ITEA 4

Project Results

Food Friend

Continuous, personalised diet and nutrition management

The ITEA project Food Friend (Autonomous and easy-to-use tool for monitoring of personal food intake and personalised feedback) has developed a toolset that improves nutrition regarding tube feeding, obesity and diabetes, thereby boosting patient wellbeing and reducing healthcare costs.

Malnutrition is multi-faceted and can cause both undernutrition and obesity; the former can lead to muscle loss and frailty and the latter to heart disease, diabetes and cancers, for instance. However, nutrition requirements differ per patient and over time, making it difficult to create methods to accurately measure intake. Additionally, patients, researchers and practitioners suffer from a lack of usable data, resulting in limited knowledge of how to affect change.

Food Friend represents a shift towards continuous, personalised diet and nutrition management, for which it has developed a toolset to measure food intake and provide personalised feedback. This enables a clear overview of dietary behaviour for patients and practitioners and allows them to balance food intake with activity. The results are spread across three use-cases and provide an understanding of nutrition in terms of both individual needs and the wider research context. The first use-case aims to increase compliance and satisfaction with tube feeding, which is currently manual and generally inefficient. Use-cases on obesity and diabetes, meanwhile, promote behavioural changes and stimulate continuous user engagement with the applications developed.

Technology applied

Each partner has developed individual tools that can be used in tangent and that draw on knowledge and expertise from other partners. The tube feeding use-case starts from an IoT-connected tube feeding pump, for which a major development by KnowL is a care provider portal and patient support application for the entire management process of tube feeding. For user experience, the pump can be connected to a central platform for secure and reliable data collection to quantify user experience using video and psychophysiological sensors. Maastricht Instruments has also developed software for indirect calorimetry, using algorithms and signal processing to monitor CO2 concentrations and therefore gas exchange in the body. This will allow researchers to measure the relationship between exercise and energy consumption. Finally, Remecare and KU Leuven have developed a smart plate to measure how much food is consumed when patients are ready to transition from tube feeding to regular food; this uses an application with a dashboard and management plan to integrate smart plate data into medical records and monitor the evolution of calorie intake.

In the obesity use-case, the aim is to simplify food intake and physical activity through data collection from sources such as smart watches, followed by data analysis and a recommendation system presented to users in a mobile application and to professionals in a web application. Likewise, the diabetes use-case is based around a self-management application for personalisation according to user profiles. This includes coaching, challenges, recommendations and a food scanner that checks photos against a database for calorie and glucose analysis. These coaching innovations can be supplemented by an ontology developed to describe the data elements of nutrition, which has been published in a scientific paper.

Patient support application for the entire management process of tube feeding and smart plate to monitor food intake when ready to transition to regular food.

Making the difference

Through the further development of its 12 distinct tools, Food Friend will serve as a modular product ecosystem that can

be used to tailor coaching for patients requiring nutrition advice or studies on nutrition. In doing so, the project demonstrates the relationship between improved patient health knowledge status and better health outcomes. For instance, use of the diabetes application improves patient knowledge by 20% (compared to a questionnaire taken at the start) and also leads to an average increase of roughly 20% in the number of steps taken per day. The focus on user experience also means that two thirds of users are retained after three months of using the application.

Most of Food Friend's results are now undergoing usability trials, including meetings with potential customers, in order to bring them to the market as products. In addition, the results can be used to supplement existing products and international competitiveness. Dutch company Maastricht Instruments, for example, has improved their product proposition by integrating their new software into metabolic chamber installations in France and Germany to study energy metabolism. This has helped them to acquire new projects within a short timeframe of Food Friend's conclusion and allows them to utilise its results in areas beyond the project's scope, such as the effect of sports on metabolism. Further exploitation of Food Friend is being aided by (academic) dissemination of the results, including 12 master's theses, one PhD, 11 conference participations and ten scientific publications.

For the consortium, Food Friend proved a valuable opportunity to learn from partners across Europe and in different domains. This positive experience has led different combinations of the partners and new participants to create two follow-up ITEA projects: TREAT, aiming to increase patient self-efficacy in managing non-communicable diseases, and MediSpeech, which will create an open digital healthcare ecosystem for automated medical reporting. As a result, Food Friend serves as an excellent foundation for its ultimate goal: increasing patient wellbeing while achieving better health outcomes.

Major project outcomes

Dissemination

- More than 10 publications, e.g. 12 master thesis, one PhD thesis, several conference publications, systematic review in Expert Systems with Applications, scientific paper in Stud Health Technol Inform, published data sets.
- Several presentations at conferences, e.g. ECAI 2020, Hannover Messe 2020, Cities of Tomorrow #8, The Things Virtual Conference, CCW 2020, WorldCist 2022, Conferecne ICTS4eHalth, PAAAMS 2022, ISAMI 2022, EPIA 2022, CAPSI 2022, Medical Informatics Europe 2023.

Exploitation (so far)

- Care provider portal and patient support application for the entire management process of tube feeding.
- Self-management application for diabetes patients, including coaching, challenges, recommendations and a food scanner that checks photos against a database for calorie and glucose analysis, supplemented by an ontology developed to describe the data elements of nutrition.
- Data image base to help improve food identification.
- Mobile application focussing on corporate users to enter their food consumption, track their food consumption activities and receive recommendations by the nutritionists as a part of corporate wellness.
- Software for indirect calorimetry, using algorithms and signal processing to monitor CO2 concentrations and therefore gas exchange in the body.
- Smart plate to measure consumed food; this uses an application with a dashboard and management plan to integrate smart plate data into medical records.

Patents

- 2 patent applications filed.

ITEA is the Eureka R&D&I Cluster on software innovation, enabling a large international community of large industry, SMEs, start-ups, academia and customer organisations, to collaborate in funded projects that turn innovative ideas into new businesses, jobs, economic growth and benefits for society. ITEA is part of the Eureka Clusters Programme (ECP).

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Partners

Belgium

- Katholieke Universiteit Leuven
- Remecare BV

Czech Republic

- Institute of Microelectronic Applications

Netherlands

- Almende BV
- Evalan BV
- Maastricht Instruments
- Maastricht University
- MEDrecord BV
- Noldus Information Technology BV
- Nutricia Research BV

Portugal

- BE Unit, LDA
- FYI DIGITAL INNOVATION
- Instituto Superior de Engenharia do Porto (ISEP) -GECAD
- University of Porto Faculty of Medicine

Türkiye

- ARD GROUP
- TMOB BILISIM
- Turkcell Teknoloji

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October 2019

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Project website

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