Summary of the context and overall objectives of the project

The Product-Service is more and more a source a new business, providing to the end users the experience they need instead of a pure product, efficiently addressing customer needs.

The main scope of the Manutelligence project is to develop a software platform to support this emerging trend, allowing enterprises to develop sustainable innovative product-services. The Manutelligence platform will be composed by existing and new software components, which integration will provide a new tool for the industry digitalization support, leveraging on product virtualization, IoT and sustainability solutions.

The industrial use cases selected for the project are the current targets to develop and validate the platform. The use-case concept bases on the collection and analysis of real life data.

Work performed from the beginning of the project to the end of the period covered by the report and main results achieved so far

WP1 - Engineering and business requirements
T1.1 - Elicitation and T1.2 - Structuration - The elicitation methodology was developed in the specific WP meeting. The 4 end user cases acted as the main sources for requirements. The requirements were structured in categories, aggregating them into a smaller number.
T1.3 - Analysis and refinement and T1.4 - The analysis of requirement trade-offs and prioritization was done. Validation workshop were done with end users and other partners. Consolidation of the results was done with workshop.

WP2 - Simulation and optimisation of PLM and SLM interaction
T2.1 - Extended the theory about PSS life cycles and identified the Life Cycle Modelling Language (LML) as a suitable approach to model life cycles formally.
T2.2 - Developed a PSS design methodology integrating Internet of Things concepts. Created life cycle models for three PSS use cases with LML.
T2.3 - Demonstrated a Life Cycle Performance Assessment tool that integrates PSS sensor data and life cycle models to simulate and optimize PSS profits and cost over the PSS life cycle.
T2.4 - Refined the design methodology and the PSS life cycle models.

WP3 - Collaborative and cross-disciplinary procedures and tools for P/S
T3.1 - Implemented the connection of the Universal Sensor Gateway to IoT platform, gathering product usage data
T3.2 - Development and verification of data models to retrieve data from the field for the different use cases
T3.3 - Enabling flow of information from middle to beginning of life phase, providing benefit from information gathered during
T3.4 - Codified engineering knowledge for an automated linkage of identified closed-loop PLM dependencies with the development of new products

T3.5 - Implementation of a pilot within the platform of the best solution for security standard

WP4 - Manufacturing Intelligence via a P-S Engineering environment

T4.1 T4.2 and T4.3 - The processes of the industrial cases were analyzed together with requirements defined in WP1 to define and design the platform architecture. The SW platform components were integrated and configured, tests were done to validate the platform. IoT solution integrated with the collaboration tools to enhance virtual analysis. Sustainability tools fully integrated to support the improvement of the design

T4.4 and T4.5 - Existing capabilities were integrated in the platform to support the ease of finding and reuse informations and data, leveraging the integration with LCC/LCA and IoT tools. 3D visualization tools were adopted in the process to facilitate the design & manufacturing.

T4.6 - The main activities are related to the development of a flexible environment to present data in a coherent way in order to unify the information and knowledge coming from different tools of the project.

T4.7 - A test strategy and plan were defined and a full set of test cases were executed in order to validate the platform.

WP5 - LCA & LCC management in PSS design and development

T5.1 & 5.2: Analysis of requirements for LCA/LCC tools to be integrated into the Manutelligence platform. Preliminary selection and finalization of candidate tools

T5.3 & 5.4: Implementation of the MaGA and LCPA tools in FabLAB and Lindbäcks pilot. Finalization and the release of the software prototypes, LCA/LCC tools integration into the 3DEXperience platform

T5.5: Identification of the functionalities for FabLAB non-expert user and development of a mock up.

T5.6: Approach to collect, analyse and present social media data in the context of PSS design. Demo for the Lindbäcks case

WP6 - Use-Case

T6.1-Use-case Automotive - The Ferrari use cases about IoT data gathering of real on circuit test and full traceability from requirements to prototype BOM were implemented and tested successfully.

T6.2-Use-case Ship - The Meyer use cases about virtual reality and IoT issues capturing with launch of change management process were implemented and tested successfully.

T6.3-Use-case Smart

Progress beyond the state of the art and expected potential impact (including the socio-economic impact and the wider societal implications of the project so far)

The Manutelligence project stems from the awareness of the transformation of behaviors and needs of people. Hence the need to proceed to a product-service design proposing a new experience and responsive to the needs of the person. The design driven by IoT informations, with a 3D virtual representation and manufacturing simulation, has the potential to provide to the end users product-services freeing the end users from management tasks, making available the most precious thing, that is the time. On the business side, it is foreseen a potential for new activities, as consulting for platform support as well as platform services for SME. The capability to evaluate environment impacts and life cycle costing can have a positive social effect.

Related information