & evaluation criteria

Identifier: BeinCPPS Call-1

Call title: First call for BEinCPPS IT Application Experiments

Project full name: Business Experiments in Cyber Physical Production Systems

Acronym: BEinCPPS

Grant agreement number: 680633

Deadline: 15th June 2016, at 17:00 Brussels local time

Expected duration of participation: 12 months, with expected commencement 1. October, 2016

Indicative budget for BEinCPPS Call-1: 800,000 €

Maximum funding request per proposal: € 80,000 (covering all participants))

Funding constraints: BEinCPPS beneficiaries are excluded by this call

Submission language: English

Internet address for full open call information:

http://www.beincpps.eu/index.php?id=429

www.i4ms.eu

Submission site: https://beincpps.ems-innovalia.org/

A contact tool is available inside the submission site.

Mail: opencall1@beincpps.eu

Submission Details

Submission deadline: All submissions must be made by 17:00 Brussels local time, June 15th 2016.

Electronic submission: Proposal submission is exclusively in electronic form using the proposal submission tool accessible via the BEinCPPS web-site: beincpps.ems-innovalia.org.

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

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

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

1. Summary (0.5 pages)
2. Industrial relevance, potential impact and exploitation plans (3.5 pages)
3. Description of the work plan and concept (3 pages)
4. Quality of the consortium as a whole and of the individual proposers (2 pages)
5. Justification of costs and resources (1 page)

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

A management structure will be imposed on the successful proposals. That is, the proposal will not need to contain a description of how the resultant project will be managed.

In addition to the 10-page proposal description, a cover page and 2 pages of administrative data, including a tabular list of proposal participants, must be provided. The participant list should include for each participant, when available, the Participant Identification Code (PIC) issued by the European Commission (http://ec.europa.eu/research/participants/portal/desktop/en/organisations/register.html).

Indicative budget for Call-1:

BEinCPPS will make use of the H2020 Third Parties Funding method to enable the inclusion of new experiment partners. The indicative funding budget for Third Parties for BEinCPPS Call-1 is 800,000€

The funding of Third Parties must follow the same principles as used for existing project beneficiaries of BEinCPPS, which receives European Commission funding as an “Innovation Action”. Thus, Third Parties will receive 70% funding of eligible costs arising (except for non- profit organisations which receive 100% funding).

The funding for an individual experiment may not exceed 80,000 € (covering all participant 3rd Parties). Proposers should consider their actual needs and not target this upper limit mandatorily. The evaluation will take into account the appropriateness of the requested resources.

Erroneous budget data included in accepted proposals will not result in final budget that possibly exceeds the upper requested limit for funding of the experiment as a whole or of individual participants: BEinCPPS reserves the right to make the appropriate and necessary effort and budget cuts.

BEinCPPS EU Open Call Eligibility

The Open Calls will be eligible for any entity which is legally entitled to act as a regular business[1], is based in an H2020 country. For the projects winning the first Open Call consortium members will provide support in order to facilitate the use of their infrastructures.

List of activities being supported by third party funding

Activities
Software licenses
Travel expenses
Personnel Costs
Equipment Costs
Indirect Costs (25% of direct costs)
Costs to collaborate with Experimental Industrial Manufacturing partners

Evaluation Criteria

The evaluation criteria and the scoring scale used are very well aligned with H2020 Programme, but enhanced to favor the integration of CPPS technology, aimed by objective FoF-9-2015. The ranking of selected projects will be created assessing:

1. Soundness of service concept, innovation;
2. Impact including industrial relevance and business strategy
3. Implementation of the work-plan17[2]
4. Effective and justified deployment of resources.

Each criterion will carry a score ranging from 0 to 5. So, the scoring scale remains the same as usual for H2020 (and also the fact that half marks can be given):

- 0: The proposal fails to address the criterion under examination or cannot be judged due to missing or incomplete information
- 1 (Poor): The criterion is addressed in an inadequate manner, or there are serious inherent weaknesses

[1] This means that not only capital companies are eligible, but also natural persons if they hold the required trade licenses etc.

[2] In order to accelerate the payment process and facilitate the participation of the SMEs, the experiment will include three milestones to better monitor the fulfilment of the objectives.

- 2 (Fair): While the proposal broadly addresses the criterion, there are significant weaknesses;
- 3 Good The proposal addresses the criterion well, although improvements would be necessary
- 4 (Very good): The proposal addresses the criterion very well, although certain improvements are still possible
- 5 (Excellent): The proposal successfully addresses all relevant aspects of the criterion in question. Any shortcomings are minor.

There will be a threshold score of 3 that will apply to criteria 1-3-4, while a threshold score of 4 will apply to criterion 2. The first criterion will have a weight of 2, while the second will have an equal weight of 3. The remaining criteria (third and fourth) will have a weight of 1. Thus, the market impact will have a slightly higher relevance than the Innovation Technical Excellence of the service, while the use of resources and the implementation will have lesser impact on the final mark. Funding is then awarded to most highly ranked proposals as long as there is available budget. BEinCPPS financial support will be granted to projects up to the limits indicated below, on the condition that the service reaches the excellence level requested and till the budget available for each phase is exhausted. If the call budget is not exhausted, the budget will be diverted to the second call. If the same situation is faced in the second call, the budget will be considered available for further activities to be agreed with the EC. The priority order for proposals with the same score is handled as follows:

These proposals will be prioritised according to the scores they have been awarded for the criterion impact.

- If these scores are also equal, priority will be based on scores for excellence.
- If these scores are also equal, priority will be based on scores for the criterion implementation of the workplan with a final reference to the use of resources.

All proposers (successful and unsuccessful) are contacted with the results of their evaluation.

The final support to each third party will be determined once the BEinCPPS project participants provide the project with the requested justification in the resources used; i.e. Personnel costs (nominal), travel expenses, equipment, etc.

All payments to beneficiaries will be handled by the BEinCPPS consortium lead partner POLIMI. Typically 30% of the payment will be released at contract signature, 30% at an intermediate review (after 6 months) and 40% at conclusion of the experimentation. The intermediate and final reviews will be based on mid-term and final deliverables produced by the project and will be evaluated by a review team appointed by BEinCPPS workpackage leaders.

BEinCPPS Business Experiments in Cyber Physical Production Systems

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BEinCPPS Experimental facilities

BEinCPPS is including 5 industrial facilities where experiments will be located and conducted:

1. Lombardia “Washing Machines: Statistical Zero Defect Quality Control system”
2. Euskadi “Plastic Components: Manufacturing Processes for New Automotive Components”
3. Baden Wuerttenberg “Agriculture Technologies: highly personalized cabin manufacturing, final assembly”
4. Norte Portugal “Footwear Manufacturing: High Speed Shoe Factory automation and control”
5. Rhone Alpes “Moulds Manufacturer: high precision moulding”

Other two Smart Factories will be offered to experiments:

6. DFKI (Smart Factory Kaiserslautern)
7. POLIMI (FoFLab in Milano), starting from January 2017).

Lombardia (Italia) Experimental facilities

Washing Machines: Statistical Zero Defect Quality Control system”

Lombardia BEinCPPS Digital Innovation Hub involves Politecnico di Milano, as Competence Center providing business innovation services and training for cyber physical production systems; Whirlpool Europe, contributing to the fine tuning and extension of the BEinCPPS digital manufacturing reference platform and technologies through the design of pilot experiments in white goods industry; Engineering and Holonix, as ICT providers; and Associazione Fabbrica Intelligente Lombardia, which plays a multiplying role in order to create awareness and interest among local SMEs.

Lombardia BEinCPPS Digital Innovation Hub aims at introducing innovations to enhance quality control procedures. Toward this end, it includes the so-called Zero Hours Quality (ZHQ) department located in Whirlpool Appliance Factory in Biandronno (ITALY), as the industrial facility where experiments will be located and conducted.

Statistical Quality Controls still play a crucial role in white good manufacturers toward the Zero Defect goal, and imply a sophisticated organization in which humans, machines and computers have to cooperate in perfect way. These controls allow inferring potential problems by examining a subset of the production (2-3%) using a deep analysis of the product as built.

In Whirlpool’s ZHQ department, Statistical Quality Control simulates the first usage of Whirlpool products at the customer’s premises (Figure 1). Quality operators connect the appliances to be tested to the testing stations, which activate a test program automatically enacting product standard functioning cycle and measure states and performance data of the appliance. ZHQ IT system guides the quality operators during visual inspection of the appliance and gathering of test results (quality level of the product is coded) as well. Test results data are stored in a central repository, supporting Quality Managers’ root cause analysis.

The ZHQ system provides four basic functions:

1) Programmability: sequence of tests can be programmed by quality managers using a programming tool (Rule Editor) .
2) Guided operations: operators are instructed in real time to perform sequence of tasks to check and measure products (Rule Editor).
3) Automatic I/O: the product under test is interfaced both in input (actuators) and output (sensors) to automatically change state of product and gather data (Box Handler) .
4) Data management: data are stored and available for immediate or historical analysis (Display Result).

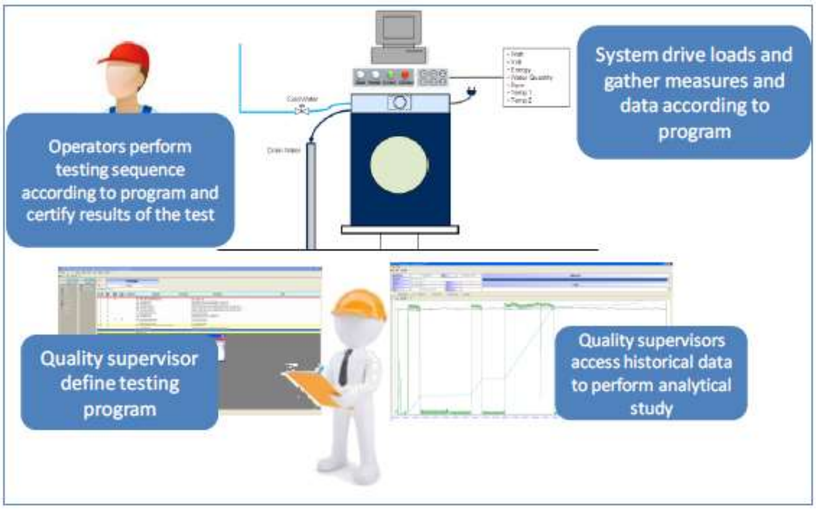


FIGURE 1 STATISTICAL QUALITY CONTROL AT ZHQ

The ZHQ system (Figure 2) is made of a specific application hosted in a dedicated personal computer where the testing rules can be programmed, and 24 stations, which according to their functionality can be classified into 20 basic stations and 4 advanced stations. The stations are controlled by 6 PCs running SQL 2000 as database. At each station a programmable sequence of tests can be started and managed by the operator according to the product under test. Stations I/O are controlled by a group of 6 PLCs. Each PC is also equipped with a laser scanner used to read product barcodes and identify both the product model code and the serial number.

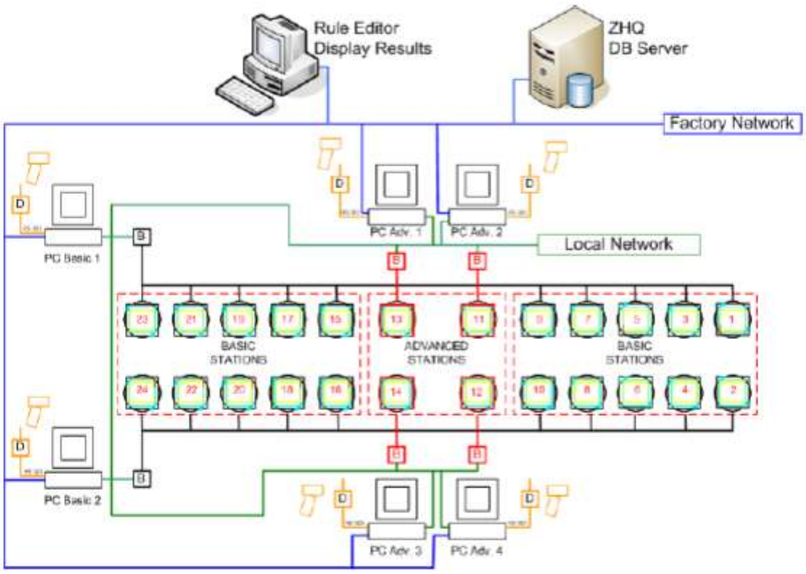


FIGURE 2 ZHQ SYSTEM AT WHIRLPOOL

The CPS-ization of the ZHQ system in Whirlpool will allow usage of mobile testing stations, enhanced operator interaction and auto-reconfiguration of the testing stations, thus improving throughput and effectiveness of the system (the latter by the possibility for the operator to interact through mobile device and modify the testing programs on the fly).
Furthermore, while, in the current situation, quality testing is based on threshold rules, focused on the identification of the most critical situations (such as pump does not provide target pressure), the CPS-ization will make it possible to highlight more in detail and in real time, a wider set of potential problems, for instance by comparing the dynamic behaviour of each component to the expected one (such as pump pressure is constantly oscillating +/-20% around the target pressure).

While the virtual world design of the ZHQ system is enabled by MSEE tool and UA modeller, the IT infrastructure available at Whirlpool experimental facility is composed of the following components, with reference to Figure 3, from bottom to top:

- Actuators: testing stations (purple).
- Controller: windows based PC board (purple).
- OPC UA software (red) connecting the PC board to the middleware FIWARE IDAS.
- Test FE (orange): the mobile interface that will support the quality operators.
- Editor FE (orange): PC interface for programming the test rules, stored in the Rules/Results database at CLoud level.
- Agent (orange): ISA agent that will connect OPC UA to the FIWARE Orion information bus
- Cloud processing of test data and results will be enabled BEinCPPS component FIWARE Cosmons and DyCEP).

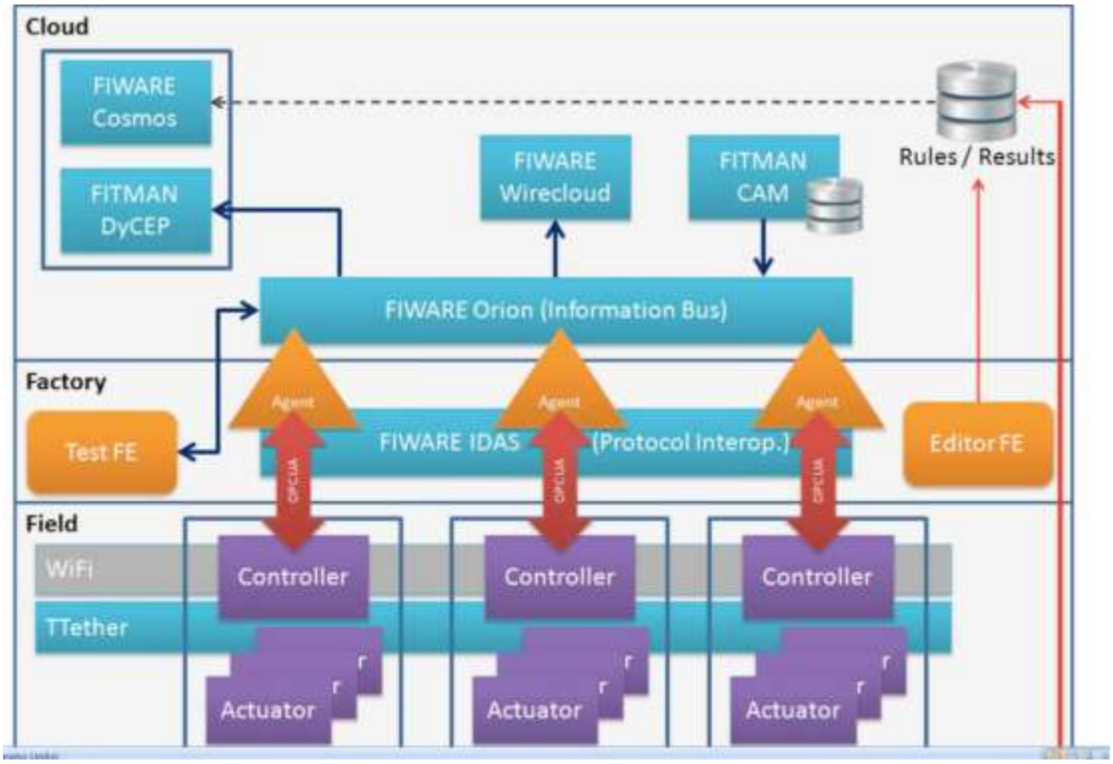


FIGURE 3 IT ARCHITECTURE AT WHIRLPOOL

Euskadi Experimental facilities

Plastic Components: Manufacturing Processes for New Automotive Components

Euskadi BEinCPPS Innovation Hub is led by Innovalia, as provider of training and business innovation services for cyber physical production systems, Trimek, as CPS technology provider for manufacturing process digitalization and virtualization, Maier and MTC that, through the design of pilot experiments in automotive industry, will contribute to the fine tuning and extension of the BEinCPPS digital manufacturing reference platform and technologies.

The Euskadi Digital Innovation Hub has deployed the experimental facilities to experiment new technologies in the checking fixtures, used as a tool for quality control in automotive part manufacturing. The aim is to implement a cyber-physical gauging system based on 3D digitalisation technologies and 3D point cloud analytics to reduce the complexity of checking fixtures.

Traditional manufacturing systems operate mainly in the physical domain: current systems make extensive use of gauges, visual analysis and dedicated measurement instrumentation to ensure the compliance of plastic components in various parts of the automobile (cockpit, front, doors, etc…). The physical control elements allow an optimum assembly and integration of plastic components in the subsystem design.

The BEinCPPS platform will allow a more efficient synchronisation and operation of the physical and cyber production operations. TRIMEK is one of the main manufacturers of metrological systems and solutions worldwide in the field of Coordinate Measuring Machines (CMM). TRIMEK metrological instrumentation provides optimum metrology solutions from the inspection of very large parts with high accuracy through the use of its large bridge or gantry scanners to the mid-sized and even portable systems.

Inside the Measuring machines, the **M3 metrology software** platform provides highly efficient and flexible **virtual part** management solutions for storage of massive 3D point cloud information and high performance exchange of virtual part information. The M3 software in combination with 3D optical scanner, see Figure 1 below, can be used to develop precise and accurate point cloud images that can then be converted to different 3D design and modelling software. These scanned images can then be cross referenced with the original designs or with other scanned objects allowing for quick and accurate comparison and discovery of deformation or other dimensional discrepancies.

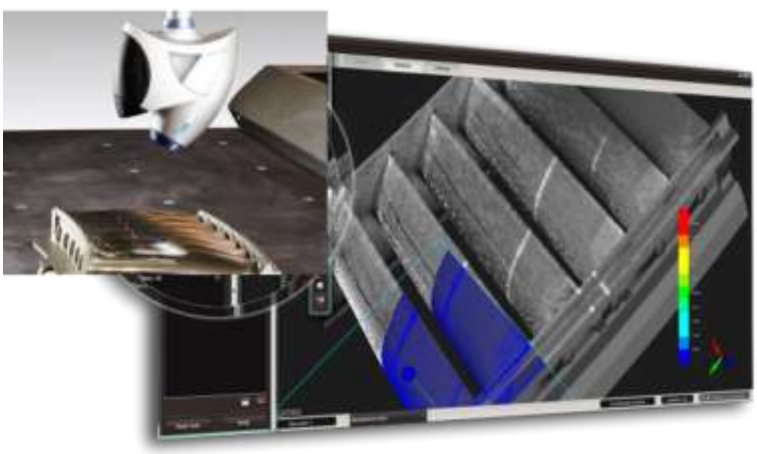


FIGURE 1 THE M3 SOFTWARE WORKS IN COMBINATION WITH 3D OPTICAL SCANNER

With this CPS assets and the BEinCPPS reference platform MAIER is intended to evolve their current physical production process in the following cyber physical solution.

For the implementation of the digital Gauge, MAIER intends to implement a Cyber-Physical gate for Industrial IoT and 3D information. Cyber-physical gates will allow the implementation of production and machine watchdogs as well as part and critical component digitalisation.

Cyber-Physical equivalents will allow the development of suitable models and manipulation of critical events and raw data being made available through the Cyber-Physical Gates, into the Cyber production domain. Data is then transformed into information through the Cyber Production Services that in this particular business process will implement the cyber-gauge and results connected to production rules and time series analysis and batch-analysis of production. The production services will trigger actions of the cyber production control agents either as CNC (computer numerical control) or automation system signal or as information to be visualised through blue-collar worker wizards or white-collar workers diagnosis and prognosis of the manufacturing quality of the process and stability.

Manufacturing assets connect to the Data Layer through the Cyber-Physical gate. Data Layer connect to the data to Information Transformation Layer through the Cyber Production services which are configured and controlled through the Cyber Physical production Cockpit. The final visualisation with Top Floor and Shopfloor is implemented through the Cyber Production Control Agents. The CPPS assets provided in Euskadi are mapped and made available to the overall ecosystem as in Figure 2. This deployment will interface with the FIWARE/FITMAN assets that will be used to build the CPPS.:

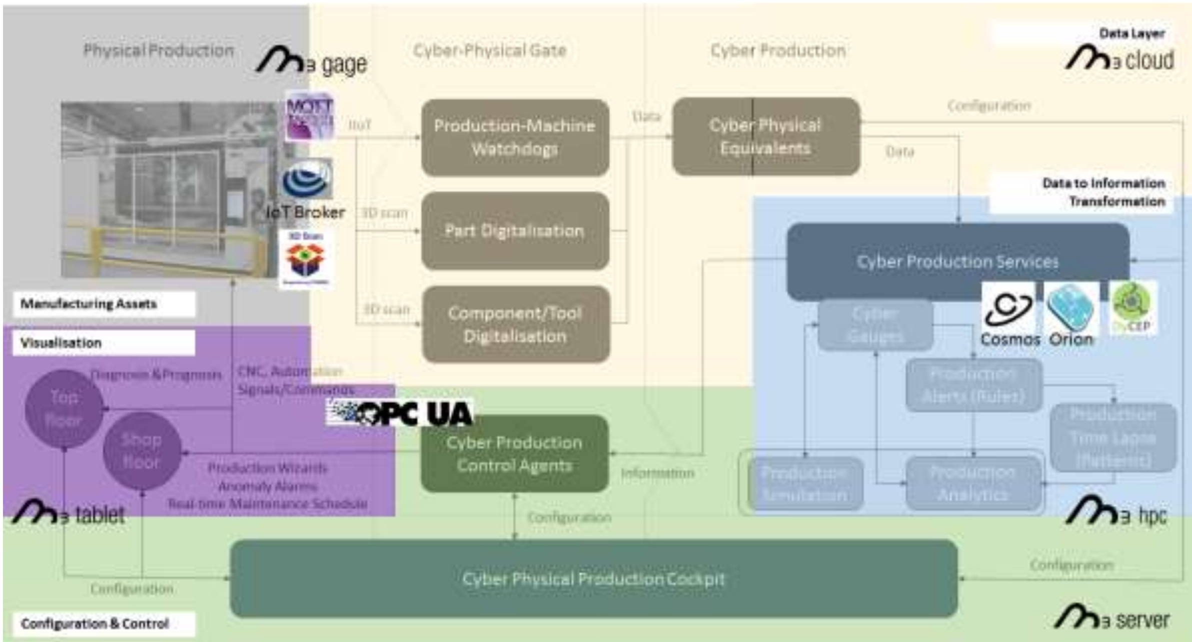


FIGURE 2 MAPPING OF THE ARCHITECTURE WITH BEINCPPS ASSETS

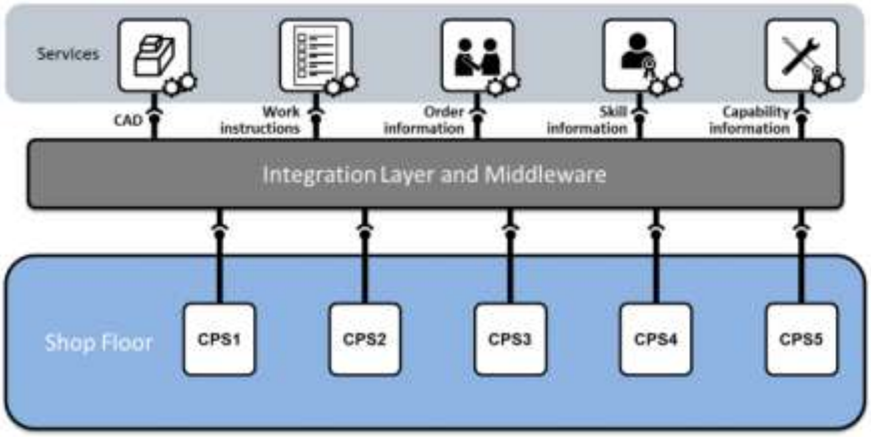
Additionally, the Euskadi regional digital manufacturing innovation hub will make available to open call participants different 3D digitalization CPS equipment and BEinCPPS platforms for the development of their experiments. Open call participants are invited to integrate BEinCPPS deterministic Ethernet and Wireless Sensor Network CPPS control modules in shop-floor experiments, aiming to provide a hybrid wired-wireless communication infrastructure that allows real time critical communication and the versatility of deployment of a robust wireless communication network for flexible process monitoring and control. Open call participants could provide innovative applications based on deterministic and wireless sensor monitoring and control combined with BeinCPPS open platform and FIWARE COSMOS and DyCEP technology for the fast (real-time) detection of manufacturing process drifting, maintenance or monitoring events. Participants could also consider the use and application of BEinCPPS Industrial Physical web technologies, as part of advanced human-shop-floor machine interactions.

Baden Württenberg Experimental facilities

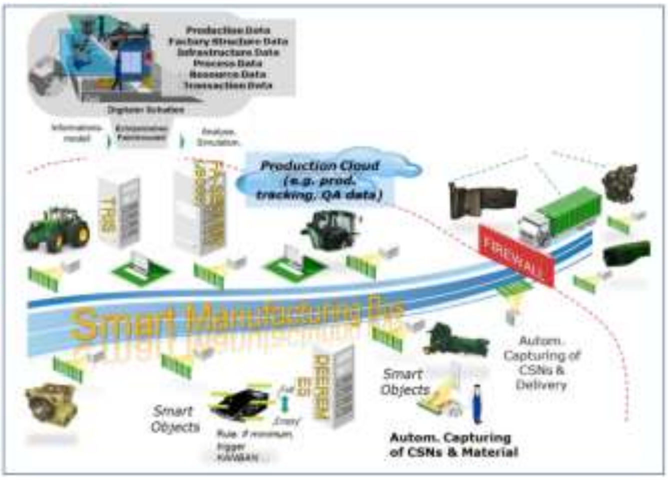
“Agriculture Technologies: highly personalized cabin manufacturing, final assembly”

Through the BEinCPPS project John Deer wants increase efficiency by further digitizing their manufacturing processes. With BEinCPPS John Deer will focus on a better integration of workers in the value adding process by promoting flexibility to allow for easier customization of manufactured parts. This will be achieved by providing workers with automatically generated order and worker specific instructions produced by information generated on the enterprise resource planning level.

Specifically at John Deer we will address:



- The integration a connection of CPS to a smart manufacturing bus that will allow the exchange of data with IT services.
- The integration of legacy IT systems to allow these to cooperate and communicate with new CPS systems.
- Reduction of manual labor and quality of worker guidance improved through the integration data produced at the ERP level (design department and order management) to the shop floor level.



The processes and changes implemented include:

- Enterprise resource planning (EPR)
- Product lifecycle management (PLM)
- Quality control through CPS and ERP integration
- Legacy and CPS integration by connection all systems to middleware as a smart manufacturing bus

The major components include: The implemented Industry 4.0 compliant extensions in the John Deer Factory will consist of CPS with monitors and tablets, creation of digital counterparts of physical objects, and data analytics of shop floor processes.

Norte Portugal Experimental facilities

“Footwear Manufacturing: High Speed Shoe Factory automation and control”

Through the BEinCPPS project KYAIA aims to improve its production flexibility to allow it to respond to customer orders and customization requests in a quick and agile way. This will be achieved by automating multiple systems related to production logistics and the companies ERP system. This automation will involve the connection of relevant sub-systems across all levels of production from machine processes up to production and logistics networks. This will allow for more flexibility by controlling and managing the production steps (pre-stitching, stitching, pre-assembly, assembly) and easier batch and product monitoring. The new automation system will be tested through simulations of the production system which will allow for optimization.

Specifically at KYAIA we will address:

- The integration of main factory elements (Internal logic system, working posts with related software based management systems) and the company´s ERP to allow for autonomous cooperation between the elements.
- Big data storage and usage that may be produced by the logic systems.
- The adoption of publish-subscribe broker that will mediate the flow of data between the PLC devices and planning, scheduling and control applications.
- The adoption of an event processor component able to analyze real time data generated by the PLC´s and to detect patterns that can result in new relevant production information that can aid in the development of a predicative maintenance system.

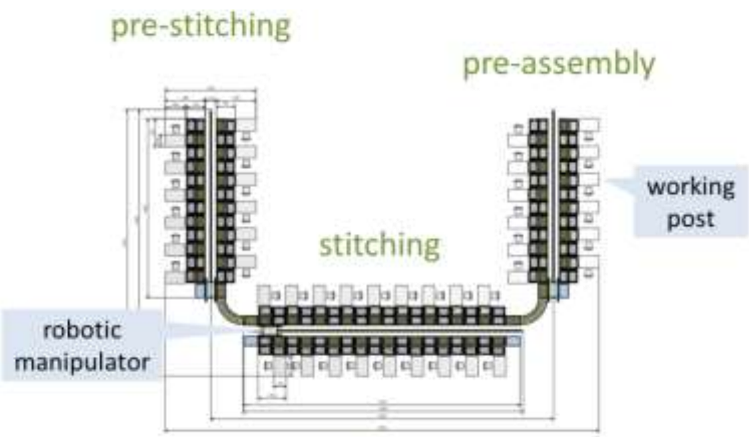
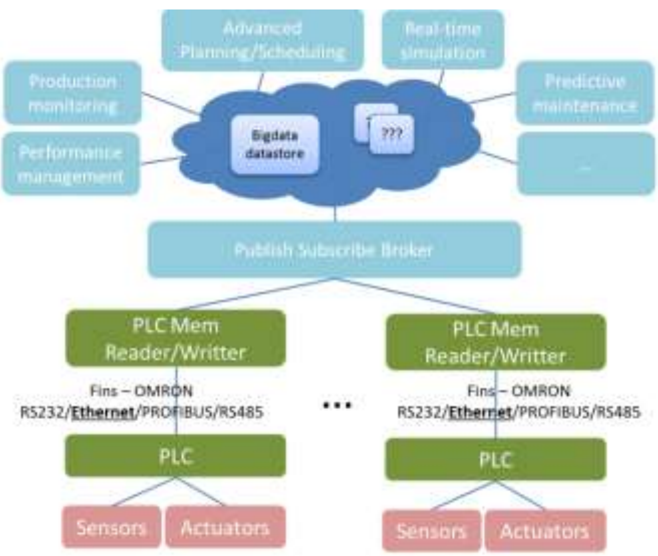


Figure 5- Stitching System: overview.



The processes and changes implemented include:

- Enterprise resource planning (EPR)
- Big data storage and analysis
- Pattern recognition through data analysis
- Predictive maintenance

The major components include: The vertical integration of the production process, the integration and communication of production sub-systems, big data storage and analysis, the linking of different relevant production information to production batches.

Rhone Alpes Experimental facilities

Moulds Manufacturer: high precision moulding”

Rhone-Alpes (France). The objective for Pernoud Company through those experiments is to add intelligence on plastic injection mold to transform this mechanical system in a CPS one, with an expectation of improving cost quality and delays of the part produced. To reach this goal we need a feedback from the mold to know what happened during the production. So to access to this information we need to instrument the mold with different embedded devices on it but also to directly have a look on that information any time it could be needed. Our first experiment is focusing on:

- Data acquisition with thermocouple (Category: CPS equipment development): Monitoring environment conditions using a smart system based on the BeagleBone Black platform, and thermocouple sensors. We are also performing experiments driving the electrical actuators which handle the mechanical parts of the mold and performing the data acquisition to be sent on the cloud.
- Driving electrical actuators (Category: CPS equipment development): Thanks to the smart system, the movement of the mold can be performed by electrical actuator. Those actuators will be driven by the Beaglebone Black and will offer to us flexibility which cannot be reached with standard hydraulic actuators.
- Cloud data monitoring (Category: CPS equipment development): To store the data acquired during the utilization of the smart tool, the smart system is linked to a cloud and this cloud will allow an access to the entire life cycle of the tool from anywhere and at any time. A cloud application implemented as user-interface widget will allow visualizing the real-time data.

The proposed experiment is about managing mold end of life. When a mold reaches the stage of end-of-life, it is normally recycled as any other piece of steel; however, in the case of the smart mold, it will be equipped with the smart system, which can still be used in another mold. Therefore, a modularity mechanism should be developed which will allow reusing and redeploying the smart system onto another mold.

A second set of experimentations will focus on :

- Experimentation with additional types of sensors (Thermoflux and Constraint gauge): Carry out experiments with other types of sensors, which will enrich the environment data acquired by our smart system. This will include sensors less easy to implement like thermoflux, which is used for sensing the injection temperature and pressure sensing or constraint gauge, which are used to analyze and measure distortion.
- Dashboard cloud 3D visualization: Our current experiments will allow us to visualize the real time data of the temperature sensors, the monitored alerts, as well as to mimic the inputs and outputs of the injection machine. However, we would like to experiment with enriching this visualization with a more advanced visualization, including a real-time 3D representation of the smart mold with the real-time conditions, which will provide a visual overview of the different sensors deployed in the mold.

DFKI (Smart Factory Kaiserslautern) Experimental facilities

SmartFactoryKL @ DFKI (www.smartfactory-kl.de)

The SmartFactoryKL in Kaiserslautern (Germany; approx. 100km South-West from Frankfurt) is a vendor-independent living lab for demonstrating and testing Industrie 4.0 solutions in the field of automation technology and human machine interaction.
Since 2005, SmartFactoryKL demonstrates the application of technologies and paradigms like Cyber-Physical Systems, Augmented and Virtual Reality, Modularization, Vertical Integration and Distributed Control in production environments.

Specifically, in the SmartFactoryKL we address:

- Vertical Integration from Field Device to ERP-System
- Distributed Control via Smart Products and in products integrated product memories
- Modularization and standardization of working stations on mechanical and IT-level

The processes of the demonstration line include:

- Production of a business card holder via:
    - Writing of the RFID-memory of the Smart Product
    - Mounting of a clamp
    - Mounting of a coverage
    - Lasering of an individual QR-code
    - Quality control via optical camera
- Providing status information of the production modules via common integration bus

The major components of the system include:

- 5 independent, autonomous production modules controlled via PLCs
  (see above: each step is represented by one module)
- Unified information model at each of the modules
- Common integration bus provided by IBM
- Software-demonstration-environment for individual solutions

The IBM integration layer acquires information from each working station (module) via OPC UA an distributes it using MQTT. In a virtual machine, own Software can be tested within this experiment. Information is provided only in one direction (read-only).
There is a limited possibility to perform experiments at other demonstrators located at SmartFactoryKL which have to be individually discussed beforehand.

Besides some small-scale demonstrators, there are three main production lines:

The **first production line produces** liquid soap which is processed, coloured, bottled and labelled according to the user's individual needs. Therefore the equipment is divided into a continuous batch process part being responsible for the production of the liquids, and a discrete bottling line for filling and handling the soap bottles. Each bottle has a product memory, which locally stores product and production information, being the first implementation of the intelligent product concept. This information can be access and processed in a decentralized manner by CPSbased production modules and by stakeholders along the entire value network.

The **second production line** assembles consumer electronic products, such as handy flashlights, using service-oriented architecture principles for a decentralized CPS-based control of the manufacturing process. Moreover, approaches for orchestrating of services features by CPS components into meaningful production processes are demonstrated. The production line includes also a technology-assisted manual workstation.

A **third production line** follows the "Plug&Produce" principle, to demonstrate the hot plugging of production modules from several distinct industrial partners. The independent modules are thereby fulfilling vendorindependent standards defined by DFKI, which are based on widely accepted communication protocols. The production line includes also a technology-assisted manual workstation.

POLIMI (FoFLab in Milano), starting from January 2017).

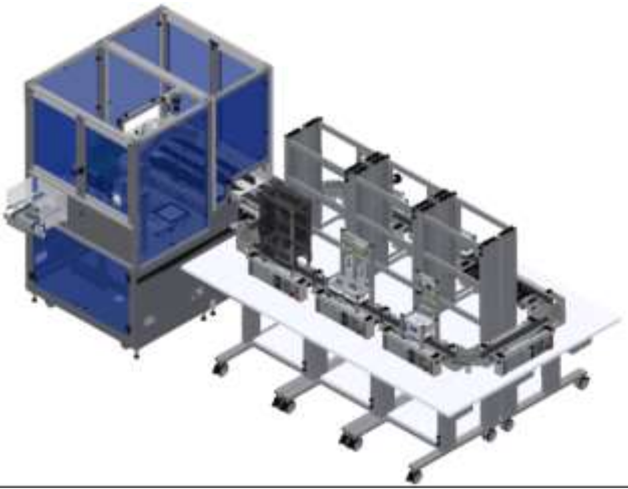
FoF LAB @ POLIMI: The teaching factory lab for the new manufacturing paradigm

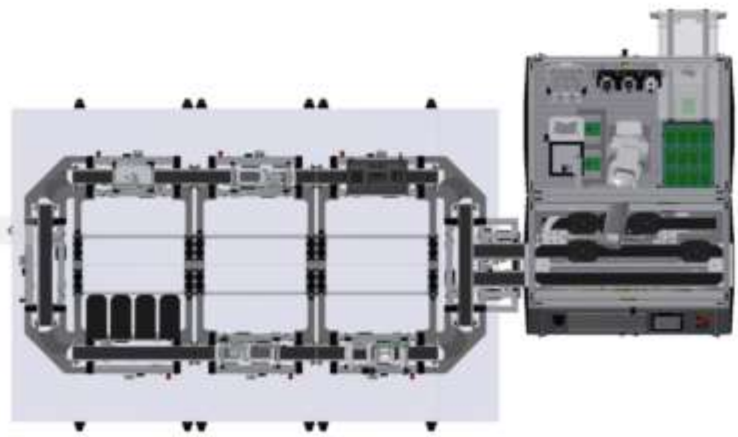
An initiative of the Manufacturing Team of Department of Management, Economics and Industrial Engineering Politecnico di Milano (www.foflab.com , www.foflab.eu)

The FoF LAB, promoted and developed by Department of Management, Economics and Industrial Engineering – Manufacturing Group of Politecnico di Milano, aims to create a tangible physical entity where the research activity in the innovative manufacturing management and planning approaches can be carried out in conjunction with a practical implementation in a "real-like" environment.

Specifically, in the FoFLab we address:

- Product LifeCycle (from Customer to Design, from Design to Virtual Manufacturing, from Design to Recycle, Track&Tracing, Product life history).
- Plant and Production Process Efficiency and Flexibility (Production system flexibility: Semantic (re)configuration of production system, Mix flexibility), The production system as a product (Production system commissioning strategies, Production system lifecycle) and the Smart Factory enabling technologies (e.g. CPS – CPPS).
- Sustainability and Energy and Resource Efficiency.





The processes implemented include:

- Flow control (bar-code, RFId).
- Processing operations emulation or real.
- Final product assembly using robot.
- Quality control using optical camera.
- Intelligent handling system.
- MES software for production, orders monitoring.
- Energy consumption measurement and monitoring.

The major components of the system include:

- robot assembly cell;
- application module stacking magazine;

- application module Drilling CPS;
- application module Press;
- application module Camera Inspection.

Finally, in FoF LAB is implemented an Industry 4.0 compliant extension set consisting of tablet with CPS, Robot Diagnostics, Augmented Reality, NearFieldCommunication apps.

FoF LAB implementation is located in an area of about 80 sqm and is located in building BL27 in Bovisa, Milan.

BEinCPPS

Business Experiments in Cyber Physical Production Systems

Call for Proposals for IT Applications Experiments

Identifier: BeinCPPS Call-1
Call title: First call for BEinCPPS IT Application Experiments
Project full name: Business Experiments in Cyber Physical Production Systems
Acronym: BEinCPPS
Grant agreement number: 680633
Deadline: 15th June 2016, at 17:00 Brussels local time

Title of the proposal

Name of the applicant

Coordinating Organisation - Title First Name, last Name

E-mail:

Table of Contents

Administrative data

No.	Participant organisation name	Participant short name	Country
1			
2			
3			
4			

No.	Participant short name	SME (yes/no)	PIC
1			
2			
3			
4			

Statistical Information for the European Commission`s I4MS Initiative

1 Participant (Organisation name)	2 Country	3 Type (SME /MID /IND / AC / OTHER)	4 First time EU project? (Y/N)	5 PIC number	6 Funding requested	7 Total costs
TOTAL						

Notes

[Please delete these notes in the submitted version]

1. Participant: Insert the name of the organisation. Please start with the coordinating partner
2. Country: Insert the 2-letter country code (using the Eurostat country codes: http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:Country_codes).
3. Type: Insert
    a. SME for an SME,
    b. MID for a mid-cap enterprise,
    c. IND for large industrial enterprise,
    d. AC for academia (universities and research institutes),
    e. OTHER for any other organisation type (e.g. governmental agencies, industry consortia etc.)
4. Fill in Y if this would be the first European project for that partner, N otherwise.
5. Provide the PIC number here if available.
6. Specify the requested funding in Euros (0 decimal places[1])
7. Specify the total costs in Euros (0 decimal places)
8. Enter Y if this experiment partner is already a partner of the BEinCPPS project, otherwise N
9. Row TOTAL: Please sum up both the requested funding & costs in the column above
10. Row Funding for existing beneficiaries: Please sum up the requested funding for the existing beneficiaries (column 6) and the resulting percentage of the total funding (column 8)

[1] i.e. rounded to the nearest Euro

Summary

(Guideline: 0.5 pages)

Industrial relevance, potential impact and exploitation plans

(Guideline: 3.5 pages)

BeinCPPS Call-1 targets the development of IT application experiments that address advanced added value production process and systems, which incorporate Cyber Physical Systems. The open call aims at complementing existing experiments currently running in the BEinCPPS 5 Industrial Hubs under the 8 categories and topics presented in the document “BEinCPPS Call-1 Introduction”.

Only one category can be selected and inside the category, only one experimental facility can be selected

Experimentation datasets as well as open APIs to provide access to the BEinCPPS platform installed in the Industrial facilities will be made available to Open Calls winners for testing and evaluation. In case of need, additional datasets and open APIs could be provided by the Smart Factories experimental facilities in Kaiserslautern (Germany, under DFKI supervision) and in Milano (Italy FoFLab, under POLIMI supervision, but just from January 2017)

BEinCPPS is including 5 industrial facilities where experiments will be located and conducted:

1. Lombardia “Washing Machines: Statistical Zero Defect Quality Control system”
2. Euskadi “Plastic Components: Manufacturing Processes for New Automotive Components”
3. Baden Wuerttenberg “Agriculture Technologies: highly personalized cabin manufacturing, final assembly”
4. Norte Portugal “Footwear Manufacturing: High Speed Shoe Factory automation and control”
5. Rhone Alpes “Moulds Manufacturer: high precision moulding”

Other two Smart Factories will be offered to experiments by DFKI (Smart Factory Kaiserslautern) and POLIMI (FoFLab in Milano, starting from January 2017). A short description of the 5+2 BEinCPPS experimental facilities is reported in a separate public document entitled “BEinCPPS experimental facilities” available on line, on beincpps.eu and I4MS.eu in the section dedicated to the open calls.

Description of the work plan and concept

(Guideline: 3 pages)

Introductory text & explanation of the experiment concept.

Applicants that will use their own experimental facilities for the experiment are required to provide an adequate description of it in this section. If needed, an annex describing in more detail the experimental facility of the applicant could be added (max 2 pages)

Experiment Title					
Participant short name					
Role[2]					
Description: •					
Workplan **Task 1 Task name** Task description. ***Deliverable***: *Deliverable short description (Experiment Month nn (i.e. within months 1 to 18 of the experiment))*					
Impact and Outputs *(Output = concrete results from the experiments, such as, but not limited to, application release, business case, analyses/reports of the experiment, validation report.* *Impact = explanation of the use of project results and the related business impact, enhanced capabilities or potential for service offerings, etc.)* The output of experiment will be: • The results of the experiment will be ..					

Participants and effort						
Participant						**TOTAL**
Effort (PM)						

PM = Person Months

[2] Examples of roles: End-user, application or technology expert, developer.

Quality of the consortium as a whole and of the individual proposers

(Guideline: 2 pages)

The descriptions of the individual proposers should explain the proposer's capability, as an entity and, in terms of the key staff to be assigned to the project, to carry out the assigned tasks. The description of the consortium (for the experiment) as a whole should provide evidence that the consortium includes the necessary and sufficient set of complementary capabilities (i.e. no unnecessary overlap of capabilities nor omission of required capabilities).

Justification of costs and resources

(Guideline: 1 page)

Cost breakdown per Participant; Funding for Third Parties

(Data in the spread-sheet is purely for illustration purposes)

Participant Number	Participant short name	Innovation Action Funding rate (70%/100%)	Estimated eligible costs						Requested Funding (€)
			Effort (PM)	Personnel Costs (€)	Subcontracting (€)	Other Direct costs (€)	Indirect costs (€)	Total costs	
1	Eg-Industry	70%	18	100.000	-	10.000	27.500	137.500	96.250
2	Eg-non-profit	100%	18	50.000		10.000	15.000	75.000	75.000
3	Eg-FF-1	70%	3	10.000	-	10.000	5.000	25.000	17.500
4	Eg-FF-2	100%	3	5.000		10.000	3.750	18.750	18.750
		Total	42	165.000	-	40.000	51.250	256.250	207.500

New Third Parties /Existing beneficiaries	Participant Number	Participant short name	Requested Funding (€)
Third Parties	1	Eg-Industry	96.250
	2	Eg-non-profit	75.000
		Sub-Total	171.250
Existing Beneficiaries	3	Eg-FF-1	17.500
	4	Eg-FF-2	18.750
		Sub-Total	36.250
		Total	207.500

Experimental facilities provided by BEinCPPS partners do not have to be included in the budget.

Costs for experimental facilities of the applicants, if any, are included in "Other direct costs".

Costs for subcontracting and other direct costs need to be clearly explained. Indirect costs are to be calculated as 25% of direct costs (i.e. personnel costs + other direct costs).