# *Master thesis*

## *“An Internet of Things vision for Quooker”*

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Delft University of Technology,
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**Disclaimer**
This report was written to fulfil the graduation requirements of the master Strategic Product Design at the faculty of Industrial Design Engineering at the Delft University of Technology.

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*Master thesis*

*“An Internet of Things vision for Quooker”*

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# Executive Summary

**This report represents an Internet of Things (IoT) strategy proposal and demonstration for Quooker. Quooker is a Dutch boiling-water tap company and a strong brand, which grows fast in revenue. The company discovered that more and more of its competitors applied IoT features to their taps. If these competitors are seen as more innovative than Quooker, they could pose a threat, which is why the company wants to apply IoT as well: to gain competitive advantage. However, Quooker realises that not all IoT opportunities on the market provide significant customer value (and are more likely to be expensive gimmicks) and thus not all opportunities are suited to provide this advantage. Therefore, the company commissioned the assignment to find an IoT opportunity that does generate significant customer value and to implement it in a new design.**

## Analysis

The analysis phase showed that there are indeed a lot of expensive IoT gimmicks on the market. It also confirmed that Quooker's innovative brand position may be at risk in the short term. More importantly, the company analysis showed that both the company's revenue growth and entire brand position is at risk in the long run because the markets they enter will eventually saturate and their innovative frontrunner, high quality, and premium brand perception will lose its strength year by year should it follow its current strategy.

The context analysis showed a different side of the IoT: it transforms business models from offering a product in the past, to offering a digitally connected service in the present and ultimately to offering a quantifiable outcome of the use of the product (pay-per-use) in the future. In particular, it changes the business models of durables with high upfront costs, a burden of ownership (maintenance) and acceptance for shared use: Quooker's and its competitor's product profile. IoT enabled the transition by allowing data collection. IoT provides a solution to the long term risks. It can provide growth after market saturation for two reasons. First, a pay-per-use model is more affordable for the consumer than a one-time purchase model and thus the market extends. The model eliminates high-upfront costs and allows companies to set a more beneficial pricing (because companies are better at maintaining the product and optimising the product usage, by the use of sensors, than a consumer is and a company can re-use broken products). Second, a pay-per-use model offers a monthly recurring revenue, beyond a market saturation point of one-time purchase business models.
The IoT can also strengthen the company's brand position on the long run by providing sustainable competitive advantage from a strong circular relationship which may provide loyal consumers and consumer insights that competitors cannot (easily) steal.
At the same time, the IoT offers additional opportunities for Quooker. The company can relieve its consumers from the burden of ownership, which increases customer satisfaction. If the company invests quickly enough, Quooker may manifest itself as the innovative frontrunner in the outcome economy.

I strongly believe that the aforementioned transition caused by the IoT is not just an opportunity, but it is inevitable and it will revolutionise existing industries just like the internet did over the last decades. Quooker must change its business model in order to survive. Therefore, the strategic design direction for the graduation project is:

"To create a **strategy** for Quooker to change its **business model** from offering a **product** to offering an **outcome**."

The realisation of the IoT strategy goes far beyond the time limit of the graduation project.. Nevertheless, a first milestone can be proposed, to demonstrate the benefits of a new strategy in tangible terms. The demonstration should be a digitally connected service to ensure that Quooker sets up a first IoT infrastructure and collects consumption data to make the offering of other products as an outcome easier.
The analysis also showed that the IoT should have customer value, otherwise it could easily turn into an expensive gimmick and consumers will not be willing to share their every day data and download/use/pay for it. Significant customer value is generated when the biggest pain point is solved. Therefore, firstly the pain point must be identified and a solution will be generated secondly. The scope for the demonstration is the Cube: an extra module for the Quooker tap, to offer the consumer filtered and sparkling water as well as boiling water.

Altogether, the design direction for the strategy demonstration is:

"To create a **digitally connected service** that will solve the **biggest pain point** for Cube consumers in order to create enough **customer value** to make consumers willing to share their **data** and **download/ use/ pay** for the concept."

## Synthesis

In the synthesis phase, the biggest pain point for consumers is discovered: the convenience the Cube offers in maintaining a sparkling water supply is too little to justify its relatively high price. Maintaining a sparkling water supply is: recognising an empty cylinder, realising it needs replacement, to ordering a new one and to returning the empty one. For the pain point three concepts are generated and tested with a lean design approach. The final demonstration is Quooker's SodaService / Thuis-Altijd-Bruis service. The digitally connected service detects when the Cube is out of CO2 and automatically plans new CO2-cylinders deliveries. The research gives a strong suggestion that the concept may generate enough customer value in order make consumers willing to share their every day data and download/ use/pay for it. However, only the market can tell if the concept is truly viable and therefore, a pilot is required.

The service is a first step towards an outcome-based business model. Furthermore, several outcomes Quooker could offer are identified and evaluated. The following outcome was the most promising:

"Quooker must change its **business model** from selling boiling, filtered and sparkling water taps, to selling '**convenience**': a service that makes a **diversity** of other water types **instantly accessible** next to normal tap water."

It is not possible to replace all taps and the Cube at once. Thus, the second step is to offer the Cube as a pay-per-use model and the third step to offer the boiling-water tap as a pay-per-use model.

The consumer pays per liter and does not have to pay for the product, cylinders and maintenance any longer. Quooker analyses and predicts the consumption, sends cylinders and predicts the required maintenance in order to keep up to their promise of always enabling instant accessibility to a diversity of water types. However, these steps require a pilot as well, to validate whether they generate enough customer value to ensure a beneficial subscription-rate and retention-rate while attracting little low-frequency consumers.

## Simulation

In the simulation phase the IoT infrastructure of Quooker's SodaService is developed in detail and future recommendations are provided for the second and third step of the strategy. Eventually an IoT infrastructure concept is developed with a weight sensor in the connector of the cylinder to measure the CO2 consumption and the IoT infrastructure consists of a new control chip, Wi-Fi connectivity, cloud service and integration with the webshop of Quooker. The concept is feasible, but possible not optimal. Therefore it is recommended to further research the infrastructure.

## Evaluation

In the final phase of the project, Quooker's SodaService and the second step of the strategy are accompanied with a businesscase, unique selling points and an implementation roadmap. The roadmap shows that Quooker should start investing to achieve the strategy within eight years. The service is evaluated with a list of requirements, built throughout the project, and the strategy is evaluated based upon its fit with the brand. Eventually the service requires some further research and a pilot, but when it is finished it can, together with the overall IoT strategy, bring significant benefits to both the consumer and company.

More importantly, the strategy will be able to solve Quooker's long term risks to ensure that the company stays a fast-growing and strong brand for many years to come. The strategy is a good fit with Quooker for many reasons, but mainly because it allows the company to benefit heavily from its strengths and it allows them to sell their products to a much larger consumer segment: price sensitive consumers with an existing kitchen.

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# Assignment & Approach

In this chapter, the initial assignment, problem definition, approach and personal ambitions are discussed.

# Design Brief

**Before the start of this project the assignment and desired outcomes were discussed with the stakeholders from the Delft University of Technology and Quooker. The results were stated in a design brief.**

## Assignment

The assignment is commissioned by Quooker; a Dutch boiling-water tap company. More and more boiling-water and kitchen-tap competitors are trying to differentiate themselves from Quooker by adding the Internet-of-Things (IoT) features to taps. The IoT refers to the connection of uniquely identifiable devices, processes, people, and data to the internet (Kranz, 2017). If these competitors are seen as more innovative than Quooker, they could pose a threat, which is why the company wants to apply IoT as well: to gain competitive advantage.

However, Quooker realises that not all IoT opportunities on the market provide significant customer value (and are more likely to be expensive gimmicks) and thus not all opportunities are suited to provide this advantage. Therefore, the company commissioned the assignment to find an IoT opportunity that does generate significant customer value and to implement it in a new design. Significant customer value can be generated from solving the biggest pain point for consumers (Fitzpatrick, 2013). In order to do so, this pain point must be identified first. Three problems are already known and may serve as a lead to find the biggest pain point and customer value. The problems are set out in the initial problem definition.

## Initial problem definition

In September 2018, Quooker launched a new product: the Cube. It is an extra module for the Quooker tap, to offer the consumer filtered and sparkling water as well as boiling water. The consumer needs to replace the CO2-cylinders for sparkling water and return the empty cylinders to Quooker. Three problems occured with the launch of the Cube. First, the product increased the number of service notifications. Second, consumers are less satisfied with the product compared to the other products of the product portfolio. Third, 15% of the empty CO2-cylinders are not returned. Whether these problems are the biggest pain point for consumers and what caused these problems in the first place requires more research.

## Industrial design engineering

The graduation project converges the three key perspectives of Industrial Design Engineering: technology - feasibility, people - desirability, and business - viability. Throughout the graduation project the strategic design will be iterated on the three perspectives.

## Approach

The approach of this graduation project is based on the process of the basic design cycle (van Boeijen, Daalhuizen, Zijlstra & van der Schoor, 2013). For this reason, the report is divided into five main phases: assignment & approach, analysis, synthesis, simulation and evaluation (see figure 1). Although the process is well-structured in theory, the design cycle is less straightforward in reality and requires multiple iterations.

**Analysis**
An analysis is conducted to explore the company, consumer, context and competitive landscape with accompanying IoT opportunities. During the analysis phase key insights for a new design are gained and the cause for the initial problem definition is analysed to provide a lead to find the biggest pain point for consumers. The insights and lead lay the foundation for the concluding chapter of the analysis phase: the design direction.

**Synthesis**
The starting point of the synthesis phase is the design direction. During the synthesis phase, the biggest consumer pain point is validated. Next, multiple design solutions are generated to test whether the solutions are viable or not. The chapter concludes with a final strategic concept.

**Simulation**
In the simulation phase, the final strategic concept will be developed in detail.

**Evaluation**
The final phase of the project provides a business case, implementation roadmap, concept evaluation and an evaluation of the fit with the company.

**Planning**
The overall planning of the design phases is shown in Appendix A.

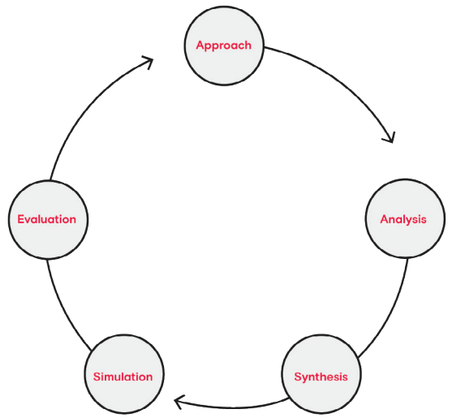



*Figure 1. An overview of the basic design cycle process*

## Personal Ambitions

The five personal learning ambitions are stated below.

**1. To be proud of the final result.**
The final result should be truly desirable for the consumer, but at the same time it should be feasible and applicable to the brand and strategy of Quooker. By doing so, the goal is to make the company, the TU Delft mentor, chair and myself proud of the final solution.

**2. To learn how to work in a multi-stakeholder environment.**
Many stakeholders from all departments of the company are working on IoT-related developments and new developments are pioneering at high speed. A proactive approach is required to stay informed and to search for collaboration opportunities. In addition, the company tends to be critical at the final presentation and therefore engaging stakeholders is key.

**3. To use an iterative lean startup approach.**
In the past, Quooker only conducted quantitative consumer research (online surveys) and never made use of qualitative research. By applying qualitative research, new consumer insights are added to the company. My personal learning objective is to educate myself in the qualitative lean design approach for my future design career.

**4. To fully understand the consumer.**
My biggest personal interest is consumer behaviour and decision-making. During my minor Neuroeconomics I enjoyed reading every textbook so much that I decided that I wanted to deepen my knowledge in this field. I followed several electives in this field and I plan on doing a second Master in Consumer Behaviour.

**5. To graduate Cum Laude.**
After my second master, I want to pursue a career in persuasive design: design based on psychological insights, to influence human behaviour through the characteristics of a product or service. In order to pursue my career in persuasive design I need to get admitted into the Consumer Behaviour Master. However, I do not have a Bachelor's degree in Psychology and therefore I need to graduate Cum Laude to increase my chances of being admitted.

# Analysis

An analysis is conducted to explore the company, product, service, consumer, competition and context with accompanying IoT opportunities. During the analysis phase key insights for a new design are gained and the cause for the initial problem definition is analysed to provide a lead to find the biggest pain point for consumers. The insights and lead lay the foundation for the concluding chapter of the analysis phase: the design direction.

# Stakeholder Analysis

**The stakeholder analysis has been conducted to analyse the key external and internal stakeholders in the context of the design challenge. For each stakeholder the main needs are briefly stated to get a global sense of the stakeholder context. In the following chapters some of these stakeholders were further analysed.**

The external stakeholders are the consumers, suppliers, company and the kitchen dealers. Figure 2 illustrates the stakeholder map.

- The main reason why consumers buy the boiling-water tap and the Cube is because of 'convenience'. Consumers do not want to wait for water to boil and they do not want the hassle with carrying, storing, cooling, and returning (sparkling) water bottles

- Suppliers want to maximise their revenue by selling more parts to Quooker and to decrease production costs.

- The company goals are to increase revenue and to strengthen its brand position. To increase revenue the company expands geographically. To strengthen the brand position, the company improves the quality of the products.

- Most of the Quooker taps are sold via kitchen dealers. The priority of kitchen dealers is to maximise kitchen sales to increase revenue. Kitchen dealers sell Quooker taps as a kitchen appliance in order to receive a margin. On contrary to Quooker, kitchen dealers are less concerned about the after-sale issues of Quooker products. After the purchase, the responsibility for kitchen accessories shifts from the kitchen dealer to the manufacturer. Kitchen dealers do not have to ensure that consumers use the Quooker tap properly, nor are they responsible for maintaining a high customer satisfaction for the tap.

The key internal stakeholders within the company are the product manager, the electronic product development (EPD) manager, the research & development (R&D) manager and the marketing manager. The internal stakeholders want to respond to the fact that more and more competitors are applying IoT features to their taps. If these competitors are seen as more innovative than Quooker, they could pose a threat, which is why the company wants to apply IoT as well: to gain competitive advantage.

As mentioned before, the stakeholders realise that not all features on the market provide significant customer value (and are more likely to be expensive gimmicks) and thus not all features are suited to provide this competitive advantage. Therefore, the internal stakeholders want an IoT opportunity that does generate significant customer value and they want it implemented in a new design.

## Conclusion

A new design solution should fit the goals of the company, the goals of the internal stakeholders and the sales channel. Therefore, the design should meet the following four requirements. First, the design should increase the company's revenue and strengthen the brand position. Second, the design should implement an IoT opportunity that generates customer value to provide competitive advantage. Third, the design should be retailed via kitchen dealers. Fourth, the correct usage and customer satisfaction of the design cannot be dependent on the role of kitchen dealers, because they do not feel responsible to take care of it.

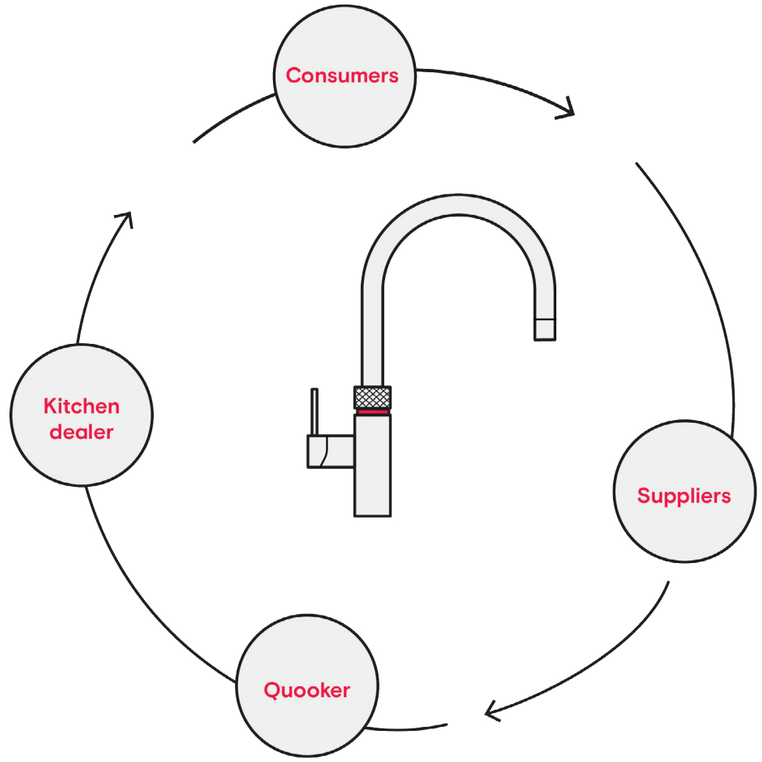


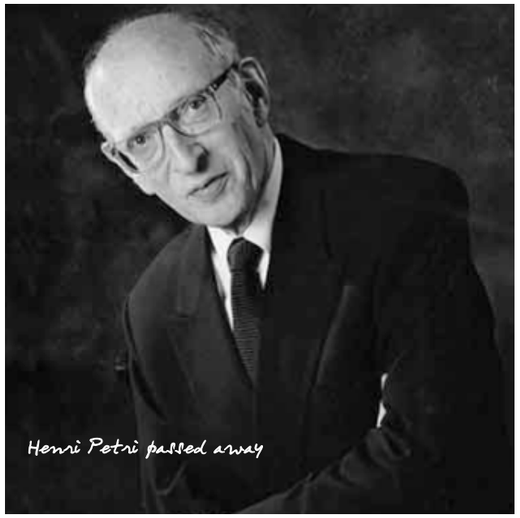

*Figure 2. An external stakeholder map*

# Company Analysis

**The assignment is commissioned by Quooker: a boiling-water tap company. The boiling-water tap is a system that immediately dispenses boiling water. In this chapter the company's history and strategy is discussed.**

## History

Quooker is Dutch company that invented the boiling-water tap. The founder of the company, Henri Petri, came up with the idea when he realised instant soup would never be 'instant' if a kettle needs five minutes to boil water. From that moment on he started developing a boiling-water tap from his basement and he founded the company in 1987. Many years of hard work had gone by and Petri depleted all of his financial resources. At the time, the boiling-water tap was hard to sell, because it was considered far too dangerous. It took thirteen years of improving the product and educating the consumer for the family business to become more broadly known and successful. Today, Quooker is market leader with a share of 55% (USP, 2019), sells 85.000 products annually, has expanded internationally to nine countries, and the revenue grows with 35% on yearly basis (Ribbens, 2016). Quooker owes its growth mainly to word of mouth advertisement (Quooker, 2018). Quooker's historical background is strongly present in the company culture. See appendix B for more information.





## Strategy

Currently, Quooker is a strong brand that grows fast in revenue (Quooker, 2018). The current strategy is to expand this success to other countries. However, that strategy does not assure that Quooker's brand strength and growth sustains in the long run.

### Revenue

The revenue growth will decrease within a couple of years when the Dutch boiling-water market is saturated. Customers who want the tap and are able to afford one will have bought one and it will take around ten years for them to buy a new one due to its long lifespan. The word of mouth advertisement will decrease and the growth will stagnate. In order to prevent the growth decrease, the company is expanding geographically to other countries in look for new sources of growth. These markets start in the introductory phase and by the time they are saturated, they will have generated enough revenue to achieve one of Quooker's main goals: to double the revenue within three years. Nevertheless, eventually these markets will saturate as well and consequently the revenue growth will decline. The company chose to dedicate all its machinery, facility space and R&D employees to achieve this imperialistic mission. They believe that specialising in boiling water-taps will allow them to conquer the world. As a result, almost no resources remain available for other purposes. For example, to enter other market outside the context of boiling and sparkling water taps (e.g. bathroom appliances) (Aghina, R. personal communication, February 13 2019).

### Brand strength

The second main company goal is to strengthen the brand. Quooker is a strong brand because it distinguishes itself well from competitors through three key competitive advantages. Nevertheless, these competitive advantages are not sustainable in the long run and consequently the brand strength is neither.

The first competitive advantage is the company's innovative frontrunner brand image (see figure 3) (Quooker, 2018). Quooker introduced the boiling-water tap for the first time into a new market. As a result, the company was able to leave the strong impression of being an innovative frontrunner ('first mover advantage'). This impression will probably not last. Quooker dedicated all its resources to achieve geographical market expansion and therefore the company does not invest in developing new innovations for the markets they already have. For example, the Dutch market currently functions as cash cow and the company took a reactive market pull approach so fewer resources are needed. In practise, this approach means that Quooker imitates competitors when they introduce an innovation onto the market. 'Catching up' with competitors is certainly not being an innovative frontrunner and Quooker is not able to catch up quickly. The company cannot adapt quickly to what other competitors develop, because the flat hierarchy does not allow them to make rapid decisions to follow a single direction which in turn affects innovation. Competitors will eventually outperform Quooker on innovativeness either by inventing new innovations or by catching up more quickly. Therefore the company risks losing its innovative frontrunner image should it follow its current strategy.

It can be argued that Quooker's achievement this year of successfully creating a tap that supplies three different types of water, or that creating a boiling-water-tap with a pull-out hose, places the company far ahead in terms of innovation. Personally, I would class these as incremental innovations or product variants. It is a fact that Quooker was the first to introduce those products to the market. However the question lies on how much these innovations actually contribute on a larger scale to secure Quooker's frontrunner position in the long run.
Consumers already expect to have a single tap that integrates all the services a tap can offer instead of two and the pull-out hose tap exists since 2008 (Google Patents, 2018). As undeniable as the technical ingenuity behind these products is for specialists, the fact is that consumers do not choose a brand based on technical ingenuity but on convenience.

The second competitive advantage is high quality (Quooker, 2018). Quooker offers boiling-water taps with the highest quality. The company is able to produce higher quality taps compared to competitors due to its technical expertise gained in the long history of developing the tap. Patents prevent competitors from reverse engineering the same quality level. The high quality perception of the brand is not sustainable, because competitors are closing in by gaining technical experience as well.

In addition, the company's most important quality protecting patent (the vacuum-isolation of the kettle) is expiring this year. As a result, competitors may reverse engineer the quality level of the kettle. To stay ahead from imitating competitors, the company focuses from 2014 onwards on incremental quality improvements. Nevertheless, the improvements do not seem to reënforce the consumers quality perception. The 2014-2018 brand tracker research, where 1.992 research subjects participated in total, shows that consumers do not notice the quality improvements. On the contrary, from 2017 onwards the quality perception is decreasing (Quooker, 2018). Therefore the distinction from competitors based on delivering high quality is at risk on the long term.

The third competitive advantage is the premium brand image (Quooker, 2018). In the past, only the higher social class could afford a Quooker product. It was perceived as a luxury item and as a result consumers want to be associated with the brand (Quooker, 2016). Since 2012, Quooker has bridged 'the chasm' between the early and mainstream market. Nowadays, in 25% of every new kitchen a Quooker is installed. Therefore, the premium perception of the brand is slowly shifting to a more everyday perception. Quooker is encouraging the shift because they want their product to be perceived as essential kitchenware, similarly to the dishwasher. As a result, Quooker's premium brand image loses its strength year by year.

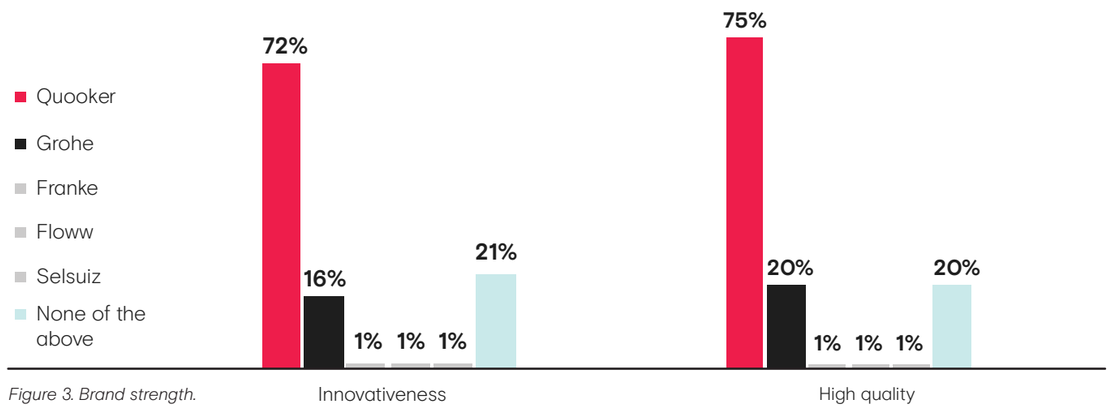



*Figure 3. Brand strength.*

## Conclusion

Quooker is a strong brand that grows fast in revenue and the current strategy is to expand this success to other countries. However, the strategy does not assure the success sustains in the long run. The revenue growth will decline because the markets they enter will eventually saturate. Most consumers being able to afford and wanting the tap will have bought one already. It will take around ten years for them to buy a new one due to its long lifespan.

The brand position is at risk, because their innovative frontrunner, high quality, and premium brand image will lose its strength year by year. Quooker is catching up with competitors rather than innovating, competitors are closing in on quality and Quooker itself is becoming a less premium brand because in 25% of every new kitchen a Quooker is installed. Facing growth decrease after market saturation and losing its distinctive brand position are the greatest risks the company would face should it follow its current strategy. The company goals are to increase revenue and to strengthen the brand position, both of which, are clearly at risk. Therefore, the company should look for new sources of growth after market saturation and the company should develop a new source for sustainable competitive advantage. A strategic design should support both. On the short term, a strategic design should require as little machinery, facility space and R&D employees as possible, because they are all currently occupied for the mission to take over the world.

# Product Analysis

**This chapter describes the products Quooker offers and the IoT opportunities that the company already identified. Three problems are identified which lay foundation for the initial problem definition.**

Quooker offers high-quality boiling-water taps with a ten-year life-span, for a relatively high price ranging from €995 to €1.790. The boiling-water tap is a system that immediately dispenses boiling water (see figure 4). It consists of a tap on top of the worktop (1) and a kettle underneath (2). In September 2018 Quooker launched a new product: the Cube. It is an extra module for the Quooker tap to offer the consumer, next to boiling, filtered and sparkling water (3). See appendix C for the complete product portfolio and appendix E for the working principle of the tap, kettle and Cube. Appendix F documents the working principle of the product data.

## Cube

The Cube costs €1.200 and offers filtered and sparkling water via a Quooker tap (see figure 5). The consumer needs to replace CO2-cylinders for sparkling water. A set of four cylinders costs €60 and provides 240 liter sparkling water. The cylinders are officially owned by Quooker and consumers are required to return them (see appendix D for an elaborate documentation of the usage steps). About 14.000 Cubes are sold since the product launch. Three problems occured with the launch of the Cube. First, the product increased the number of service notifications. Second, consumers are less satisfied with the product compared to the other products of the product portfolio. Third, 15% of the empty CO2-cylinders are not returned (Loois, R, personal communication, February 15, 2019). These problems are the foundation for the initial problem definition. Information on the inside work of the Cube and information on the cylinders is developed in Appendix E.

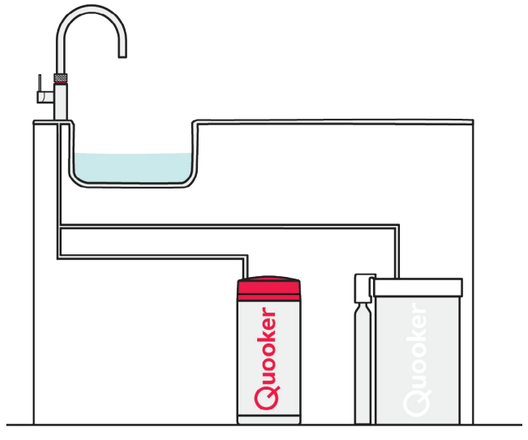



*Figure 4. The boiling-water tap system and the Cube.*

The Cube owes its existence to Grohe. The competitor invented the sparkling water module and Quooker imitated the innovation. The time to market for the product had to be short, because Quooker had spent quite some time deciding whether or not they were going to develop a sparkling water module as well. Quooker needed to 'catch up' quickly. Therefore the product was not produced in-house, but by external suppliers in China. As a result, the Cube reports more teething troubles and a lower quality-level compared to other in-house produced products (Loois, R, personal communication, February 15 2019).

## Developments

The company is not planning developments further than two years ahead. The company works on three key new developments. First, a highly energy-efficient kettle is being developed to decrease the standby energy usage by 70%.


*Figure 5. The Cube.*

Second, a new version of the Cube is being developed to reduce teething troubles and to add a screen for the user (the purpose for the screen is not yet defined). The Cube 2.0. is expected to be launched in two to three years. Lastly, the company wants to launch a mobile application for the Cube 2.0. and boiling-water tap with several IoT features.

The potential IoT features that Quooker already defined for an app owe their existence to either solving a known consumer problem retrieved from online surveys and service notifications (Quooker, 2018; Quooker, 2019; Aghina, 2018) or to other IoT features spotted on the market. The IoT features and their raison d'être are listed in table 1.

| IoT features | Raison d'être |
|---|---|
| Prevent splashing water jet | Problem: the water jet splashes |
| Adaptable effervescence level | Problem: the effervescence level is too low / should be adjustable |
| Volume indicator of CO2 (inside the cylinder) | Problem: consumers think the Cube is broken, but cylinder is empty |
| - Proactive service notifications<br>- Remote software updates (to prevent product recal) | Problem: teething troubles (e.g. leakage) |
| Proactive service notifications | Problem: quickly empty CO2-cylinders (because consumers do not tighten the cylinder firm enough) |
| Remote holiday mode activation | Problem: forget to deactivate the Cube on holiday |
| Show personalised energy-demand | Seen on the market |
| Tap specific water quantities | Seen on the market |
| Voice control | Seen on the market |

*Table 1. Quooker IoT features and their raison d'être.*

In order to validate the desirability for each feature, the company conducted another online survey to ask consumers for their likelihood of using these features in a potential Quooker-app (see figure 6). The result is measured with a customer satisfaction score (CSAT-score). If the CSAT-score exceeds 80%, Quooker assumes that consumers want these features in an app and so it is assumed that developing these features in an app is a good idea. However, the outcome of this research are future promises without commitment (Fitzpatrick 2013).


*Figure 6. A slide from the IoT feature desirability research with the question 'How likely is it that you would use the functionalities below in a possible Quooker app?' (Quooker, 2019).*

## Conclusion

The company is not planning any developments further than two years ahead. In order to increase the changes of Quooker developing the new design, the maximum time-to-market to adhere is two years. Currently, the company is developing a new version of the Cube and planning on launching a mobile application with several IoT features for the Cube and boiling-water tap. It is not validated whether these IoT features generate significant customer value, because the outcome of the desirability survey is grounded in commitless future promises. Consumers indicate that they are likely to use these features, but they could also mean 'one day' or 'occasionally'. The questions is: are these IoT features delivering enough customer value in order to make consumers willing to download an app for it (or pay for it)? (Fitzpatrick 2013).

It could happen that Quooker develops an app with these features and that in the end consumers will not take the effort to download or use it. Another possibility is that the app will suffers from 'feature-creep'; excessively adding new features to a product that causes over-complication (Sullivan, 2005) while not generating significant customer value. As a result, consumers may quickly abandon the app. Therefore, it is recommended to execute qualitative research to find out if these specific IoT features and other IoT features generate significant customer value.

# Service Analysis

**This chapter describes the service Quooker provides and a potential cause of the intial problem definition which serves as a lead to find the biggest pain point and customer value for in the synthesis phase.**

Quooker's brand promise is a high-quality service. This is being carried out by, for example, friendly service employees and by, in various cases, repairing products after the two year warranty is expired without charging any costs. When a component of the tap is broken, mechanics often replace more than just the broken component. In this way, they ensure that the tap will last longer and that they will not have to return within a few months.

The high-quality service that the company provides is an important part of the brand because it is the only direct touchpoint with consumers. This interaction with the consumer is mapped in appendix G. The boiling-water tap needs service once every five years for maintenance (to remove chalk from the tank) and when the product fails. The same applies for the Cube and it needs an annual filter replacement. Most of the time the product is not installed by Quooker, but by a kitchen dealer. Therefore, Quooker often does not directly communicate to consumers how the product works. The boiling-water tap is designed for a ten-year life-span, so consumers rarely reach out for service for the boiling-water tap. However, Cube consumers do reach out for service more often.

The two most frequently occurring service notifications with regard to the Cube are caused by consumers incorrectly using the product. The most frequently occurring problem is that consumers do not tighten the CO2-cylinder firm enough. Consequently, the cylinder leaks CO2 gas and is suddenly empty within a few days. The second most frequently occurring problem is that consumers think the Cube is broken, but in fact the CO2-cylinder is empty and needs replacement. To solve both problems, consumers reach out for service and service mechanic visits to explain the product and to replace the cylinder. The third most frequently occurring problem is that the Cube is leaking as a result of one of the many teething troubles. See more information on service notifications in appendix H.

Site surveys with service mechanics have shown that for a number of years the service department runs at under-capacity. The cause for the under-capacity in the past is explained in Appendix H. Before the launch of the Cube consumers waited on average three to eight days for an appointment, but since the launch the amount of incoming calls has grown and service mechanics must visit consumers more often. Due to the under-capacity, the waiting times for service appointments increased and the consumer is less satisfied (Quooker, n.d.).

The customer journey research provides a possible explanation to the frequently occuring service notifications. These online surveys show that replacing and returning the cylinders are the biggest customer satisfaction bottlenecks (see appendix J). The CSAT-scores are below the threshold of 80%. Consumers rate both usage steps in the online survey as unclear. The unclarity may be the cause for consumers to 'not tighten the CO2-cylinder firm enough' and to 'think the Cube is broken, but in fact the CO2-cylinder is empty and needs replacement' and to 'not return empty cylinders'. A creative session is conducted to explore ideas to solve the unclear replacing and returning the cylinders (see appendix I).

## Conclusion

Quooker offers high-quality service for durable products that require an installation and maintenance once every five years. Online research showed that the unclear replacing and returning procedure of cylinders are the biggest customer satisfaction bottlenecks. Research also showed that the many teething troubles of the Cube and longer waiting times cause dissatisfaction. Therefore, it is assumed that the unclear replacing and returning procedure, teething troubles and longer waiting times are the main drivers for a relatively low customer satisfaction of the Cube and thus the biggest pain point for consumers.

The following assumption is created for the cause of the pain point. When the product is installed by a kitchen dealer, Quooker does not directly communicate how the product works with consumers. Therefore, it is assumed that it causes confusion in the replacement and return procedure of cylinders. As a result, consumers use the product incorrectly. The combination of incorrect product usage and many teething troubles of the Cube causes consumers to reach out for service more often. Consequently, the amount of service appointments increased and thus the average waiting time for an appointment. In addition, it is assumed that consumers do not return empty CO2-cylinder because of the same confusion.

The pain point assumption requires validation, because it is likely that these problems provide some dissatisfaction. Yet it is not validated whether these problems (combined or seperate) are the key drivers for the relatively low customer satisfaction of the Cube and thus the biggest pain point. Therefore, before designing a solution, the pain point assumption is taken as a first lead and requires validation in qualitative research.

If the problems are the biggest pain point, the cause assumption require validation in qualitative research. Third, the cause for the dissatisfaction of the replacement and return procedure requires validation. The term 'unclear' is a preset answer in the online survey. Therefore, it is not validated if the unclarity is really the cause for a low customer satisfaction or if consumers are dissatisfied with these steps as a result of a different cause.

# Consumer Analysis

**In this section, the consumer and trends are analysed. Since Quooker applies both a business-to-business (B2B) and business-to-consumer (B2C) approach, research subjects belong to two main types of consumers: kitchen dealers and end-users.**

## Kitchen Dealers

About 71% of the products are sold by kitchen dealers as a kitchen appliance. Kitchen dealers play an important role in every touchpoint of the customer journey as figure 7 illustrates (Quooker, 2016). Most products are sold to kitchen dealers in the high price segment, because the product is a relatively small investment to end-users with a large budget (Harkema, R. personal communication, february 17, 2019). Site surveys at kitchen dealers revealed that the highest priority of dealers is to sell kitchens. Kitchen dealers are less likely to recommend a Quooker product in the low price segment. If the total price of the kitchen exceeds the small budget set by the end consumer, the dealers risk not selling a kitchen at all.

Kitchen dealers have two main reasons to sell Quooker products. First, customers exert high pressure on kitchen dealers because they specifically ask for a Quooker in their kitchen. If dealers are not able to meet their demands, they will switch easily to competitors. Especially during the crisis, the customer pressure on dealers was at a plateau. Many customers postponed the purchase of a new kitchen and only visited dealers for a Quooker. Secondly, kitchen dealers receive a margin on every Quooker sold.

The latter has secured Quooker's dominant position amongst kitchen dealers. By offering every dealer the same price (no discounts) the company avoids price negotiations and also, by prohibiting dealers to sell their products before having attended an official product training or installed a demo Quooker makes sure their quality standards are met. The trainings are important, because after the purchase kitchen dealers are not responsible for the Quooker tap anymore. By offering trainings, Quooker tries to stimulate the sense of responsibility for dealers to properly inform consumer about the usage and to install the taps correctly so a service visit can be avoided. However, dealers do not receive a product training for the Cube.

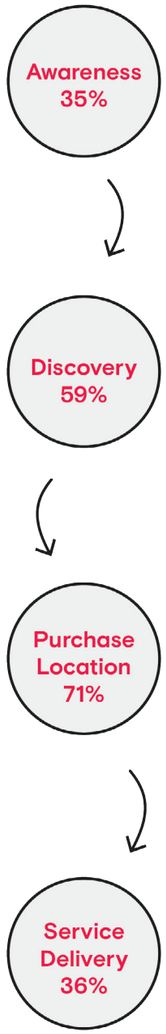



*Figure 7. The role of the kitchen dealer in the customer journey. (Quooker, 2016).*

## End-user

The average end-user of Quooker is a higher social class homeowner (Poot, 2019) that lives in the Randstad (54%) (TSN Technology, 2014). The most important reason for consumers from all age groups to purchase the boiling-water tap and the Cube is for 'convenience' (Quooker, 2016; Quooker, 2019). The boiling-water tap decreases the waiting time and steps to get boiling water and the Cube eliminates the hassle with carrying, storing, cooling, and returning (sparkling) water bottles. The main reasons not to purchase are not seeing no need for it, high price, perception of lack of safety and energy consumption (Quooker, 2018).

Price and safety's negative effect are mitigated after purchase once the consumer has processed the financial disbursement and realised the product is safe. Word-of-mouth advertisement ensures the significant revenue growth of the company, because the majority of consumers come into first contact with the boiling water tap via friends, family or colleagues (Quooker, 2016). Consumers are more likely to purchase a Quooker product with a new kitchen (61%) rather than adding it to an existing kitchen (39%)(TSN Technology, 2014)(Quooker, 2016). See Appendix L for a study on the jobs consumers have to do to use the product, the pains/gains consumers experience from doing the job and some initial ideas to create gains and relieve pains. See Appendix K for more demographic information of the consumer.

## Trends

The two most interesting consumer trends are summarised below (see appendix K for more trends).

1. Consumers increasingly value the importance of a product experience over product possession.
Millennials tend to be more experience than material-oriented, because "they grew up during the recession, entered a struggling job market and must now pay off record amounts of student debt." (Weinswig, 2016). As a result, Millennials perceive monetary value and possession as something temporary, yet experiences are forever. Millennials also grew up in the age of materialism. Due to the industrial revolution millennials experienced a world that can endlessly produce allowing products to become more affordable. Consequently, some consumers feel like they have bought too much and feel oppressed and burdened by the ownership of the products. As a response Clean up Gurus and decluttering lifestyles arised to support consumers with throwing away products in order to have more room for pleasant experiences. The trend indicates that more consumers perceive ownership as a burden instead of a pleasure.

2. The distrust in sharing data is growing.
A study from Nati (2018) indicates that 60% of the consumers feels nervous about sharing every data with the IoT products. The distrust of consumers is growing, because they notice more often that the data ends up in the wrong hands (e.g. online advertisement, data breaches). According to Nati 40% of the consumers abandon a service because of a trust issue. To reïnforce trust, IoT products should secure the data and provide transparency of how the data is collected and utilised.

## Conclusion

Quooker has two types of consumers: the kitchen dealers and the end-users. The average end-user of is a higher social class homeowner that lives in the Randstad. A new design solution should fit the profile of this consumer. The end-user is likely to purchase the product simultaneously with the purchase of a new kitchen from the higher price segment. Convenience is, for consumers of all age groups, the number one purchase driver for both the boiling-water tap and the Cube.

Furthermore, two interesting consumer trend were identified. First, consumers increasingly value product experiences over possessions, because possessions are often temporary and burdening. Quooker could look into offering experiences instead of possession to unburden its consumers from ownership. Second consumers are not eager to share their every day data, because they fear it ends up in the wrong hands. If Quooker wants to ask for consumer data, the minimal they should do is provide data security and transparency of how the data is collected and utilised.

# Competitor Analysis

**In this chapter the competitors are analysed by visiting the ISH fair in Frankfurt and a market study.**

As mentioned before, Quooker is currently able to distinguish itself well from other boiling-water tap competitors due to their innovative frontrunner brand image, due to offering the highest quality products and due to being a premium brand (see appendix M for an elaborate competitor analysis). To compete with the company's strong brand position, competitors seek other ways of differentiation.

Currently, a way to differentiate is by adding IoT features to taps. For example, Grohe has recently launched an app to customise the tap settings and HansGrohe has launched an installation app. See appendix M for more IoT features spotted on the market. The competitive IoT features may increase the innovative brand image of competitors. If these competitors are seen as more innovative than Quooker, they could pose a threat. However, it is questionable whether the features offer significant customer value or whether the features are just expensive gimmicks driven from a technology-push. Most of the features do not seem to solve a problem and according to Ries "consumers only buy something when it solves a problem."(2011, pp. 86). As a potential result, both the Grohe and Hansgrohe app have few downloads (<5.000) and a low ratings (<3,0/5.0). Grohe also released a water tap on the ISH fair that indicates the water temperature (see figure 8). When the Grohe salesperson was asked what the exact benefit of the tap is to the consumer, the sales person responded: "Not much, it's just cool."

Competitors in the boiling-water tap market are likely to imitate successful innovations from each other. Quooker also competes with kitchen tap, close-in boiler, generic competitors and budget competitors (kitchen appliances). See appendix M for an elaborate documentation.

## Cube

The Cube competes with sparkling water bottles and the Sodastream. See appendix M for an elaborate analysis. The Cube is relatively expensive compared to bottled sparkling water and Sodastream. The price per liter of the Cube is €0,25 and requires a one-time purchase of €1.200. The price per liter for bottled water is €0,62. The price per liter of the Sodastream is €0,22 and requires a one-time purchase of €63. The Cube does offer some advantages in return for the high price (convenience, sustainability, innovativeness), but whether these advantages justify the large price gap and ensure a strong brand position is not clear.

## Conclusion

As mentioned before, Quooker has a strong brand position in the boiling-water tap market, but on the long run it is not sustainable. In the short term, the innovative frontrunner brand image of Quooker is also at risk. Competitors are adding IoT features to taps and may outperform Quooker on innovativeness. Therefore the company should also look into IoT opportunities for their products.
Whether Quooker created a strong brand position for the Cube is questionable. The Cube competes with sparkling water bottles and Sodastream and is relatively expensive. The product does offer some advantages in return (convenience, sustainability, innovativeness), but whether these advantages justify the large price gap and ensure a strong brand position is not clear and requires further investigation with qualitative research.

An IoT opportunity may be a solution to provide sustainable competitive advantage and may strengthen the brand position for both the boiling-water tap and the Cube. Therefore it is interesting for Quooker to look into IoT opportunities for the short and long term. However, it is important to validate whether the IoT opportunity provides customer value, otherwise the opportunity easily turns into an expensive technology-driven gimmick. It is questionable if there is really a market for these products, because they do not seem to solve a problem and consumers buy products to solve problems. If the opportunity does not sell, the opportunity cannot support a short and long term strategy. Lastly, the design solution should be difficult to imitate, because competitors are likely to steal successful innovations.

*Figure 8. Grohe temperature indicator tap.*

# Context Analysis

**In this section the overall context of the Quooker products is analysed by diving into macro trends, kitchen trends and technology trends. The IoT trend is analysed due to the initial assignment.**

The long-term macro trends are shown in Appendix N. Quooker products are mostly used in the kitchen and therefore kitchen trends are analysed. The second area of interest are the overall technology trends that shape the context of Quooker products. The trends were analysed by Google searching 100 kitchen- and 100 technology-related images (see figure 9 & 10). Next, the pictures were printed and clustered based upon overlap.

## Kitchen trends

The most interesting trends in the kitchen are foods for the experience and subscription models. The trends shows that food companies and kitchen appliance companies (budget competitors) changed their traditional business model from selling a product into selling experiences and services. Other trends are summarised in appendix N.

## Technology trends

Many technology-related images show again the rise of expensive technology-driven gimmicks that do not offer significant customer value. The most interesting technology trend is the shared economy (e.g. airbnb, mobike). The trend indicates that (some) consumers are willing to share a service instead of individually possessing a product. Other trends are summarised in appendix N.


*Figure 9. The kitchen trend analysis.*


*Figure 10. The technology trend analysis.*

## The IoT trend

The trend of the Internet of Things, or IoT, is analysed in specific due to the initial assignment. As mentioned before, IoT connects uniquely identifiable devices, processes, people, and data to the internet (Kranz, 2017) and can be capitalised for more purposes than just making expensive technology-driven gimmicks. IoT allows anything to communicate with anything else and it creates entire new business value chains by reshaping service, marketing, production, supply chain and product design (Kranz, 2017; Slama, Puhlmann, Morrish, & Bhatnagar, 2015; Porter & Heppelmann, 2014).

The IoT can also be utilised to reduce a company's operational costs by monitoring the supply chain or to reduce production costs. However, a study from Tata Consultancy Services (2015) shows that this 'inwards-focused IoT' does not bring the greatest revenue increases. Besides an inwards focus, the IoT can also be utilised as a source for providing significant customer value. According to the same study the most benefit from IoT can be capitalised when it is generating as much (or more) value to the consumer than to the company. The largest customer value can be created from solving a large consumer pain point. By focusing on customer value generating IoT, a design does not easily turn into an expensive gimmick and consumers are more willing to share their data in return. The latter is important because, according to the study, this type of IoT can only be capitalised if it receives consumer data and consumers are not eager to share their everyday data because of distrust (consumer analysis).

To get a better grip on customer value, the world of the consumer and their needs has been analysed and how the IoT is changing this world. In the past, the consumer bought a product with features and benefits. The focus was on design, function, and aesthetics. In the present, consumers buy a total experience and its context with a product or service that is connected digitally. The consumer pays a monthly fee. IoT enabled the transition by allowing data collection (Slama, Puhlmann, Morrish, & Bhatnagar, 2015). In the future, consumers will not buy a product or an experience, but a measurable outcome or impact that is relevant for multiple persons, organisations and the society. Consumers are not buying the product anymore, but the quantifiable outcome of the use of the product (pay-per-use)(see figure 11). (World Economic Forum, 2015). For example, consumers will not buy a bicycle, or a subscription to a shared bike system, but mobility. They will "pay for the mileage and wear used on the tires, each month in arrears." (Gilchrist, 2016, p.10). This industry is called the 'outcome economy' and it is expected to emergence within roughly eight years (World Economic Forum, 2015).

The IoT will not completely replace every product for an outcome, but it will probably have a major impact on the replacement of durables with high upfront costs, a burden of ownership and acceptance for shared use because a pay-per-use model offers significantly more benefits to both the consumer and company (Hagel, Brown, Wool, & de Maar, 2016).

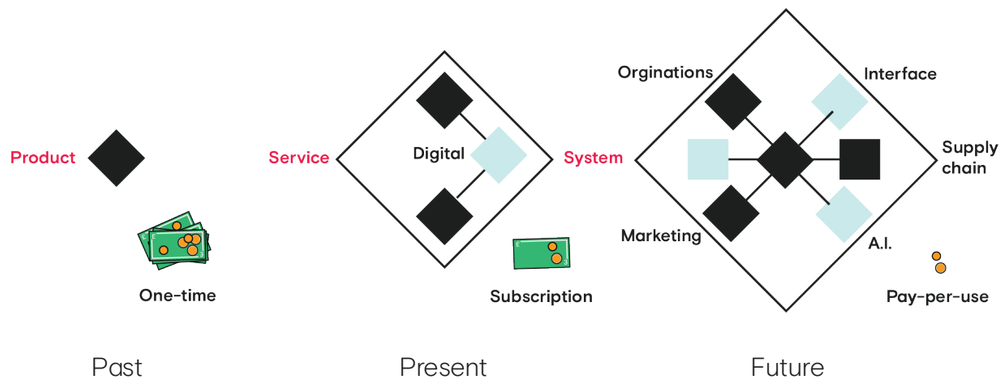



*Figure 11. A visual of how the IoT trend is changing the world of the consumer and their demands.*



First, because a pay-per-use model reduces the high up-front costs making the product more affordable for consumers that can afford the (periodically) use of a product. By doing so the market for a company expand significantly.

Second, because a pay-per-use model enables cost-savings for the consumer. Companies are better at maintaining the product and optimising the product usage (by the use of sensors) than a consumer is and a company can re-use broken products. As a result, companies are able to set a more beneficial pricing for the consumer with a pay-per-use model compared to one-time purchase model. As a result, a pay-per-use model is more likely a recurring saving than a recurring financial pain.

Third, because a pay-per-use model diminished the burden of ownership for consumers with products that, for example, require maintenance and installation. More consumers feel burdened by possession (consumer analysis) and want to pay only for the outcome which is "the inherent need or desire a customer is trying to satisfy, and the motivational force that drives the customer to your company or brand." (Guarnaccia, 2015).
Of course, consumers have additional needs in their pursuit to satisfy the need for the outcome. For example, certain needs related to paying and possession. An example is given in appendix O to illustrate these kind of needs and the opportunities to satisfy them for the majority of consumers. A company may benefit from relieving its consumers of the ownership burden by an increase in customer satisfaction and thus brand strength.

Fourth, a pay-per-use model offers companies a monthly recurring revenue for a predictable and stable operating result, beyond a market saturation point of one-time purchase business models.

Fifth, a pay-per-use model enables a circular relationship with a company and consumer. This relationship provides companies with the opportunity to create of a loyal consumer base and acquire sustainable competitive advantage. A loyal customer base provides both loyal consumers and consumer insights which competitors cannot (easily) steal (Tzuo, 2018). See appendix O for an elaborate documentation of the product type and benefits.
Thus, a pay-per-use model offers many benefits to the consumer and company and that is reflected in the numbers. According to Brewer (2018) companies can earn for €1 spend on product sales €12 in offering services and outcomes.

## Conclusion

Multiple ways to capitalise IoT are noticed previously on the market, but also in the kitchen and technology context. The most revenue increasing way to capitalise IoT is to generate significant customer value by solving a large consumer pain point. By doing so an IoT design does not easily turn into an expensive gimmick and consumers are more willing to share their data.

The IoT trend is also changing the world of the consumer and their demands. It will probably replace many durables with a pay-per-use model. More specifically, durables with high upfront costs, a burden of ownership and acceptance for shared use. Quooker's boiling-water tap and Cube (with CO2-cylinders) fit the product profile (see product and service analysis).
Therefore, the IoT offers Quooker an opportunity to expand its markets by eliminating high upfront costs and offering a less expensive pay-per-use service compared to a one-time purchase, to relieve its consumers from the burden of ownership, to acquire a monthly recurring revenue for a predictable and stable operating result beyond the market saturation point of a one-time purchase business model and to create a loyal consumer base and gain consumer insights to acquire sustainable competitive advantage.

If Quooker is able to invest early enough in adapting its business model to the outcome economy they can also manifest themselves as an innovative frontrunner in the outcome economy. The first step to shift to an outcome-based business model is to go from selling a product to providing a service. However, the company's product form, category and budget competitors also fit the product profile (appendix M). If Quooker does not adapt its business model quickly enough they may risk not being able to meet the changed consumer demands and risk being left behind by these competitors in the outcome economy (Tzuo, 2018).

# Design Direction

**The stakeholder, company, product, service, consumer and context analysis provided key insights and a lead for the biggest pain point of consumers for a design direction. The design direction is the starting point for the synthesis phase.**

## IoT strategy

The competitor analysis showed that Quooker's innovative brand image is at risk on the short term. More importantly, the company analysis showed that both the company's revenue growth and brand position is at risk in the long run. The context analysis showed that the IoT offers a solution to decrease both risks. First by enabling growth after market saturation due to expanding the market and by offering monthly recurring revenue. Second, by providing a sustainable competitive advantage from a loyal consumer base to strengthen the brand. A loyal customer base provides both loyal consumers and consumer insights that competitors cannot (easily) steal. At the same time, the IoT also offers an opportunity for Quooker to relieve its consumers from the burden of ownership to increase the customer satisfaction and if the company invests quickly enough, they may manifest themselves as the innovative frontrunner in the outcome economy.

If Quooker does not adapt to the outcome economy and sticks to their current strategy, they may face growth decrease after market saturation, losing its distinctive brand position, not being able to meet the changed consumer demands and being left behind by competitors in the outcome economy.

## Vision

I strongly believe that the aforementioned transition caused by the IoT is not just an opportunity or a minor risk, but it is inevitable and it will revolutionise existing industries just like the internet did over the last decades. As a company it is important to go along with this transition, because if a company misses two of these technology transitions, it is likely to perish (Kranz, 2017). It is shown in the high company mortality rates: only 19% of all 50-year-old companies still exist and the rest have perished (Boston Consulting Group, 2015). Fortunately, Quooker still exists as a 50-year-old company, but I believe they have to change their business model in order to survive. Therefore, the strategic design direction for the graduation project is:

"To create a **strategy** for Quooker to change its **business model** from offering a **product** to offering an **outcome**."

## Demonstration

The realisation of the IoT strategy goes far beyond the time limit of the graduation project.. Nevertheless, a first milestone can be proposed to demonstrate in tangible terms the benefits of a new strategy.
The first step to shift to an outcome-based business model is to go from selling a product to providing a service. Therefore, the demonstration should be a service that is connected digitally with a maximum time-to-market of two years to increase the chance that Quooker will develop the new design solution (see the product analysis chapter).

## Customer value

However, the service must generate significant customer value to capitalise the IoT technology or it easily turns into an expensive gimmick and consumers are not willing to share their every day data and download/use/pay for the service (see the competitor and context analysis chapter). Significant customer value is generated when the biggest pain point is being solved (Fitzpatrick, 2013). Therefore, the biggest pain point must be identified first and a solution will be generated second. The scope for the demonstration is the Cube, because of the relatively low customer satisfaction it reports compared to the boiling-water tap. This suggests that there may be a bigger (and possibly more urgent) pain point present than for the boiling water tap.

## Design direction

Altogether, the design direction for the strategy demonstration is:

"To create a **digitally connected service** that will solve the **biggest pain point** for Cube consumers in order to create enough **customer value** to make consumers willing to share their **data** and **download/ use/ pay** for the concept."

From the service analysis a first lead to the biggest pain point is identified which will serve for now as a part the design direction for the strategy demonstration:

"The biggest pain point is defined as the **unclear replace** and **return** procedure of CO2-cylinder, the **teething troubles** of the Cube, and the longer **waiting times** for service appointments."

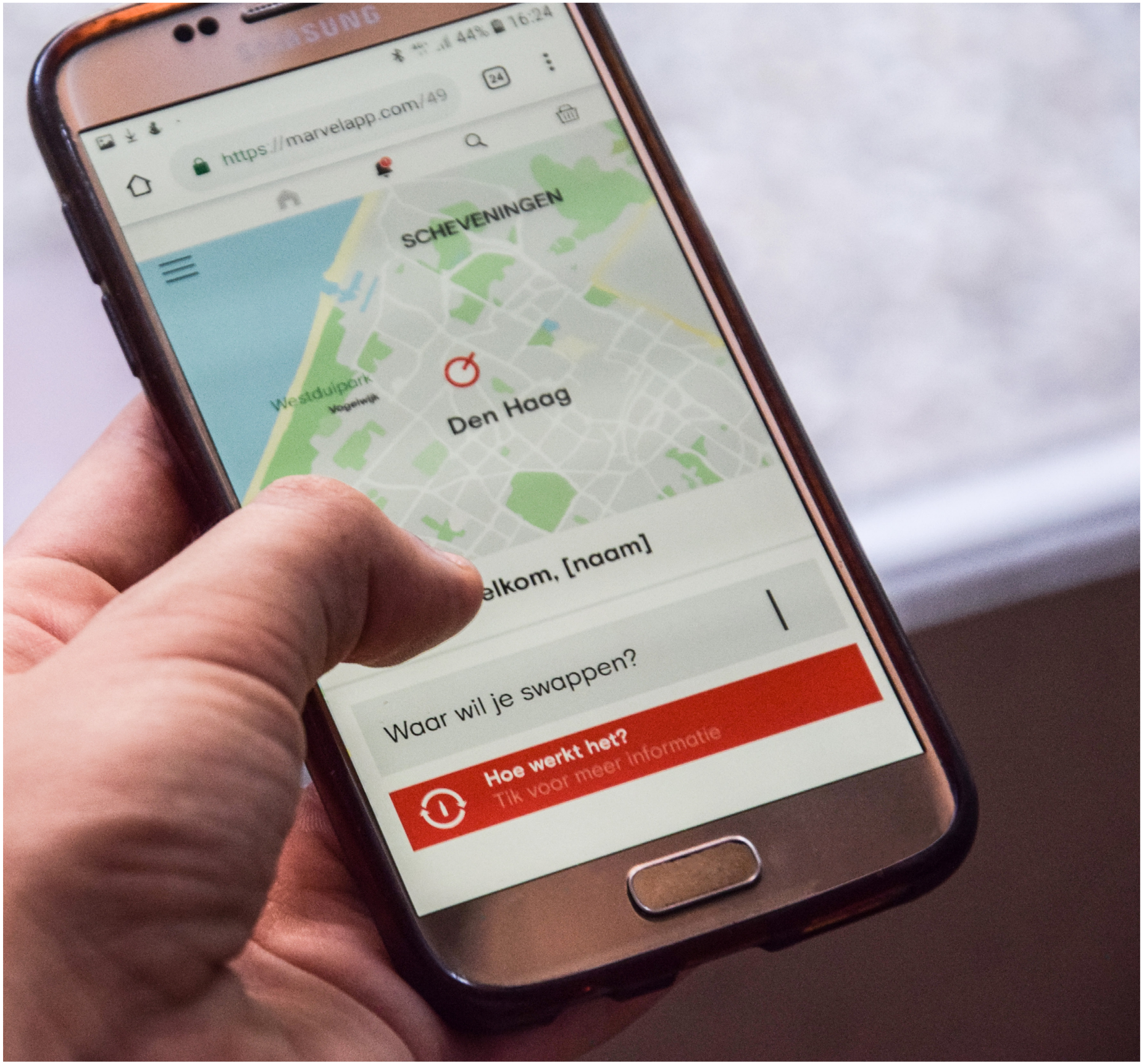
The definition of the biggest pain point requires validation with qualitative research. The design direction is the starting point of the synthesis phase.

## List of requirements

During the analysis phase several requirements for a digitally connected service and strategy were identified. The list of requirements is documented in appendix P. Throughout the graduation project more requirements are collected. In the evaluation chapter the demonstration will be evaluated on the list of requirements.

## *Design direction*

*"To create a **digitally connected service** that will solve the **biggest pain point** for Cube consumers in order to create enough **customer value** to make consumers willing to share their **data** and **download/ use/ pay** for the concept."*




# Synthesis

During the synthesis phase the biggest consumer pain point for the strategy demonstration will be identified. Next, multiple concepts are generated to validate as quickly as possible whether consumers are willing to share their data and download/ use/ pay for the concept. The final demonstration concept is used as a preparation for the strategy to move towards an outcome-based business model. This strategy is created in the final chapter.

# Method

**In this section, the method for the synthesis phase is described.**

The traditional design methodology is the 'waterfall method'. Designers follow a sequential linear process of design steps and at the end of the process the concept is tested with consumers. The risk of this approach is to invest a lot of time, money and effort in developing a perfectly detailed service that nobody wants. "To achieve perfect failure: successfully executing a plan that leads nowhere." (Ries, 2011, p. 38). As a result, consumers do not want to share their data and download/ use/ pay for the service. Consequently, the demonstration and overall strategy will fail. To prevent achieving a perfect failure, an alternative design approach is chosen.

## Lean

A lean design approach focuses on increasing efficiency by eliminating 'waste'. Hypothesis are created to discover whether consumers are willing to share their data and download/ use/ pay for something or not (waste). Next, a minimal viable product (MVP) is developed. A MVP is the least amount of effort and development time required to (in)validate these hypothesis (Ries, 2011). It is a product without extra features or content in order to test what needs to be created rather than what can be created. The reactions to the MVP are measured and lastly the researcher learns from the insights (Mindtools, 2018). The design approach is illustrated in figure 12. The first two cycles served to identify the biggest pain point for consumers and did not include an MVP. The last cycle consists of three quick and dirty lean cycles to generate a solution for the pain point. The overall goal of the approach is to continuously improve (a demo of) a digitally connected service to get as quickly as possible a viable customer value generating concept.

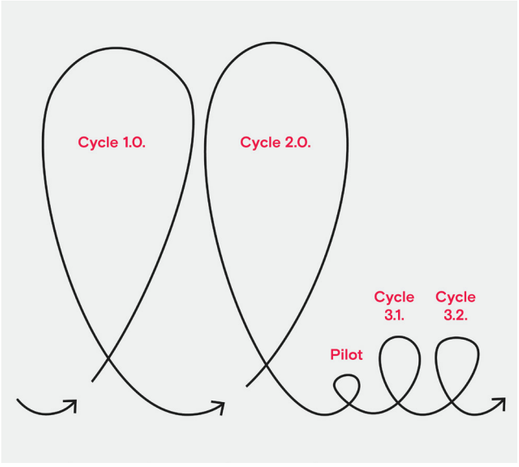



*Figure 12. A visual of the lean design approach for the synthesis phase.*

## Limitation

In comparison to the waterfall design approach, the focus is less on the feasibility question 'Can we build it?' and more on 'Should we build it?'. Nevertheless, from an industrial design perspective, all three aspects (viability, desirability and feasibility) should be integrated and therefore feasibility is further developed in the simulation chapter.

## Guidelines

In order to (in)validate hypothesis it is necessary to talk to consumers. The key pitfall is to ask the wrong questions. Consumers often lie and even though the lies are well intended, they encourage someone to invest into something that nobody wants (Fitzpatrick, 2013). Therefore, the goal is to "learn what customers really want, not what they say they want or what we think they would want." (Ries, 2011, pp. 38). In order to succeed the following three guidelines, called 'the Mom-test' are followed:

**1. Talk about the consumers life instead of the MVP.**
Consumers often lie about the MVP to make someone feel better. "You shouldn't ask anyone if your business is a good idea. It's a bad question and everyone will lie to you at least a little." (Fitzpatrick, 2013, book cover.). Yet if the MVP is not brought up they are less able to lie. Nevertheless, at some point the reactions to the MVP have to be measured, but "the big mistake is to mention your idea too soon rather than too late." (pp. 13). Therefore, the MVP is introduced after an elaborate user interview is conducted.

**2. Ask about concrete examples in the past instead of generic and commitless future-promises.**
"Anything involving the future is an over-optimistic lie." (Fitzpatrick, 2013, pp.15). Consumers are less likely to lie about concrete examples in the past and therefore this information valuable.

**3. Listen instead of talking.**
After introducing the MVP, the focus is rather on listening than talking in order to learn how the consumer perceives the concept. Consumers do not receive an instruction on how to use the MVP because in reality there is probably no one explaining them the concept.

In addition, the following data is deflected: compliments (often a lie), fluff (information that includes 'always', 'might' and 'will' often reflects a non-realistic or ideal scenario) and ideas (consumers often come up with solutions, but it is a designers job to provide the solutions to problems). The interviews serve to find commitments or negative feedback.

## Sampling

It was not possible to recruit consumers from the company's customer database. In order to talk to consumers a snowball sampling was used. Cube users were recruited via colleagues, via the researchers personal network and in a few cases by joining service mechanics. In total 15 Cube user interviews were conducted and that lasted between 0,5-2 hours. The interviews were conducted at the participants' home. All Cube users were Dutch and thus the used probes and MVP's are in Dutch as well.

# Cycle 1.0.

**For Cycle 1.0. four Cube users are interviewed which were recruited via colleagues (peers and family). The starting point of cycle 1.0. is the design direction for the strategy demonstration.**

### I believe that...
The biggest pain point for Cube consumers is the unclear replace and return procedure of CO2-cylinder, the teething troubles of the Cube, and the longer waiting times for service appointments. The hypothesis is separated into several sub-hypothesis shown in Appendix Q.

### To verify that, I will...
Ask consumers about their lives and what they love and hate about the Cube. The consumers are asked to priorities the aspects. The hypothesis is explicitly not brought up to prevent the nudging of the consumers into a certain direction.

### And measure...
If pain points of the hypothesis are mentioned and highly prioritised during the interviews. If the pain points are not mentioned when consumers are being asked what they love and hate about the product (or in other parts of the interview) it suggests that they are not important enough for a consumer to included them in a product evaluation and thus not a significant consumer pain point. If the pain points are not highly prioritised it also suggests that they are not important enough.

### Result
The consumers do not mention problems with waiting times for service appointments. The consumers also indicate that they do not return cylinders, because their peer or colleague from Quooker does that for them. Consumers do mention cylinder replacement problems and teething troubles. When consumers are being asked about the last time experienced the problem, they respond:

Cylinder replacement problems:
IV1: “What I did wrong the first time was that I had not turned it [the cylinder] far enough. And then he didn’t do it. And then I tried again. Now I know how far you have to turn it (...) so is is doing well now. Now the thing works, it is ideal. I grade the Quooker a 9 and the spa an 8.“

Teething troubles:
IV2: “Well... those malfunctions are a bit of start-up problems, I don’t have any problems with that.”

See appendix Q for more quotes.

### Conclusion
The result indicates that the pain points are not a big deal for the consumers and not significantly influencing customer satisfaction. For that reason, the hypothesis is invalidated. The biggest pain point for Cube consumers is not (separate or combined) the unclear replace and return procedure of CO2-cylinder, the teething troubles of the Cube, and the longer waiting times for service appointments. The interviews do confirm a lower satisfaction-rate for the Cube compared to other Quooker products (when grades were asked). However, the cause to the dissatisfaction of consumers remains unclear.
The result also indicates that the sample may not be representative for regular consumers. The sample did not order cylinders, return cylinders and use the service department in the same way like regular that customers do and they received a price discount (see appendix Q).

### Pivot
Consumers did mentioned some other problems that overlapped which were already defined by Quooker before in table 1 (see appendix Q). These problems are used for a new hypothesis (‘need pivot’) to define the biggest pain point. Since the sample is not representative for regular Cube consumers a different sample is for cycle 2.0. is required.


*Figure 13. An interview with a Cube consumer.*

# Cycle 2.0.

**For cycle 2.0. seven Cube users are interviewed, recruited via the researchers personal network (peers, social media and online or offline neighbourhood communities).**

### I believe that...
The biggest pain point for Cube consumers is the splashing water jet, a low effervescence level and a (suddenly) empty CO2-cylinder. See appendix R for the sub-hypothesis.

As mentioned before, Quooker has already identified IoT features for the hypothesis which require validation to prove if they generate enough customer value to make consumers committed. Along with the validation of the hypothesis, the IoT features are tested as well (see appendix S). The same verification and measurement approach from cycle 1.0. is used for cycle 2.0.

### Result
The consumers do not mention problems of the splashing water jet, a low effervescence level and forgetting to deactivate Cube on holiday in the interview. A consumers did mention the problem of a (suddenly) empty CO2-cylinder. When the consumer was asked about how he/she experienced the problem, the response was:

Suddenly empty CO2-cylinder:
IV4: “It was like. Oh he’s empty. Then walked to the basement and got a new one. (...) It was fine, but if you give a party. Then you don’t want to do that.”

### Conclusion
The hypothesis for the splashing water jet and a low effervescence level is invalidated because the problems are not mentioned. The hypothesis for a (suddenly) empty CO2-cylinder is somewhat validated, because one consumer did mention the problem in its product evaluation.







*Figure 14. Interviews with Cube consumers.*

## Pivot

The biggest pain point remains unidentified. However, during the interviews consumers did mention problems with recognising an empty cylinder and realising it needs replacement. Consumers also indicated that ordering new ones and returning the empty ones requires effort. The consumers also explicitly asked for the following features: a return label (7x) , a spare CO2-cylinder (3x), reminders when to order new cylinders (2x) and a cylinder subscription (1x). When the consumers are being asked for the reasoning behind these feature proposals, their responses immediately include the price of the Cube:

Spare CO2-cylinder:
IV3: “You buy an expensive device, then make sure that everything is fine. Make even the price a little higher, but make sure that people do not have to make an effort and order extra”

Two things can be concluded: consumers think the Cube is expensive and consumers only provide solutions related to recognising an empty cylinder, realising it needs replacement, ordering a new one and returning the empty one. In other words, maintaining a sparking water supply (see appendix R for more quotes). Consumers indicate that because of the high price of the Cube they expect a solution in return that saves them time and (cognitive) effort (‘convenience’) in terms of maintenance of the sparkling water supply. When consumers are asked why they perceive the product as expensive, they immediately compare it to the price of bottled sparkling water:

IV2: “Hmm.. 60L per bottle, €60 euros for 4 bottles. *calculates* It is 29 cents per liter. Well, I think it’s expensive. Compared with the Aldi or Lidl.”

Thus, because the Cube is perceived as much more expensive than bottled sparkling water, consumers expect a high level of convenience in return. Currently the convenience is not meeting their expectations and this results into dissatisfaction:

IV2: “What is the exact benefit then? Because that’s why you buy it for. I think it’s a poor product.”

Therefore, it is concluded that the price-convenience-ratio of the Cube (vs. sparkling water) is too low. Due to the frequency of the mentioning the issue, the dissatisfaction/ emotions it triggers, and due to convenience being the number one purchase driver of the Cube (consumer analysis), it is concluded that the low price-convenience-ratio is the biggest pain point for consumers.

Yet the Cube has other advantages over bottled sparkling water, but consumers do not mention these benefits in the comparison of the Cube with bottled sparkling water. When consumers are explicitly asked about these other benefits, they respond:

IV2: “Yes, you could say sustainability I guess... with plastic. But the thing uses power as well right?... And plastic.”

Therefore, it is concluded that these benefits do not contribute enough to justify the relatively high price of the Cube. See appendix R for a more elaborated explanation on why the pain point was not discovered in cycle 1.0. and why Quooker was not able to discover this pain point before.


*Figure 15. An interview with a Cube consumer.*

# Cycle 3.0.

**In cycle 3.0. several demo's of a digitally connected service are designed to decreases the (cognitive) effort to recognise an empty cylinder, to realise it needs replacement, to order a new one and to return the empty one. The demo's are used to validate as quickly as possible if they create enough customer value to create a viable concept.**

## Viability

Four requirements for viability have been identified during the analysis phase. First, consumers should be willing to download the concept (product analysis). The downloading of the concept is important because it is a key viability factor of a service is the subscription-rate (Ries, 2011). Second, the consumer should be willing to use the product and not quickly abandon the concept (retention-rate). This requirement cannot be measured during the cycles. Third, consumers should be willing to pay (if the concept costs money)(competitor analysis). Fourth, consumers should be willing to share their data (context analysis). The latter is required to capitalise the IoT technology.

The cycle is splitted up in two short cycles. The ideas for the MVPs were retrieved from a creative session shown in appendix I. It was difficult to recruit new Cube consumers and due to time limitations also colleagues and peers were recruited. It is recognised that colleagues are biased and peers have no experience with- nor commitment to the Cube. Therefore their feedback is only used to optimise the user friendliness or feasibility of the MVPs. A pilot is conducted to practise the testing of the MVP with colleagues before involving scarce Cube consumers (see appendix W and see figure 16).

During the previous interviews some consumers questioned the credibility of measuring CO2 (see appendix V). Therefore a bicycle light acting as an IoT sensor glued to the side of the connector is used in both cycles (see figure 17).

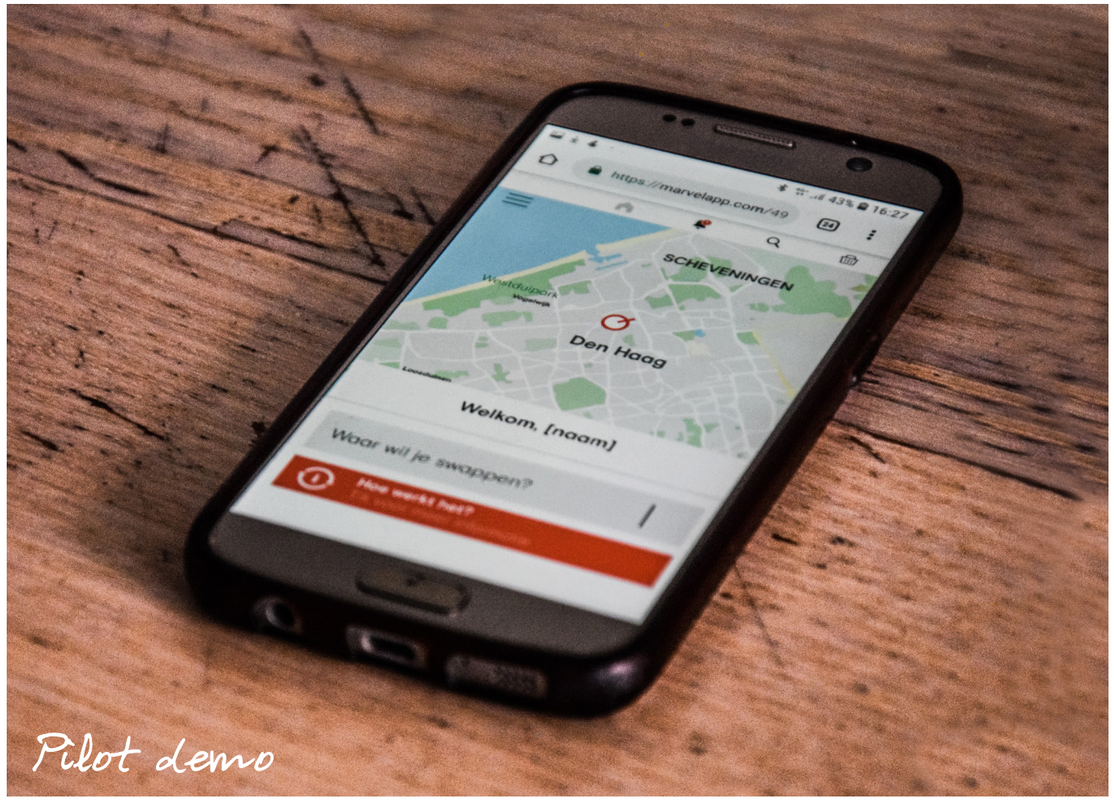



*Figure 16. The mobile application demo for the pilot.*


*Figure 17. The bicyle light acting as an IoT sensor.*

# Cycle 3.1.

**Two Cube consumers and five colleagues were recruited for the cycle. The goal of cycle 3.1. is to verify whether the MVP creates enough customer value to make consumers willing to share their data and willing to download the following MVP.**

### The Sparkling Water Swapper

A mobile application demo that detects when the Cube is out of CO2 and automatically plans new CO2-cylinders deliveries (figure 19 and 20). The consumers places its empty cylinders in a swap crate in front of their doorstep (figure 18). Next, they close the crate and secure it with a lock to another object to prevent theft. See more information about the design of the crate in appendix X.

### I believe that...

The MVP creates enough customer value to make consumers willing to share their data and download the MVP. See appendix Y for the sub-hypothesis.

### To verify that, I will...

Ask consumers to enter their personal data into a registration login page. Consumers are asked if they feel comfortable to share their data. To verify if consumers are committed to download the MVP, they are asked to sign up for a fake pre-subscription list. Ask if consumers trust to place the crate with CO2-cylinders in front of their door if they are able to secure it with a lock.


*Figure 18. The swap-crate.*

### And measure...

How many consumers are comfortable with sharing their data and measure how many consumers are signing up for the subscription list. It is also measured how many consumers indicate that they trust the concept.

Note: it is recognised that the fake registration page does not prove whether consumers are really committed to share their data, because they are not able to enter their own details. In addition, the pre-subscription list does not prove real commitment because it is not equal to downloading the app. Yet, it is able to validate a small, but different type of commitment. A positive answer to the trust question is a future committless promise. Nevertheless, for all hypothesis, negative feedback is valuable.

### Result

Both consumers are comfortable with sharing their data. One consumers signed up for the subscription list and one did not (see appendix Y). Consumers indicate they do not trust to place the crate with CO2-cylinders in front of their door.

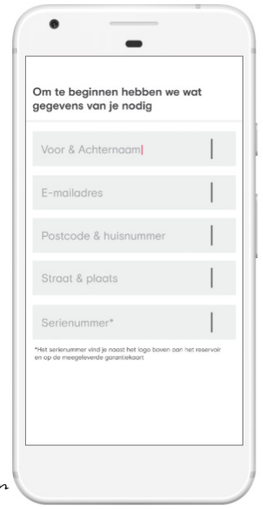
### Conclusion

One consumers signed-up for the subscription-list and both consumers do mention that ordering and returning cylinders requires effort before introducing the MVP. This suggests that there may be some desirability for the automatic order and delivery app, but still no real commitment is proven.

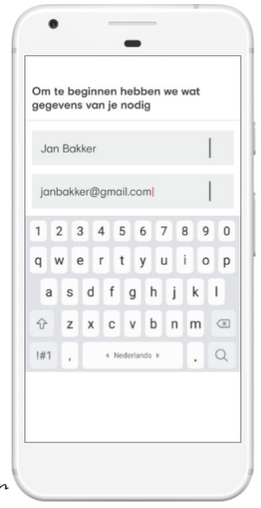
The return crate does not create significant customer value, because of two reasons. First, because consumers already have a better solution to solve the return inconvenience. They indicate that the last time returning a package with a label included was fine, because it requires little cognitive effort. On contrary to the label, the MVP requires much cognitive effort to understand the principle (both consumers could not figure out by themselves how the MVP worked). Second, because both consumers did not trust the concept (See appendix Y).

Therefore, the crate MVP is ruled out as a return system and the label is the best choice to solve the issue. The automatic order and delivery app demo is used for the next cycle, but with a few improvements (see appendix Y).

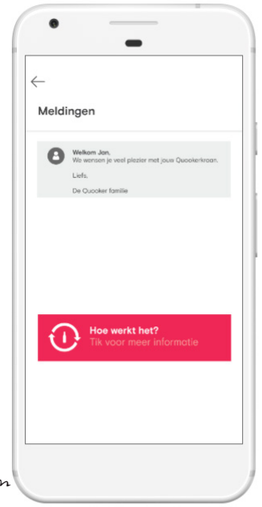

*Figure 19. The mobile application demo.*



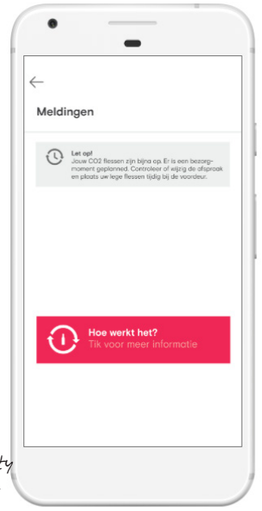

Registration



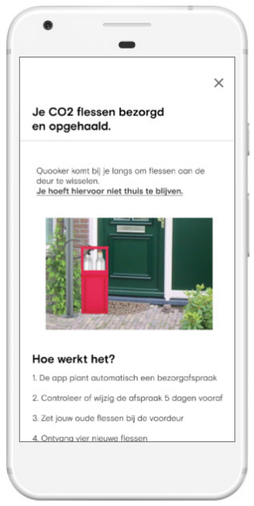

Registration



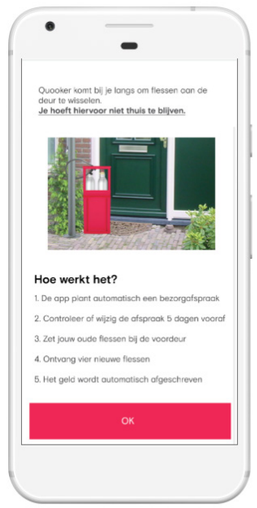

Welcome Notification



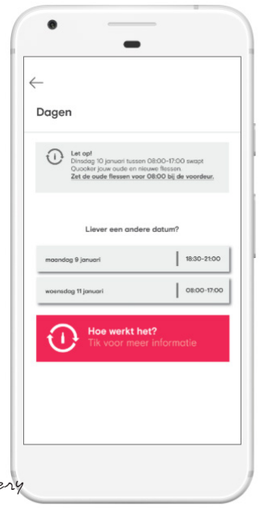

CO2 almost empty notification



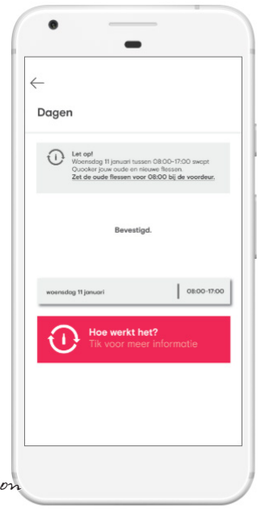

Pop-up



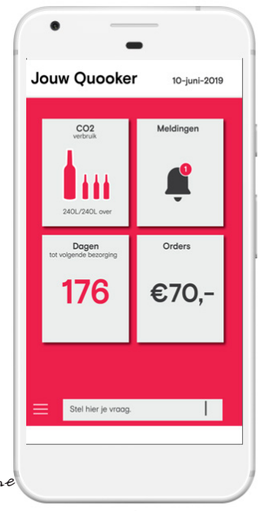

Pop-up



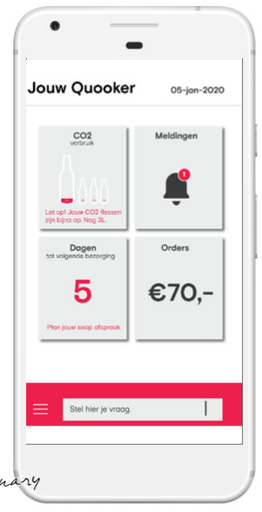

Days until next delivery



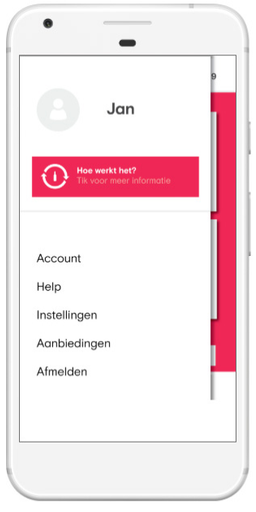

Pick-up Confirmation




Home - June




Home - January




Account

A QR-code link to the demo

*Figure 20. The main screens of the demo*

# Cycle 3.2.

**Two Cube consumers, two colleagues and three peers were recruited for the cycle.**

A new measurement for viability, paying, is added (see appendix AA for information). The goal of cycle 3.2. is to verify whether the MVP creates enough customer value to make consumers willing to share their data, willing to make a small payment to allow the service to debit money automatically and willing to download the following MVP.

### Quooker's SodaService/Thuis altijd bruis-service

The MVP is a mobile application demo that detects when the Cube is out of CO2 and automatically plans new CO2-cylinders deliveries (figure 21 and 22). A flyer (instead of a box) is designed to trigger consumers to download the app. See more information about the design of the flyer is in appendix Z.

### I believe that...

The MVP creates enough customer value to make consumers willing to share their data, willing to make a small payment to allow the service to debit money automatically and willing to download the following MVP. See appendix AA for the sub-hypothesis

### To verify that, I will...

Ask consumers to enter their personal data into a registration login page and to set up a Wi-Fi connection. Consumers are asked if they feel comfortable to share their data. To verify if consumers are willing to pay for the service, they are asked to make a fake €0,01 payment to subscribe to the service in the app. To verify if consumers are committed to downloading the MVP they are asked to sign up for a fake pre-subscription list.

### And measure...

How many consumers are comfortable with sharing their data, how many consumers are comfortable with making a payment and how many consumers are signing up for the subscription list.

Note: it is recognised that the fake registration page and Wi-Fi connection does not prove whether consumers are really committed to share their data, because they are not able to enter their own details. Ditto for the payment system.

As mentioned before, the pre-subscription list does not prove real commitment, yet, it is able to validate a small, but different type of commitment. Nevertheless, for all hypothesis, negative feedback is valuable.

### Result

Both consumers are comfortable with sharing their data, paying, and they also signed up for the subscription list:

IV10: "Oooh this stimulates (about the flyer)" (...) Oh I would definitely keep this app! Definitely. And I would check it regularly. Because then I can check on the Quooker. We use the Quooker quite often. I like to see things visually. Now I don't forget it (ordering)."

IV11: "I would download it. (...) Yes because it is free. Free is always better."

### Conclusion

Hypothesis is validated. The MVP creates enough customer value to make consumers willing to share their data, willing to make a small payment to allow the service to debit money automatically and willing to download the MVP.

However, consumers know the concept is a demo. Thus, committing to hypothetically sharing data and paying is not equal to the real commitment of consumers.. The pre-subscription list does not prove viability because it is not equal to downloading the app. Yet, it is able to validate a small but different type commitment. In addition, the sample of the interviews is small and the outcome insignificant.

It is also not clear if consumers will download the app only for the welcome package (see appendix AA) or for the actual customer value. The welcome package (and flyer) will increase the subscription-rate of the MVP, but it is also important to measure whether the app is able to continuously deliver enough customer value to make consumer retain to the service (retention-rate).

Altogether, the interviews do not prove 'Quooker's SodaService' / 'Thuis altijd bruis-service''s viability, but they do strongly suggest that it may be viable.

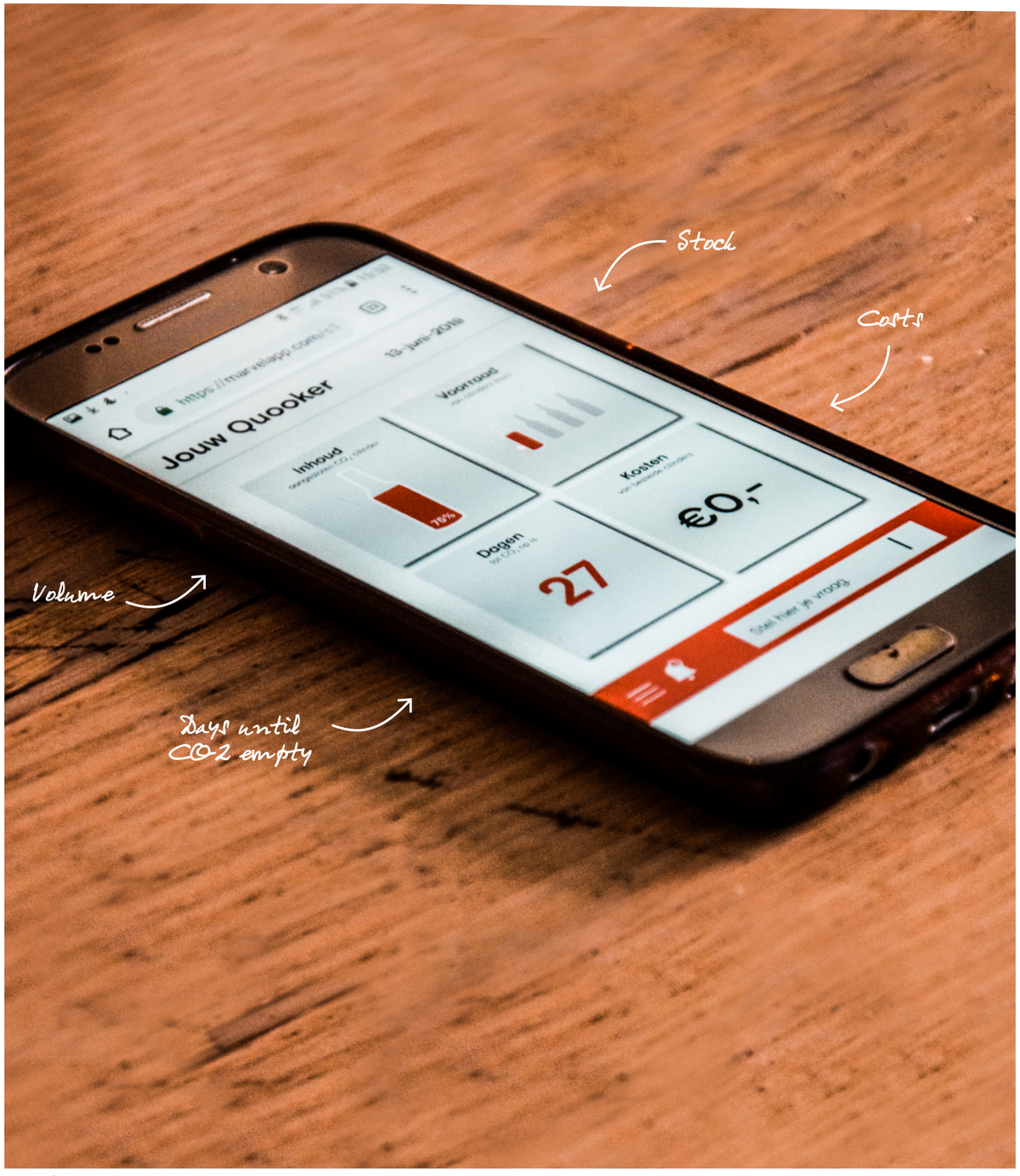
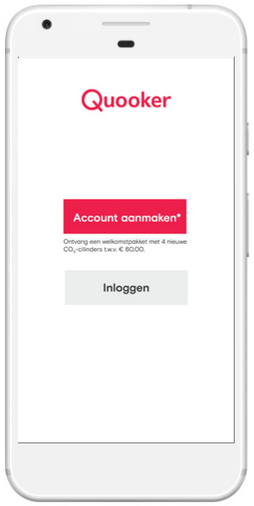
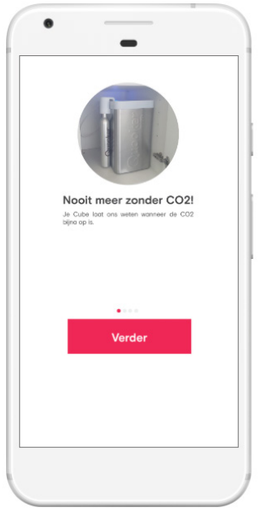



*Figure 21. The mobile application demo.*

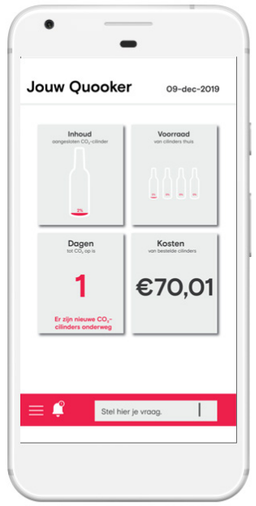
Login




Never without CO2!




Home - December




Consent for subscribing


Delivered at your address




How does it work?



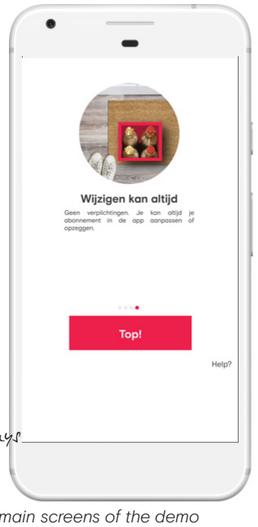

Set up Wi-Fi connection to share data



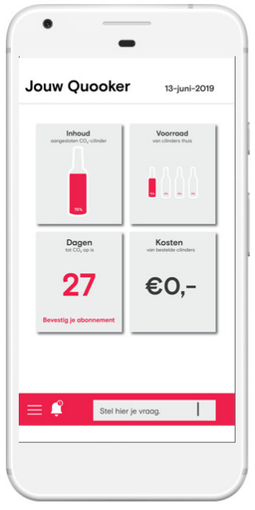

Set up Wi-Fi connection to share data



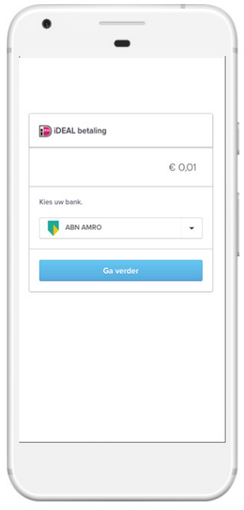

You can always change your mind




Home- June




Payment to subscribe




A QR-code link to the demo

Figure 22. The main screens of the demo

# Pilot

**To test the subscription- and retention-rate, a pilot is recommended.**

The pilot should launch the service onto the market. After all, “only the market can tell if your idea is good.” (Fitzpatrick, pp. 15). The goal of the pilot is to continuously improve the MVP until a retention-rate of 90% is achieved (Carpenter, 2014). Both rates should be measured quantitatively and qualitatively to understand the reasoning behind the consumer behaviour and to identify improvement opportunities. It is recommended to set up a small team with short cycle times in order to speed up the process. The minimal duration is six months because consumers should at least order CO2-cylinder once. If both rates enable a stable significant growth, the concept is proven to be viable.

To question whether the 90% retention-rate is feasible, HP instant Ink is chosen as an example. Instant Ink is a similar service which detects when a supply (ink) is running low and automatically plans new cartridge deliveries (see figure 23). The service reports a retention-rate of 97% (Orr, 2015) which illustrates that achieving a 90% rate is not impossible, but whether it works for Quooker requires validation.


*Figure 23. Hp Instant Ink (Consumentenbod, 2019).*



# Overall IoT Strategy

**In this chapter the IoT strategy is developed in detail.**

Quooker’s SodaService is the first step towards an outcome-based business model. Instead of offering a product (cylinder), a digitally connected service is created that utilises the products. The service does not require a radical change in the business model. The only required changes in the already existing circulair relationship, are automatic payments and orders. Therefore the service can be implemented within a two-year frame. A pay-per-liter service would require more radical changes in the business model, because the revenue is recurring instead of paid upfront. For example, what if the consumer unsubscribes with a half full cylinder at home? What if the consumer decides not pay anymore? What if the consumer disconnects the device? Therefore a cylinder-as-a-service is easier to implement within the two-year frame. Because of that, there is a higher chance that Quooker will develop the concept.

## Outcome

The next step needed for Quooker to change its business model to offering an outcome is to define that outcome. What is the inherent need or desire the consumer is trying to satisfy that motivates him to buy a Quooker tap and Cube? Multiple possible outcomes are identified, as shown in figure 24 and evaluated with a balance-scorecard in appendix AB.

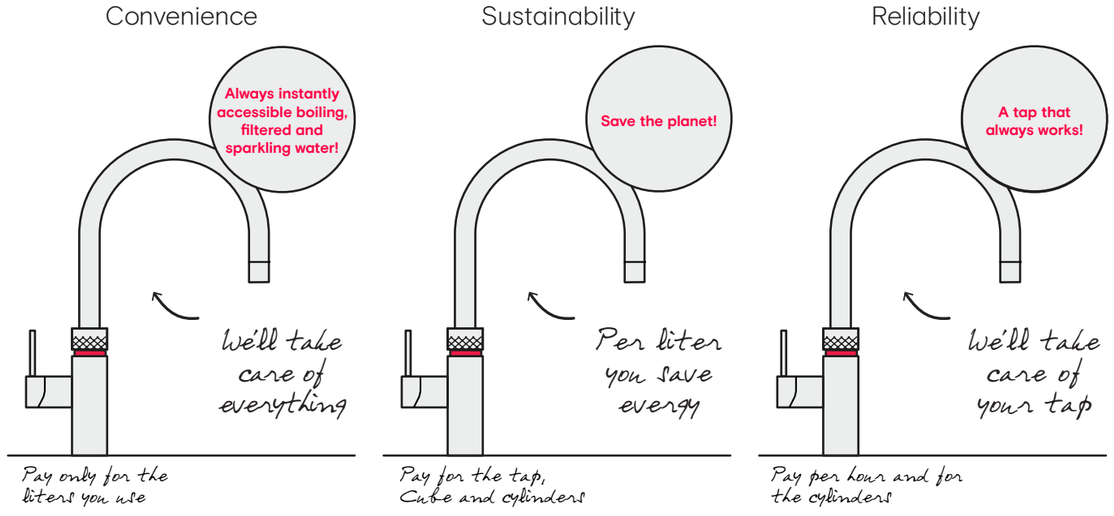



*Figure 24. Multiple possible outcomes for the boiling-water tap and Cube.*

For the boiling-water tap the convenience and reliability outcome both receive the highest score, because in a way they offer the same outcome. However, ‘always instantly accessibility to boiling water’ is probably more easy to sell than ‘a boiling-water tap that always works’, because convenience is the number one purchase driver and reliability (or quality/ lifespan) is not. For the Cube, the convenience outcome receives the highest score. Therefore, convenience is chosen and combined for both products into a value proposition:

“Quooker must change the **business model** from selling boiling, filtered and sparkling water taps, to selling ‘**convenience**’: a service that makes a **diversity** of other water types **instant accessible** next to normal tap water.”

The consumer pays per liter and does not have to pay for the product, cylinders and maintenance any longer. The consumer does not have to recognise an empty cylinder, realise it needs replacement and order a new one. Quooker analyses and predicts the consumption, sends cylinders and predicts the required maintenance in order to keep up to their promise of always enabling instant accessibility to a diversity of water types.

## Steps

Nevertheless, it is not possible to replace all taps and the Cube in one go. Consumption data is required first to set up a viable business case and research is required to find out how to predict the maintenance per product. However, Quooker's SodaService does make the step to offer the Cube as an outcome easier. The service ensures that Quooker sets up a first IoT infrastructure and already collects consumption data. While launching the cylinder service, the company can invest in ways to enable predictive maintenance for the Cube. Within a few years they can use the consumption data and predictive maintenance to set up a viable business case. After the Cube is launched as an outcome, the company can repeat the steps for the boiling-water tap. Therefore, the following three steps towards an outcome-based business model are defined (see figure 25).

## Validation

Offering the Cube as an outcome will likely improve the low price-convenience-ratio pain point of the Cube. The convenience increases (easier maintaining of a sparkling water supply, no burden of ownership) and the price decreases (eliminating high upfront costs and a cost-saving pay-per-use model). However, these and other mentioned benefits (see design direction) do not validate the viability of a pay-per-use model for the Cube and boiling-water tap. It is not known if the benefits generate enough customer value to make consumers subscribe to and retain the services (see appendix O for two more viability requirements regarding control over payments and freedom of possession). Therefore, it is recommended to carry out a similar pilot as to Quooker's SodaService for both the second and third step of the strategy. The pilot prevents Quooker from investing a lot of time and money into an outcome that nobody wants.

Personally, I estimate that there is a good chance of achieving a high retention-rate for four reasons. First, because convenience is addictive and consumers often indicate in the online surveys that they feel that the Cube/boiling-water tap is indispensable in the kitchen and they cannot go without it (Quooker 2016; Quooker 2018) (see Appendix J). Second, because in a pay-per-use model the default behaviour of consumers is to retain instead of churning. Consumers tend to stick to the default option, because switching is associated with 'losing something' (also known as the 'default effect') (Mobbs, Seymour & Calder, 2010). Third, because switching is incongruent with their previous decision-making (also known as the 'status-quo bias')(Silver & Mitchell, 1990). Fourth, some consumers will simply retain because they forgot to unsubscribe.

Cylinders | Cube | Boiling-water taps

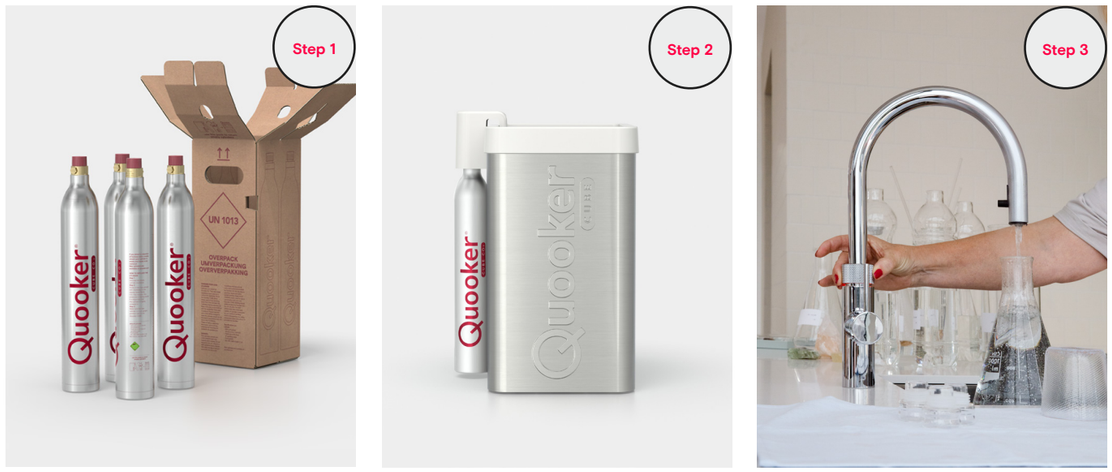



*Figure 25. Three steps towards replacing the product portfolio with outcomes.*



The pilot should also measure the amount of low-frequency subscribers. If consumers do not use the tap frequently, the business model is not viable. Yet, the pay-per-use model may also hook-and-bait low-frequency consumers into using the product more often than they initially planned to. During the interviews many consumers indicated that they started drinking more water since they purchased the Cube and online surveys show that consumers use the tap more frequently then they would have expected (Quooker, 2018)(see appendix J). If the water types are always instantly accessible, the step to using it is quickly made.

## Disadvantages

There are two disadvantages to an outcome-based business model. When consumers unsubscribe, it costs €85 to de-install the Cube or tap (Put, G., personal communication June 22, 2019). To recover the costs, Quooker can decide to set a minimum subscription duration or charge a relocation allowance. Most pay-per-use washing machines have a minimum subscription period of six to twelve months (Homie, Plus). However, during the interviews, some consumers indicated that they would like to have the option to cancel at any time. In addition, the first demo included the word 'subscription' which some consumers did not like because it felt restrictive. If the word subscription already scares consumers off, a minimal subscription duration will certainly do more damage.

Lastly, restricting consumers to a certain time-frame does not fit the brand. Quooker does charge a fine of €40 when cylinders are not returned on time. Therefore a relocation allowance seems a better option. The company Bundles charges a relocation allowance of €89 if the subscription is cancelled. When a consumer subscribes, the company charges the money as a deposit and if the subscription exceeds a certain amount of time the money is returned to the consumer. A relocation allowance deposit seems less restricting, which is why it is recommended to charge this allowance if the subscription is cancelled within one year. The minimal duration is an estimate and needs refinement.

The second disadvantage of an outcome-based business model is the transition. During the transition from one business model to the other, a margin decrease can be expected due to lower revenue and cost increase. The revenue decreases because consumers do not pay for their products upfront, but the costs have to be recurred from the service overtime. The costs increase because of the required investments to realise the outcome model (Tzuo, 2018). The transformation is called the fish model and according to Thomas and Wood (2016) 'you have to swallow the fish', but a return of investment can be expected between one and three years later.

# Simulation

In this chapter the data requirements are described and the IoT infrastructure for Quooker's SodaService is developed. The chapter also provides recommendations for the second and third steps of the strategy. The processing of data is also discussed. Throughout the chapter new requirements for the concept have been collected for the evaluation phase.

# Data Requirements

**This section discribes the data requirements for the first, second and third step of the strategy.**

Figure 26 illustrates the current system of the Cube and CO2-cylinders. The system involves many stakeholders and there is a lack of communication between the three databases: 'Magento', the webshop platform for CO2-cylinder orders, 'Exact', the finance database for payments and the service database for consumer support.

### Step 1 - Quooker's SodaService

Quooker is responsible for always providing a supply of CO2-cylinders to the consumer. In order to do so, the Cube must have a perception of the world outside (consumption behaviour) and react to this perception (predict when stock is empty and send cylinders). The consumption data is collected to set up a viable business case for second step of the strategy.

### Step 2 - Always instantly accessible sparkling water

For the second step consumption data and predictive maintenance is required to always provide the consumer with instantly accessible sparkling (and filtered) water. Predictive maintenance is particularly essential because the consumer pays per liter and product downtime decreases the revenue. Failure by Quooker to deliver their promise may result into a loss of consumers (Cierzan, 2018).

As mentioned before, collecting data from a (loyal) consumer base offers insights to provide a company with (sustainable) competitive advantage. For example, Quooker may find out that the consumption of sparkling water drops when the first CO2-cylinder is empty, because a specific consumers segment finds it more difficult to replace the bottle and waits for someone to support them. These kind of insights provide opportunities to improve the product design and to increase sales. In creating more accurate forecasts of the demand, the data can also support the supply chain to manage the suppliers and distribution and it can support marketeers in the more specific targeting of consumer segments.

### Step 3 - Always instantly accessible water types

The third step for the boiling-water tap demands the same data requirements as the second step.

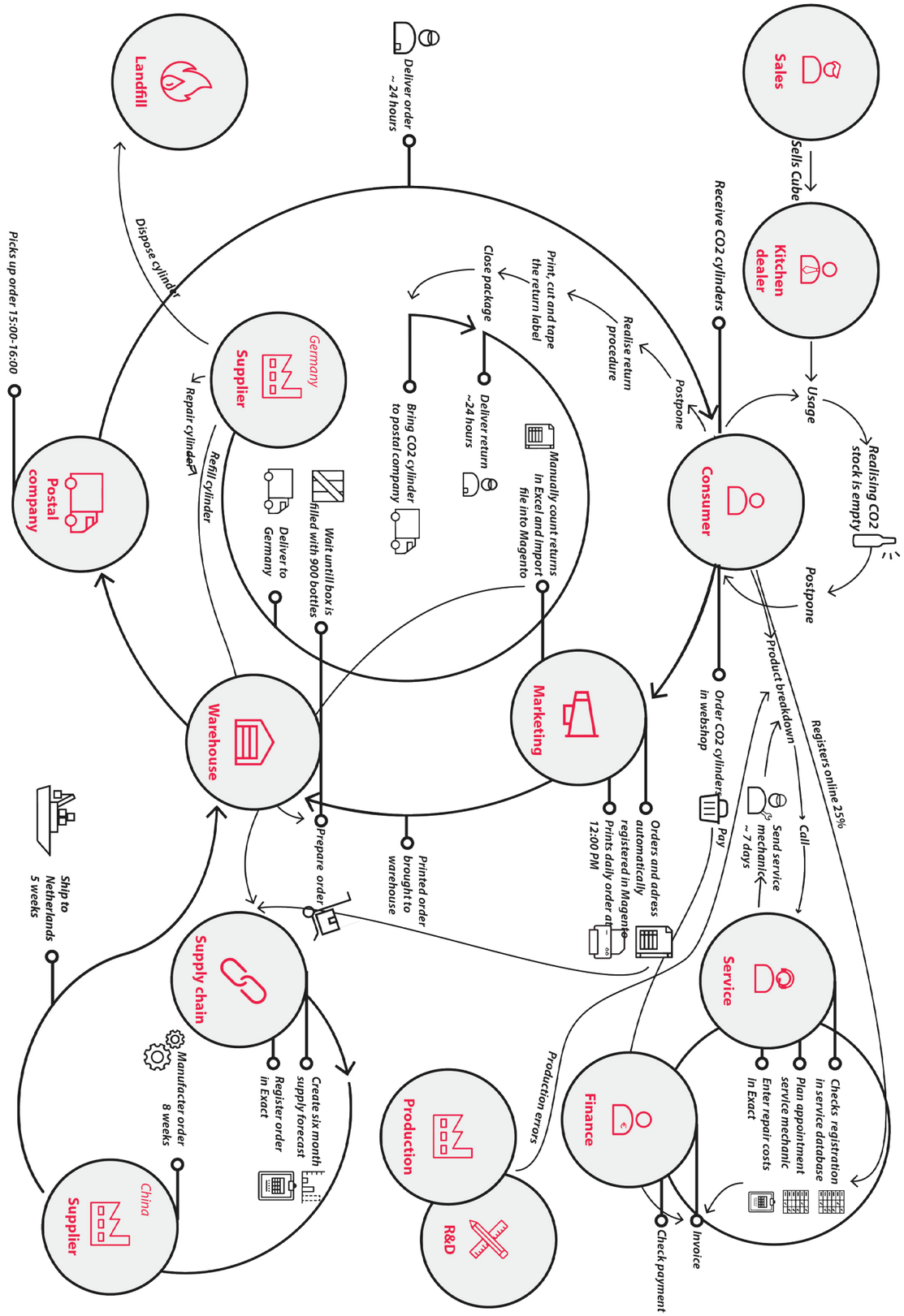



*Figure 26. A stakeholder map of the system around the Cube and CO2-cylinders based upon site surveys.*

# IoT Infrastructure

**The IoT infrastructure to measure consumption behavior for Quooker's SodaService is shown in figure 28.**

The infrastructure consists of eight key components: product hardware, product software, connectivity, a gateway, a cloud server, external data sources, integration with business systems and security tools. A brief summary for the design of each component is discussed in the chapter, see appendix AC for an elaboration of the design decisions. Appendix AD provides a recommendation for the IoT infrastructure of the second and third step of the strategy.

## 1. Product hardware

The first layer is product hardware which contains sensors, processors and a physical connectivity component. In order to predict consumption, the Cube needs to measure the volume of the CO2 inside the cylinder, identify if the cylinder is being replaced, and keep track of the absolute time.

**Measuring CO2 volume and identifying cylinder replacement**

Measuring the CO2 volume inside the cylinder is a crucial aspect of the graduation project. If the volume cannot to be determined, the product cannot predict consumption and the IoT strategy is not feasible. Multiple possible ways to measure the volume of the CO2 are discussed and evaluated in appendix AC. The most promising way is to measure the weight of the CO2 and cylinder.

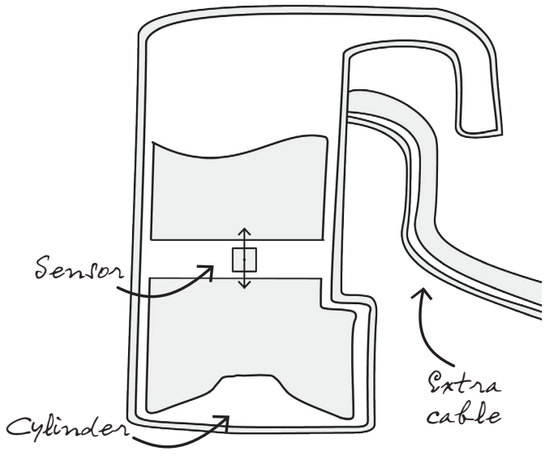



*Figure 27. A redesign of the connector.*

A load cell is used for measuring the weight of the CO2 cylinder. The load cell also detects if a cylinder is being replaced. To measure the weight of the cylinder accurately, a redesign of the connector is required. The disadvantage of the redesign is that it requires an extra power cable to the connector. (see figure 27)(see more information in appendix AC). The load cell is able to measuring the CO2 volume with an inaccuracy of 0,36L (0.6%). However, external forces may influence the measurement and therefore the volume of the cylinder should not be visualised in percentages in the mobile application, but less precisely (e.g. with blocks).

**Keeps track of the absolute time**

The Cube needs to know the absolute time to predict when the cylinder runs out of CO2 and to plan cylinder deliveries on time. For more information, see appendix AC. Since the Cube is connected to the internet, the device can request the absolute time from the network. A request to a network time protocol can synchronize the Cube with the coordinated universal time. By doing so, the Cube knows the absolute time and date (Huston, 2012).

Finally, a Wi-Fi communication chip is required for connectivity (see paragraph connectivity).

## 2. Product software

The second layer is product software which includes the embedded operating system, control components and onboard software applications.

The current control chip inside the Cube is manufactured by an external supplier. Quooker has no access to the software of the control chip and therefore re-programming the chip is not possible. See more information in appendix AC. A new control chip is required.

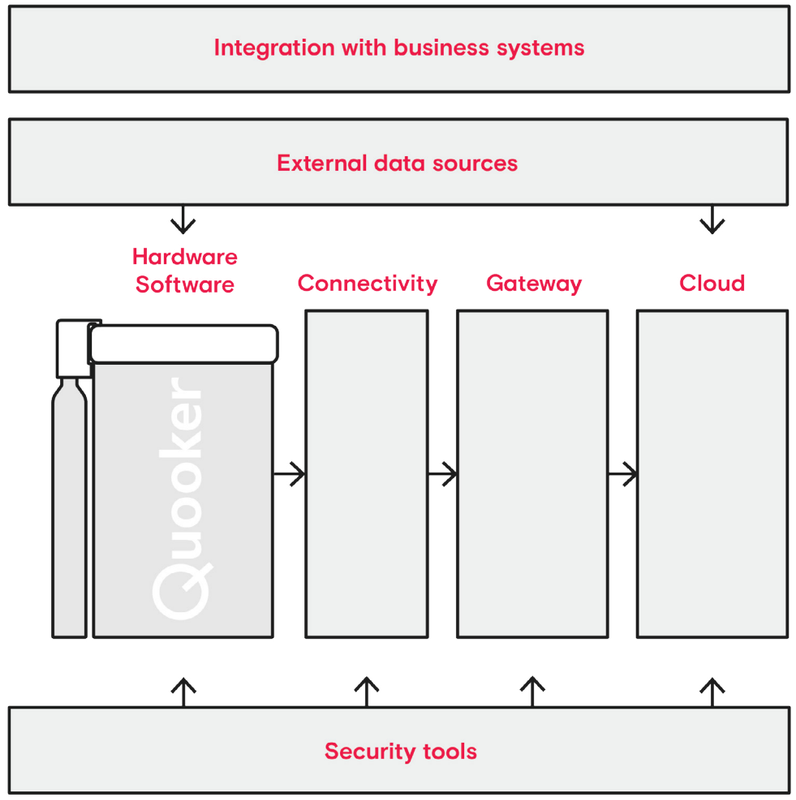



*Figure 28. The IoT infrastructure*

## 3. Connectivity

The third layer is connectivity, which are protocols to transmit information between the product and the cloud.

Several types of connections and features are shown in tabel 2. For short- and long-range connections (e.g. Bluetooth, NFC), the choice for Wi-Fi connectivity is made because it does not limit the flexibility of the consumer (data range) and it can feed back real time data (to feed the consumption data back) (see list of requirements). For cellular connectivity, the choice for Wi-Fi connectivity is made for two reasons. Firstly, because the majority of the consumers already has a Wi-Fi connection available and a sim card and subscription with the network provider is required for cellular connectivity (costs). Secondly, because Wi-Fi connectivity keeps consumers in control of sharing their data because they can disconnect at any time, preventing distrust and brand damage (see Appendix AC more information on each connection type and the design decision).

A Wi-Fi connection has two disadvantages which both can be solved. First, the onboarding process of a Wi-Fi connection for the consumer is somewhat difficult. The process should be simple and quick, otherwise consumers may not take the effort to set up the connection and share their data. In order to connect the Cube to a network, the device needs a button to activate the Wi-Fi function.

Next, the consumer can log in to the same network with the mobile application and enter the password of the network. If the consumer changes the password, he/she needs to reconnect the Cube. During cycle 3.2., a Wi-Fi onboarding process was designed in the mobile application demo, and the interviews showed that consumers were (hypothetically) willing to set up the connection and share their data (see figure 22).

The second disadvantage is the reliability of the connection. Wi-Fi connects devices to a nearby wireless router that in term connects to an internet service provider (Verizon, 2015). Therefore, a Wi-Fi connection depends on the performance of the nearby router. If the Cube is not connected to the internet, the consumption cannot be analysed and the prediction fails. As a result, Quooker is not able to deliver the cylinders in time. Therefore consumers need to receive a notification if the product has been disconnected from the internet for a while.

## 4. Gateway

The fourth layer is a gateway, a physical device or software program which is able to pre-process the acquired data close to the original source before sending it to the cloud ('edge computing').

| Features | Bluetooth, Zigbee, NFC and Z-wave | LoRa | Cellular | Wi-Fi |
|---|---|---|---|---|
| Data range | Short | Long | Long | Moderate |
| Real-time data | Yes | No | Yes | Yes |
| Costs | Low | Low | Moderate | Low |
| User control | Yes | Yes | No | Yes |
| Onboarding | Easy | Moderate | Not present | Difficult |
| Reliability | Moderate | High | High | Moderate |

*Table 2. Different type of connections and features.*



A gateway is not present in the concept because it does not need to transmit large quantities of data to the cloud. The filtering of data can therefore be processed locally (for example, with a wake-up-function or thresholds) and edge computing is not necessary. In addition, unifying access to third devices is not necessary for Quooker's SodaService. See more information for B2B applications of a gateway in appendix AC.

## 5. Cloud

The fifth layer is the cloud which is software application running on a server with four sub-layers: a 'database system' to store product data, an 'application platform' to design and manage custom business applications (Mendix, 2019), a 'rules/analytics engine' that consists of algorithms to operate the product or to reveal product insights, and 'smart product applications' which are software applications running on remote servers to manage the monitoring, controlling, optimisation and autonomous functions of the product.

The chosen cloud service is Microsoft Azure and costs €0,03 per transmitting Gigabyte (Microsoft, 2019). See appendix AC for more cloud services and an elaboration of the design decision.

## 6. External data sources

The sixth layer contains external data sources. External data sources can provide data to optimise the consumption prediction. For example, weather data could predict when consumers use more sparkling water (e.g. at warm temperatures). Or maybe the consumption is influenced by the amount of times (sparkling) water is mentioned in mass media. An integration with a API's is recommended, but not required for the IoT solution.

## 7. Integration with business systems

The seventh layer contains tools to integrate data from the product with business systems. As mentioned before, to deliver CO2-cylinder automatically an integration with the cloud, Magento and the mobile application is required. There are two options. Either a connection is established between Magento and Azure or the data from Magento is migrated to Azure. With the use of the Azure support plan and the Azure database migration guide, Quooker can internally migrate the data from Magento to Azure, which reduces costs.

## 8. Security tools

The last layer consists of tools to secure the consumption data. As mentioned in the analysis phase, many consumers abandon a service because of a trust issue and the distrust in sharing data is growing. If the data is not well secured, hackers may be able to acquire financial data and the location of consumers. As a result, consumers distrust the concept and Quooker, as a premium brand, may suffer severe brand damage and a loss of consumers (Drinkwater, 2016). Hackers may be able to remotely control the Cube, but they cannot cause life threatening situations by modifying the product operation. (Note, the Cube does not contain a heating element to heat the CO-cylinder and increase pressure for an explosion). Hackers infiltrate IoT solutions by detecting the most vulnerable part and therefore security must be integrated into every key component of the IoT system.

The decision to outsource security is made for three reasons. Firstly, because Quooker has no expertise in securing IoT infrastructures. Secondly, because a specialist offers a security label, it allows Quooker to shift the responsibility to the specialist when a data breach occurs. Thirdly, because outsourcing is less expensive than hiring an in-house security specialist. See appendix AC for a more detailed explanation.

# Data Processing

**In this section the data processing is described.**

## Metrics
The success of the service is measured by two metrics:

Metric 1:  minimizing the time people are out of CO2 stock.
Metric2: minimizing the time people have an empty cylinder connected to the Cube.

See appendix AC for the metric formulas.

## Data processing
The data processing flow chart between the product, cloud, user and company is shown in figure 29.

## Algorithm
An algorithm predicts the remaining consumption time of the installed CO2-cylinder and it improves as it is exposed to more data and time. The algorithm is trained with supervised data. An incoming variable (location, time, serial number, weather temperature, mass media, etcetera) causes an classified output: “CO2 usage” or “no CO2 usage”.

If the algorithm has not collected enough data, it cannot feedback the prediction correctly to the consumer in the app. Data scientist van Schetsen estimates the time duration for fine tuning the algorithm at one year (assuming the 20.000 Cube annual sales target is achieved) (personal communication, Juli 3 2019). In the meantime another formula is used, based upon the average consumption over-time:

$t_{remainingmeantime} = w(0)(w0-w(t)/ t)$

When the customer has not yet used any CO2, the following formula is used based upon the general average consumption of all Cube users.

$t_{remaininginitia(days)} = 60/1{,}5$

After a few days $t_{remaininginitia(days)}$ is replaced with $t_{remainingmeantime}$.

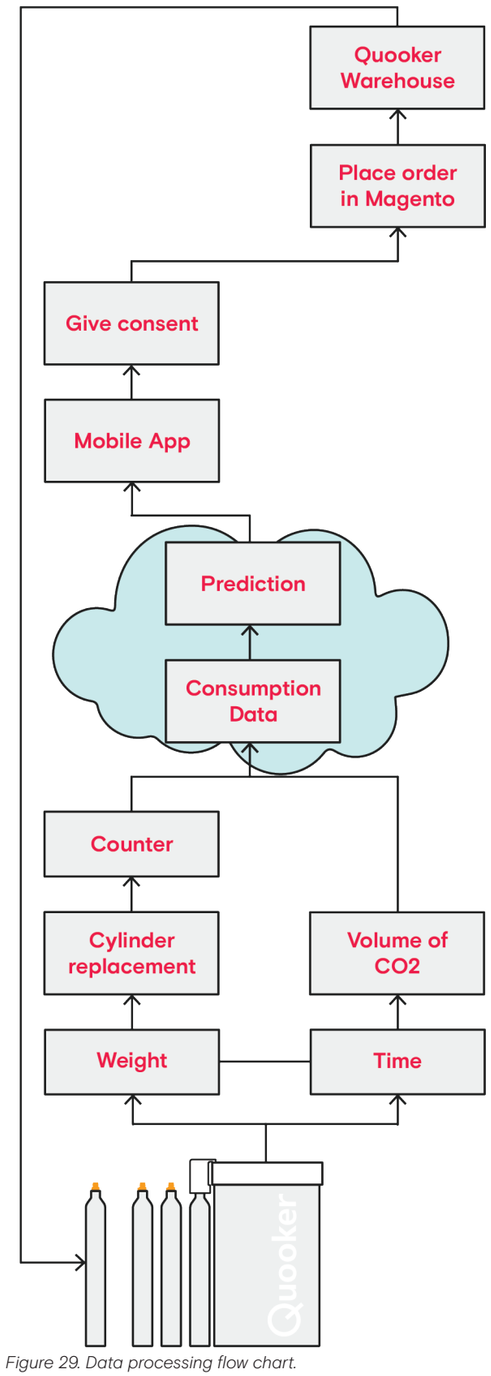



*Figure 29. Data processing flow chart.*



# Conclusion

**This section describes the conclusion for the synthesis phase.**

During the simulation phase the data requirements and processing are described. An IoT infrastructure concept has been created for Quooker’s SodaService with future recommendations for the second and third step of the strategy (see appendix AD). Every key component has been discussed and a design decision was made. It is, however, recognised that in certain layers better choices can perhaps be applied and that there are still some limitations that require fine-tuning. The focus in the graduation project is on strategic design and therefore, there is no elaboration on some decisions. Altogether, a feasible, but not ideal concept has been created. It is recommended to execute more research on external forces on the connector, temperature dependence of the load cell and cloud services to create the ideal IoT infrastructure. For now the concept and future recommendations are used for the evaluation phase. During the synthesis phase several new requirements for the concept have been collected for the evaluation phase.


# Evaluation

In the evaluation phase of the project, the proposed strategy will be accompanied with a business case and unique selling points. The strategy will be evaluated on its fit with Quooker and the strategy demonstration will be evaluated by the list of requirements. The chapter completes with future recommendations and a conclusion.

# Businesscase

**A business case for Quooker's SodaService and the second step of the strategy is created. The third step is left out of consideration as a result of too many uncertainties/ assumptions.**

## Quooker's SodaService

In order to roughly estimate the costs for the service a digital agency (Blis digital) is consulted. The costs are estimated in appendix AE. In order to calculate the revenue and profit of the service several assumptions were made. See appendix AF for the assumptions and the calculation.

After 0,49 years the cost for the IoT investment is recurred, as the fish model predicted. The service increases the sales of cylinders. The service also improves the return-rate of cylinders, which results in a cost reduction. The cumulative profit of the service, after the 'fish is swallowed', is estimated at € 549.814 which increases year after year, depending on the annual Cube sales, subscription-, and retention-rate (see table 3). In comparison, the current annual profit of the CO2-cylinders system is € 297.360.

The profit margin per cylinder is significantly lower compared to the current system. Yet, the service generates more profit as a result of the stable sales increase due to high the retention-rate (see the synthesis phase).

## Unique selling points

The profit gained by Quooker's SodaService is only 2% of Quooker's annual profit and therefore monetary value is not the reason to develop the concept. In addition to direct monetary value, Quooker's SodaService provides more important benefits:

| | Year 1 | Year 2 | Year 3 |
|---|---|---|---|
| Subscription sales | 3.781 | 4.121 | 4.492 |
| Annual profit | € -167.349 | €341.058 | € 376.105 |
| Cumulative profit (CP) | € -167.349 | € 173.709 | € 549.814 |
| CP / the company's total annual profit | ~ 2 % | | |
| Payback time | 0,49 years | | |

*Table 3. An estimate for the profit for Quooker's SodaService.*

**1. Innovative front-runner brand image**
By applying IoT, Quooker's innovative front-runner brand image is strengthened and the company can better compete with other competitors who also apply IoT in their taps. While these competitors probably create rather expensive gimmicks, Quooker provides a service that generates significant customer value by solving the biggest pain-point for the consumer. The latter, of course, requires validation with a pilot.

**2. Brand position**
Quooker's SodaService also strengthens the company's brand position against Sodastream and bottled sparkling water. The service makes the Cube by far the most convenient option for maintaining a sparkling water supply and as a result, the relatively high price of the Cube is probably justified. Consequently, the sales of the Cube increase and consumers are more satisfied with the product.

**3. Sustainable competitive advantage**
Lastly, Quooker strengthens its circular relationship with the consumer and can create a loyal consumer base. These loyal consumers are more difficult for competitors to steal. The loyal consumer base also provides consumption insights which can be used, for example, to improve the product design, marketing campaigns and supply chain. Competitors cannot steal these insights and thus Quooker is able to acquire sustainable competitive advantage.

## Conclusion

By increasing the sales and return-rate of cylinders, Quooker's SodaService enables a cumulative profit of € 549.814 after three years, which is a 85% profit increase compared to the current cylinder business model. The profit will increase year after year, depending on the annual Cube sales, subscription-, and retention-rate.

Yet the service provides more important benefits than direct monetary value. By applying IoT, Quooker strengthens its innovative front-runner brand image and strengthens the company's brand position against Sodastream and bottled sparkling water. Consequently, the sales of the Cube increase and consumers are more satisfied with the product. Lastly, Quooker strengthens its circular relationship with the consumer and is able to gain a loyal consumer base and consumer insights which competitors cannot easily steal, thus enabling the company to acquire sustainable competitive advantage.

However, the service is not the solution to the long term risks the company faces. As mentioned before, Quooker's SodaService is a first step towards an outcome-based business model and without it, the second step is not feasible. Therefore the service should rather be seen as an investment.

### Step 2 - Always instantly accessible sparkling water

The costs for the second step are roughly estimated to get a global sense of the benefits for an outcome-based business model. The costs are estimated in appendix AE. In order to calculate the revenue and profit of the service, several assumptions were made. See appendix AF for the assumptions and the calculation.

After the 'fish is swallowed', the cumulative profit is estimated at € 2.479.982, which increases year after year, depending on the annual Cube sales, subscription-, and retention-rate (see table 4). However, the profit calculation is based on very rough estimates and therefore it is recommended to look at the increase in profit over each year, rather than focusing on the absolute numbers. The calculation is merely an example to show the significant profit gain a pay-per-use model can offer year over year and to show that offering the Cube as a pay-per-use model is a recurring saving rather than a recurring pain. The price-per-liter is only € 0,58 per liter (vs €0,68 of bottled water), so for example: with drinking 1L per day a monthly fee of €17,40 is incurred. This is, of course, more affordable than paying €1.200 and €0,25 per liter and maintenance costs, thus potentially expanding the market significantly, while still generating a growing profit. The profit margin per Cube is significantly lower compared to the current situation. Yet, the service generates more profit as a result of the stable sales increase because the of the high retention-rate.

| | Year 1 | Year 2 | Year 3 |
|---|---|---|---|
| Subscription sales | 3.800 | 4.142 | 4.515 |
| Annual profit | €-175.584 | € 1.268.258 | € 1.387.308 |
| Cumulative profit (CP) | €-175.584 | € 1.092.674 | € 2.479.982 |
| CP / the company's total annual profit | ~ 7 % | | |
| Payback time | 1,14 years | | |

*Table 4. An estimate for the profit for second step of the strategy.*

### Unique selling points

Next to direct monetary value, the second step of the strategy provides more important benefits.

**1. Growth after market saturation**
The Cube is more affordable and thus the market is expanding. The €1.200 upfront cost is eliminated and a € 0,58 price per liter is cost saving compared to bottled water. In addition, a pay-per-use model provides a monthly recurring revenue for a predictable and stable operating result, beyond a market saturation point of one-time purchase business models (see figure 30).

**2. Sustainable distinctive brand position**
As mentioned before, Quooker strengthens its circular relationship with the consumer and gains loyal consumers and consumption insights, which can be used to improve the product design, marketing campaigns and supply chain. Competitors cannot steal these consumers and insights and thus Quooker is able to acquire sustainable competitive advantage. Based upon this sustainable competitive advantage, Quooker can strengthen its distinctive brand position.

**3. Innovative frontrunner**
Quooker can keep up with the changed consumer demands and manifest itself as the innovative frontrunner in the outcome economy.

**4. Customer satisfaction**
Not only is the price of the Cube reduced, but the consumer is also unburdened from ownership of the Cube. The price-convenience-ratio improves and thus the customer satisfaction.

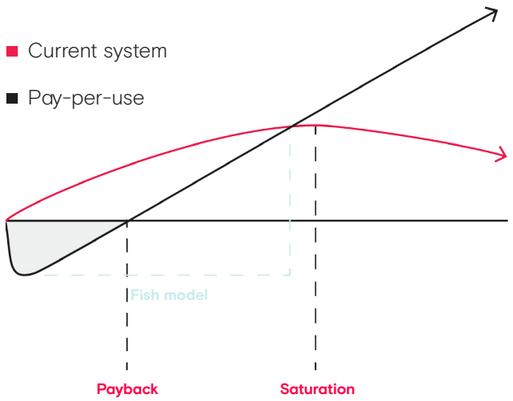



*Figure 30. Simplified graph of the growth after market saturation.*

### Conclusion

Altogether, a pay-per-use model offers significantly more benefits to both the consumer and the company. The benefits for the consumer are clear: Would you pay €1.200 for a Cube and €0,25 per liter and maintenance costs or would you rather pay a price per liter (€0,58) that is cheaper than a one-time purchase and cheaper than bottled sparkling water, instantly accessible and you do not have to do anything for it? The benefits for the company are that the following risks are prevented: growth decrease after market saturation, losing its distinctive brand position, not being able to meet the changed consumer demands and being left behind by competitors in the outcome economy. The strategy ensures that Quooker stays a fast-growing company and a strong brand for many years to come.

Some might not fear these previously mentioned risks Quooker faces, because they take place too far in the future. Some might not believe in my vision that the IoT transition is inevitable. To those I say, at least consider the following benefits of a pay-per-use model: a growing profit year over year due to a high retention-rate, market expansion by offering a more affordable products, sustainable competitive advantage from loyal consumers and consumer insights, an innovative frontrunner brand image and an increase in customer satisfaction with less expensive and more convenient products.

# Brand Evaluation

**In this chapter the strategy is evaluated on its fit with the Quooker brand. The strategy fits with the brand because of the following eight arguments:**

### 1. Expansion into the existing kitchen market
Currently, Quooker sells the Cube and boiling-water tap mostly to consumers who buy it with a completely new kitchen (see consumer analysis). In this scenario, consumers are not price-sensitive to the high upfront cost (see appendix U). However, with a pay-per-use model, the company eliminates the upfront cost and sets a cost-saving pricing. As a result, Quooker is also able to sell its products to price sensitive consumers: consumers with an existing kitchen. Which is, of course, a larger consumer segment, allowing Quooker to expands its market for the Cube and boiling-water tap significantly.

### 2. Imitating competitors
The competitors imitate successful ideas from each other and for that reason, sustainable competitive advantage for Quooker is especially beneficial. Competitors may copy the mobile application, but they cannot copy the consumer insights Quooker acquires.

### 3. Benefit from high quality
Quooker develops products with a ten-year lifespan and they can benefit from it because the burden of the ownership (maintenance) is placed at the company. Competitors, such as Grohe and Franke, develop products with shorter lifespans and have greater effort and expenses in maintaining the product.

### 4. Benefit from high quality service
Quooker's brand promise is service. Consumers expect great service, so why not go the extra mile? In addition, it happens regularly that the warranty of a product expires and Quooker still repairs the product without charging any costs (see service analysis). With this strategy, the company gets paid for offering this service.

### 5. Strong brand image
Quooker is a strong premium brand, that consumers want to be associated with (Quooker, 2018). Less-premium competitors such as Grohe and Franke may have more difficulties with creating a customer relationship and thus loyal consumers.

### 6. Brand trust
Consumers trust the Quooker brand (Quooker, 2018) and therefore they may be more willing to share their data with Quooker than with competitors.

### 7. Company goals
Eliminating high upfront costs and setting a cost-saving pay-per-use model makes the products more affordable and brings Quooker one step closer to being perceived as essential kitchenware, similarly to the dishwasher. The strategy also supports the current company goals: increase the revenue and strengthen the brand position.

### 8. Being an innovative frontrunner
Being an innovative frontrunner is in Quooker's DNA. Quooker could be the innovative frontrunner, just like founder and pioneer Henri Petri wanted it to be since the seventies.

### Disadvantage
To implement the strategy, Quooker has to cannibalise its one-time purchase revenue for a pay-per-use model which seems quite a risk for a succesfull company with a well-functioning sales channel via kitchen dealers. Therefore, the company can also decide to offer both a one-time purchase and pay-per-use model for the new and existing kitchen market. With a pay-per-use model they may even directly sell the product to consumers (e.g. online) and bypass kitchen dealers. As a result, Quooker can gain consumer names, addresses and financial details, no longer has to pay a margin to kitchen dealers and the product is more often properly installed and explained to consumers (see consumer analysis). More importantly, the business transition is required to sustain the company's success on the long run and the return of investment is expected 1,14 years later.

### Conclusion
The strategy is a good fit with the brand, because it allows Quooker to sell products to a much larger customer segment: price-sensitive customers with an existing kitchen. As a result, the company can increase their sales significantly. The strategy is also difficult to imitate which is valuable in the market they are competing in. The strategy fits the current company goals and mostly, the strategy allows the company to benefit heavily from its current strengths: high quality, high quality service, strong brand image and brand trust.

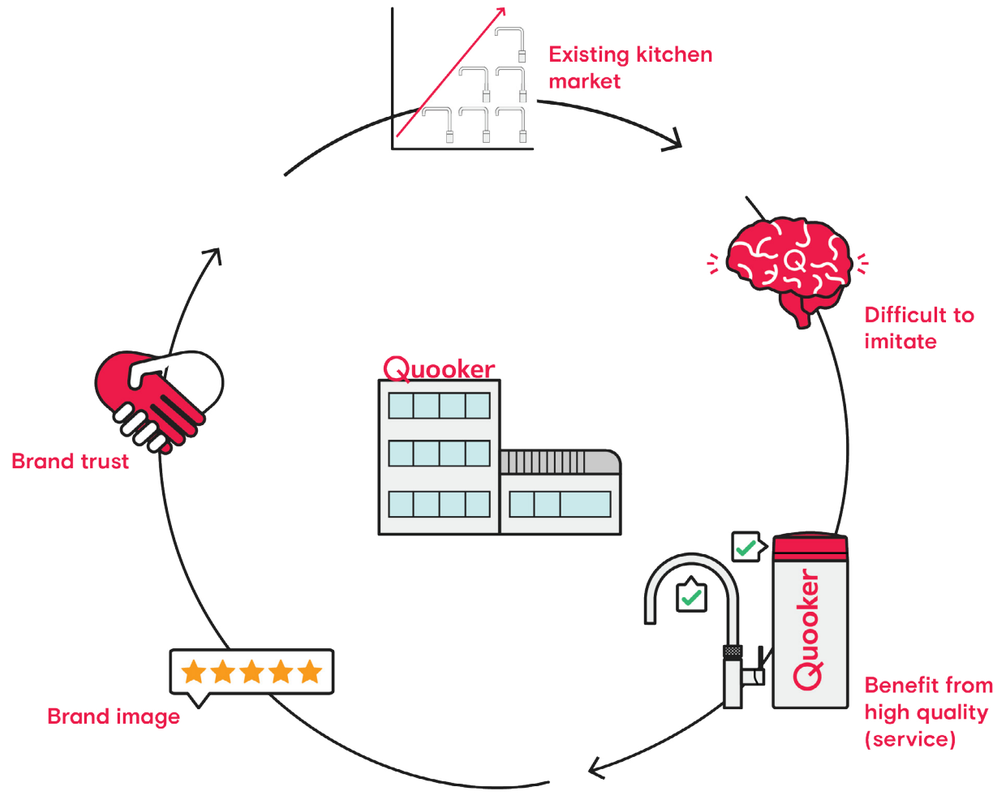



*Figure 31. Fit with the brand.*

# Implementation

**The implementation of the strategy is visualised in figure 32. Within roughly eight years the shift towards an outcome economy is expected and therefore the roadmap shows that Quooker should start investing now to achieve the strategy within the time-frame.**

## Step 1 - Quooker's SodaService

A digital agency (Blis digital) is consulted provide a rough time estimation for the first step.

**Prototype**

Developing the hard- and software for the prototype will take three weeks for the EDP department. In the meantime a connection will be developed to the cloud with Magento and the app, which will take two months. Azure consultants support with the data migration. The development of the app will be outsourced and takes two months. Security will be outsourced as well and take one month (Ogilvie, 2017)(see more information appendix AC). Finally, the payment system needs a reorganisation to enable automatic payment which will take two months as well. In total the duration of the pilot development is estimated at two months.

**Preparation**

The duration to prepare for the pilot is estimated at sixteen months. The redesign of the connector (including the research on the temperature dependence of the load sensor and the prevention of external forces influencing the weight measurement) is estimated at four months (see appedix AC). The design of the flyer (see appendix Z) and finding a partner for production is estimated at two months. The time to produce a the new version of the Cube with embedded hard- and software is estimated at twelve months. In the meantime, the account managers need to prepare kitchen dealers with information about the new service which will take three months.

**Launch**

The Quooker's SodaService pilot will be launched on 2-4 February 2020 at the VSK fair in the Netherlands (International Trade Fair for Heating, Sanitary Engineering and Air-conditioning) and the app will be launched in the Google play store and the Applestore.

**Pilot**

The minimum duration of the pilot is six months (see synthesis chapter). Yet a duration of twelve months has been chosen to ensure that there is enough time to optimise the product for a high subscription- and retention-rate. During the pilot consumption data is collected for the second step of the strategy. After twelve months a go/ no-go decision is made.

## Step 2 - Always instantly accessible sparkling water

**Preparation**

The duration to prepare for the second step of the strategy is estimated at twenty four months. Consumption data is collected and alaysed to set up a viable businesscase. Sensors are researched to develop predictive maintenance for the Cube. A redesign for the Cube is developed with the embedded sensors and a connection with the cloud and the service database is created. Furthermore, the company should investigate whether cylinders/ pipeline require a resign to remotely close off the supply if consumers do not pay/disconnect. The company can create a custom API and/or build connections for incoming API's to improve the consumption and maintenance predictions (see more information in appendix AD). If the concept fits the sales channel via kitchen dealers also requires investigation. Finally, the marketing department starts promotions to advertise the pay-per-liter model.

**Launch**

The second step of the strategy will be launched in February 2023.

**Pilot**

A similar pilot as for Quooker's SodaService for both the second and third step of the strategy is recommended. This pilot should also measure the amount of low-frequency consumers.

## Step 3 - Always instantly accessible water types

**Preparation**

The tasks of the second step are repeated for all boiling-water taps and the duration is estimated at three years. Yet, the security measures are increased and the IoT infrastructure needs altering to manage large quantities of data (see appendix AD). The pay-per-use model for the entire product portfolio is expected to launch in 2027.

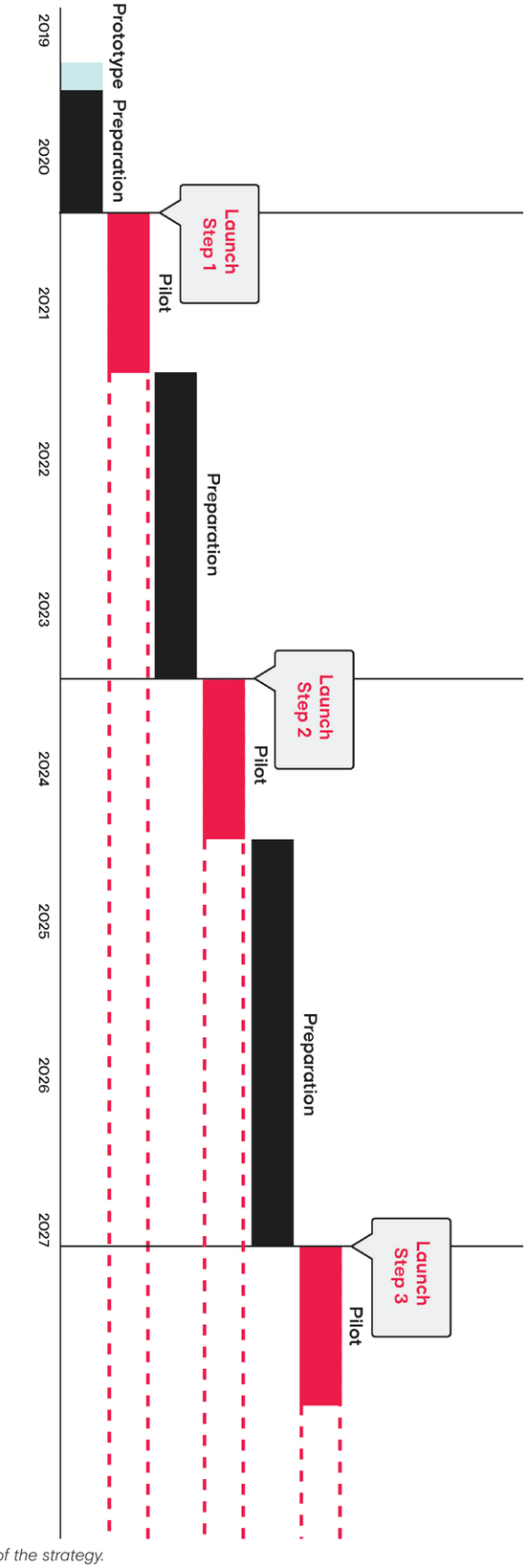



*Figure 32. The implementation roadmap of the strategy.*

# Concept Evaluation

**Quooker's SodaService is evaluated based upon the list of requirements which is build throughout the project and shown in Appendix P.**

Even though many internal stakeholders already gave feedback on the concept during the synthesis phase, the stakeholders were asked for last requirements (also to provoke a sense of co-creation)(see figure 33 & 34). The feedback and list of requirements is used for the development, evaluation and future recommendations for the final concept of Quooker's SodaService. See the final concept in figure 35.

### Future recommendations

The concept does not pass the following requirements. It is not proven that the design makes consumers willing to share their data, to download and to pay. A retention-rate of 90% is also not proven. Therefore, it is recommended to execute the previously mentioned pilot (see synthesis chapter). Quooker's SodaService includes a mobile application, while many consumers show a strong resistance against this interaction type. Therefore, it is recommended to create a web-based alternative to the mobile application, otherwise a large consumer segment is eliminated. The alternative does not necessarily have to include a CO2 volume indicator of the installed cylinder (see appendix U).

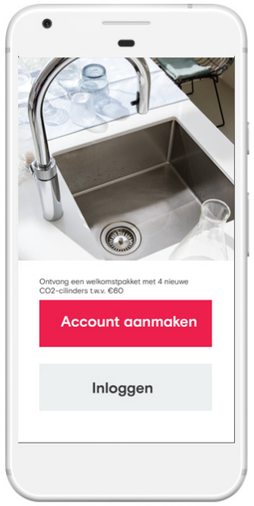

*Figure 33. A Cube consumer with the final concept.*

Furthermore, the volume of the cylinder should be visualised in blocks instead of percentages (because external forces may influence the accuracy of the CO2 indication). It is also recommended to include a notification feature in the concept to send consumers messages when the Cube is disconnected from the internet for a while. In addition, the concept is not scalable to other countries. The concept is tested with Dutch participants and it is not validated whether consumers from other countries experience the same needs. Therefore it is recommended to perform qualitative research internationally and use Englisch text in the app. The design allows users to controll their data (Wi-Fi connection), but it could provide more transparency of how the data is utilised to increase the consumer's trust and thus possible the retention-rate. Lastly, the design is not applicable to other products of the portfolio yet. When the third step of the strategy is developed, the app should be applicable to the boiling-water tap as well to offer one holistic solution.

Cycle 3.2 showed that the concept should include a consent option before the payment is debited. The flyer should include an explanation on the purpose of the app, a website link to the app and an option to make the serial number of the Cube easier to find. A suggestion is a QR-code on the flyer that already includes the serial number. It is also recommended to validate whether kitchen dealers keep the flyer and do not take the cylinders themselves. Finally, more research is recommended to create the ideal IoT infrastructure, since the focus of the graduation project was on strategic design rather than integrated design.

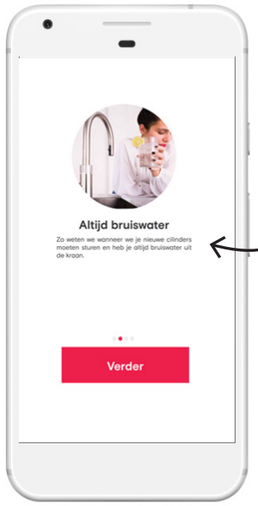

*Figure 34. An internal stakeholder with the final concept.*


Opening



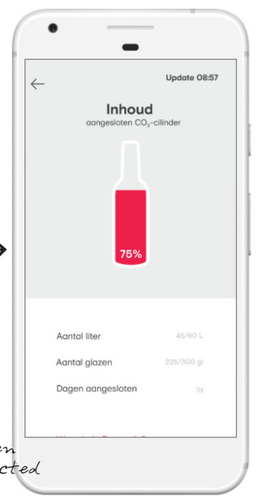

Login


Discover Quooker's SodaService!




Less text

Third explanation slider




Should be blocks

The CO2 volume screen of the connected cylinder

A QR-code link to the final demo

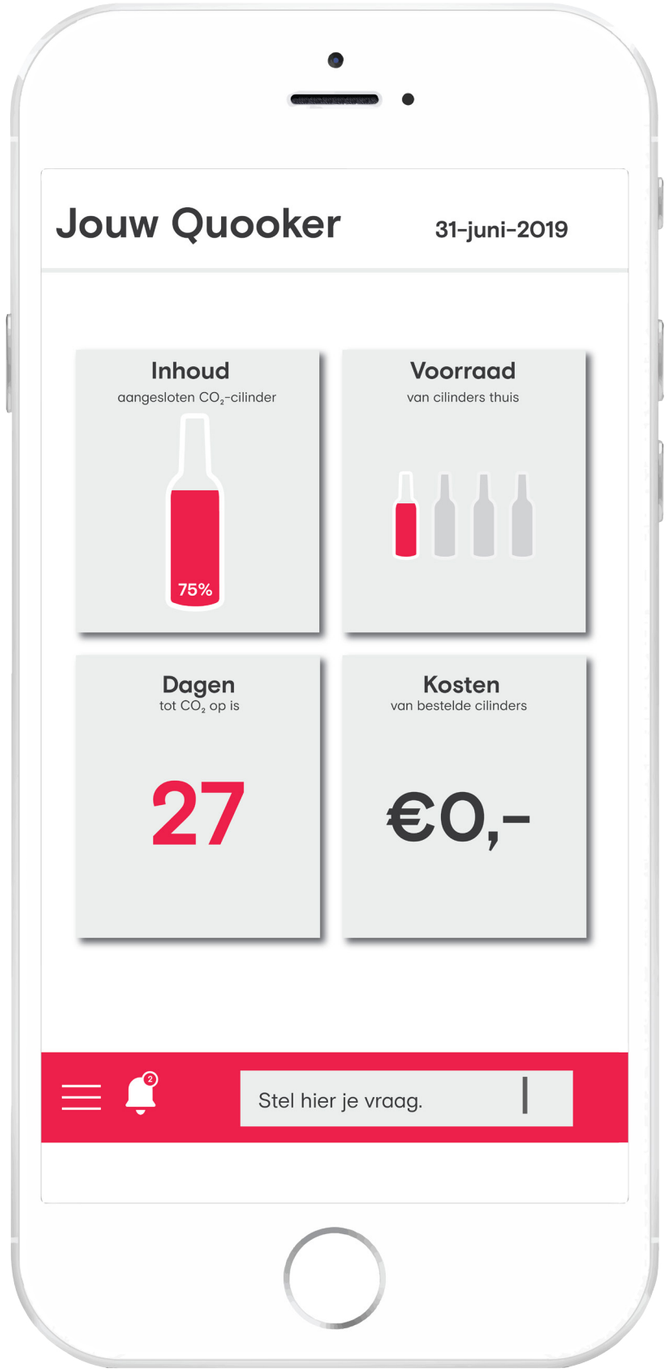



*Figure 35. The final concept is the demo from cycle 3.2. with these new screens.*

# Conclusion

**This section describes the conclusion for the evaluation phase.**

During the evaluation phase, Quooker's SodaService and the second step of the strategy are accompanied with a business case, unique selling points and an implementation roadmap. The roadmap shows that Quooker should start investing to achieve the strategy within eight years. Quooker's SodaService is evaluated with a list of requirements which is built throughout the project and the strategy is evaluated based upon its fit with the brand. Eventually the service requires some further research and a pilot, but when it is finished it can, together with the overall IoT strategy, bring significant benefits to both the consumer and company. More importantly, they are able to solve Quooker's long term risks to ensure that Quooker stays a fast-growing company and a strong brand for many years to come.

The strategy is a good fit with Quooker for many reasons, but mainly because it allows the company to benefit heavily from its current strengths and it allows the company to sell products to a much larger customer segment: price-sensitive customers with an existing kitchen. As a result, the company could increase their sales significantly.

# Reflection

The final chapter of the graduation project is concluded with a reflection.

# Reflection

**This chapter is concluded with a reflection on the personal learning ambitions and the life lessons I have learned.**

## Personal learning ambitions

The five personal learning ambitions from the design brief are evaluated below.

**1. To be proud of the final result.**
In the past six years, I almost never created a design of which I was confident that it could be truly valuable. Now I feel like I have, because the concept was continuously optimised and not based on consumer lies, but commitments. Consumers are very enthusiastic about the design and in the long term it can deliver great benefits to the company. For these reasons, I am proud of the final result.

**2. To learn how to work in a multi-stakeholder environment.**
I have learned how to involve other functionaries and disciplines effectively within a company and I also learned that things stated are sometimes dependent on personal interests or that they are rather subjective views. I had colleagues roast my MVP three times but in the end they, too, became enthusiastic. I noticed that my concept creates movement: within the company, the idea about proactively offering cylinders and considering a return label gets more and more support and is taken seriously.

**3. To use an iterative lean startup approach.**
I started this project as an enormous 'lean-noob'. My first hypothesis were quite insufficient. Yet after reading much, much literature especially Lean Startup and The Mom Test and also after all the valuable feedback by Gert Hans, I feel like I understand the method. Yes, I do recognise that there are still improvements possible, that some hypotheses were somewhat unstructured and/ or a bit bumpy sometimes. I recognise those shortcomings, I acknowledge those shortcomings, and I will definitely not repeat them.

In addition, I discovered the biggest pain point of Cube consumers: a too low price-convenience-ratio. Something that was not discovered before, and could just as easily not have been discovered with the regular method of online surveys or feedback from peers/relatives. Therefore, the qualitative research also contributed valuable new consumer insights to the company.

**4. To fully understand the consumer.**
I feel like I understand the consumer. I have been in their homes, I have learned about their lives, I have seen their family photo albums, cellars, attics and they even call me in the evening if something is wrong with their Cube. Yet, I still want to learn more. I want to go further, I want to go into depth and gain explicitly more academic knowledge about consumer psychology, besides practical knowledge, and use it for persuasive design. Therefore, I want to study a second Master in Consumer Behaviour.

**5. To graduate Cum Laude.**
As mentioned before, it would be regretful if this goal which I a worked for with passion over the last years is not achieved. I need a Cum Laude graduation for my further learning process: a Consumer Behavior master at Goldsmith University in the United Kingdom. However, I understand and believe that such a title not for free, you have to fight for it. You either earn a Cum Laude or you do not.

## Life lessons

Next to my personal learning objectives, I learned great lessons that I carry with me for the rest of my life.

**A no is not a no**
I learned that a 'no' is not a 'no'. For a certain period the company did not allowed me to interview consumers. After some time, however, my supervisor agreed that I could use my personal network to approach consumers, but then the marketing manager did not agree. Finally I learned how to manage all these different views within the company, without making anyone feel like he or she is passed by.

**I am not a do-er**
During the green light meeting I received the feedback that I am not good at structuring, conclusions, communicating and that I am too much of a do-er. The first thing I did after the meeting was to call my dad, asking him; "Dad, am I a just do-er?" And he responded: "No, no. You are go-getter!" And then I started thinking. Have I ever received this feedback before in the past six years? And the answer was: no I have not. I was quite nervous every time I stepped into a consumer's home and when I tested the MVPs with colleagues (because what if they hated it?). However, I just went for it, because I did not have time for hesitation.
I understand where the 'do-er'-feedback comes from and what circumstanced played a role here. And the structure and conclusions of the green light report and the presentation are just not in line with my normal, regular performance over the last six years. However, I did not want to receive feedback on these aspects, because I know I can structure, conclude and communicate. On the contrary, I know I have difficulties with lean and designing for the IoT. Personally, I feel like the circumstances of the project forced me too much into the role of a 'do-er'.

**Project management**
Why did the project push me into a 'do-er'-role? Assumable, it is a result of project management. I hardly knew anything about lean and designing an for the IoT, and I had not made eight-year-strategies very often. I never thought it would take so long for me to learn the hypothesis and I never thought I had to diverge on all IoT infrastructure steps and find references for every single detail. As a result of not knowing, likely I leaned too much on my supervisors. I thought if it is not doable, I will hear it from them.
Crucial and essential is here, that I never presented them an overview of what the other supervisors said to me what I should do. As a result, they could not sufficiently advice me on time management. I should have been more proactive, show them an overview of the steps I still had to take and ask them during the midterm: do you think this is doable? I also should have involved my chair earlier in the process. When data-driven design was off the table, I thought I would just make an app. Therefore, I started on the IoT strategy in a very late stage.

**Reflection**
While gathering the very extensive amount of feedback, at a certain moment I seriously doubted whether it was doable. But I thought: I will go for it! I will just work harder then! The life lesson I learned here is that you cannot solve everything by just working harder, by working 20 hours a day. For six years long in Delft, I thought that would solve all my challenges and problems. However, time is your greatest enemy. Time can sometimes win from persistence. Time can win from dedication and motivation. So at certain moments in life, you have to step back and reflect. That is a lesson I will take with me for the rest of my life.

So, I want to thank my supervisors, Gert Hans, Jacky and Robbin for making me learn these life lessons. In addition, your feedback helped enormously with improving the report and final result. I could never have done it without your help.

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