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FreshAnalytics – Developing a Platform for AI optimisation of the food supply chain

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ABSTRACT

Within the forerunner project of FreshAnalytics, referred to as FreshIndex, project partners dealt with the development of algorithms and the underlying models allowing for the seamless monitoring of storage and transport temperature as well as the analysis of transmitting sensor data via GS1 standards along the whole supply chain in order to allow for a dynamic best before date. The follow up project FreshAnalytics will work on a digital base system for uniform data management along the food chain and providing a food-specific tool library for value-added services. The consortium will develop demonstrators for a cloud-base foundational system serving as a supervising system for storage conditions and product quality of groceries along the supply chain from manufacturer to retail and consumer.

Keywords: *Food Waste; Sustainability; Transparency; Artificial Intelligence; Supply Chain; Dynamic Pricing; Forecasting Information Systems*

Introduction

143 billion euros worth of food end up in waste every year in the European Union (EU) (FUSION, 2016). A significant part of the waste is generated along the increasingly complex food supply chain due to non-compliance with quality and safety requirements or due to expiry of the sell-by date without the goods being sold or consumed. While involved companies and consumers can already obtain detailed information about ingredients, nutritional values and increasingly also the origin of food, there is currently no broadly introduced solution with regard to freshness quality. Digital platforms provide the opportunity to reduce food waste by

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exchanging data between the involved companies and by this provide a higher degree of transparency for companies as well as for consumers.

FreshAnalytics as successor of FreshIndex

The FreshIndex, which was developed within the German FreshIndex project (FreshIndex, 2020) acts as a new shelf life indicator for food instead of or in addition to the static best-before date (tsenso, 2020). This index is based on the manufacturers' hygiene data and the existing storage conditions and is implemented in a digital cloud application (GS1 Germany, 2018).

Within the FreshAnalytics project, a cloud application will be developed to monitor the storage conditions and product quality of individual food products along the entire supply chain from industry to retail and finally to the consumer (see figure 1; Federal Ministry for Economic Affairs and Energy, 2019). State of the art food modelling approaches will be enhanced to provide reliable results. Extensions will enable these models to provide a scientific framework for evaluating the freshness of perishable products. Modelling results constitute the basis of the envisaged system.

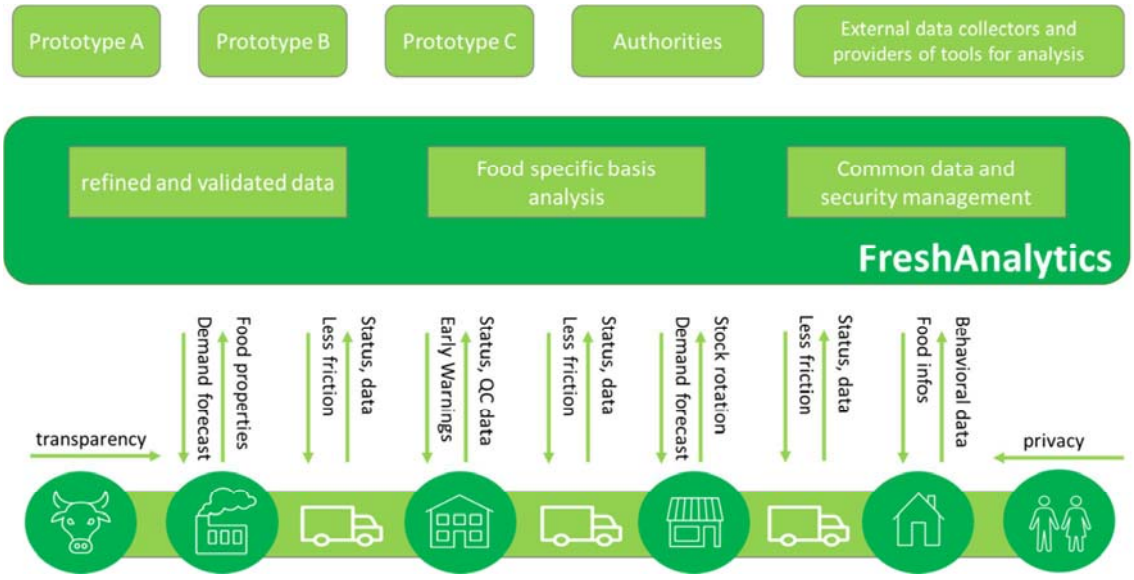

Figure 1: FreshAnalytics System

The project intends to generate various services in the food supply chain based on fresh and quality data. Forecasting information systems will be developed according to machine learning methods. A key element of this approach is the deployment of artificial intelligence (AI) in distributed systems. This involves algorithms that have the ability to learn independently from data and thus automatically adapt and optimise themselves in the running system. In food trade, data-based forecasting systems are already in use that forecast customer demand on a daily basis. By linking data along the value chain, FreshAnalytics now has the opportunity to incorporate quality data into the system at an early stage in order to significantly improve the accuracy of the

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forecasts. This enables further services in the food supply chain to be derived, such as the use of innovative pricing models like dynamic pricing or smart contract.

These approaches will be tested in an extensive practical test in an industrial B2B environment and for a B2B2C information system for consumers. The FreshAnalytics system will be expanded by three prototype applications, which will be validated technically and operationally in a practical test over several months. Possibilities of connection for further, external data providers, users and analysis tools will be provided.

The results will serve as a basis for decisions regarding potential follow-up financing for the further development of the prototype into a marketable product. Hereby, the FreshAnalytics solution meets industry-specific requirements, considers the consumer as the final stage of the food supply chain and is based on standardised data interoperability.

Summary and Conclusion

The development of FreshIndex pursued the goal of developing a dynamic best before date based on hygiene data and existing storage.

In addition to FreshIndex, the follow-up research project FreshAnalytics focuses on the use of data from the food sector, its safe and legally compliant exploitation and its treatment as an independent economic asset. FreshAnalytics develops and tests prototype applications for the economically attractive field of data use along the food supply chain. In particular, the development of forecast information systems and dynamic pricing models will be tested in order to reduce food waste and at the same time to deploy new price models for perishable food based on a dynamic best-before date. The results are expected to contribute to the digital transformation of the EU economy by novel solutions, including improved data exploitation, derived data services and data-based business models.

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