

PRINCIPAL ACADEMIC TUTOR

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EXTERNAL INSTITUTIONS

Fluid-o-Tech

EXTERNAL TUTOR

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WEB OF WATER

Executive summary

Web of Water (WoW) is an innovation project supported by Fluid-o-Tech, international leader in the design and manufacture of pumps, valves, sensors and fluid management systems.

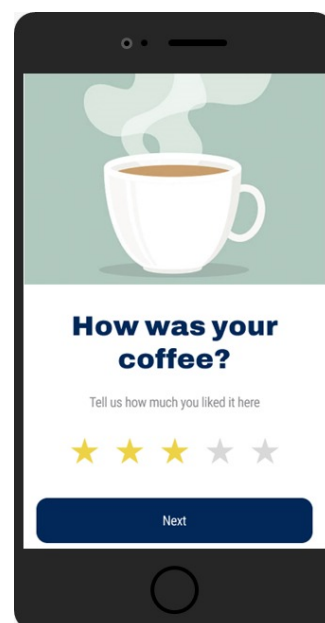
The project focuses on water quality and on the value that can be extracted from sharing water data, which arises from digitizing water. In its broader meaning, Web of Water aims at creating an **interconnected network of nodes** that share information on the water quality. The goal of the team was to realize this vision by investigating the possible fields of application of WoW through accurate benchmarking and developing a prototype solution in a specific area.

At the end, the commercial sector of coffee shops was selected, and three outputs were produced: a **physical prototype** for measuring water parameters, a **digital platform** for data sharing, and, not less important, a **business model** for this Internet of Things solution to work.

As an IoT project, from a technical point of view, it required multidisciplinary skills, and a research phase with the analysis of existing solutions in fields ranging from medicine to swimming pools and involving the study of stakeholders' needs, water parameters and working business solutions for each industry.

Finally, Web of Water was applied to the commercial sector of **coffee shops**, with the aim of facilitating machine maintenance, improving coffee taste according to customer feedback and enabling new frontiers in the study of coffee quality.

Water Quality, Water Digitalization, Coffee, Digital Platform





Physical prototype: IoT system embedded in Nespresso's coffee machine

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List of my Machines

Notifications 2

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Map of all my Machines

Status by Area

Status	Areas
●	Centro Storico
●	Stazione Centrale, Gorla, Turro, Greco, Crescenzago
●	Città Studi, Lambrate, Venezia
●	4 Vittoria, Forlanini
●	Vigentino, Chiaravalle, Gratosoglio
●	Barona, Lorenteggio
●	Baggio, De Angeli, San Siro
●	Fiera, Gallarate, Quarto Oggiaro
●	Stazione Garibaldi, Niguarda

Latest updates

The filter in your Appia Life XT 2 Groups is changed and functioning!

more info

The filter in your Prontobar Silent needs to be changed!

more info

The filter in your Aurelia Wave needs some maintenance!

more info

Digital Platform: Machine Producers' Homepage

**Project description
written by the
Principal Academic
Tutor**

The issue investigated by the Web of Water (WoW) project is particularly contemporary and challenging. More specifically the objective of the project is twofold:

(i) on the one hand measure and monitor water quality,

(ii) on the other hand capture new opportunities from data about water parameters.

The challenge addressed by the WoW project is intrinsically connected with several Sustainable Development Goals.

The multidisciplinary nature of the project team, as well as their enthusiasm and creativity, has allowed to achieved three fundamental results that can be applied in the coffee industry:

(i) physical prototype (ii) digital platform, and (iii) business model.

From the technological point of view the prototype mainly relies on the opportunities provided by Internet of Things. The digital platform involves both coffee shops and end customers. The conceived system allows to both to control the taste of the coffee that is significantly influenced by the water quality and improve the maintenance performances in relation to the filters of the coffee machines.

**Team description
by skill**

The Web of Water team consists of one industrial engineering student, an architecture student, two design students, an electronic engineering student, a computer engineering student, a mathematical engineering student, and a cinema and media engineering student. Given the wide variety of skills and study backgrounds of the members, the project was carried out with a unique overall vision, and through many different points of view. The first phase of work focused a lot on benchmarking, which took the whole team busy for the first months, through the analysis of various market solutions. Only after this long research phase, the project started to need specific skills. Two resources in particular, Pietro Segala and Syed Arsalan Aijaz, were applied in the experimental work in the laboratory for the tests with the sensors and the realization of the prototype, directly at the physical headquarters of Fluid-o-Tech in Corsico (MI), with the precious collaboration and supervision of Fabrizio Tessicini and the engineers of the innovation team.

Martina, Marco and Karolina mostly applied their skills for the most high-level study of the system, from the point of view of user experience, as well as for the realization of the prototype of the platform and other multimedia contents. Three other components, Akanksha, Gianluca, and Giulia were particularly engaged in the design of the business model in all its aspects and in all its phases.

Goal

The project's main objective is to design a platform based on IoT technology to monitor and share the quality of water and its contaminants and control it in one specific sector after evaluating the existing market solution in homes, hospitals, and commercial spaces. As an aspirational goal, the project aims to drive the necessary meaning and technological change to digitize water, finding value in sharing this data.

The project went through different chronological phases, where different objectives were the points of focus:

1. Understanding water quality concepts in different sectors, starting from three verticals suggested by the company: medical, commercial and drinking water networks (private homes).
2. Identify business models and commercial solutions that exploit an IoT paradigm for monitoring and sharing water data.
3. Select a fertile field of application where a strong interest for a solution like this exists, but there is a lack of innovative solutions or the existence of incomplete ones.
4. Elaborate an innovative business model, build and test a physical prototype and a prototype of a digital platform for sharing water data.

Understanding the problem

The idea began with the simple questions: *What is the quality of the water coming out of your tap today? What do we actually know about the water that we and our families drink or bathe in every day?* And the truth is that today we have more information about the quality of the water in the can of soda or bottle of water than we know about the water in our homes. And that can seem odd, knowing that each person uses around 220L of water per day. If we only considered the coffee that each of us is so eager to drink every day, we would realize that only 2 per cent of it is coffee, and the rest is water. But there could be many more examples. Let's recall for example, the medical sector. Each haemodialysis treatment requires around 120 liters of water, making it by far the highest water-consuming treatment in the healthcare system. And that water doesn't come from the tap, but what if it could? The issues regarding misinformation about the quality of water might be solved by the digitalization of water, which uses real-time data to provide recommendations to users — actionable intelligence that can bridge the gap between our inherent need for clean water and the practical reality of working across an ever-failing national infrastructure. At the beginning of the project, the company presented a starting point: Fluid-o-Tech, in fact, has developed a new sensing technology able to record a light response texture coming from the interaction with coherent light. The sensor can be trained to classify fluids, detecting the smallest changes in composition, contaminants, or structure. And by digitalizing the fluids, we open the possibility of training the sensor to recognize patterns and substances - saying, in short, it can read the properties of any liquid, which makes the technology useful for many fields of interest.

Exploring the opportunities

In this project, we are dealing with architectural innovation that consists of components which are already widespread technologies, such as IoT platforms, mobile applications, sensors, valves and pumps and algorithms for data analysis.

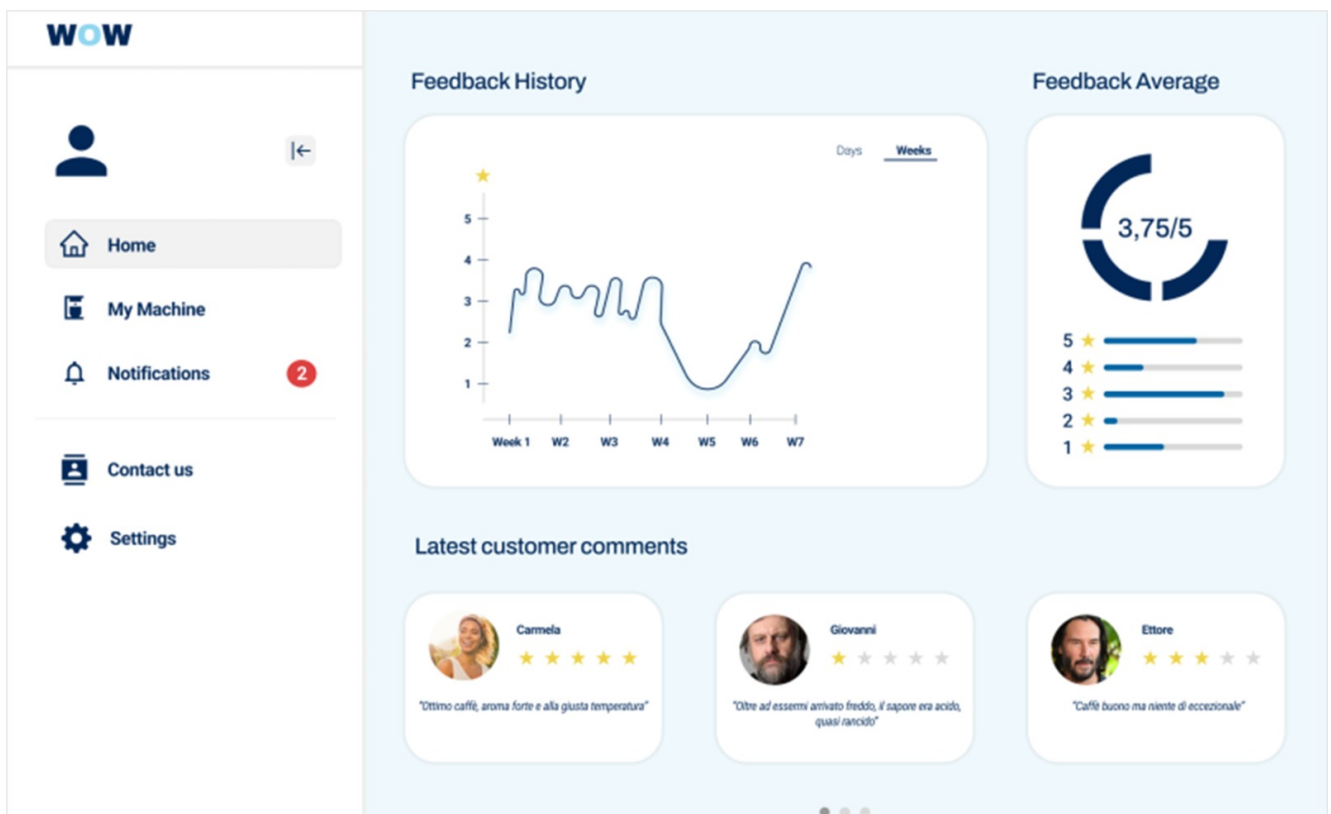
The innovation introduced by the project resides in putting together these pieces and finding an appropriate market sector for the application, building a blending business model.

We explored the opportunities for creating this vision in several markets, in the public and private water business, but in some areas we found obstacles such as:

- Unfeasible hardware cost for the private home sector
- Technological entry barrier in the medical area
- Presence of tailor-made monitoring solutions for hydroponics agriculture

Finally, the coffee sector was selected, because we could identify several opportunities for growth, including:

- Gap in the filter market: there is not any solution for the maintenance of the filters.
- Innovative solution for coffee quality: there is no existing solution that permits to monitor coffee quality real time.



Digital Platform: Bar Owner's Homepage

Generating a solution

The proposed solution of Web of Water as applied to the coffee sector is aimed at two broad categories of customers – the producers of the coffee machines (whose needs revolve around the maintenance of the coffee machines) and the bar owners who use the coffee machines (whose primary goal is to improve the taste of coffee). For the producers of the coffee machines, the generated solution is two-fold: the first part is the physical electronic system which will be embedded in the coffee machines and measure the quality of water being used to prepare the coffee, whereas the second part involves an online platform which shows a map of coffee machines manufactured by the producers which allows them to track the quality of water used in the machine and thus plan the maintenance of the machine and set alarms for fault detection. On the other hand, for the bar owners, the solution offered revolves around the conception of data for which an online platform is created which gathers feedback from the consumers of coffee. This feedback combined with the collected data on quality of water which was used to produce the said coffee will be analysed scientifically and empirical relations between the two will be drawn. Needs of both these categories of customers are addressed through the common and innovative business model.

Overall, the system proposed by our team could be inserted into the broader framework of number 6 of the Sustainable Development Goals: “clean water and sanitation” as it spreads sensibility on water quality and highlights the possibility to generate concrete value from its monitoring because in the designed scenario all users would have a return from water data, ranging from an economic benefit to an improved taste of coffee.

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