# XMANAI
## MAKING AI UNDERSTANDABLE

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

## Newsletter #8 - August 2023

### Whirlpool Pilot

Whirlpool Corporation (NYSE: WHR) is the world's leading kitchen and laundry appliance company, with approximately $19 billion in annual sales, 78,000 employees and 57 manufacturing and technology research centers in 2020. The company markets Whirlpool, KitchenAid, Maytag, Consul, Brastemp, Amana, Bauknecht, Jenn-Air, Indesit, Hotpoint and other major brand names in nearly every country throughout the world.

Whirlpool EMEA is the division of Whirlpool Corporation operating In Europe, Middle East and Africa (EMEA) it has approximately 19,000 employees, a sales presence in more than 35 countries and manufacturing sites in 5 countries with headquarters in Milano (Italy).

## Use cases
### and
### overview of timelines

**Whirlpool's use case is focused on 2 groups of stakeholders:**

**1. The business roles:** Central demand planning, D2C marketing, and sales: they're interested in getting access to the forecast result and in the explanation of the reason why it has been generated with specific values. They'll have a dashboard for the demand profile visualization and for the visualization of the key features which have generated it. They'll have visibility about the relations and correlations among the different features and they'll have the possibility to simulate the effect of specific values of the forecasting process and, on the contrary, have evidence of the combination of values to generate a specific expected forecast ("what if" simulation). They'll have also the possibility to get evidence of anomalies, trends, patterns, behavioral schemas, and the features which have generated them.

**2. The technical roles:** data engineers and data scientists: they're interested in maintaining AI and XAI functionalities performances, and managing data pipelines and algorithms, in order to ensure minimal forecasting error. The Demo sessions will be held in 3 phases: the first involves Central demand planning for the preliminary AI validation of demand forecasting and for XAI functionality on demand profile and what-if simulation. The feedback will be captured for system improvement and for the preparation of the second phase. This will involve also D2C marketing and sales with a special focus on XAI functionalities: Also, in this case, the feedback will be captured for the final demo session. This third one will be held fully replicating daily operations and the platform will be used for a period of 2 months to properly capture the measures of project KPIs. For all the phases the technical roles will be involved as validators and system administrators.



*Figure 1: Whirlpool Oven*


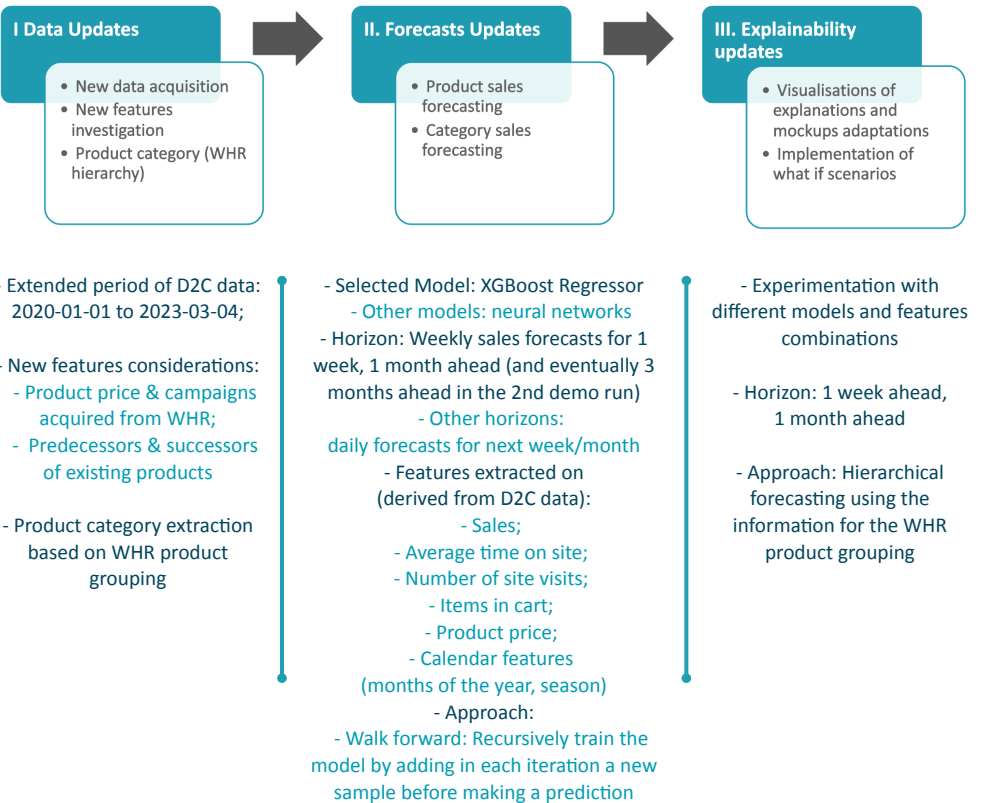
*Figure 2: Whirlpool Combined Fridge*

# Initial Results

## DEMO Progress achieved:

- Data pipeline setup and activation;
- Data processing and analytics;
- System architecture design and security compliance;
- Explainability requirements definition;
- Users' stories and demo scenarios definition;
- Explainability dashboard design and implementation;
- First Demo session with users.

See more about Whirlpool pilot:

## XAI Implementation Progress and Updates

**I Data Updates**
- New data acquisition
- New features investigation
- Product category (WHR hierarchy)

**II. Forecasts Updates**
- Product sales forecasting
- Category sales forecasting

**III. Explainability updates**
- Visualisations of explanations and mockups adaptations
- Implementation of what if scenarios

- Extended period of D2C data: 2020-01-01 to 2023-03-04;

- New features considerations:
  - Product price & campaigns acquired from WHR;
  - Predecessors & successors of existing products

- Product category extraction based on WHR product grouping

- Selected Model: XGBoost Regressor
  - Other models: neural networks
- Horizon: Weekly sales forecasts for 1 week, 1 month ahead (and eventually 3 months ahead in the 2nd demo run)
  - Other horizons: daily forecasts for next week/month
- Features extracted on (derived from D2C data):
  - Sales;
  - Average time on site;
  - Number of site visits;
  - Items in cart;
  - Product price;
  - Calendar features (months of the year, season)
  - Approach:
- Walk forward: Recursively train the model by adding in each iteration a new sample before making a prediction

- Experimentation with different models and features combinations

- Horizon: 1 week ahead, 1 month ahead

- Approach: Hierarchical forecasting using the information for the WHR product grouping

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# XMANAI Hackathon event

Last month, the Hackathon event took place in Greece.

Thank you to all the participants who made this event a success and thank you also to the XMANAI partners who ensured its realization!

See more about how the Hackathon event went, here:
https://www.linkedin.com/company/xmanai/

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