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Executive Summary

This document is the public part of Deliverable **D8.5, Business ecosystems report**, which also has a restricted part (submitted as D8.5.1). According to the DoW, D8.5 has the following goals.

D8.5) Business ecosystems report: This deliverable provides a first attempt at the identification of the possible business models to be used in the exploitation of SmartH20. The report builds on the market analysis provided by D8.1 and outlines a set of business plans corresponding to the various implementation and exploitation alternatives. An update of this deliverable will be produced at month 36, focussing on the various geographic areas of Europe, starting from the countries of the project partners.

where D8.1 was defined as follows.

D8.1) Early Exploitation plan: In this deliverable each partner describes its initial and expected plans to exploit the results and the foreground assets that will be produced during the project. This deliverable will include the identification of the project results and classify them according to their exploitation potential.

A major advantage of smart metering over traditional metering is the opportunity to create win-win situations both for utilities and for the start-ups that develop innovative demand management tools for these utilities. This deliverable explores the advantages for both sides, and its main findings (from both the public and restricted parts) are that:

- This deliverable presents a (confidential) return-on-investment analysis of smart metering.
- Its results suggest that switching from traditional metering to smart metering is cost-beneficial, but switching from no metering to smart metering is not in itself. Yet, benefits are expected to represent around 80% of the costs, which is not the case of supply-side investment, which usually yield no benefit in themselves.
- Demand-side management can markedly improve the benefits of smart metering, even when assuming its effects are modest. This deliverable considers two demand management strategies: the integration of the SmartH2O platform and dynamic pricing.
- This is a favourable context for the assets developed for commercial use in the SmartH2O project: 1) the SmartH2O platform, 2) the “Drop!” game and the online app, and 3) the smart meter data management component of the platform, which can also be sold a s a standalone solution.
- Business plans are outlined for these main assets. Figures given in that context should not be understood as commitments, but as the result of perspectives that have to be precised and confirmed in the third and final year of the project.
- Yet, the overall picture from these business plans and from other sections of the project is that SmartH2O assets, starting with the platform as its core asset, are well-positioned to take full advantage of the growing implementation of smart water metering by utilities.
- This deliverable has been the opportunity to develop a methodology that uses state-of-the-art business models and financial plans for SaaS (Software as a Service) in order to facilitate the future commercial development of the SmartH2O platform and its components.

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1. Introduction

This introductory section not only outlines the contents of D8.5, but also situates the contributions to the public part of this deliverable with respect to their confidential counterparts, found in D8.5.1.

Besides this introduction, this deliverable is organised into six main sections. For each section (except Section 7 which is completely public), there is a public part and a confidential part. As this deliverable is public, all confidential parts have been collected and assembled in an extra deliverable, submitted as D8.5.1. Both deliverables explore business implications for the two types of actors that are to benefit most from smart metering: utilities and the IT companies that can propose them solutions to manage their data and engage their customers. The confidential deliverable D8.5.1 contains information on prospected business exploitation activities of the SmartH2O consortium, which is therefore not to be released to the general public.

Section 2 puts in context the business ecosystem at the project-wide level. This includes updates to the technology and regulation watch, and documenting examples of successful startups in the sector and relating their strengths and weaknesses to those of the assets being built in the SmartH2O project. It also includes a list of business actors related to smart metering and / or assets that the SmartH2O project is building. The confidential part of Section 2 in D8.5.1 enumerates the business contacts of the SmartH2O project and all its partners. It is confidential because some of this contacts are of strategic nature regarding the exploitation of SmartH2O assets; others are nominative.

Sections 3 and its confidential counterpart in D8.5.1 explore the implications of smart metering for utilities. Section 3 recounts the experience of the three utilities involved in the project, namely TWUL, SES, and EMIVASA. These experiences outline the expected benefits but also the challenges associated with adopting smart metering. Section 3 from D8.5.1 then devises a general methodology to compute the return on investment of smart metering. This ROI can be evaluated first without taking into account any demand management strategy. This basic cost-benefit analysis is completed by factoring in the consequences of integrating a technological solution such as the SmartH2O platform, and by outlining the financial implications of dynamic pricing. That part is a confidential section because it implies computations that use sensible information for utilities, especially TWUL and EMIVASA.

Then, Sections 4 to 6, and their confidential counterparts from D8.5.1 outline business plans for three assets of the SmartH2O project. As the project makes progress, the fourth asset put forth in previous deliverables, the “Dashboard for customer behaviour analysis and water demand planning” (Section 7) is increasingly seen as an integral part of the platform for commercial purposes. Therefore, no business plan is outlined for this asset at this stage. For the three other assets, the confidential part comprises the business plan quantitative projections. These figures should not be interpreted as a commitment from the project partners. Rather, they are merely indicative of what they expect can happen if they follow the strategy exposed in this deliverable. While they hope to not be held up by unpleasant surprises, unexpected adverse events happen routinely in the life of a business. Likewise, they hope their evaluations correspond to the market reality, but project partners and reviewers alike should keep in mind that evaluations that looked reasonable and justified beforehand sometimes prove to be overly optimistic *a posteriori.*

As the project progresses, the specificities of each of the assets to be marketed become clearer, and that is expressed throughout the business plans as they are not articulated exactly in the same way.

Section 4 builds on D8.4 to update on the business models for the SmartH2O platform, and to progress towards a business plan for the project's core asset (financial part in the confidential part, D8.5.1). In particular, it relies on the state-of-the art for Software as aa Service (SaaS) to propose the methodology for the business model. This is expected to serve as a basis for future business development of the platform and its associated component.

Then, Section 5 presents a business plan outline for the Drop! game and its associated online app, developed and marketed by Moonsubmarine. Since SaaS development is not at the core of this asset, the business plan builds more directly on the business model of previous deliverables.

Finally, Sections 6 outlines a business plan for the Smart Meter Data Management component of the platform (SMDM). This is another example of SaaS, and the methodology developed for the platform's business model is applied. This shows that this method is appropriate for relating the platform's business model with those of its component, an essential advantage for integrated commercial development of the project marketable outcomes.

2. Business ecosystem context

This section repositions SmartH2O in the broader context of smart technologies for customer engagement in the water efficiency sector. This is why, it provides – where applicable – updates to previous deliverables on technology (Section 2.1 updates D8.2) and regulation watch (Section 2.2 updates D8.1). It then uses success stories in the sector to highlight how the advent of smart water metering can markedly improve customer engagement, and show that assets developed in the SmartH2O project are particularly well-positioned to do so (Section 2.3). Finally, this panorama is completed by a list of contacts made by project partners (Section 2.4).

2.1 Update to technology watch – Gamification

In this section we overview the new findings in the areas of serious games for environmental and sustainability issues and in business application gamification, as an update to the overview in D8.2 Technology Watch Report. This is the only area identified in D8.2 where significant novelties that we are aware of happened since D8.2.

Deliverable D8.1 already introduced they key elements of Gamification, "the use of game mechanics and experience design to digitally engage and motivate people to achieve their goals" [Gartner, 2014] and its market trends and segmentation; Games with a Purpose and serious games were also analysed. The document concluded the section by describing case studies related to the public administration and utility sectors. In the following, we provide an overview of the novelties in both Gamification and Serious games, as they emerged in the reporting period.

2.1.1 Serious games

The following table contains an updated list of water games for sustainability.

Table 1. Updated list of serious games for sustainability and the environment.

	TipTank[1] (Water – Use it Wisely)	Washing Machine Basketball and Dripping Faucets Game	The water family[2]	Water Sense	Use Water Wisely[3]
Creator		Regional Water Providers Consortium (Portland)	UK Water Industry	US EPA	Nestle Water
Technology	Flash-based	Flash-based	Flash-based	Flash-based	Flash-based
Assessment	N/A	N/A	N/A	N/A	N/A
Mechanics	Memory game	Online casual games	Decision making	Maze + trivia	Tips discovery

[1] http://wateruseitwisely.com/tip-tank-game/

[2] http://www.thewaterfamily.co.uk/index.htm

[3] http://www.discoverwater.org/use-water-wisely/

Players	One player	One Player	One Player	One Player	One Player
Focus	Sustainable water consumption	Water saving practices	Water saving in the house hold	Water saving in the house hold	Water saving in multiple scenarios
Target Audience	Kids, education	Kids, education	Family	Family	Kids
Platform	Online, browser based	Online, browser based	Online, browser based	Online, browser based	Online, browser based

Figure 1: Water saving tips in the Tip Tank game, Water – Use It Wisely.

Figure 2: Scenario-based water saving gameplay in The Water Family.

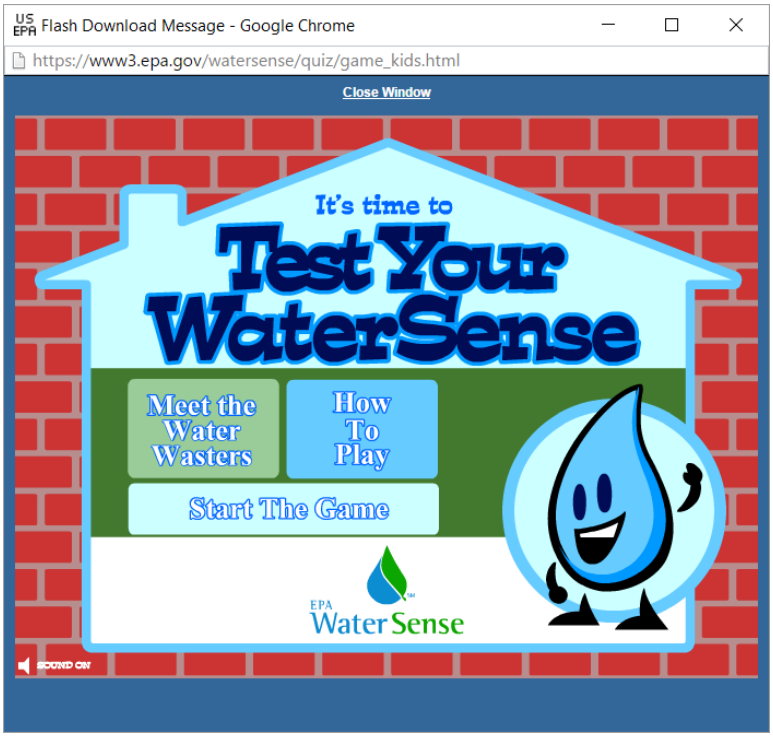

Figure 3. US EPA Water Sense online game (Main menu).

Figure 4: US EPA Water Sense online game (gameplay).

Figure 5: Use water wisely game by Nestle Water.

2.1.2 Gamification

In the following, we overview examples of gamification initiatives specifically acting on the behavioral change towards more sustainable practices

Oasys water sensor and app (http://oasys.io/) Oasys provides a sensor that can be installed around the exterior of the main pipe and a 9.5-inch wide wall-mounted white disc with a smaller, 3.5-inch display screen at its center. Daily information updates are sent wirelessly from the sensor to the Ôasys console, which visualizes water consumption data. The disc hooks into a band placed around the house's main water pump that sends wireless information about the amount of water being used in the home. Glowing different colours depending on the type of information displayed, the screen uses that data to show daily usage trends and compare it with the surrounding area's weather, to contextualize / gamify water usage. It can alert the users to times when conservation is important, periods of time over which water usage is increasing or decreasing, and even alert users (via smartphone

updates) when there appears to be a leak in a house pipe.

Water Saver of the Month Award: South Coast Water District's Water Saver of the Month Award is a community program designed to recognize District customers who have made a tangible contribution to conserving water. Winners receive $500.

Figure 6: South Coast Water District (CA) water saving award.

Eligibility criteria are as follows.

1. Water conservation initiatives at single family residences that have been disapproved or are not eligible for a rebate.
2. Water conservation activities that occurred, generally, in 2014 or later.
3. Initiatives that conserved in a discernible manner the greatest amount of potable water.
4. New California landscaping that was established in 2014 or later.
5. Single family residences that have allowed landscaping/turf to transform to dirt areas.

The CO2 fit App. It is a mobile app targeted to organizations, which promotes sustainable action of employees and digitizes the corporate health management. Employees get motivated to let the cars at home, use their bicycles more often and reduce their own CO2 Footprint at the same time. For every CO2 saved kilometer, CO2 fit awards the user with ReCoins. Later users can change ReCoins into premiums their company has chosen. In further categories such as Sport, Good nutrition, and Prevention‘ users can indicate even more activities and get rewarded for them.

2.2 Update to regulation watch

The potential of SmartH2O platform is contingent upon the progressive roll-out of smart meters in Europe. The normative at EU level requires Member States to incentivize a more efficient use of water resource through “putting the right price tag on water” [Directive 2000/60/EC].

The following Communications 670, 672, 673 (2012) emphasize that water metering constitutes a fundamental prerequisite for the economic incentives to be truly effective. Communication 673 (2012), for instance, says: *“…pricing is a powerful awareness-raising tool for consumers and combines environmental with economic benefits, while stimulating innovation. Metering is a pre-condition for any incentive pricing policy*”.

Despite the EU directions, a few regulatory authorities have implemented measures to foster the deployment of smart water metering. As pointed out in a previous deliverable [SH2O2015], two exceptions are represented by OFWAT in England and Wales and AEEGSI in Italy, who have already introduced or are gradually introducing performance indicators aimed at measuring the quality of water metering activity.

Recently, the Italian regulator has promoted an initiative aimed at trialing multiservice smart meters targeted at electricity, gas, water and district-heating sectors. The project, involving approximately 60,000 customers in 9 large and medium-sized cities, will allow targeted customers to check their energy, gas and water consumption by connecting to a single web portal. The project is currently at the implementation stage. Results and possible criticalities

will be unveiled in the next months.

In addition, in the very last weeks the Italian regulator closed the consultation period during which water utilities and water industry organizations could provide comments and suggestions on the water metering regulation framework the AEEGSI is currently developing. The outcome of the consultation will offer valuable insights into the attitudes of Italian water utilities towards metering and related services.

2.3 Examples of success stories in the sector

This section presents examples of success stories in the sector of technologies for water and / or power efficiency. These companies are presented in Table 2, and the lessons learned for the SmartH2O project are summarized in Section 2.3.7.

Table 2. Success stories presented in this section.

Company name	Country	Water / Energy	Core of business
WaterSmart	USA	Water	Customer engagement
TaKaDu	Israel	Water	Utility management assistance
Opower	USA	Energy	Customer engagement
Amphiro	Switzerland	Water	Smart technology for faucets
Nascent Object – Doppler	Canada	Water	Smart, customer-oriented objects
APANA	USA	Water	Utility management automation

2.3.1 WaterSmart

Founded in 2009, the US company WaterSmart focuses on a combination of behavioural psychology, big data analytics, and cloud computing to improve global water-use efficiency. Their mission is to change the way the world uses water. Using their technology solutions, water utilities are able to better educate their consumers about how much water their household is using, how it compares to others and how they can save water and money. These benefits translate into significant system-wide savings for utilities in the form of avoided costs for water, energy, treatment, and future capital investments, which helps ensure sufficient supplies of our most precious resource for all our communities.

WaterSmart is already working with about 40 utilities in the U.S., with a concentration in water-scarce California, as well as Colorado, Utah and Texas. The company claims over 1 billion gallons of water saved across about 2 million homes. Since 2011, WaterSmart has raised over $ 13 million in six funding rounds. The start-up is well positioned to ink deals with California water utilities in the near future in light of the new regulations. About one-quarter of its clients came on board in the latter half of 2014, and most of them are in California. Since 2014, WaterSmart syncs with Opower for behavioural reports on water usage.

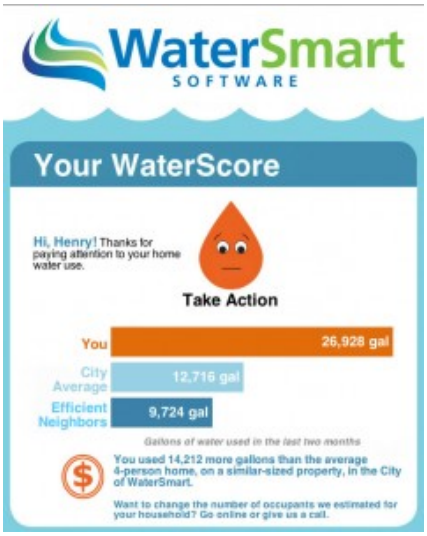

Figure 7: WaterSmart WaterScore supporting behaviour change in water consumption.

WaterSmart provides a software-as-a-service with a focus on utility-customer engagement. The firm aims not only at strengthening the relationship between water utilities and their residential water users, but also at using the "water-use data narrative" to allow customers to compare themselves against neighbours and people with like-sized homes. WaterSmart will promote both behaviour change and retrofits of appliances and fixtures, with available rebates, discounts and services offered by water and energy suppliers. Through their SaaS platform, WaterSmart provide consumers with customized water saving tips and neighbour comparisons, and thereby deliver water use reductions to water utility customers. The reports will only be delivered quarterly, but residents in Palo Alto can log onto a web portal at any time for water history information and water efficiency tips. For the city of Palo Alto and other customers, one of the most valuable parts of WaterSmart's offering is using the platform to better target customers for water efficiency programs. The reports are delivered quarterly because that is the frequency at which meter readings occur.

There are many experiences from the WaterSmart case providing valuable insights for the SmartH2O project as well. On average, WaterSmart claims to be able to help save about 5 percent per household (as has been shown in a recent pilot with 10.000 customers in East Bay Municipal District[4]). The independent one-year study in the East Bay Municipal Utility District found that households that use the most water tend to save even more when using the program. The top quartile saved about 6 percent, while the lowest quartile saved about 3 percent. Interestingly, paper reports were found to be more effective than emailed reports. The median unit cost of saved water was only slightly higher for paper versus email reports, about $400 per acre-foot compared to $380. That is far lower than the median unit cost of $700 per acre-foot that the California Water Foundation identified in 2012. The cost per household per year is about $5 to $7, depending on the report delivery method.

As other WaterSmart pilots have found, one of the upsides is not just the savings, but also the fact that households that receive the reports are about twice as likely to participate in audit and rebate programs. As is the case with electricity, many people have no idea how much water they use at home. In the one-year pilot, however, those who received reports didn't fare much better than those who didn't when it came to estimating average daily water use. One reason for this could be that WaterSmart reports focused on gallons used per billing period, rather than per day, during part of the study period. It could also be that the behavioural feedback simply needed more time to educate and influence people. "It is also

[4] http://californiawaterfoundation.org/uploads/1389391749-Watersmart_evaluation_report_FINAL_12-12-13(00238356).pdf

not obvious to us that a quantitative knowledge of daily water use is particularly relevant to most decisions about household water use," the report authors state. It might be more important to know how to shop for a water-efficient clothes washer than to know specifically how much water the household is using.

Many of the findings from the large pilot are lessons that water utilities could pluck directly from their electricity brethren when it comes to new consumer programs: **good data management is key**. Customer service representatives need to be trained in the tenets and strategies of the program; and phasing in the program gradually allows for tweaks as it scales up. Additionally, it can help cash-strapped water utilities understand where to focus their residential conservation efforts to get the most "bang for their buck".

2.3.2 Takadu

The Israeli start-up TaKaDu, founded in 2009 by tech entrepreneur Amir Peleg, is a leading provider of Integrated Event Management solutions, enabling water utilities to improve efficiency and make smarter decisions. Events are for example leaks, bursts, zonal problems, usage patterns or water quality hazards. Using advanced statistical and mathematical algorithms, TaKaDu harnesses utility data, translating it into actionable insights and transforming the way water networks operate. The solution offers a comprehensive decision-making platform that can be integrated across the utility from the analyst monitoring the network to the executive team considering long-term strategic investments.

TaKaDu provides water infrastructure monitoring as a service and acts as the "online eyes and ears" of the network. The firm's software-as-a-service model allows water utilities to reduce water loss and improve operational efficiency with no network changes or capital expenditures. Their system is based on mathematical and statistical algorithms that use readings from existing water metering equipment (flow, pressure, quality, turbidity, etc.). It can take sparse and spiky data from existing sensors and fold that in with weather data, acoustic data, and GIS data to enable the smart water grid. The water utility can then improve its ability to plan and forecast, saving money and resources in the process. TaKaDu's water network management can prevent, weeks or months ahead of time, significant events in real-world networks by alerting utilities to the small changes that precede bursts and other anomalies.

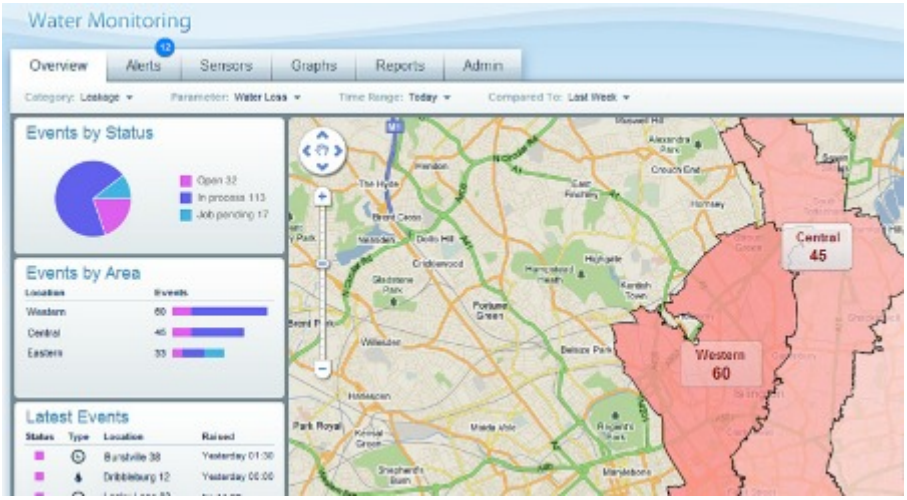

Figure 8: Takadu water monitoring dashboard.

The solution requires no physical changes to the pipeline network, can be installed within 4 -

6 weeks and provides customizable reports for data such as:

- Online sensor data (flow, pressure, and quality)
- Network structure (GIS/schematics)
- Reservoir levels
- Repair records
- External data (holidays, special events)

TaKaDu is operational, with utilities and partners in Europe, Australia, Latin America, Israel and the U.S. The startup sells through partners in the hydrocosm like IBM and Schneider Electric rather than selling directly to water companies. In 2013 TaKaDu succeeded in raising 6 Mio $ private equity capital[5]. The cost of the software can range from $10,000 to $150,000 per month depending on the size of the pipeline system.

2.3.3 Opower

Working with more than 90 utilities partners and serving more than 32 million households and businesses across eight countries, Opower is a global leader in providing cloud software to the utility industry. Founded in 2007, Opower is headquartered in Arlington, Virginia, with offices in San Francisco, London, Singapore and Tokyo. Opower is focused on electrical utility-customer engagement and behaviour modification, and is currently providing tens of thousands of homes with in-home energy data and efficiency advice via paper reports or online. The platform is described as advanced customer engagement. The firm says about 85 percent of their customers will cut power consumption by around 3.5 percent. The customized data lets people know how much energy they're using in comparison to their neighbours and then follows it up with a course of action. Revenues exceeded $144 million in 2015[6]. Since 2007, Opower has raised over $ 65 million in three funding rounds[7].

Opower's customer engagement platform positions utilities as trusted energy advisors to the customers they serve. Its software provides customers with better information about their energy consumption, along with personalized ways to save energy and money. Opower's technology platform analyses more than 300 billion meter reads to deliver its services, and has created enough energy savings through behaviour change to power all the homes in a city of 1 million people for a year. The average customer receiving the Opower platform has cut energy usage by more than 2.5 percent[8].

Opower's software uses statistical algorithms to perform pattern recognition analysis from data in order to derive actionable insights for utility customers. Without any devices installed in the home, the platform can perform usage-disaggregation analysis, presenting end users information such as heating or cooling usage apart from overall usage, and thus allowing them to spot additional opportunities to save money.

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5 https://www.crunchbase.com/organization/takadu#/entity

6 http://www.greentechmedia.com/articles/read/opower-lands-50m-deal

7 https://www.crunchbase.com/organization/opower#/entity

8 http://www.businessweek.com/innovate/content/nov2009/id2009115_475766.htm

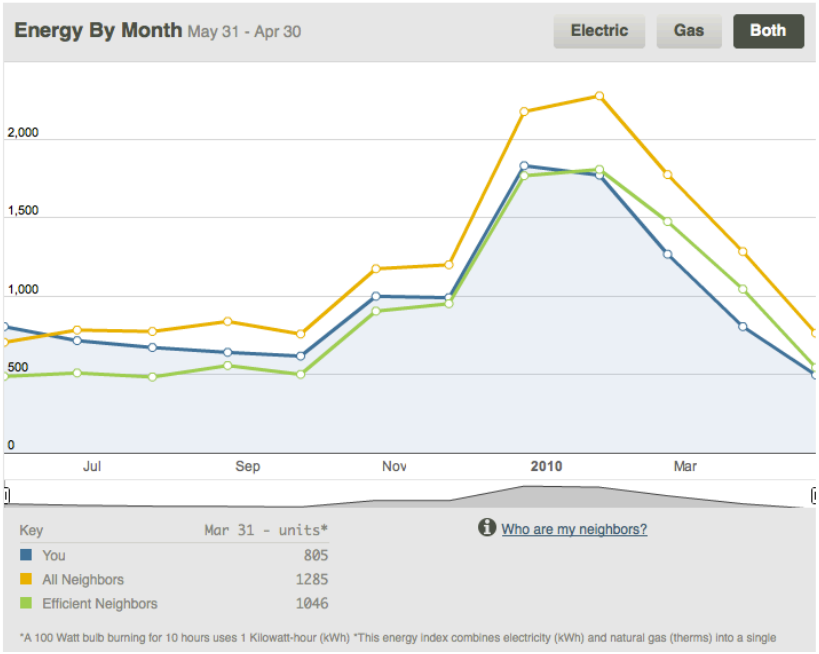

Figure 9: Snapshot of Opower's energy report.

Opower's Energy Reports incorporate the behavioural science techniques with targeted tips that seek to motivate customers to lower their energy consumption to the "normal" neighbourhood rate. The reports also feature smiley-face emoticons for the most energy-efficient homes, a feature that Opower added after research showed that some consumers who used less energy than average started using more once they knew the norm. The reports also compare energy usage among neighbours with similarly sized houses[9]. The company mails the reports to consumers, but also offers the information in other formats, including internet portals, text messages, email and in-home energy displays. Opower's software enables customers to input more information to generate recommendations about specific types of energy use, such as air-conditioning and heating.

2.3.4 Amphiro

Amphiro AG is a Cleantech-Spinoff from ETH Zurich under the ownership of its founders. Amphiro is supported by the Commission for Technology and Innovation (CTI), the Swiss Federal Office for the Environment (BAFU), and ETH Transfer. Amphiro was founded in 2009 by doctoral candidates of ETH Zurich. From the first day, the team pursued the goal to increase comfort and energy efficiency of one of the most widely used products in the world: faucets. Their mission is that by the year 2020, more than 10% of all faucets sold will be equipped with Amphiro technology. In 2015, Amphiro successfully completed a crowdfunding campaign on Kickstarter, raising € 30.663 (of their 25.792 funding goal)[10].

[9] http://usatoday30.usatoday.com/money/industries/energy/2010-02-01-homeenergy01_ST_N.htm

[10] https://www.kickstarter.com/projects/amphiro/amphiro-b1-energy-feedback-where-its-most-helpful

Figure 10: Amphiro a1 water usage visualization device for showers.

Amphiro builds a series of small, self-powered shower meters, designed to be easily retrofitted in the shower, between the shower nozzle and the hose itself. The meters provide real-time insight into how much water and power you're using and thus enables you act up to your standards. To aid children in the house with visualizing this relationship, an animated polar bear is displayed on the A1 Arctic model, and the bear slowly loses its ice floes and is forced to swim for it after the shower has been running for a long time. For the more data centric, the A1 Control offers a detailed display of the actual metrics for your showers, as well as the ability to compare them with the average consumption of your ten previous showers. You can enable the device to send data automatically to an app or the Amphiro platform where you can get feedback on your personal shower behaviour for free. Every time you take a shower, your Amphiro device generates a new online code that contains the average values of your previous showers. Data can be accessed via smartphones, tablets and computers. You can track your consumption in real-time and see your history and consumption trends. Set your own saving goals and work on pursuing them. You can also challenge a friend and find the energy saving champion. It offers an open API, so that Amphiro products can be combined with other smart home products.

2.3.5 NascentObjects – Droppler

NascentObjects is a modular consumer electronics platform and marketplace with the aim to empower consumers to create products themselves, but the company is launching with a handful of fully-baked designs. One of them, Droppler, tracks water usage throughout the day. The device was born out of a collaboration between Nascent Objects and the University of British Columbia's Behavioral Sustainability Lab, which discovered that water consumption could be reduced by over 30 percent if people understood how much water they were using moment-to-moment. The scientific evidence that supports a product like Droppler comes from a series of experiments conducted at the Behavioural Sustainability Lab, which demonstrate that the visibility of resources directly reduces consumption[11]. In 2016, NascentObjects successfully completed a crowdfunding campaign on Indiegogo, raising $ 61,853 (of their $ 60.000 funding goal)[12]. Nascent Objects partnered with renowned design firm Ammunition, led by industrial designer Robert Brunner, to create Droppler and many of the modular consumer electronics available from the Nascent Marketplace. Ammunition's designs

[11] http://psych.ubc.ca/prof-jiaying-zhaos-research-inspires-a-new-product-to-change-water-use-habits/

[12] https://www.indiegogo.com/projects/gadgets-as-individual-as-you-are--2#/

showcase the versatility of Nascent's platform and its potential for quickly turning fresh ideas into compelling products.

Figure 11: NascentObject Droppler: sound-based water usage measurement.

With the help of audio recognition algorithms, Droppler determines water usage based on the sound of running water nearby. It is based on a set of algorithms that can identify the source of flowing water according to its audio signature as water makes a different sound falling into a kitchen sink—which is typically metal and filled with dishes, sponges, or a set of hands—than it does falling into the basin in your bathroom, which is usually empty, ceramic, and smaller than the one in your kitchen. Droppler relies on other information, too. During setup, users are asked whether their faucet or shower head is low flow or normal flow (a typical low flow faucet puts out 2 gallons per minute, a normal-flow faucet four gallons per minute) and to set a water-use limit. When Droppler hears water running, it starts translating minutes into gallons used and displays that information on a glowing LED strip. In the morning Droppler's LED strip is filled to the top, but every time you turn on a faucet or your shower, the glowing light begins to dip. Users start by plugging in information about their water fixtures and intended budget on the Droppler app, which recommends budgets for different locations. To begin tracking their progress, they can then place the device alongside the fixture.

"One of the most effective ways to decrease consumption is surprisingly simple," said Dr. Jiaying Zhao, assistant professor of psychology at the University of British Columbia. "Making the resource itself visible can substantially reduce consumption. A product like Droppler with its immediate, visual feedback of water use and its ongoing indication of monitoring usage will have a dramatic impact on individual water consumption habits."

Current water monitoring tools are complicated, and most require direct attachment to pipes, locating and augmenting water-mains and other cumbersome installs. Droppler's powerful processor uses pattern recognition technology (similar to Shazam) in the world's first audio-based water detection system. This means that Droppler can recognize water-usage in sinks, taps and faucets without needing to be directly installed against pipes. In addition to simplifying installation, this innovation increases reliability by removing the possibility of water damage. Droppler connects with an iOS or Android app to further analyze water consumption and see how small changes in water use lead to big results.

2.3.6 APANA

APANA, formerly Kirkland Analytics, is a technology and services company focussing on automated water management for business, helping commercial and industrial companies make informed decisions by analysing, operationalizing and accounting for water use. By working with APANA, companies save money by saving water, reducing compliance risk and strengthening supply chain and operational sustainability. By working with APANA, any business can analyse, manage and account for its inside-the-fence water footprint, and get real-time information to the frontline to save water and money. Industrial and commercial companies of all sizes and all sectors also use APANA intelligence to reduce compliance risk and strengthen operational sustainability. APANA's solution is approved for up to 50% installation rebates in multiple US states.

APANA helps businesses in three primary ways:

- **Analysis** - The most advanced prescriptive analytics on the market alerts a business of a waste event in real-time
- **Action** - Automated notification system provides real-time guidance to stop both operational and mechanical water waste, leading to enhanced sustainability practices and strengthened compliance
- **Accounting** - Integrates water into corporate performance indicators, accounting and reporting

APANA's water efficiency solution deploys advanced technology and real-time analytics to monitor a business's overall water footprint, pinpointing waste and delivering business intelligence to the frontline for immediate corrective action, while incorporating fresh data for continual system optimization. APANA provides high-resolution, real-time data collection and visibility across the entire business operation, for frontline, administrative and executive teams. It is the only solution on the market with prescriptive analytics, using integrated technology that combines the most advanced sensors, telemetry and software. The software automatically detects water waste, both mechanical and operational. Aggregation of data from multiple sites provides a single view into data, helping companies forecast how water will impact current and future growth.

"Amid unprecedented drought and greater scrutiny from regulators and investors, water is taking its rightful place as a fundamental business issue," said Matt Rose, APANA co-founder and CEO. "By helping businesses across many industries manage water like inventory, APANA is making sure frontline managers and company executives are ready for a world in which both water quality and quantity are coming under increasing pressure." APANA makes water an integral part of corporate accounting and reporting. It reduces risk exposure for three metrics: resource consumption, regulatory compliance and environmental impact.

APANA works across multiple industry sectors, including Fortune 500 customers such as Costco. The technology easily integrates into existing operational processes, with simple installation in existing and new facilities. APANA's solution is also approved for up to 50% installation rebates within several U.S. states, and it can lower the permitting costs for future development. Return-on-investment is typically within 18 months, with typical savings of water consumption ranging between 15% and 25%. APANA has successfully deployed dozens of its systems in the United States and internationally, claims to have saved its customers more than 30,000,000 gallons of water in 2014[13].

2.3.7 Lessons for the SmartH2O project

The experience with behavioural change applications described in these success stories demonstrate the uptake of solutions that are in some ways similar to Smart H2O. Business

[13] http://www.prnewswire.com/news-releases/apana-introduces-first-automated-water-management-for-business-300115918.html

impact is achieved through reduced water consumption facilitated by advanced analytics that allow for data-driven network management. For example, WaterSmart provides quantifiable evidence for the impact of consumption information and water saving tips, through a SaaS-based service set-up that is comparable to the Smart H2O business plans.

Like WaterSmart or the energy provider Opower, SmartH2O offers comparison with peer communities (e.g. neighbourhoods) also provides social comparison to enable users to better estimate how they are performing in comparison to others. But unlike WaterSmart, SmartH2O is always accessible, not just quarterly, and presents water consumption info at different granularity levels: per day, week and month. Furthermore, SmartH2O also calculates for users how much they would spend in a year based on their current behaviour. This means that we provide ways to better understand consumption as well as the meaning of units and volumes that are used. Contributing to this increased understanding and awareness, SmartH2O also provides visualizations beyond mere bar charts. It uses metaphors related to water consumption (for example showing a water pipe that fills up). And because SmartH2O is an interactive application, users can set their own goals, which are also translated into both numerical and metaphorical units (water saved measured in number of bathtubs or water spent in number of swimming pools for one year).

Interestingly, the examples pay relatively little attention to the incentives for users to engage in water saving, even though the literature has shown that this is important to engage users with different kinds of environmental actions. SmartH2O distinguishes itself from these examples by a strong focus on the motivation of customers to engage in water saving through gamification, as well as virtual, social and physical rewards (see D4.3), which is expected to reduce water consumption, and which will also provide utilities with detailed customer insights through the dashboard (see Section 7).

However, the impact of SmartH2O strongly relies on the availability of smart metering infrastructure. Where this is not available, solutions such as Droppler that can provide continuous reliable estimates of water consumption and may lower the barriers to deploy SmartH2O's solutions. However, payment models and the cost distribution within the value chain need to be investigated with a particular focus on the customers' willingness to pay for smart metering technology.

Specific gadgets such as Amphiro that are attached to water consuming appliances in households can provide in-situ feedback about water consumption, which is a strong stimulus for the visibility of the feedback. However, customers' willingness to invest in appliance-level technology must yet be investigated. Amphiro is currently offered as a reward in the Swiss case study and has proven to be a very good supplement to the overall monitoring that SmartH2O provides. Like Amphiro, SmartH2O will soon be available as a mobile app and consumption will be accessible anywhere.

The examples have shown that water saving technology and water consumption analytics provide versatile opportunities for new business models with new sources of revenue and new cost distributions, as well as new services and added-value for customers, utilities, and technology providers. Experiences from the energy domain – which often is more prominent in the awareness of every day resource usage – can shed light on new business opportunities and environmental impact.

2.4 List of business ecosystem contacts

This Section lists the actors that have been contacted within the SmartH2O project regarding different aspects of smart metering.

- Who are they?
- How are they related to smart water metering?

Abering	Water meters and communication infrastructure
Acquametro AG	Smart meter supplier
Aguas del añarbe, S.A. (San Sebastian, Spain)	Public water utility
Amphiro	Water efficiency company (faucets)
Anglian Water	Water utility
APA Nova SA Bucuresti	Water Utility
Aquarimat	Software company
Arqiva	Smart data collection and management
Arson	Water meters and communication infrastructure
Artlantis srl	Commercial Software house
Azienda Comunale Acqua Potabile Pedemeonte	Public water utility
BASEFORM	Smart water management systems
Center for Water-Energy Effficiency	Research centre at UC Davis
City of Haßfurth	Public authority
City of Milton Keynes	Public authority
Climate Alliance	Network of European cities and municipalities
Compania de Apa Oradea SA	Water utility
Companyia D'aigues De Sabadell Sa.	Water utility
Contazara	Water meters and communication infrastructure
DAIAD	Water Cluster FP7 project
Dal Negro Spa	Card maker company
Echelon Corp.	Smart meter supplier
EFFINET	Water Cluster FP7 project
Elster	Water meters and communication infrastructure
EMACSA (Cordoba, Spain)	Public water utility
EMALCSA (La Coruña, Spain)	Public water utility
EMASA (Malaga, Spain)	Public water utility
EMASESA (Sevilla, Spain)	Public water utility
Environmental Defense Fund	Non-profit environmental organisation
European Utility Week	Event for the utility sector (worldwide)
Fabio Gadina	Online Marketing Consultant
Hagihon	Water utility
Ikor	Water meters and communication infrastructure
ISS-EWATUS	Water Cluster FP7 project
ista ROMANIA SRL	Metering services for water utilities
Itron	Water meters and communication infrastructure
iWidget	Water Cluster FP7 project

Kaleidos Publishing	Boardgame company
Kalikantus srl	Commercial Software house
Leicester City Council	Public authority
Mancomunidad Comarca de Pamplona	Public water utility
Naturschutzbund Deutschland	Environmental association (NGO)
Public Utility Board	National water agency
Sappel	Water meters and communication infrastructure
Sensus	Water meters and communication infrastructure
Sophisticated Games	Board Games Company
University of California Davis	Public research and higher-education institution
Vodafone	Communication solutions
WATERNOMICS	Water Cluster FP7 project

3. New utility business models

The public part of this section recounts the experience that the three utilities involved in the SmartH2O project have had with smart metering. The confidential part of this same section will then build on these accounts to propose return-on-investment calculations of smart metering.

3.1 TWUL

3.1.1 Presentation of the smart metering programme

Thames Water has a programme to install about 3 million Smart revenue water meters over the next 15 years. These Smart meters will be connected to a radio based fixed network to enable near real time data capture.

Every five years Thames Water is required to prepare business plan to its economic regulator (Ofwat) and a Water Resources Management Plan to the Government (DEFRA). In 2013 the Thames Water region was classified as an area or Serious Water Stress [Environment Agency, 2013]. Therefore, in the 2014 regulatory submissions, a detailed and optimised evaluation of the options to manage water resources was prepared [Thames Water, 2014]. This demonstrated that a programme of Smart Water Metering was a cost effective solution within the overall water resources Management plan. This programme was agreed by the Regulators in 2014.

The programme started in London in Spring 2016 incorporates four main programmes of work:

1. **Progressive Programme** – first time installation of a meter at household customer properties on an area by area basis;
2. **Optant Programme** – any household customer who requests a meter to be fitted;
3. **Replacement Programme** – fitting a smart meter where the old meter has come to the end of its life; for both household and commercial properties;
4. **New Connection Programme** – for both household and commercial properties.

A Smart metering solution using fixed network data capture was procured during 2014 and awarded in March 2015. The solution provides an end-to-end system that includes new digital meters, a radio based fixed network data capture system using the 412 MHz frequency band, data management and secure transfer to the company systems. A key element in the selection was a meter with a 15-year battery life so that there was some certainty that the new digital meters would last a similar life to existing technology. All digital meters are initially installed in Automatic Meter Reading mode where a meter reader can read them as they walk or dive by. The fixed network installation will be rolled out across the Thames Water region over a 10-year period. When the meter detects the fixed network is operational, it automatically switches on and provides data through the fixed network.

The use of new technology placed greater emphasis on getting the installation right. This ensures the installation contractor installs meters against an agreed installation specification and that the quality of each step in the process is consistently high. Wherever practicable data is collected by electronic means such as bar code, photograph and GPS, there is a rigorous audit and that the supply between the meter and the individual property the meter serves is properly proved. Finally, new systems have been implemented so that all data is stored, checked and automatic transferred to Thames Water corporate systems.

Thames Water is the first company in the UK to implement a programme of smart water metering and is aware that there is great interest to see how well the programme performs. The next steps are to:

1. install the meters at customer premises;
2. make the system work;

3. achieve the expected benefits;
4. take opportunity for the next possible innovations.

There are aspects of smart metering that are expected to cause customers some concern and there are parallels to be drawn from the Energy Smart Metering programme. The key areas where work will be ongoing to manage any issues customers may have:

- **Impact on bills** – customers currently pay for water by reference to the rateable value of their property. When switched to metered charging it is inevitable that some customers will pay more and some will pay less. To help customers manage a two-year transitional tariff will be used where the switch to metered charging will be delayed by two years. In this time customers will receive comparison letters every 3 months that show their current rateable bill and what their metered bill would be were they to pay by meter. This two-year window gives customers an opportunity to understand their future metered bill. If the metered bill is higher they can take advantage of the water efficiency service and change their water use. If it is lower, they can request to switch earlier and take advantage of the cheaper bill.
- **Health Aspects** – all modern water meters emit very small amounts of Radio Frequency (RF) and some customers are concerned this may have an impact on their health. Independent research has been implemented to investigate the amounts of RF emitted by the meters being used and to establish if these levels of RF are within regulatory limits and whether they pose any health impacts to customers. The finding clearly show that the RF levels are very low, that they are well within the regulatory limits and based on best evidence they pose no health impacts on customers. A copy of the report has been placed on the Thames water website.
- **Data Protection** – all modern water meters with electronic registers are capable of collecting more data and as such are covered by the requirements of the Data Protection Act (DPA). Data collected from water meters electronically is deemed to be Personal data under the definitions of the DPA and therefore Thames Water has taken compliance with the requirements of the Act very seriously. A Privacy Impact Assessment has been conducted where 17 legitimate business interests have been defined. This limits the use of the data to these 'interests' and a copy of these has been prepared into a Privacy Notice that is available to all customers.

3.1.2 Benefits of smart metering

Some of the benefits of Smart metering that justify this programme are linked, like the issues exposed above, with customer satisfaction and engagement:

- **Improvements in billing information** so that all bills are based on the use of actual readings both for normal cyclic billing and for other requirements such as move in / move out.
- **Enhanced customer awareness**. Customers shall get a better understanding of their water use and help them understand ways they can manage their water use and as a consequence indirectly influence the size of their water bills
- **Dynamic tariffs and incentives**. To provide an opportunity for more advance interaction with customers through improved tariffs, not necessarily the usual tariff types but to introduce incentive tariffs to help customers share in benefiting from water saving
- **Customer engagement.** In the future there are many customer centric opportunities, some of the best being the Gaming approaches to customer education and incentives to conserve water

Other benefits are related primarily with the improved monitoring of the water network:

- **Leakage identification**. Smart metering is expected to enhance the ability to identify problems customers water supply such as continuous use which is indicative of either wastage from plumbing fittings or leakage from the customers' underground pipework.

- **Improved monitoring of water in the network** to properly and for the first time understand where water is going in the network and make a measured assessment of the balance between genuine water consumption and leakage from the network.
- **Enhanced water network operations** through use of other sensors including pressure and temperature to better understand how the network is performing and how to make improvements.

3.2 SES

3.2.1 Presentation of the smart metering programme

Smart metering for electricity consumers has been long a priority for SES. SES is a power utility covering more than 70,000 customers with 88,000 metering points located in Canton Ticino, Switzerland. As of now, SES has installed roughly 10,000 smart electricity meters for residential households, along with 4,000 for consumers with a high demand in energy (industries, businesses, etc). Therefore, about 15% of all SES meters are “smart”. The utility has yet to offer specific services for smart-metering customers, but it is following trends and future scenarios with interest in order to maximise the value of our assets.

The initial deployment of smart electricity meters was completed before the start of the SmartH2O project. Following that, SES took the chance offered by the SmartH2O project to test the deployment of 400 smart water meters in the Terre di Pedemonte municipality and to integrate them in their network. The steps which have been performed were:

1. **Procurement of the smart water metering solution.** This phase has been conducted in co-operation with the Water Utility of Terre di Pedemonte, who is the authority in charge of distributing water to the end users. Their requirements in terms of the performance and maintainability of smart water meters led to the choice of the Aquametro smart water meters (Aquametro Topas ES KR (DN 15/20/25) for residential purposes). Every time a smart water meter was installed, the electricity meter was replaced with a “smart” one at the same time. Our standard smart electricity meter for residential customers is the Echelon 83332-3IVAD. The task of installing smart meters was performed by SES electricians.
2. **Selection of the installer after trial.** Installing water meters is a technical task that needs to be conducted by a specialised plumber. The selected contractor has to work in team with the electricians of SES in order to hook up the smart water meters to the electricity smart meters, either through a wireless link or through a physical link – depending on the specific situation. The installation cost of a smart meter has been found to be close to the cost of the hardware itself (
3. **Testing the data link and the reliability of the transmission.** After smart water meters have been installed and linked with electricity meters, the hourly data are stored in the local memory and transmitted once per day to the electricity meter. Then, the electricity meter uses a Powerline connection to transmit both electrical and water usage data up to the server located in the SES premises. The SES server then relies the data to the SmartH2O servers via FTP connection.
4. **Operational use.** After the initial testing phase, which lasts at least two weeks for each new smart meter, the installation is validated. Provided it passes the quality controls in terms of accuracy and reliability, the data transmitted by the meters is then also validated from then onwards.

SES has been through all these stages for the SmartH2O test site in Terre di Pedemonte.

Table 3: Costs of installation of new water meters in Canton Ticino.

Task	Cost CHF
Water meter Aquametro Topas Dn 25 (price may be different for different radius)	266.00
Adaptation socket (if needed)	19.00
Wi-fi dongle Aquametro Ambill	87.00
Locking device	2.00
Electricity meter Echelon	Not part of the project
Installation of the water meter (plumber)	70.00
Installation of the electricity meter, wifi dongle, other on-site works (SES)	70.00
Setting up the connection and the data-transfer (SES)	80.00
Other direct costs	16.00
TOTAL per water meter	550.00

The current solution is not devoid of challenges. One of main issues experienced by SES is with some technical aspects of linking the smart water meter to the electricity meter. On one hand, the default linking of the two meters was done by WIFI M-BUS. Yet there exist configurations where the wireless connection might now work, especially with old houses for which the mains are quite distant and separate. In very rare instances, even a cable connection might not be possible because of the investment needed to perform the required intervention. This might be a limiting factor to consider when planning future smart meter deployments. On the other hand, the hourly data are internally stored within the electricity meter and sent daily to the concentrator located at the nearly transformer station (data transmission by power line communication). Despite the fact that PLC is a well-known technology, there were some problems in transferring the data between households and transformer stations.

Another concern is the battery life of water meters. The manufacturer guarantees 16 years of battery life, but that figure does not take into account the high-frequency data readings that are a hallmark of smart metering.

3.2.2 Benefits of smart metering

Smart metering enables SES to optimise periodic readings and to reduce the costs associated with meter readings in remote locations, which is typical in the network of SES customer. Indeed, in Canton Ticino, there are many small villages up in mountain valleys, which are rather hard to reach (travel intensive).

The availability of a large (in relation to the user base) smart metering infrastructure for SES is an opportunity to generate a number of additional customer-oriented services, aimed at increasing the trust and friendliness of the customer relationships. Moreover, the SmartH2O project has demonstrated that the smart metering infrastructure for electricity can be used to manage and transmit data related to other utilities, such as water and, in the near future, gas. This places SES in the best position to offer smart metering solutions for third parties, such as other water and gas utilities. In 2012 SES main shareholder ALPIQ decided to divest its majority participation in the Company, the shares were then purchased by the Municipalities located in the distribution area of SES. One of the strategic pillar of SES is therefore to offer, in the future, services as a multi-utility company (electricity, water and gas).

This being said, the monetary value of benefits is hard to measure. Water meters need to be substituted every 20/30 years, so the replacement of an old traditional meter with a smart meter is almost cost neutral. The benefits are mainly in terms of:

- **Savings in meter readings.** Assuming that each meter read would take 15 min on average, and that the cost of personnel can be assumed to be 40 CHF per hour, there is a saving of at least 10 CHF per meter per year, in case of a yearly meter reading. This is a conservative estimate.
- **Reduced water consumption.** This is not a direct benefit for the water utility, which actually could lose money due to the reduction in revenues. On the other hand this can be a benefit in terms of reduced infrastructure and investment in water supplying infrastructures.
- **Improved relationship with customers.** Systems such as SmartH2O can detect leaks and monitor consumption, providing useful information for the customer, thus creating a stronger link with the water utility.

Note that the above benefits are not directly impacting SES business, which is and remains a power utility, not a water utility. SES would sell this service to municipal water utility as part of a multi-utility strategy.

3.3 EMIVASA

3.3.1 Presentation of the smart metering programme

After nine years of continued Smart metering deployment, the AGUAS DE VALENCIA (AVSA) Group (from which EMIVASA is the main affiliated company) is in condition of presenting the benefits that such process has represented to the water supply service. The group is currently leading the implementation of smart metering technologies in Europe, with more than 490 000 units providing near-real time data to data centres (650 000 expected by the end of 2015).

At early stages of deployment (in 2006), the amount of data generated was overwhelming and weekly resolution for water meters was considered enough for household metering. However, the experience gained in the analysis and further processing of *Big Data* suggested that receiving hourly reading from consumers could bring several operational benefits and significant improvements in the quality of the service. This step forward was possible thanks to the decision of promoting the adoption of *fixed network* solutions for the smart metering communication infrastructures in front of *drive-by* or *walk-by* techniques.

In order to exploit the untapped potential of smart metering it became necessary to develop software tools that helped overcome existing drawbacks.

The first tool was an integration platform that allowed AVSA overcoming the lack of standardized solutions for the metering and communication infrastructure. This tool, called *W-mDM*, enabled the integration of the most consolidated technologies of the market (Itron, Sappel, Contazara, Ikor, Abering, Sensus, Elster and Arson) into a single platform. This way the company not only avoided vendor lock-in, but also became more flexible in order to install the most appropriate metering solution in each location (regardless of the communication infrastructure needed). This platform permits a centralised management of all metering and communication systems integrated, enabling remote control of parameters needed for the control and proper functioning of all component systems. It is important to mention that the company promotes this way the adoption of open solutions (capable of working with all manufacturers regardless of the communication solutions adopted) in opposition to proprietary solutions that are being promoted from several leading water utilities.

The next step consisted in the development of a superior platform to manage efficiently the deployment, operation and maintenance of fixed networks called *W-mTM*. This tool allows an integral management of work orders considering all phases of the process of installation and exploitation of smart metering infrastructures: planning, installation, surveillance and monitoring, and optimisation. This platform is also connected with the customer relationship management (CRM) system and includes management of all assets integrating the smart metering infrastructure. The *W-mTM* creates work orders and alarms (e.g. when an internal leak is identified an alarm is sent to the user and a work order is created for the maintenance

service so that an operator supervises the incidence). The platform also permits the optimisation of all processes (e.g. operators displacement layout optimisation) taking into account all the variables affecting each process.

Once the processes of infrastructure installation and data acquisition had been optimised, the next step consisted in the development of a set of tools that allowed further management and processing of *Big Data*. In relation to this, the *MERLIN* tool (see Figure 12) developed in AVSA displays alarms when abnormalities are detected in District Metered Areas. This platform integrates data from smart metering with data from SCADAs and other external parameters (e.g. meteorological) in order to complete hydraulic balances in the Water Distribution Network (WDN). Significant variations in the gap between the water flow entering a DMA and the consumption registered in the same DMA indicates the presence of leaks or illegal consumption. A deep analysis of Big Data has enabled AVSA to identify the reason for most incidences, allowing for a more efficient localisation and repair of leaks and an improved management of fraud.

Further work is currently being done in the understanding of consumption patterns, substitution of missing data, and identification of patterns of leak and frauds. The participation of EMIVASA in the SmartH2O project is also expected to bring significant improvements in the assessment of the impact that gamification activities have on consumption reduction.

Figure 12: Snapshot of the MERLIN tool developed in AGUAS de VALENCIA.

3.3.2 Benefits of smart metering

Benefits from the adoption of a management system based on smart metering can be understood from different perspectives: socio-economic, environmental, operational etc.

First of all, there are several intangible benefits:

- No need of accessing houses in order to read the meter (except for regular maintenance).
- Displaying consumption information to consumers through the Virtual Office.

From the CRM point of view:

- Reduction (almost elimination) of consumption estimation as a consequence of the impossibility of accessing houses and premises. This has conducted to a significant reduction of complaints. Only in the city of Valencia, water bills with estimation have been reduced in 1.1 million during 2014.
- Reduction in the water bill thanks to the notification of alerts for major internal leaks. With the current deployment of smart metering an average of 50 major internal leaks are being notified every month, representing a water saving of 50 000 m^3 per month.
- Possibility of notifying minor leaks to customers as consequence of problems in internal systems.
- Increase in the detection of fraud and tampering.

From an operational point of view, the most important consequence of the adoption of smart metering is an enhanced capability of leak identification and repair. For example, in the municipality of Albalat dels Sorells (Valencia), which is the first pilot of integral management of smart metering and hydraulic balances, the hydraulic performance of the network has increased from 69% to 85.9% in the period 2009 - 2013. Similar results have been achieved in the city of Gandia (from 69% in 2009 to 83.3% in 2014).

From the environmental point of view, the benefits from the adoption are consequence of the reduction of water production, the reduction of displacements, and the associated energy saved in each process.

With the current implementation of smart metering in AVSA, a reduction of 210 000KWh/year of energy demand has been avoided thanks to a 600 000 m3/year reduction in internal leaks; and 1 330 000 KWh/year thanks to 3 800 000 m3/year reduction of major leakages within the WDN (which entails about 7% of the total water demand in smart metering partially equipped towns). This reduction would have been much more significant if initial performance of WDN was lower than 70%-75% that was the case in the networks considered.

Furthermore, displacement of vehicles has been also dramatically reduced thanks to: (1) less displacements to check false leakages; (2) no need of displacement to read meters manually. All together represent a reduction of 225 000 km/year.

If we transform the referred reductions into greenhouse emissions, it is estimated that a reduction of 604.45 $TnCO_2$/year has been achieved for the AVSA group.

The adoption of smart metering has also had also significant positive impacts on the job-related market. Smart meters must still be checked once a year, so the adoption of smart metering -based metering infrastructures implied a reduction/reorganisation of personnel in charge of meter visualisation (reduction of 50% if visual meters were read twice a year; 75% if four times a year and 83.3% (5/6) if every two months, and so on). However, one of the observed benefits from adoption of smart metering was, as mentioned, that detection of leaks and incidences of fraud increased, so the actual effect of adopting smart metering was that low-qualified personnel moved from reading-related tasks, to: (1) leak repair tasks; (2) fraud surveillance; and, (3) installation and maintenance of smart metering infrastructure. In addition to this, there was a need of contracting/training qualified personnel who were in charge of: (4) studying and designing the SM infrastructure to be installed; (5) designing implementation solutions for smart metering data management.

To sum up: it has been observed that the adoption of smart metering implies a change in the related jobs. The most significant consequence is the necessity of training/hiring more qualified personnel.

4. SmartH2O platform

In this chapter, elements already presented in deliverable D8.4 – Intermediate Exploitation Plan, chapter "3. SmartH2O Platform: joint exploitation strategies" – are taken to a more concrete level, and additional information is presented. The following section presents the business plan outlined by Set Mobile for the SmartH2O platform. It is completed by its confidential extension, the financial plan presented in Section 4 of D8.5.1.

Set Mobile is a Romanian IT development and services company specialized in real time solutions for business. The company has been founded in 2004, offering to the local and international market a solution portfolio that includes:

- Avansales – the Sales Force Automation solution
- Avanfield – for Field Force Automation
- Coupon Plus – the service for loyalty rewarding using coupons
- Avanstore – the store checking solution

The company is analyzing the opportunity to enter to the new and growing market of smart services for utilities in general (and primarily for the water utilities) on the base of its competitive advantage acquired within the SmartH2O project.

This section aims at aligning the business model and financial plan with Software as a Service (SaaS) state-of-the-art. This is presented in Section 4.1, and is intended to the backbone of SmartH2O platform business development. It is also meant to be the starting point for a business development of this technological solution beyond the prototype stage. Then, other sections use the canvas from Section 4.1 to develop a more classic business plan outline.

4.1 Business model canvas for a software as a service (SaaS)

As a rationale, the business model can be defined as the tool that companies use to deliver value to customers, entitle customers to pay for value and convert those payments into profit [Teece, 2010].

The business model establishes the content, structure and governance of transactions designed to create value through the exploitation of business opportunities [Amir and Zott, 2010].

Despite the growing importance of the concept of the business model, there is not an established definition about it generally accepted in the scientific literature [Amit et al., 2010]. The business model definition and conceptualization from [Osterwalder and Pigneur, 2010], named business model canvas, has been chosen for this section as it provides a consistent and reliable framework that has been extensively tested and recently applied in the areas of the smart metering.

Regarding the state of defining the business model for the SmartH2O platform, in deliverable D8.4 – Intermediate Exploitation Plan:

- we defined the product its benefits and functionalities
- we identified product competitive advantages over existing competition
- we identified the potential market and competition
- we proposed a marketing and communication strategy

We are now in the position to further refine the intermediate business plan and elaborate business models suited to get SmartH2O platform to the Market.

As previously mentioned in D8.4 – Intermediate Exploitation Plan, two complementary business models can be employed for the commercialization of the SmartH2O platform:

- 1. On premises licensing is the traditional way software applications are installed, run and maintained on the IT infrastructure of the purchaser.

- 2. Software as a Service (SaaS), which as defined by Gartner, is "software that is owned, delivered and managed remotely by one or more providers."

The SaaS business model appears to be the most promising one for starting up the commercial activity of the SmartH2O, as:

- It entails shorter product and service engineering time, which will accelerate the time to market and decrease the initial capital investment;
- It enables a sales strategy focused on small and medium utility businesses, which constitute a majority of the European markets;
- It allows a secured license control than the on-premises installations;
- It allows better and faster customer services.

As the on-premises business model remains a mandatory choice for specific cases only, the SaaS business model has been considered as the winning option for the Market. In the following, it is assessed using as guiding support the business model canvas conceptualized by *Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers* [Osterwalder and Pigneur, 2010]

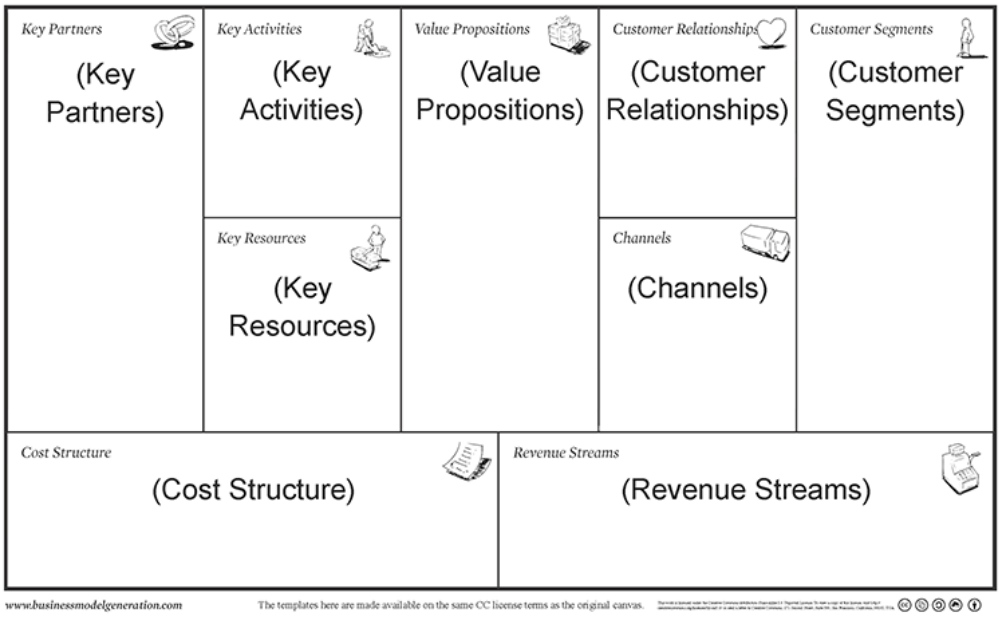

Figure 13: The business model canvas conceptualized in *Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers* [Osterwalder and Pigneur, 2010].

The business model canvas has nine elements that provide a coherent view of a business key drivers. In the following, the business model canvas elements are described next to the expected accomplishment of the SmartH2O platform, as stated in the D8.4 deliverable and subsequently refined.

4.1.1 Value Propositions

- What is the value delivered to customers?
- Which one of customer's problems is being solved?
- What bundles of products and services are offered to each Customer Segment?
- Which customer needs are satisfied by the value proposition?

The Value Proposition that SmartH2O platform delivers to its customers is "A software solution that permits the utilities to manage demand, optimize operations, and increase

customers' satisfaction and engagement."

It provides the water utilities, the municipalities, and citizens ICT services for designing, developing and implementing better water demand management policies.

The main needs of the water companies addressed by the SmartH2O platform are:

- demand management
- operational efficiency
- customer management

It pinpoints the transitioning of the water utility from the "top-down commodity provider" to a "service provider" by offering a range of services as:

- gamified online water bill
- board game and digital game for customer loyalty relations
- dashboard for customer behaviour analysis and water demand planning
- smart meter data collection, processing and delivering

4.1.2 Customer Segments

- Who is the target of the created value?
- Who are the most important customers?
  The primary market is represented by the **water utility market**. Secondary markets are represented by the other utility markets: **energy, gas,** and **waste utility markets**.

  The main Customers are the departments of a water utility:
- **Strategy and Planning Department** - in charge with operations regarding: Information technology, Integrated water management, Business performance and Asset management
- **Customer and Community Relations Department** – in charge with Field services and network operations, Customer services, Water systems and Capital investments
- **Marketing Department** – in charge with Defining strategic marketing plans and Calculating the ROI of company's actions

4.1.3 Channels

- Through which Channels do we reach to the Customer Segments?
- How are the Channels integrated?
- Which ones are most cost-efficient?
- How are we integrating them with customer routines?

Depending on the interaction stage of addressing the customer, a mix of channels could be identified as follows:

- **Awareness**: we will raise awareness about the SmartH2O platform by performing presentations to main industry local and global events, by engaging the prospects through a mix of cold calls, follow ups and on site presentations performed by the Sales and Marketing force of the consortium business development partners. Recommendations from the water utilities already performing demo-cases, trials or running the platform will be requested and used as drivers for engaging new water utilities. End users will be addressed by a web site, mobile apps and pages on social media.
- **Evaluation**: we will offer limited trials on a SaaS base. On-premises limited trials could be offered for strategic prospects.
- **Purchase**: we will offer a one-stop-shop web site where prospective customers shall be able to either directly subscribe or register for. The business development partners will perform contracting of new subscribers or service up-sells for existing ones through sales force representatives.
- **Delivery**: depending on the sales model which the water utility may subscribe to (SaaS or on-premises) the SmartH2O platform will be delivered using a cloud service

provider as Amazon Cloud Services or Google Cloud or as an on-premises installation integrated and customized for the utility needs.
A GitHub account will be used to deliver the original SmartH2O platform open-source implementation

- **After sales**: After sales service refers to various processes which make sure customers are satisfied with the products and services. Customer retention is a direct consequence of an effective after sales process. In the context of running the SmartH2O platform services, the customers will be offered an Annual Maintenance Contract. This will stipulate transparent policies in favour of the customer.

4.1.4 Customer Relationships

- What type of relationship does each of the Customer Segments expect us to establish and maintain with them?
- Which ones have been established?
- How are they integrated with the rest of the business model?
- How costly are they?

In the first instance, the need expected to drive the customer relationship is Customer Acquisition. This will be followed in the next stages by the Customer Retention and Increased Sales (up-selling).
A mix of customer relationships is foreseen to be established in order to reach these objectives. For the clients subscribed to the SaaS model, we will point towards automated and self-service for satisfying the permanent needs from a cost efficient perspective while for the on-premises installations, the common customer relationship is foreseen to occur through personal assistance performed by human interaction.
Permanent communication will occur by e-mail, blogs, social media, phone calls or remote assistance.

4.1.5 Revenue Streams

- For what value are the customers really willing to pay?
- For what do the customers currently pay?
- How much are the customers currently paying?
- How would the customers prefer to pay?
- How much does each Revenue Stream contribute to overall revenues?

The revenue streams expected from the SmartH2O platform are synthetically presented in the following table.

Table 4. Expected revenue streams.

Model	Initial Deployment Services (1-time)	Platform Usage Fee (recurring)	Custom Development Services (on demand)	Board Game Selling (recurring)	Consultancy Services (on-request)
	Y	N	N	Y	Y
1b	Y	N	Y	Y	Y
2a	Y	Y	Y	Y	Y

It is worth noting that different markets may differ significantly among each other, so that a specific business model can be more appropriate to a specific market context than to another. Likewise, depending on the market, the relative importance of revenue streams can change.

Several major factors can influence the decision to choose a business model over another:

- Market regulation
    - mandatory or optional character of smart-metering of the market
    - time-frame to deploy smart-metering
- Utility Company readiness for smart-metering
    - existing smart-metering infrastructure
    - development plans to extend current infrastructure
- Utility Company available personnel resources
    - existing technical know-how on technologies involved with SmartH2O platform
    - available personnel resources to operate and maintain SmartH2O platform
- General attitude of Utility Company customers attitude towards social gamming

Each of the proposed business models are detailed in 4.1 SmartH2O platform chapter of this document.

4.1.6 Key Activities

- What Key Activities do the Value Propositions require?
- What Key Activities do the Distribution Channels require?
- What Key Activities do the Customer Relationships require?
- What Key Activities do the Revenue streams require?

Offering the platform to the market in both SaaS and on-premises models requires to cover all the life cycle of a software service. This requires Key Activities as:

- Offering an **Online Sales Solution** via Web, requiring limited customer interaction
- Forming an in-house sales force to sustain the **Direct Sales** process
- Organizing **Indirect Sales** through affiliates, resellers and value-added resellers, distributors and value-added distributors, OEMs (companies with their own product to sell, who aim at expanding their offering with complementary products)
- **Developing and maintaining** a well-designed **software architecture** suited for integration to ongoing processes of the water utilities
- Continuously sustaining the process of software development, integration, customization and maintenance
- Ensuring the channels - both automatic self-service and personal interaction– for a proactive and permanent customer relationship
- Performing the **account management** process for ensuring the revenue collection

4.1.7 Key Resources

- What strategic assets do the Value Propositions require?
- What strategic assets do the Distribution Channels require?
- What strategic assets do the Customer Relationships require?
- What strategic assets do the Revenue Streams require?

In order to deliver the SmartH2O platform value proposition, a series of strategic assets have to be ensured. Such strategic assets include:

- Sales and Marketing team
- Software Development team
- Integrating cloud providers' services (outsourced)
- Access to water industry experts
- Access to environmental sensitive communities

4.1.8 Key Partnerships

- Who are the Key Partners?
- Who are the key suppliers?
- Which Key Resources can be acquired from partners?
- Which Key Activities do partners perform?

The following Key Partners will be considered for facilitating the adoption of the SmartH2O platform on the base of specific Key Activities foreseen to be performed together:

- Smart Meter Manufacturers for teaming-up to promote smart metering adoption. Smart Meter Manufacturers represent Key Suppliers for the SmartH2O platform also.
- Citizen Associations for informing over the consumer's right of having access to his water consumption data recorded by the water utility
- Schools and Educational Institutions for educating pupils and children in regard to efficient water consumption habits through gamification
- Environmental Organizations for promoting the benefits gained by the environment when adopting a water consumption measured in real terms
- Third party System Integrators for offering viable integration solutions when direct commitment of the software development consortium partners is not possible

4.1.9 Cost Structure

- What are the most important costs inherent to the business model?
- Which Key Resources are the most expensive?
- Which Key Activities are the most expensive?

The following represents the structure of the anticipated costs required for offering the SmartH2O platform to the market:

- Research and Development (mainly the salaries of the software developers and consultants, specialization courses, certifications)
- Marketing, Sales and Branding development (salaries and commissions of the sales and marketing personnel, fairs and exhibitions fees, transportation and accomodation, online advertorials and campaigns, seminars and conferences, flyers and catalogues)
- Customer Support (mainly the salaries of the customer support personnel)
- Data Center operations (cost of acquiring infrastructure services such as processing power, memory, storage, web traffic)
- Equipments and Materials (smart meters for performing demos,
- General and Administrative (rents, utilities, communications, accountancy)

4.2 Value proposition

Until recently, addressing the customer came second as an area of interest for most of the utilities, after the network infrastructure itself. Many utilities are now undergoing a cultural revolution in the way they handle customer relationships considering new ways to perform their requirements for billing and customer information systems. Smart meters, new models of energy distribution, market regulation, social media, analytics, and advancing customer technology sophistication and expectations are transforming the focus of traditional billing and customer information systems to a more customer-centric approach throughout the entire customer lifecycle.

As previously referred in the business model methodology of Section 4 for the SmartH2O platform, the Value Proposition of the SmartH2O platform is defined as:

"A software solution that permits the utilities to manage demand, optimize operations, and increase customers' satisfaction and engagement."

The deployment of smart metering infrastructure is driving a revolution in utility customer relationship management. In addition to the big amount of usage data that smart meter deployments will generate for basic meter-to-cash processes, smart metering infrastructure is enabling utilities to develop new products and services. This opportunity will put the utilities into a position to master customer relationship skills for ensuring program and competitive success.

4.3 The market (segments, target, needs and trends)

The SmartH2O platform's primary market is the water utility market. Secondary markets are represented by the other utility markets: energy, gas, and waste utility markets.

The distinction of the primary and secondary markets is based on the following considerations:

The primary market (water utilities) is still at the inception, but is forecasted to grow steadily in the next years, as pressure from water scarcity will prompt more and more

- public regulators,
- administrations,
- utilities to invest in operational efficiency
- technologies allowing advanced connectivity of devices and systems to exchange data

The secondary markets, especially energy, already see the presence of several large incumbent players (e.g. Oracle, Siemens, IBM), also owing to a greater homogeneity of geographic contexts. Such markets therefore have higher entry barriers and can be afforded only when a solid presence in the water market is established.

The achievement of a stable presence in the water market can be instrumental to the entry into the secondary markets, by targeting multi-utilities and cross-selling the SmartH2O platform also to the business units that manage other services than water (gas, energy, waste).

Factors driving the smart metering market include government policies, rise in smart grid deployment, growing demand for energy, increasing investments in power sector and utilities. Smart water technologies are experiencing a first wave of deployment focused mainly on real-time data collectors, which include sensors, meters, and so on. A second wave is expected to be directed to solutions able to effectively employ this burden of data and transform it into business intelligence to better help water utilities in their operational, maintenance and planning decisions, as well as to promote demand management practices.

4.4 Product and service description

The SmartH2O platform brings together two powerful emerging market drivers into an innovative solution:

- The Internet of Things (IoT) revolution enabled by smart metering and big data management technology.
- The social media revolution enabled by social networks, games, and gamified business applications, which set the consumer at the centre of the interaction.

4.4.1 Functionality and modules

The functionality of the SmartH2O platform can be packaged commercially into different level modules and versions. This approach is meant to facilitate the progressive adoption by customers, who could start with a low complexity, low investment version and then switch to more powerful versions as they progress in the deployment of their metering infrastructure and in empowering their organization of SmartH2O platform usage.

As previously defined in D8.4 Intermediate Exploitation Plan, the following table shows the envisioned versions of the SmartH2O platform, with the associated features and target customers for the three versions: the Entry Level version, the Advanced Level version and the Gold Level version.

Table 5. Versions of the Smarth2O platform.

Version	Proposition	Features	Target Customers
Entry level	Collect consumption data and provide feedback to your customers	Consumption data acquisition Near real-time data visualization to the customer Customer relationship management Customer support Utility dashboard	Small medium utilities (e.g., < 20k users), at initial stage of development of the Advanced Metering Infrastructure (AMI)
Advanced level	Understand and engage your customers for better operations	Customer relationship management Customer support Customer engagement and loyalty Utility dashboard (peak smoothing KPIs visualization)	Medium to large utilities, with expertise in CRM and AMI deployment
Gold Level	Manage demand, simulate customers' response and optimize efficiency and customer satisfaction	Consumption-based customer classification and demand prediction Utility dashboard Integration with network management and simulation	Medium to large utilities with consolidated AMI deployment and data analytics in place

4.5 Competitive edge

Smart meters serve as gateways into better understanding and serving the energy consumer, more efficiently operating a transmission and distribution network, and as effective tools to bring value-added data for competitive advantages to energy service providers.

As the consumers are expecting more from providers to tempt them to engage, and the highly growing adoption of smartphones and tablets as key communication channel, SmartH2O platform offers to water utilities a toolset to adapt their current marketing strategies for opening an effective engagement channel to end consumers.

The key competitive advantage offered by the SmartH2O platform is using gamification

for engaging the end consumer in a new digital relationship with the water utility.

The SmartH2O platform implements the five most commonly used game mechanics as follows:

- **Points**: Points are often used in non-gamified applications as a way to denote achievement. Points also measure the user's achievements in relation to others and work to keep the user motivated for the next reward or level. At some stage of consumer – water utility interaction, points can even double as action-related currency.
- **Badges:** While badges have their origins in the real world, SmartH2O platform targets to link real-life merit badges to water saving virtuous behavior. Badges assignation process range from easy Beginner Water Saver to Expert Water Saver.
- **Levels:** The SmartH2O platform uses Basic and Advanced logging levels to make the user aware of the opportunity to step-up his engagement in water saving.
- **Leaderboard**: The SmartH2O platform leaderboard ranks users by their engagement level, and works to motivate and encourage users to become water saver and water savvy players.
- **Challenges:** SmartH2O platform also is an excellent playground for water education concerning school children and adults. It enables them to trigger water saving challenges involving communal activity and group play.

4.6 Marketing and sales strategy

This section presents the way to approach potential clients for showing the benefits of SmartH2O platform. In this sense, business development partners will be recommended to embrace the idea of **selling the new vision** of *managing demand, optimize operations, and increase customers' satisfaction* through gamification instead of just selling a new product. This change of perspective has the potential to increase the future customer's loyalty.

In order to place the SmartH2O platform on the market and start selling it, a **strategy reflecting the stages of the sales pipeline** has to be considered. Sales projections have to be made considering the rates of conversion, normal time lag in decision making, and reflecting the contributions of both sales and marketing to generating revenues and gaining new customers.

An action plan regarding marketing activities must be set in order to measure the most effective marketing actions that can be leveraged in order to impact a maximum number of customers. The choices that currently can be foreseen are a mix between the two following extremes:

- an large number of local water utilities with a limited number of consumers;
- a limited number of large water utilities -- from bigger towns and cities – with large number of customers.

The planned marketing actions will be detailed based on the following best practice approach: [YY] Australian Business Consulting & Solutions, Align your sales and marketing, Parisis, P, Hage-Ali L. online http://www.australianbusiness.com.au/marketing/marketing-strategy/sales-marketing-strategy

Action 1: business objectives

Defines the business objectives as well as the direction that the sales and marketing strategies are supporting in a clear and understandable manner.

As the primary aim for all business organizations is to add value and in the private sector this involves making a profit, establishing business objectives we are following the SMART approach in order to know at any time the progress that it has made towards achieving them. SMART is a set of criteria that stands for:

- **S**pecific - clear and easy to understand.
- **M**easurable - i.e. able to be quantified.
- **A**chievable - possible to be attained.
- **R**ealistic - not 'pie in the sky'.
- **T**ime bound - associated with a specific time period.

The following represents the SmartH2O platform business objective **as from Set Mobile perspective**:

> *SmartH2O platform will be deployed to 7 water utilities and 50.000 end-consumers from Romania and Eastern-Europe in the next two years from its launch on the market.*

Similar business objectives are expected to be stated by the other business development members of the SmartH2O consortium (especially Politecnico de Milano and Webratio – associated third party) as well as by a joint entity that may be formed by the aforementioned Consortium partners for commercial operations after the end of the R&D project.

Action 2: target market

Customer segmentation will be completed, based on profiling, purchasing behavior, needs and value.

At the current stage, based on direct research and observations made during participations at industry events, it appears that the water utilities from the local and regional market ready or close for SmartH2O platform adoption can be divided in two segments:

- a low number of large international utility operators that are running water operations for large cities under long term contract with the municipalities,
- a significant number of municipal water operators running operations for small towns.

Action 3: definition of solution

Define the solution offered to and desired by customer segments, and range of services that should be offered.

For water utilities, the general approach is to target cost-effective software solutions that decrease operational cost and increase customer satisfaction. In particular, the water utilities state the need for a better knowledge of the customer behavior, and for an enhanced identification of patterns different nature: from the response of the network in front of leakages to identification of fraud. Also, customer engagement and asset management are very important for water utilities.

Action 4: strategic position

This defines the projected position of the SmartH2O platform in the marketplace against existing similar solutions considering factors as price, turnaround speed, quality of the processes. This process provides the support for performing a Competitor Overview, comparing relative key strengths and weaknesses and identifying opportunities.

The SmartH2O platform will be positioned as a ready-made customer engagement SaaS service for water smart metered companies. An emphasis will be placed in order to stress the environmental consciousness of the end consumers of those water companies.

During the third year of the project and beyond, the refined outcome of this step will lead to the definition of a Unique Selling Proposition (USP) relative to other companies. That proposition will be emphasized in marketing and sales activity at later stages.

Action 5: identify marketing objectives and alignment with sales objectives

Based on the business objectives, customer segmentation and percentage of repeat business, sales parameters such as the number of projected new clients, or customer retention rate – two figures required to achieve the revenue objectives – will be modelled.

Action 6: marketing strategy

A broad strategic framework will be outlined, including identification of key marketing channels, the objective behind their use, and integration between channels.

Some of the marketing channels that can be included in the strategy are:

- online web site
- email to prospects
- participation to events
- social media
- search engine marketing
- advertising
- surveys

Action 7: marketing plan and campaign development

A marketing plan will be developed, to align with sales activities and overall business objectives. A pipeline model will be used to determine the objectives for each step of the individual campaigns, with specific goals for both sales and marketing. The individual campaigns will be integrated into a twelve-month marketing plan, including suggested timeframes and the responsibilities of marketing and sales teams.

4.7 Organizational plan

In order to implement the business objective, as from the above Marketing and Sales Plan, the proposed structure of the Staff Establishment Plan is the following:

Management

- 1 x Managing Director (CEO)

Sales and Marketing

- 1 x Sales and Marketing Manager (SM)
- 1 x Pre Sales Assistant

Research and Development

- 1 x Senior Developer (CTO)
- 1 x Junior Developer
- 1 x QA and Support Engineer

The projected organizational plan considers a conservative approach, with some of the members performing more than one tasks (e.g. sales and marketing, quality assurance and support) in order to minimize the initial costs. As the revenue stream becomes more clear and steady, and the financial model is positively adjusted, the organization staff can be expanded.

5. Drop! game

This section exposes Moonsubmarine's business plan outline for the "Drop!" board game and its online extension. The company chose to make most of the business plan publicly available, except for the financial projections. These are in the confidential part, presented in Section 5 of D8.5.1.

5.1 Executive Summary

Drop! The game has been thought as a modern combination between a physical card game and a mobile digital extension, this peculiar combination has been produced with the end in mind of introducing at a home level a mechanism able to engage all the members of a family and then communicate, in a *gamified way*, the basic principles of water consumption saving.

The digital extension is a natural bridge to the social platform used by the project to collect and gather all the important information about water usage and trends. The business models behind such type of artefact could be basically three:

- Retail distribution
- Licensed distribution
- B2B customised versions of the game

The first model is the most impactful from a potential point of view, but it is even the hardest to be exploited due the nature of the physical distribution ecosystem. This is the reason why Moonsubmarine will approach the B2B market collaborating with established publishers and dealers to test the distribution channel without dealing initially with the complexity of such market.

Once tested the appeal of the product on a large scale will be possible to plan further investment in marketing and sales to be able to exploit and penetrate the European card game ecosystem.

In parallel, thanks to a precise business development activity, Moonsubmarine will try to sell deals with B2B subject for specific customised version of the game to be distributed directly by the branded partners.

5.2 Moonsubmarine

Moonsubmarine Limited is a UK based company set up in 2012 and dedicated to Gamification and Game Development. The company is owned by Fausto Dassenno and Giuseppe Pasceri with 45% each and Robert Hyde with 10%. Our pivotal areas of interest are **mobile development** and **game design** over mobile platforms such as iOS and Android. As part of the game design we also provide **gamification design** services. The main offices are located in Cambridge in the UK, and subsidiary offices are located in the north of Italy (Parma) while some collaborators work from the Netherlands.

In 2012, Fausto Dassenno and Giuseppe Pasceri founded Moonsubmarine to develop the Ipad game "London : The Game". The game is in association with "The London Museum". (www.london-thegame.com). Fausto and Giuseppe compose the management team, in addition there are two developers currently working on the mobile apps and a highly professional Graphic Artist working with the team as freelance. The personnel planning and expenditure are shown in details in the Financial Plan section.

5.3 The market: segments, targets, needs and trends

Based on a 2014 research the Hobby Game in general market is worth 880 Million USD. to arrive at the estimate for the total industry, we compiled estimates on five individual categories:

- collectible games
- miniatures
- board games
- card and dice games
- roleplaying games.

We found that the collectible games category was by far the largest, at $550 million; miniatures and hobby board games were tied for second, at $125 million each; hobby card and dice games were fourth at $55 million; and RPGs last at $25 million.

We define "hobby games" as those games produced for a "gamer" market, generally (although not always) sold primarily in the hobby channel of game and card specialty stores. We define the "hobby games market" as the market for those games regardless of whether they're sold in the hobby channel or other channels.

Collectible games were particularly strong as an extra Magic: The Gathering release from Wizards of the Coast, more *Dice Masters* from WizKids, and the launch of *Force of Will* joined strong sales from *Pokemon, Legends of the Five Rings*, and Bushiroad's *Cardfight!! Vanguard, Weiss Schwartz*, and *Future Card Buddyfight*.

More in general there are basically four markets (categories) in which to sell games to publishers. They're defined by the type of consumer who buys the games in that market, methods of distribution, and product expectations of the publishers. The categories are mass market, hobby games, American specialty games, and European games.

The mass market category consists of the ones you see on the shelves of Wal-Mart, Toys "R: Us, and Kay-B. They are mostly made up of family and party games like Pictionary, Taboo, Boggle, and Cranium.

Hobby games are mostly the domain of males in their teens and 20s who play religiously every week or more. In general, these games are extremely complex, and it's not unusual for fans to spend hundreds of dollars a year buying supplements, cards, figurines, or new rulebooks for a single game.

American Specialties is sort of a catchall category for American games that aren't mass market or hobby games. It includes products targeted at a certain segment, such as abstract strategy board games, war games, games with physical game play, and so forth

Finally talking about European games we mainly talk about games published by German companies. The German game market is a big one. In Germany, games are quite a bit more popular as a mainstream entertainment choice when compared to North American tastes. German companies put out dozens and dozens of new games each year, only a small fraction of which ever get translated and make it over to the United States of America.

5.4 Product and service description

The board game & companion mobile app solution is a unique value proposition for the market aiming to leverage on the appeal coming from the board game product enhancing it with the digital extension.

In our case the board game is more properly a card game designed to be played by families aiming to raise the awareness around water consumption.

The game is based on a classic "push your luck" paradigm used in card and board game since the Egyptians and here revisited in order to be appealing for a juvenile audience. It is

supposed to be rewarded by water utilities to customers that showed a water saving behaviour.

The box for the Drop! board game (Figure 14) is composed of:

- a set of fully coloured cards;
- a point badge;
- an instruction manual written in several languages.

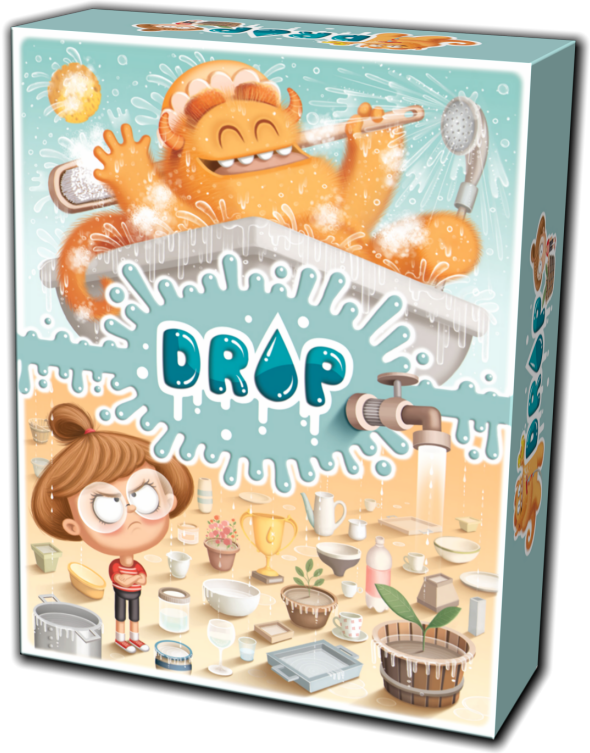

Figure 14. The Drop! Board game box.

The main characters of the game are Lily and Monster. Lily is a young girl who understands that water is a very important resource which should never be wasted. Lily, however, has a friendly monster hiding in her wardrobe. He's not a scary monster... rather a clumsy monster. He watches Lily from behind the wardrobe doors, eager to imitate her. The problem is, when he comes out of the wardrobe trying to imitate Lily, he always makes a big mess!

Figure 15. The main characters: Lily and Monster.

The objective of this game is to increase water efficiently in your home and garden... but you have to be quick, before the Monster comes out of the wardrobe and spoils all your water savings! The game is divided into a series of rounds. Each round ends when either one of the two conditions described below is reached. The player who received the deck starts the game by declaring aloud how many Lily cards he will be able to draw, one after the other, without getting a Monster card. The player sitting to his left has two options:

1. Challenge the player who has the deck to start turning cards and see if he can fulfil his declaration.

2. Take the deck declaring that they can turn a higher number of Lily cards until a monster card is turned.

It is now up to the next player, moving clockwise around the group, to decide whether to further raise the declaration or launch the challenge.

The deck may change hands many times, until one player is finally challenged. When a player is challenged, he or she starts turning the cards from the top of the deck, one at a time and placing them face up on the table. The player keeps on drawing cards until the amount of Lily cards drawn matches the declared number, winning the challenge, or until a Monster card is drawn, losing the challenge.

If the challenge is won, the player gets points depending on the total value of the numbers shown on the Lily cards drawn. Any drawn cards with the same number value are calculated only once.

Here's an example, using cards drawn by Chris, who scores 16 points (7 + 5 + 3 + 1). Each player's score is tracked using the score tokens. The score tokens are kept in front of each player during the game. After a player wins a challenge all the cards are placed back in the deck, which is shuffled again and given to the player sitting to the left of the winner. This player begins the next round of play, with a new declaration (the player can start with any number he or she likes).

When the player drawing the cards loses a challenge, the other players score points. Starting with the challenger, each player can select a drawn card already on the table and scores the number of points shown on that card. Each selected card is put back into the back of the deck. Then the next player to the left can choose from the remaining cards, one at a time, until there are no cards remaining on the table. Players may only choose one card each and if there are not enough cards available for all players, those who haven't selected a card score just one point. The player who lost the challenge scores nothing and keeps the Monster card that caused his or her defeat face up in front of them. The card deck is then

shuffled and given to the next player sitting on the left of the previous player. This new player then begins the next round of play with a new declaration.

The game goes on in this way until one of the following two situations eventually occurs:

1. A player loses his or her turn by discovering the final seventh Monster card.
2. There are no more tokens remaining.

Figure 16. The board game and mobile game.

But the game does not end here (Figure 16). You can download the free mobile app and try to convert the monster cards you have in your hand into points.

Start the APP and choose the option "scan the QRcode". Scan your monster card with your smartphone camera. A question with multiple answers will appear on your smartphone screen. If you answer correctly your negative Monster card will be transformed into a +10 points card! If the answer is wrong, your Monster card will remain a “-10 points” card. Repeat this for all Monster cards that have been discovered in the course of the game and recalculate the final score.

Present situation

After having developed the card game and its digital extension within the SmartH20 project we have started to test its appeal within a pretty restricted number of people used a focus groups.

We have then tried to model possible business models that could fit for real both the retail market and our ability to produce and distribute the game.

5.5 Competitive Edge

Gamification is about taking the essence of games—fun, play, transparency, design and challenge—and applying it to real-world objectives rather than pure entertainment. In a business setting, that means designing solutions for everything from office tasks and training to marketing or direct customer interaction by combining the thinking of a business manager with the creativity and tools of a game designer.

The use of items like leaderboards, badges, missions and levels is part of a trend called gamification that can be seen in a growing variety of industries and applications. It is a trend that analysts claim will be in **25 percent** of redesigned business processes by 2015 [Gartner, 2012] will grow to more than a **$2.8 billion business by 2016**, and will have **70 percent** of Global 2000 businesses managing at least one "gamified" application or system by 2014 [Gartner, 2011].

In today's engagement economy, where time and attention are becoming increasingly scarce and resources precious, people are likely to gravitate to activities that are authentically rewarding and filled with the opportunities to achieve, grow and socialize. The lessons that can be learned from games and game designers are one set of tools to help us increase our return in such an economy.

M2 Research estimates that the market spend on gamification solutions, applying game mechanics and behavioural analytics in non-traditional applications will reach **$242 million by the end of 2012**, which is more than double from 2011. Revenue estimates are comprised of a number of components that includes:

1) platform vendor revenue
2) agency and production revenue
3) internal development

Figure 17. Market Segments for Gamification

Market growth is consistent with the growth seen by companies as they ramp up their internal efforts to meet demand. The number of consumer brand and media companies implementing game elements has grown rapidly in 2011 and all signs point to further growth in 2012. Additionally, there are many implementations within enterprise, healthcare and educational markets that are starting to come online, further accelerating the market.

M2 Research's overall projections for the industry thus remain consistent with our earlier assumptions. We expect double-digit growth for the coming years, with our overall market estimates reaching **$2.8 billion by 2016**.

Market Segments: as with many emerging platform technologies, gamification has quickly gone from a horizontal market to decisively more vertical orientations. There are a number of vertical markets centred on key industries. The primary vertical markets include: Entertainment, Retail, Media & Publishing, Enterprise, Education and Healthcare/Wellness. Each of these markets supports both consumer and employee-level engagement initiatives.

5.6 Competitor panorama

Competition in the gamification area is not showing a clear leadership yet, checking globally we can find just a few examples of well-developed companies. Crossing this information with [Gartner, 2011] the Gartner report detailed into the Market Review chapter ("*By 2014, a gamified service for consumer goods marketing and customer retention will become as important as Facebook, eBay or Amazon, and more than 70% of Global 2000 organizations will have at least one gamified application*"), it seems quite clear that at the current state of the art there is still enough space to grow in the global market, especially in the consulting area.

The main competitors today are:

Badgeville The #1 Gamification Platform

According to Badgeville, it is the #1 gamification and behaviour management platform. "The world's leading businesses turn to Badgeville to increase customer and employee engagement. Samsung, Oracle, EMC, Universal Music, Opower, The Active Network, Autodesk, Microsoft, NBC and over 200 global innovators rely on Badgeville to measure and influence user behaviour".

GAMIFY

Gamify Inc. is the creator of Gamify.com as well as the Gamification Network (http://gamification.org, http://gamification.net, etc.)

According to Gamify.com, "it is a new kind of social game -- made for the web, mobile and your life! Meet friends, explore fun game spaces, interact with your favourite brands and unlock cool rewards!

'Everything is a Game', and the purpose of Gamify.com is to make that possible.

Gamify can turn your brand into a social game in a few easy steps".

Founded in June 2009 by Keith Smith and Jeff Malek, BigDoor is a gamified loyalty platform that powers social engagement through the use of game mechanics. According to BigDoor, "our goal is to help publishers grow and engage their communities.

We provide an instant loyalty solution that creates deeper brand affinity through innovative user incentives, including sharing, ability to earn rewards, points and badges as well as participation in quests, earn virtual currency and more. We work with over 300 partners, from small independent bloggers to Dell, Major League Baseball and Nickelodeon".

CloudCaptive's UserInfuser platform is "a powerful tool designed to drive the engagement of your site's visitors through the use of game mechanics. The platform allows you to utilize gaming elements such as badging, points, live notifications, and leaderboards to reward and engage your online community".

According to their literature, "Bunchball is the industry leader in gamification. We shipped the first gamification solution in the marketplace back in 2007, continue to work with some of the largest consumer and B2B companies in the world. Our customers include Warner Bros., Comcast, NBC Universal, ABC Television, Stella & Dot and LiveOps among many others. These companies use Bunchball's Nitro gamification platform, and its powerful analytics solution, to create customized, actionable and scalable user experiences for consumers, employees and partners.

5.7 Marketing and sales

We are now using the networking behind these universities in order to expand our business. Our tailor-made solutions will be our ambassadors. Furthermore, for the beginning of the second half of 2013 we have planned to hire a dedicated business developer able to contact and acquire many other different subjects external from the original border that we set.

We see ourselves as technological tailor makers. There are no prototypes or default projects, each and every client has its own needs and we manage each project in a unique way from the design to the development.

At the same time, we produce components that are easily reusable, the concept behind could be called ‘shelf technology procurement’. Every new activity enriches our framework letting

us be able to be *competitive with our prices* even if the solutions are always designed specifically for the customer needs.

Another source of promotion will be international fairs and events where we will present our products and services, especially the most advanced in terms of technology.

A whole new source of visibility and marketing will be kindled by the publishing of a market version of Drop! the Game. We are planning to publish with Kaleidos Games an OTC version of the game. The commercial version of Drop will be printed and distributed in countries across Europe thanks to the Multilanguage instruction manual and the easy to grasp game concept.

The mobile app, supporting this flight will be localized in the most spoken European languages and will be available in the stores. This exploitation will bring the board game plus companion app value proposition to a final real market validation. We aim to market this commercial value proposition in all the most important fairs in Europe with the support of Kaleidos Games visibility and the international distributor support.

We will take part and promote the game plus app in the following fairs:

- Lucca Comics & Games 2016 - 2017
- Hessen Game Fair 2016 -2017
- Spielwarenmesse 2017

6. Smart meter data management component – SMDM

The following section presents the business plan outlined by Set Mobile for the **Smart Meter Data Management** (SMDM) component.

SMDM is being developed as a critical component of the SmartH2O platform dedicated to leveraging the use of smart meter measurements across utility organizations. It acquires and process data independently of the hardware measurement device upon a standard interpretation of the meter ID – timestamp – value pair. The solution loads, validates and stores metering data in order to facilitate the business processes of utility companies. Because of its full set of functionalities, and of its relevance to a utility company, **SMDM** can be packaged and sold as an independent solution both within and outside the SmartH2O platform.

Set Mobile is preparing to address the growing market of services dedicated to utilities using smart metering, with a focus on water utilities.

Similar to the SmartH2O platform at-large, SMDM is a SaaS, so that the business model methodology developed in Section 4.1 applies. It efficiently describes many aspects of the business model, and allow for completing the business plan outline with an implementation strategy (Section 6.2) and a confidential financial plan, to be found in Section 6 of the confidential part delivered as D8.5.1.

6.1 Business model canvas for a Software as a Service (SaaS)

As stated in *D8.4 Intermediate Exploitation Plan*, the objective of the **Smart Meter Data Manager** (SMDM) platform component is the acquisition and processing of data streams from smart meters and consolidation within the SmartH2O platform database. It collects and processes raw meter data, which usually can be “noisy” (affected by errors) and use it to drive cost savings and operational efficiencies in different areas, including meter-to-cash, diversion and theft, customer service, and distribution optimization planning.

This software component has been architecturally projected for supporting enrichment with data analysis functionality provided by the Business Dashboard component of SmartH2O Platform. In certain circumstances it can become an extension of the water utility data analytics and therefore it can evolve into a dedicated software solution by itself.

The SMDM component is the most industry independent component of the SmartH2O platform. Its position is offering a larger potential Market but also faces a more challenging competition being a more general product. Still, the proven experience in the Utility domain offers the product a good “pedigree” that offers competitive advantages in the market.

The SMDM **Value Proposition** can be defined as: a Metered Data Management System connected to various metering infrastructures (water, electricity, gas, heating).

The main features already developed or planned for development are:

- Metered data collection
- Metered data cleaning and consistency checking
- Metered data processing (filtering, aggregation, map–reduce operations)
- Processed data delivery to Customer

SMDM software component addresses the following **Customer Segments**:

- Water Utility services
- Property management services
- Smart Meter manufacturers
- Water Softeners manufacturers
- Other service providers linked to water services (as for example the market of peak consumption limitation)

Following primarily the SaaS model, the **Channels** that SMDM will implement to deliver its Value Proposition are:

- Online Web platform – a Multitenant Enterprise App Store (owned and/or rented)
- Online forum and/or Blog – as a knowledge repository for delivering self-service support to registered customers
- Google Play and App Store mobile apps for end consumer engagement
- Online ads on social media and industry dedicated online portals
- GitHub account – to deliver the original SMDM open-source implementation

The secondary On-premises model followed by SMDM will pinpoint to **Channels** such as:

- Sales Force Representatives – for performing direct pre-sales demos, offering limited trials, contracting prospects and proposing sales partnerships
- Fairs and events demo corners
- Partner programs for rewarding cross-sales, leads and opportunities

The Channels for addressing the prospects and customers will be enforced by a **Customer Relationship** policy adapted for specific sales models.

- Online Web platform (SaaS – awareness and client acquisition phase)
- On site presentations, demo trials (On-premises – awareness and client acquisition phase)
- Self-service and online support (SaaS – support phase)
- Email, phone calls, remote access, personal assistance (On-premises – support phase)

Offering Affiliate and Referral Programs for rewarding cross-sales, leads and opportunities will be established as a common Customer Relationship for both the SaaS and on-premises models

The sales models driving **Revenue Stream** that SMDM component could follow are:

1. Metered Data Management Service for a Utility Company – starting with Water Utilities and progressively adapting it for electricity, gas, heating utilities - or any other Company that processes metered data (road-traffic management companies for example).

Table 6. Revenue Stream projected for implementing SaaS business model.

Model	Initial Setup (1-time)	Platform Usage Fee (recurring)	Consultancy Services (on-request)
SaaS	Y	Y	Y

2. On-premises Meter Data Collecting and Processing Solution for a Utility Company – starting with Water Utilities - performing long-term data storage and management for the vast quantities of data delivered by smart metering systems (be it electricity, gas, heating) or any other Company that processes metered data.

Table 7. Revenue Stream projected for implementing the On-premises business model

Model	Licenses (N x Users) (1-time)	Services (Solution set-up and Personnel training) (1-time)	Maintenance Services (recurring)	Consultancy Services (on-request)
On-premises	Y	Y	Y	Y

Here is the list of Key Activities that are foreseen to sustain the SMDM business model, as

they come close to that performed for the entire SmartH2O platform:

- **Online Sales Solution** for sustaining the SaaS
- **Direct Sales** through dedicated sales force
- **Indirect Sales** through affiliates, resellers, value-added resellers, distributors, value-added distributors and OEMs
- Software development, integration, customization and maintenance

while the **Key Resources** and **Key Partners** needed for SMDM business development are:

- Sales and Marketing team
- Software Development team
- Integrating cloud provider services (outsourced)
- Smart Meter Manufacturers
- Third party System Integrators

The required **Cost Structure** is claimed by:

- Research and Development team
- Marketing and Sales team
- Customer Support team
- Data Center operations

6.2 Strategy and implementation

6.2.1 Commercial strategy

SMDM in its entirety (as a data gathering instrument and analytics tool) considers a two-way marketing approach.

The main approach will be dedicated to the water utilities (and later energy and gas utilities) for empowering them to use the water consumption data and the insights that can be inferred out of it in a real time approach. The secondary approach will take into account the end-user needs in regard to own water consumption and due payments considering in the same time the impact of his water usage footprint in relation to the environment.

In most of the cases, the market of the SMDM solution is **the same market that has been analyzed for the whole SmartH2O platform** in Section 4.3. Also, for particular cases SMDM can be sold as a standalone component integrated with the existing IT systems and analytic services of the utility company.

For taking solution to the market, a multilevel strategy will be considered:

- We will try to find the right positioning of the solution in the existing market. As bigger players as Oracle, IBM and Siemens are already on the smart metering market, positioning can be challenging. For an effective approach against market giants, we will consider the competitive advantages of the solution, as:
  - its service oriented architecture that allows an easy integration,
  - its flexibility in configuring existing features and exposing custom developments,
  - its performance parameters inherited by the Big Data technology that stays for the backbone of the solution and allows to process large amounts of meter readings in a short time and using.
- Marketing and sales actions will be undertaken to discover the most competitive price that the utilities would be interested to pay for SMDM solution,
- We will perform market segmentation in order to find out which is the most appropriate utility segment to target for an effective outcome
- We will address a mix of online and offline marketing actions in order to get to prospects and customers. Such foreseen actions are: online advertising, marketing referrals, participating to industry events, sales demos,
- Free demo trials will be offered to prospects to get convinced about the features of the solution.
- An automated system for demo trials and paid subscriptions will be set on the

solution web-site.

Sales projections will be continuously performed and adjusted, considering the rates of conversion, normal time lag in decision making, and reflecting the contributions of both sales and marketing to generating revenues and gaining new customers. An action plan regarding marketing activities will be set in order to measure the most effective marketing actions that can be leveraged in order to impact a maximum number of customers.

6.2.2 Building customer base

Providing quality services and developing a bond of trust with customers are essential to spread the service adoption and establishing a strong MRR (Monthly Recurring Revenue). As the main users of SMDM are IT administrators, specific actions to build the customer base will be implemented, such as:

- Integrating SMDM to industry online forums
- Building a user community
- Integrating to social media
- Adding gamification to SMDM
- Providing easy to use administration tools for in-house customization
- Establishing unofficial channels for “emergency” support
- Providing customer testimonials

6.2.3 Milestones

Defining milestones for reaching the business objectives is useful for focusing on the next move and re-evaluating the priorities. The milestones foreseen for an effective market deployment of the SMDM solution are specific to SaaS solutions:

1. Solution market fit: having a steady pool of customers using the solution
2. Getting paying customers: getting customers that agree to pay for solution usage
3. Statistical significance on the market: projecting future revenues that prove realistic
4. Capital-efficient growth: improving the Annual Recurring Revenue
5. Positive cash flow: rising cash balance
6. Profitable: reaching to a positive net income

6.2.4 Revenue streams

SMDM solution will closely follow the revenue model of the SmartH2O platform, as for the first sales cycles it will be sold as part of the platform with an entitlement to a share of the revenue made by the platform. For the next sales cycles, presumably after the second year from starting business operations, we presume to reach to a strategy for selling SMDM both as part of the platform and as standalone service.

In this matter, the sales models that SMDM component will follow for driving Revenue Stream are:

1. SaaS Metered Data Management Service for a Utility Company – the main model ensuring a projected majority of the revenue
2. On-premises Meter Data Collecting and Processing Solution for a Utility Company – the secondary revenue model

For the SaaS model, the assumptions of SMDM financial plan of foresee a revenue share of 25% from the SmartH2O platform ARPA.

6.2.5 Cost structure

The cost structure of the SMDM solution will echo the cost structure of the SmartH2O platform as SMDM is sold, developed and maintained by the same teams as for the platform.

The cost is made up by the following expenses:

1. General and administrative (salaries and bonuses)
2. Sales and marketing (salaries and bonuses)
3. Research and Development (salaries and bonuses)
4. Other costs (server infrastructure, marketing, office rent, office supply, travel)

The assumptions of SMDM financial plan of foresee an operational cost fraction of 30% of the operational costs of the SmartH2O platform.

7. Dashboard for customer behaviour analysis and water demand planning

The other asset directly related to the SmartH2O platform, and that cannot be sold separately is the Dashboard for Customer Behaviour Analysis and Demand Planning, henceforth “the Dashboard” in short. Due to the lack of data against which to calibrate and validate the models developed to be part of the Dashboard, the commercial development of this asset has been halted for now. Instead, the Dashboard can increasingly be considered as a component of the project’s main asset: the SmartH2O platform (business plan outlined by Section 4).

Therefore, this section should strictly be read as an update to D8.4 regarding the Dashboard, and not as part of a business plan outline *per se*.

7.1 Asset definition

The SmartH2O platform relies on the Smart H2O platform itself, on the board game and digital extensions, and on the customer behaviour analysis and water demand planning dashboard to modulate and influence water demand behaviour. In this section we focus on the specific asset represented by the Dashboard for Customer Behaviour Analysis and Demand Planning, henceforth “the Dashboard” in short.

The Dashboard is aimed at managers from the water utility. They can use the dashboard to profile their customers and to extrapolate their consumption patterns under various scenarios. In particular, the Dashboard allows to explore the potential impact of deploying gamification objectives and the impact of measures to raise social awareness.

The Dashboard is centered around the Agent Based Modelling and Simulation Component which contains models of

- Users’ water consumption behaviour, based on user profiling data and psychographic variables, elicited from the consumers through the gamified bill in the SmartH2O platform
- User sensibility to network interaction: how much the users respond to comparison against examples of sustainable water consumption behaviour by other users in their network or circle of friends, both real and virtual

The dashboard allows for continuous real-time monitoring of customer activity on the platform, their real-time water consumption, and the prediction of water demand – based on agent-based simulation and advanced user modelling.

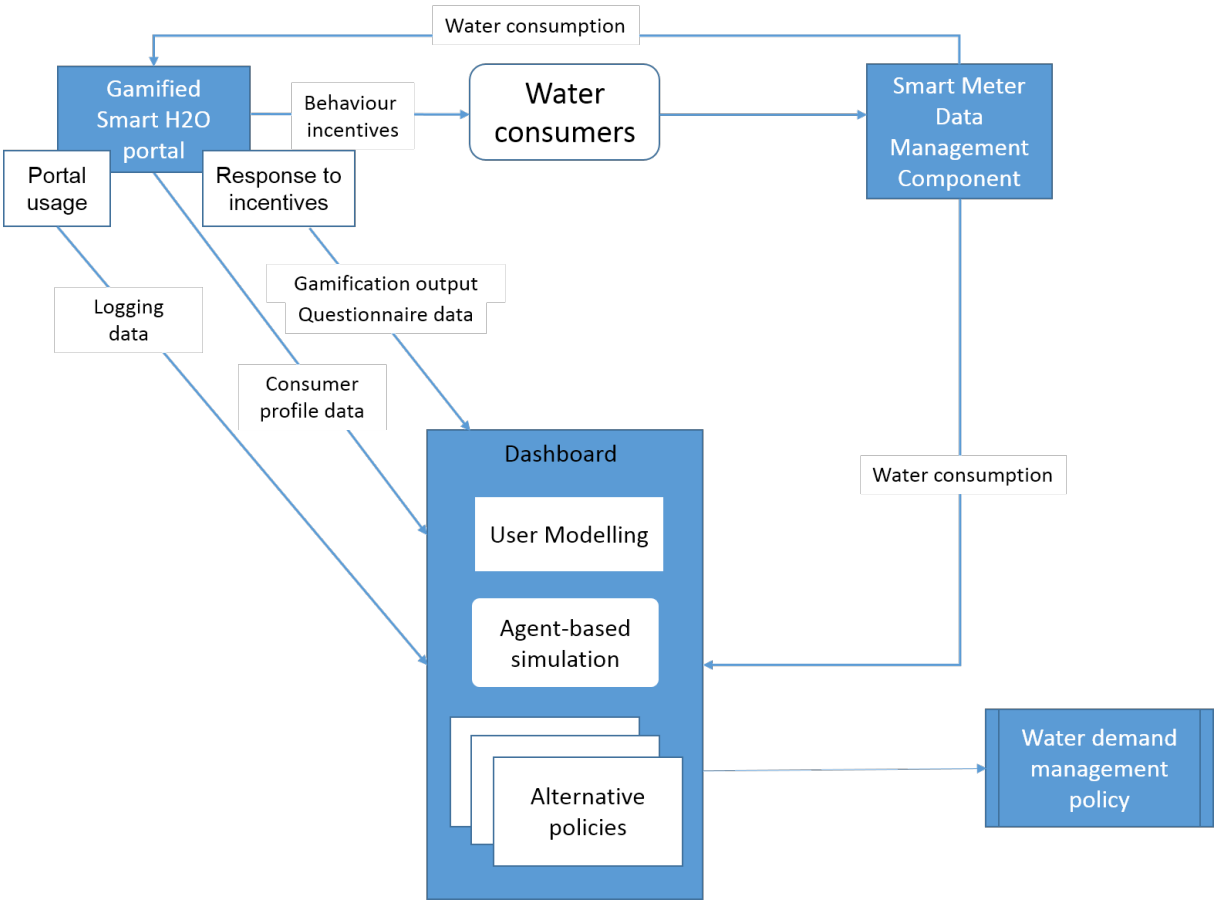

Figure 18: Overview of the logical flows among the dashboard and other SmartH2O components.

As can be seen from Figure 18, customer insights come from multiple sources that when fused together help to predict the effectiveness of the utilities' campaigns and policies to influence water behaviour.

First, the users' interaction with the platform, which when compared against water consumption levels give insight into the effectiveness of specific incentives, consumption feedback mechanisms, or other water-related information included in the portal. Examples of how this information can be represented on the dashboard include:

- Number of logins per time period, and the relationship with water consumption levels
- Leaderboard containing users with the most points
- Activity level (represented by the number of points) over time, plotted against water consumption levels and against time
- Usage frequency for different features of the Smart H2O portal (e.g. viewing water consumption visualisations, viewing water saving tips, setting goal), plotted against water consumption levels and against time
- Number of physical rewards claimed plotted against time

Second, the Smart H2O platform contains a messaging system, as well has an integration with questionnaire tools which allows for detailed customer opinion collection. The questionnaire tools are linked with the incentive strategy in the sense that points are awarded for filling out questionnaires. This integration enables utilities to monitor water saving awareness, and other psychological determinants of water consumption behaviour that

cannot be collected from smart meters or other behaviour indicators.

These two sources not only provide insight into the optimization of the impact of the Smart H2O portal (e.g. adjustment of points awarded), but also provide utilities with real-world longitudinal data on the effectiveness of particular measures they can use in water efficiency campaigns.

When these two sources are combined with user profiling data and agent-based simulation, utilities are equipped with a powerful tool to gain insight into customer behaviour, and to predict future water demand based on a range of variables related to household composition, appliances installed, but also on direct and indirect awareness measures.

Discussions with the utilities have demonstrated that whereas there is a long-term interest in the deployment of dynamic pricing mechanisms, utilities are reluctant to expose these mechanisms to their customers, even in a simulated fashion. However, aforementioned questionnaire mechanisms as well as the data that was already collected on users' sensitivity to monetary and non-monetary incentives (see D7.2) can be made available through the dashboard.

7.2 Market definition

The expected market for the Dashboard is the same market that has been analysed for the whole SmartH2O platform in Section 4. The possibility to sell the Dashboard as a standalone component, present in previous deliverables until D8.4, has been relegated to the background as the project evolves. Indeed, project members want to focus first on finding commercially viable solutions to the three most prominent project assets.

7.3 Product/ service definition

The Dashboard is implemented as a loose collection of software artefacts that can be either implemented as software as a service within the SmartH2O Platform, but they can also be used independently as software units.

The licensing model of SmartH2O is based on an open source access to the code, and the main revenues are to be generated by the consulting services to be provided for the set-up, execution and management of the Dashboard elements.

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