Moving from 'black box' to 'glass box' Artificial Intelligence in Manufacturing

Newsletter #2

Key Stakeholders

XMANAI has a trustful "human-centric" approach that is respectful of European values and principles, adopting the mentality that "**our AI is only as good as we are**". The aim is to transform the manufacturing value chain with 'glass box' models that are explainable to a 'human in the loop' and produce value-based explanations for:

- **Data scientists** – to understand the problem at hand, create AI models and derive actionable insights from data in different application domains.
- **Data engineers** – to build the necessary underlying infrastructure to collect and prepare data, and to deploy AI models in a scalable manner.
- **Business experts** – to understand the results of an analysis in a tangible manner and take more informed decisions depending on the pilot case.

A look into our Pilots

Ford Motor Company (Spain), the Valencia engine plant will be focused on the application of artificial intelligence techniques on corporate production reporting systems, batches, quality, life tools, maintenance actions, with the aim of implementing a system of recommendations that help to optimize and maximize production. Ford will build novel AI models that contribute to optimize the line throughput of the current and successive shifts.

AI for Product Optimization

Whirlpool Corporation (Italy), the leading kitchen and laundry appliance manufacturer business case will focus on improving the Direct To Consumer demand forecasting, a business channel that has been recently launched and activated in Whirlpool EMEA markets to generate effective and reliable input for demand management decision taking. XMANAI will ensure visibility and the capability to understand complex multi-parameter processes.
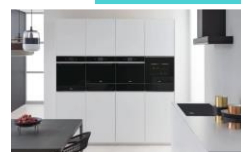

AI for Product Demand Planning

CNH INDUSTRIAL (Italy), manufacturer of all purpose tractor light (ALP) and all purpose tractor heavy (APH) drivelines used to equip tractors assembled by CNH INDUSTRIAL in its plants worldwide. Thanks to XMANAI project CNH INDUSTRIAL will create a more organized data management, sharing, and generate hybrid and graph AI models to simulate different scenarios related to optimizations and predictions such as product quality, product measurements, and the tool change strategy based on line efficiency and tool life.

AI for Process Quality Optimization

UNIMETRIK (Spain), a company that offers industrial solutions related to Calibration, Measurement and Metrological engineering, seeks to evolve its metrological software to an intelligent and training environment that improves quality control prior to measurement planning definition and indirectly contributes to generative design. XMANAI will increase the speed of metrological analysis and guide engineers through the best decisions.
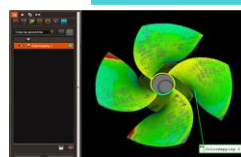

AI for Semi-Auto Hybrid Measurement Planning

Requirement Elicitation

To ensure that all project objectives **meet the requirements of the community**, XMANAI implemented a collaborative agile methodology in which interactive online sessions were organized among project stakeholders using Miro (www.miro.com) boards. The boards were configured to each of the XMANAI roles, namely **Data Scientist, Data Engineer and Business Expert**. Several user stories expressing requirements were extracted, and the TO-BE user journey specification was followed by grouping and organizing user stories into a sequence of activities and features.

The main purpose of this collaborative agile requirements elicitation was to co-create a detailed vision of the XMANAI concept as a novel approach for using explainable AI and graph analytics in manufacturing operations, as well as to provide an initial, high-level, version of the MVP to be used as a guide for the research and development activities of the project.
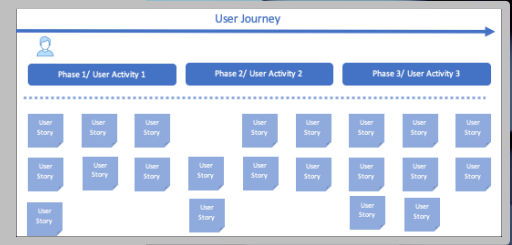
MVP Core Features

- **XAI Model Management**
- **XAI Pipeline Design**
- **Collaboration over XAI Pipelines Creation**
- **XAI Model Security Assessment**

XMANAI Minimum Viable Product (MVP)

The MVP refers to a version of a product with the minimum set of features and functionalities that can satisfy early adopters who, in turn, can promptly provide feedback for future product improvements. It represents the overall mindset and strategy adopted for distributing efficiently the development and integration workload, allowing continuous co-creation. As such, the XMANAI MVP will be **maintained as a 'live' document**.

The definition of the MVP is an iterative process following the requirements elicitation with **3 core phases namely Feature Definition, Feature Assessment and MVP Consolidation** that swiftly moves towards the prototyping avoiding development with to low acceptance, lack of alignment to the users' needs and high complexity:

- **Feature Definition** - Based on the technical requirements expressed as user stories, a user story mapping exercise has been performed to extract MVP features (or epics). In total, 45 features were extracted which constitute the basis for the XMANAI MVP definition.
- **Feature Assessment** - The XMANAI pilots, in the role of different stakeholders, were requested to describe and rate in a qualitative manner: (a) the Added Value of each feature for their organization; (b) the Innovation in Manufacturing per feature, and from the technical partners (c) the Complexity of each feature, and; (d) the Feasibility of each feature.
- **MPV Consolidation** - Considering the preliminary assessment, the MVP confirmed the explainability (XAI) features as the most critical (indicated on the left).

Dissemination and Collaboration

Recently, the project had its 3rd virtual GA and has also been presented in the AI-MAN workshop "Explainable AI in Manufacturing". The AI-MAN cluster of ICT-38 funded projects has been created with the support of EFFRA. Visit www.ai4manufacturing.com for information, exciting news, inspiring use cases, upcoming events, latest publications and webinars to share with a community of similar interests, regarding AI and Manufacturing!

AI4MANUFACTURING

Future Activities:
- AI-MAN workshop on Ethical & Legal Aspects of AI in Manufacturing/Industry
- Digital Factory Alliance (DFA)