CBI4AI 2022

SOAP *Sniffing Out All Pathogens*

AI LAUNDRY SOLUTION

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INITIAL PROJECT

Food Waste in the Hospitality & Service Industry

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Our Exploration Process

INITIAL THOUGHTS

- Transportation, manufacturing, energy production - particularly interested in water pollution

RESEARCH PHASE

- Narrowed it down to 5 more specific topics
- 2 hours research phase on each topic

FORMULATING PROBLEMS

- Identified link between industry & carbon footprint
- Considered possibility of SMART goals

Initial Problems We Considered

LAUNDRY

70% of carbon emissions created during the life of a typical t-shirt comes from washing and drying – during manufacturing, dry cleaning or doing laundry at home.

FOOD WASTE

1/3 of the food harvested is wasted, which is an enormous problem in a world where over 800 million people suffer from hunger and undernourishment.

Problem Statement

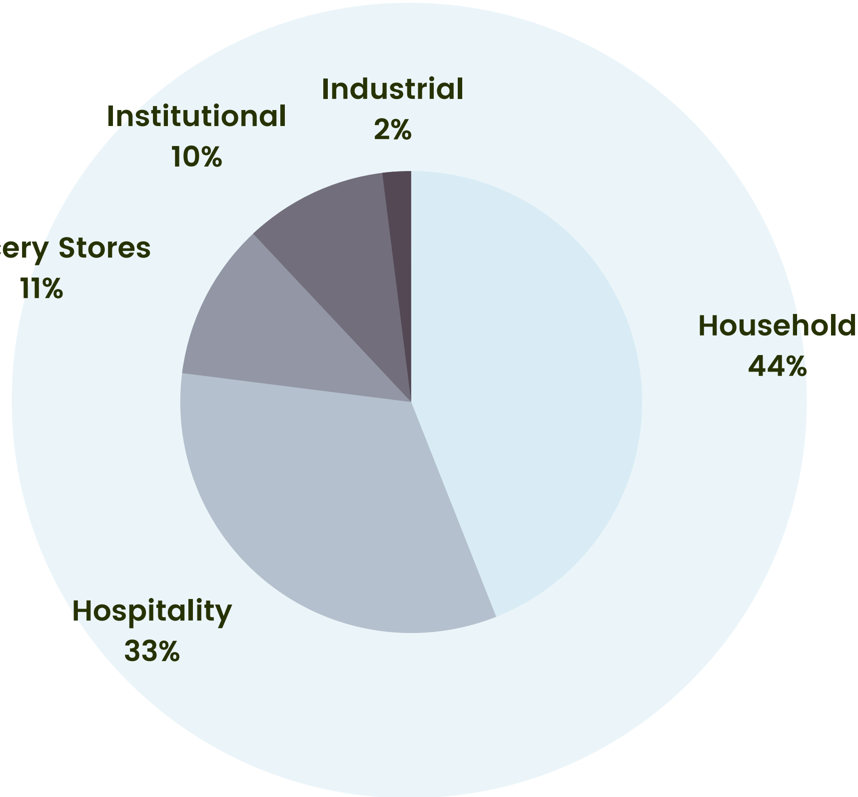
FOOD WASTE

is an enormous problem in a world where **over 800 million people suffer** from hunger and undernourishment. All these people could be fed by l**ess than a quarter of the food lost or wasted in the US and Europe**.

Wasting food has irreversible environmental consequences: it **wastes the water and energy that was used to produce it, and it generates greenhouse gases.**

WHERE FOOD IS WASTED

Based on research on where food is wasted most, we chose the hospitality industry as is it the second biggest contributor.



https://www.rts.com/resources/guides/food-waste-america/

Implications

40%

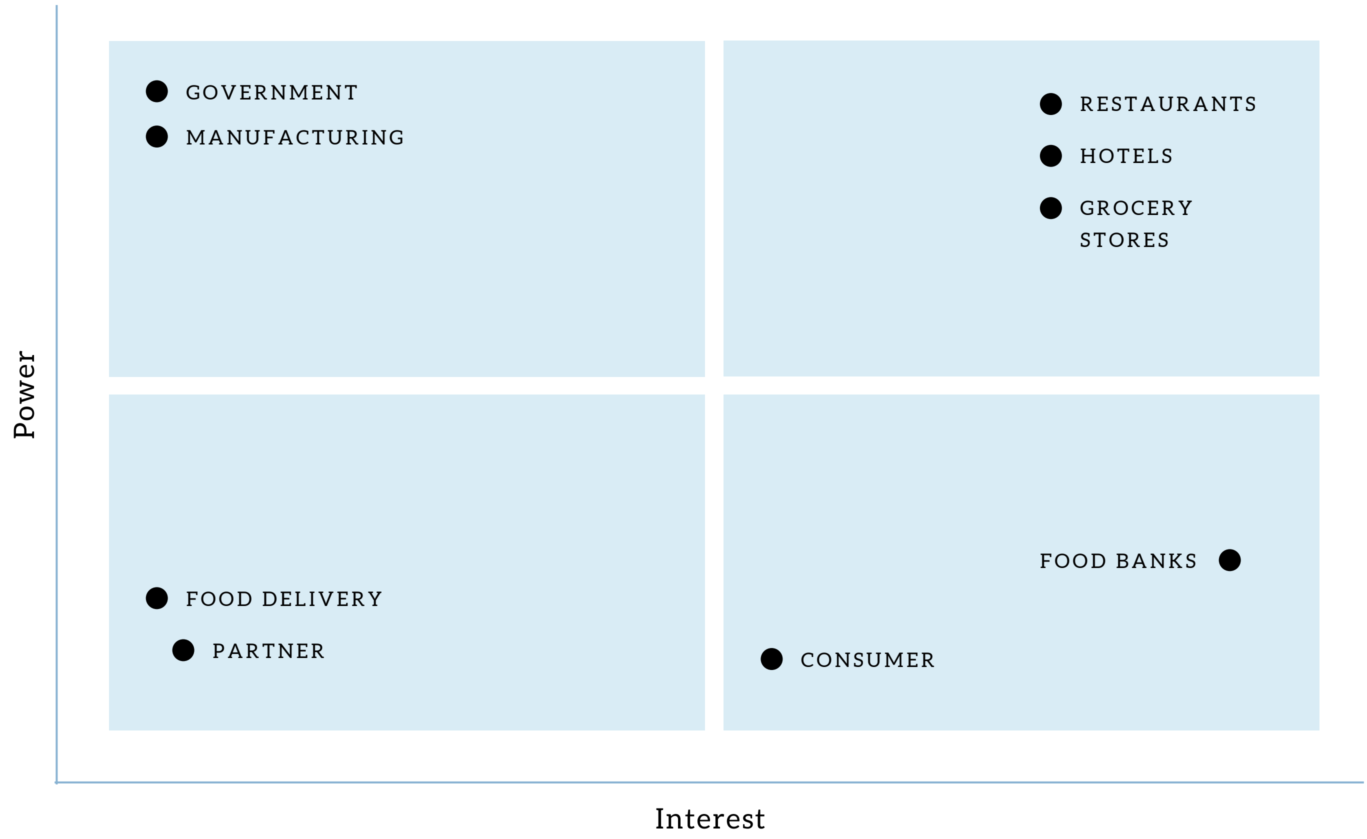
OF FOOD IS WASTED IN RESTAURANT, GROCERY STORE AND FOOD SERVICES PART OF THE FOOD SUPPLY CHAIN

11%

OF GLOBAL GREENHOUSE GASES COME FROM FOOD THAT IS PRODUCED, BUT NOT EATEN.

https://www.rts.com/resources/guides/food-wast

PROBLEM OWNERS/STAKEHOLDERS



When Along the Supply Chain Does Food Waste Occur?

SUPPLY

"Ugly", deformed food gets thrown out or sometimes produce is over ordered and remains unused.

STORAGE

Some food is thrown out because of expiration dates or because they aren't stored optimally and decay fast.

PREPARATION

When food is being prepared, the scraps or "extras" get thrown out.

SERVING

After being served, whatever is brought back, is thrown.

User Research

9 INTERVIEW PARTICIPANTS

In order to evaluate our Problem-Solution fit, we asked restaurants, cafes and hotels:

- about their food usage
- their perception of the economic & environmental impact of food waste
- the 3 main causes of their food waste
- how they monitor food waste
- what type of food is wasted the most
- what percentage of food is wasted daily
- what they do with the food thrown away

Problem-Solution Fit

RESEARCH FINDINGS - SANT CUGAT

ENVIRONMENTAL CONSCIOUSNESS

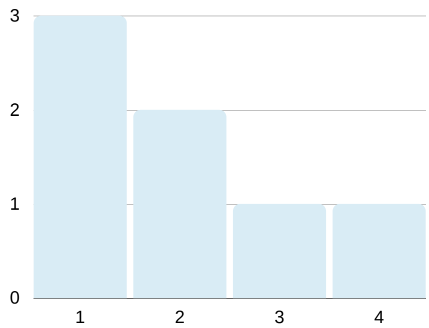
Everyone thought food waste is a problem

WASTE MONITORING

44% yes, 33% no, 22% maybe

ECONOMICAL IMPACT

Mostly respondents were not concerned



REASONS FOR WASTE

Rejected dishes
Excess Ordering
Appearance
Seasonal Menus

DECISIONS

Expiration date, leftovers, food state

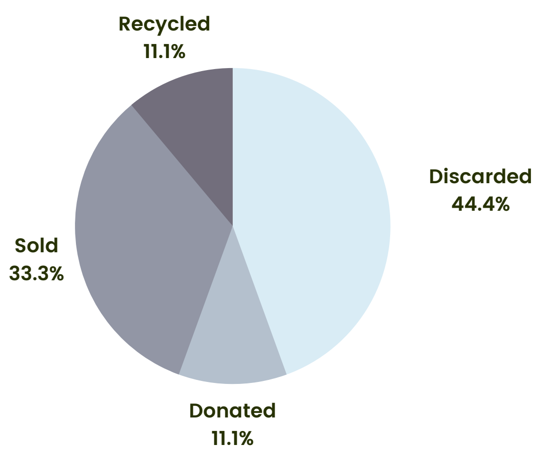
% WASTED

0-5% of food is wasted daily

FOODS MOST WASTED

Bread/baked goods, fruit/vegetables, fried foods, meat

OUTCOME



Solution Concept

SMART FOOD MONITORING

How might we... use ATTRACT technologies to provide a solution for enabling hospitality and food sector employees to have more certainty in the status of the food in their kitchens.

This will help them to rely less on (often arbitrary) expiration dates and more on smart technology in order to save food that isn't actually bad yet.

Basic Functionality

SENSORS

The tech will sense when foods are going bad through smell and infrared detection

INSTALLATION

The tech can be placed in fridges in any location and thus are easily adaptable to any kitchen

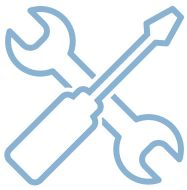
REPORTING

The sensors will monitor the fridge environments and provide reports and alerts to an app or a platform on the location of foods that are nearing expiration

Attract Technologies

IMAGE/LIGHT

- GASRAMAN
- SMARTOPSY
- TIMES
- SENSEI
- BIOPIC
- HYPERTERA
- THERMOQUANT
- STEMS
- GRANT
- ROTOR



VIBRATIONS

- PERSEFONE

ODOR

- SNIFFDRONE

CHARGE

- DETECT-ION

TEMPERATURE

- SPT-CAM
- T-CONVERSE

Addressing Challenge #3 –Sustainable Infrastructure

ENVIRONMENTALLY FRIENDLY

Helps save food from being wasted unnecessarily and thus addresses the CO2 issue

INDUSTRY FOCUSED

Targetted at the hospitality and food service industry but can be used in consumer and other settings too

TESTING

Questions for Testing

EFFECTIVENESS

How effectively do the sensors actually sense mold and bacteria?

USABILITY

How easy it is to place the sensors in a fridge and connect them to the app?

QUANTITY

How many sensors are needed for an average sized fridge?

TRUST

Would hospitality & food service managers actually trust the technology?

Preliminary Conclusions

FURTHER EXPLORATION NEEDED - OR A PIVOT

RECIRCULA SOLUTIONS

Sant Cugat is home to a local sustainability startup (launched in 2020/21) that allows them to sell food that's left at the end of the day (grocery stores, hotels, restaurants) through their app for a discounted price.

SANT CUGAT VS BARCELONA

A privileged part of the city that likely has more resources to focus on sustainability and more awareness. We anticipate that businesses in Barcelona may not be as fortunate in these aspects thus we **need further research**

> "Consumers can buy food left at a reduced price and help to reduce food waste, decrease CO2 emissions and help stop the climate crisis, and help the shop recover the cost for that food. For example, a food pack that might cost € 12 can be obtained at a reduced price of € 3.99. Then, if each packaging recycled gives 1 recycling point to the citizen, and 1 recycling point is equivalent to € 2, then by recycling correctly two packaging items, the citizen will be able to buy the food pack at discounted price.
> www.recirculasolutions.com"

Feedback Needed

TO PROVE THE PROBLEM-SOLUTION FIT

MANAGERS

People who make decisions on whether or not to implement a new tool in the business

BUYERS

People who make decisions on how much food is needed and when to order more

ENGINEERS

People who can advise on the feasibility and improvements for our solution

REGULATORS

People who can incentivize businesses to implement this technology

TESTING TIMELINE

We plan to begin testing as soon as we have a viable prototype, and allow stakeholders to experience the beta version of the solution.

Spring 2022	Summer 2022	Fall 2022
Research & Development	Prototyping	User Testing

THE PIVOT

Reasons for Pivoting

After a coaching session with the mentors and careful consideration of the various factors that would need to be validated in order to confirm the problem-solution fit, we decided that the problem was not big enough in the industry and primarily not interesting enough to solve. We had found a lot of research and potential solutions to the problem, so we felt that the problem was too explored, and no interesting new perspective on it could be found at this time.

We also weren't sure that the combination of technologies would be effective enough to accurately sense mold growing in a fridge, and we were very unsure that restaurants and bars and hotels, concerned with food safety regulations, would be trusting of our technology enough to use it instead of relying on the expiration dates.

Furthermore, multiple members of the group felt that our other original problem statement we had considered, the one about laundry water temperature, was a more interesting and relevant and S.M.A.R.T. problem to solve.

With exactly two weeks left until the presentation date, we decided to pivot...

FINAL PROJECT

SOAP

Sniffing Out All Pathogens

AI LAUNDRY SOLUTION

RESEARCH

PROBLEM

Fast fashion and textiles have, in recent times, become a hot topic in the realm of sustainability. Producing and using clothes costs a lot of energy and releases a lot of emissions. Of these emissions, 23% are produced by wearing clothes. Washing and drying clothes requires tons of energy, especially when these processes are performed at high temperatures. Thus, to put that in perspective, 0.9-2.3% of global emissions are caused by washing and drying clothes.

Besides the massive emissions, an equally worrying issue is the micro-plastics that have been discovered in plants, animals, and recently even in human lungs (National Geographic). The major contributor to this problem is the explosive growth of synthetic fibers such as polyester. Although these are argued to be more sustainable due to the reduction in the amount of water and land required to produce them compared to cotton, they release minuscule pieces of plastic while being washed and dried, especially at high temperatures (phys.org).

However, clothes are not the only things we wash. Texiles are washed in a variety of industries, from domestic use to hotels, nursing homes, spa & wellness or within the public sector where wearing uniforms is mandatory. To achieve some standard of hygiene, especially within industries such as hotels and hospitals, clothes and fabrics are washed at high temperatures to get rid of bacteria, microbial contamination, or stains. However, it is not always clear what the exact temperature of a wash should be, and it can heavily depend on the presence and amount of the above-mentioned factors and on the industry.

McKinsey estimates that reduced washing, such as, for example, lowering the temperature of each wash, can save up to 186 million tons of CO2 emission each year. That is 0.5-0.9 % of total emissions worldwide.

Washing clothes at high temperature accounts for 0.9-2.3% of carbon emissions worldwide and, in part, is a major cause of the microplastic problem. An estimated 0.5-0.9% of global emissions can be saved by making washing more efficient.

Magnitude of the Issue

About 90% of the energy the washing machine uses goes towards heating the water. Washing synthetic fibers in hot water too often deteriorates them faster, produces unnecessary CO_2 emissions and releases microplastics into the water. Most types of soiled clothing do not need to be washed in high temperatures - modern machines can handle your average dirty laundry basket, with the exception of tough protein stains such as blood. Additionally, liquid detergent lift grease and dirt more easily than powder at lower temperatures.

Reducing washing temperature

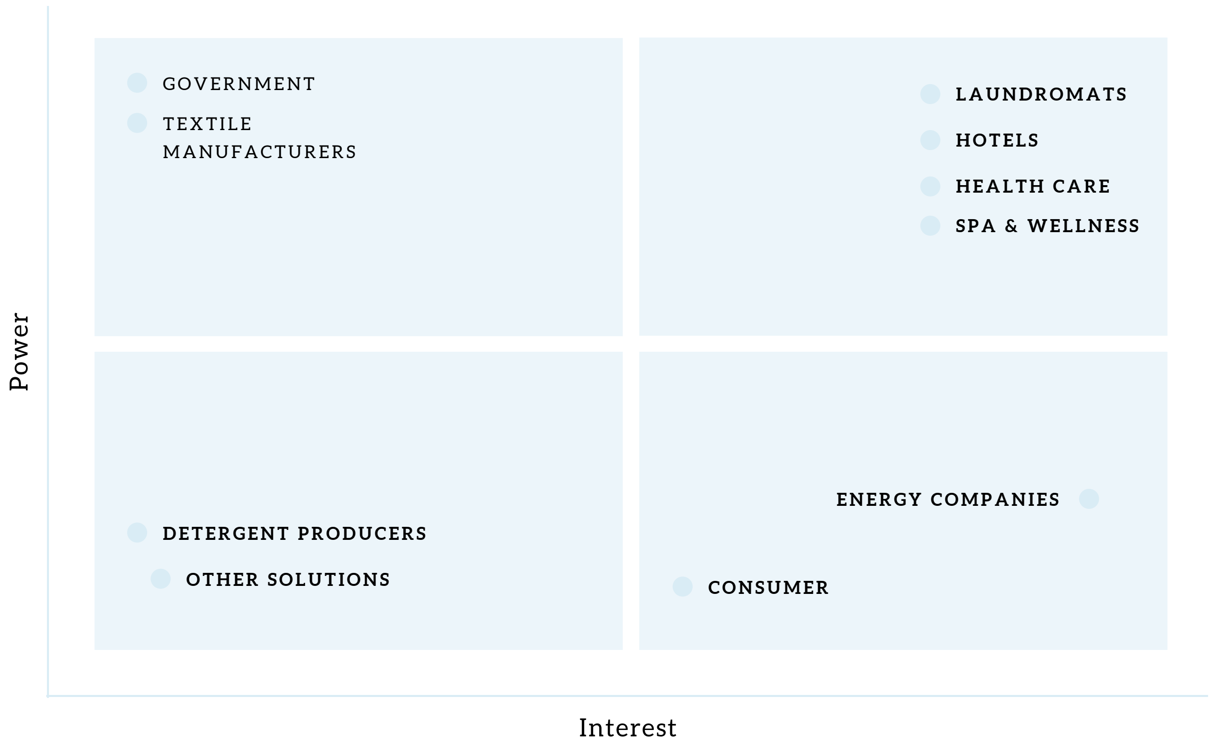
40° → 30°

Reduces energy consumption

- **~57% per cycle**
- **3.5M tons of CO_2 per year**
- **2 Million cars off the road**

60% *of laundry's carbon footprint comes from the washing temperature*

Stakeholder Map



LAUNDRY BASICS

Laundry is a form of cleaning that involves the removal of stains, soils, and other materials from clothes and other textiles. This can be done through the combined action of four factors: temperature, time, mechanical action, and chemical action.

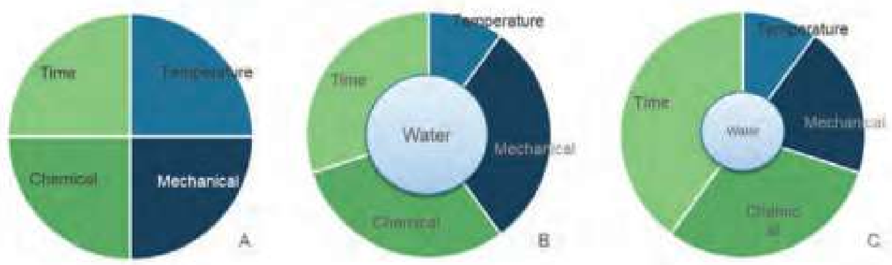
- **Chemical action:** The combination of detergent or other laundry chemicals with the soils on textiles allows the soils to be removed. The effectiveness of this chemical reaction can be increased through water temperature, the degree of friction between the textiles, and the duration of the washing cycle itself. Detergents can consist of various chemicals, such as surfactants, builders, polymers, and enzymes, which allow the soils to be loosened from the fabric.

- **Mechanical action:** Friction and pressure are created through the shaking and spinning of the washing machine drum, which allows water to be distributed (along with the aforementioned chemicals) throughout the laundry load and imitates a scrubbing action on the fabrics.

- **Temperature:** Generally speaking, when hotter water is used in laundry, detergents are better enabled to clean tough stains and heavily soiled materials. Hotter temperatures may also be necessary for proper sanitization of fabrics that are stained with pathogens or protein fluids, such as blood and urine.

- **Time:** The length of a laundry cycle also affects the cleaning efficacy due to the extended length of time that the aforementioned chemicals interact with the stains and soils on the textiles.

Dr. Herbert Sinner originally noted the relationships between these four factors as necessary to equal 100% when added together. Thus, if one factor is decreased (e.g. temperature), one or more other factors must increase in order to still attain the same degree of cleanliness. This can be seen in the charts below:



PATHOGENS

As mentioned, modern day washing machines are able to handle most dirt and grime with cold water. An equally important function of the laundry is the removal of pathogens that might be lurking on the fabric. Pathogens come in a multitude of versions, which all need to be considered.

First, bacteria are discussed. Naturally, bacteria can be found on any piece of clothing after wearing it. For example, bacteria which grow in the glands of the armpits, or which are found close to the genitals are the main culprits of body odors (Shelley et al., 1953). However, bacteria like salmonella can be found on clothes, towels, or sponges, E. coli can be found on undergarments, and certain skin infection causing bacteria can contaminate any piece of clothing after coming in contact with them (Abney, S. E., 2021). When storing fabrics before or after wearing (like in the closet, or the laundry basket), the number of bacteria might increase.

Secondly, fungi or mold commonly manifest themselves in clothes. They generally grow well in closed, humid, and dark areas, like the laundry basket. Fungi like Microsporum canis, which belongs to the group of dermatophyte fungi (fungi that grow well on the skin), can cause infections on the skin or under the nails (Abney, S. E., 2021). Most common household washing machines were found to host populations of several fungi on the machinery parts.

Third, a wide range of viruses have been found in fabrics. These included hepatitis A and B viruses, the herpes simplex virus, the SARS-CoV-2, the influenza virus, HIV, and the papillomavirus. The lifespans of these viruses heavily depend on the type of virus and the amount that has contaminated the fabric. Most enveloped viruses like HIV, the hepatitis viruses, the herpes simplex virus, and SARS-CoV-2, do not survive more than one day on cotton, but do survive longer on polyester, from 7 to 12 days, which thus does pose a concern for laundering (Abney, S. E., 2021). Enveloped viruses, such as the adenovirus, which causes the common cold, can last up to months at temperatures lower than 4 degrees Celsius, or for roughly a week at room temperature (Public Health Agency of Canada (2010)).

PATHOGENS

Lastly, helminths (worms) and their eggs can be found in clothing that has been in contact with feces. These are especially common in Europe and the United States. The eggs of helminths can survive up to 3 weeks on clothing and bed lines (Abney, S. E., 2021).

For each of these categories, different methods work well to inactivate them. This is important, as depending on the pathogen, lower temperatures can be considered for inactivation.

For bacteria, Cerf, Davey, & Sadoudi (1996) already provided a statistical framework for working out the inactivation rate of E.coli and other bacteria. Basically, the natural log of the inactivation rate of bacteria can be estimated as:

$$\ln(k) = C_0 + \frac{1}{C_1}T + C_2\mathrm{pH} + C_3\mathrm{pH}^2$$

Where C0, C1, C2, and C3 are coefficients that can be estimated, T is the temperature, and pH is the pH value of the water. Using tests, the coefficients for the inactivation rate of all bacteria can be determined which would give us a full model of the required temperature as well as detergent needed to remove a certain number of bacteria over time.

As viruses come in two categories two different models for inactivation are considered. For the enveloped viruses, using detergent was shown to be highly effective for inactivation. An example is the SARS-cov-2 virus, of which its envelopment breaks when applying some base solution. Non-enveloped viruses are harder to tackle and inactivation requires different techniques per strain of virus (Nims, & Zhou (2016)). For most non-enveloped viruses however, inactivation can be required at temperatures around 90 degrees Celsius for 1-2 minutes (Nims, & Zhou (2016)).

Regarding fungi, Hammer, Mucha, & Hoefer (2011) show that washing at 30 degrees Celsius achieves a 2.2-log10 reduction in certain strains of fungi and total reduction for others. At 60 degrees they found all fungi to be completely inactivated. However, they were not able to test more intermediate temperatures.

Lastly, helminths and their eggs are shown to die quickly at high temperatures or by exposure to base substances such as detergent (Espinosa, et al., (2020)).

PROBLEM OWNERS

Problem owners were classified in different categories. First, the hospitality sector (like hotels, spa & wellness, and sport clubs) is concerned with doing the laundry for two different types of laundry. Laundry that is created by the clients that make use of the hospitality and laundry that is worn by the staff members. For the first type of laundry, some standard of hygiene is required as it would be unacceptable if clients got sick due to cross contamination by means of the bed sheets. For the clothes of the staff, less caution is needed as these do not immediately come into contact with the guests.

More specific industries like restaurants, public sector institutions, or the army and the marine do the laundry to clean uniforms that come in regular contact with specific types of environments, and thus specific types of pathogens. Thus, a solution regarding the regulation of laundry would be sector specific.

The highest level of hygiene is needed within the healthcare industries. Just like hotels, hospitals and nursing homes have two types of laundry, those of fabrics used by the clients and those used by the staff. But in the case of the healthcare industry, it is known that pathogens are present, and it should be prevented at any cost that these pathogens spread. Therefore, extra care should be taken in designing solutions for these stakeholders.

Private users, for example within households, campsites, or universities, present another group of stakeholders. On a regular basis these groups can be exposed to pathogens in the clothes that they wear, however, this risk is irrelevant compared to the risk other industries face. Rather, this group is more concerned with the smell that certain sweat consuming bacteria and molds produce.

PROBLEM OWNERS

Clothes designers are also part of the problem. It was found that polyester is able to host pathogens up to 3 times as long as cotton. Clothes can be designed with specific materials that reduce the number of pathogens that can survive on them, which indirectly also reduces the temperature of washing that needs to be done for each wash.

Some detergent companies have already started developing detergent that can be used for lower temperatures. Harboring these technologies and integrating them with any possible solution created in this project could increase the benefits and effectiveness of the solution.

Lastly, washing machine producers also play a major role. The way a laundry machine is designed has a direct effect on the amount of energy it consumes. Some producers have found ways of designing programs that significantly reduce energy consumption.

The first four problem owners all contribute to the problem the same way: washing at high temperatures while this might not be needed for the specific laundry that they are doing. This is simply because the laundry isn't smart enough, and no information exists for determining the best settings for the laundry.

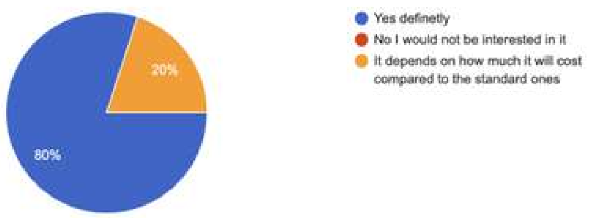
The quantity of laundry in these sectors depends heavily on the sector. For hotels, bed sheets and linen are cleaned after every guest, meaning that, depending on the size of the hotel, a hotel has more laundry. This is somewhat the same for hospitals, but then measured in the number of patients that are in the hospital. For longer staying patients/clients bed lines may be washed between every three days or on a weekly basis. Most hotels and hospitals wash at 90-degree Celsius in order to get rid of any possible germs.

The other group of problem owners contribute to the problem by designing the architecture that holds the need for high temperature washes in place. Solutions that allow low temperature washing can be created, but need adoption by the first group of problem owners in order for it to really take effect.

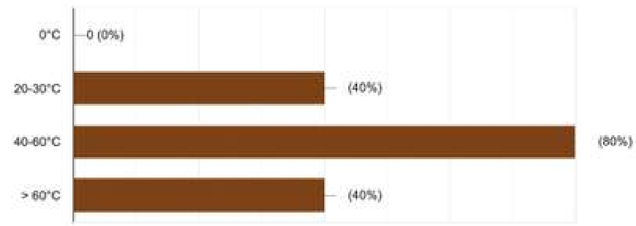
USER RESEARCH

To validate our assumptions, we created a survey and asked 17 different problem owners to answer our survey questions. We found that users overwhelmingly wash at higher temperatures than needed, and wash bed linens the most.

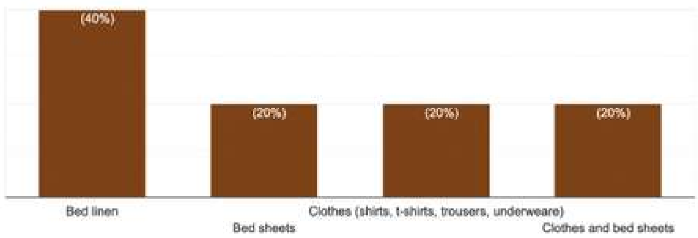
Would you buy a washing machine that would fully automated reduce the amount of energy used for each wash, depending on the type of clothes and how dirty they are?



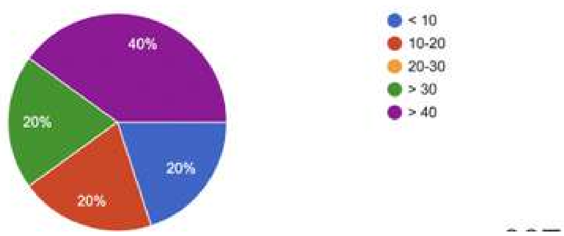
At what temperature do you usually wash?



What is being washed the most?

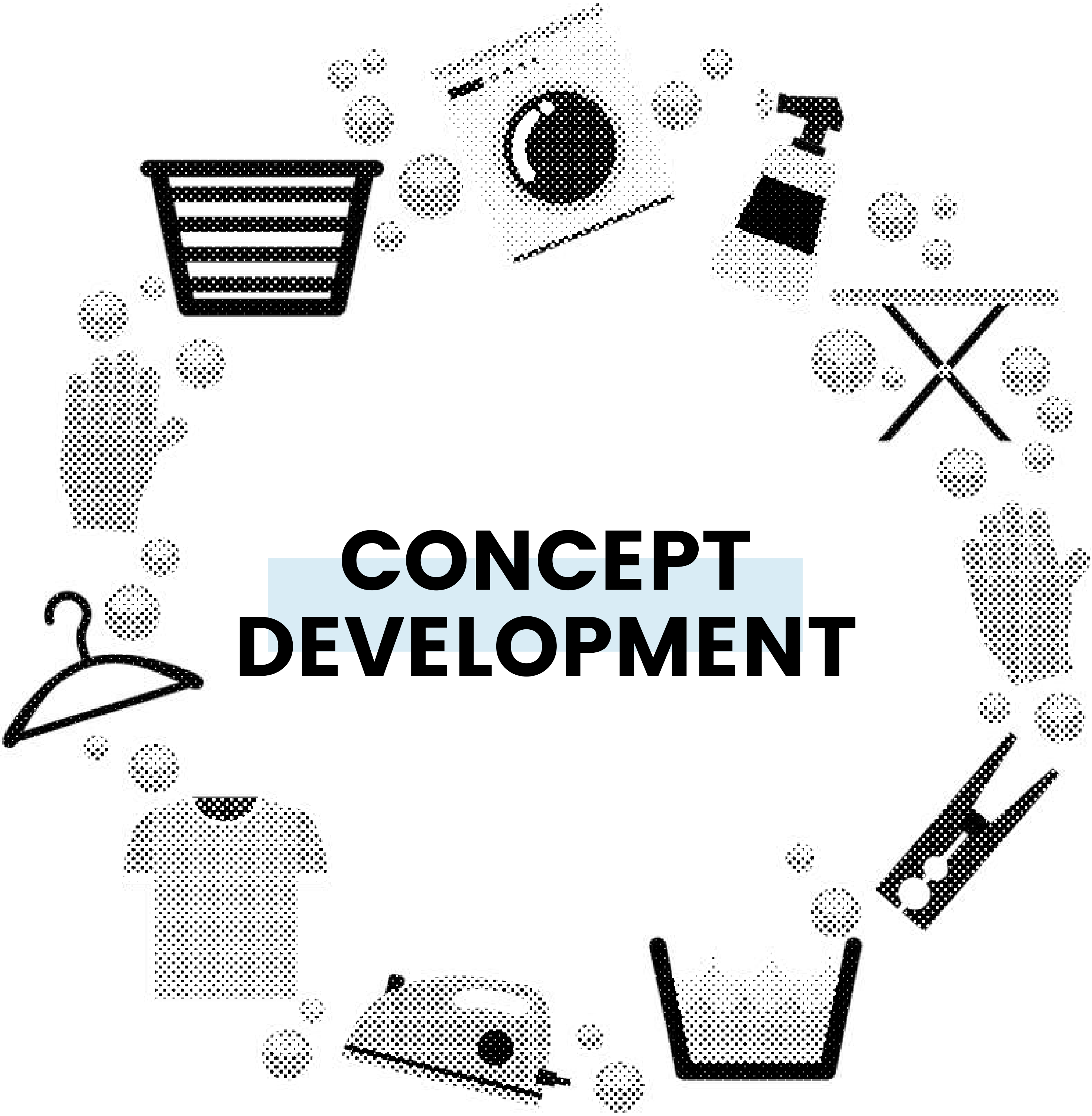


Can you quantify how much laundry do you regularly do (e.g. per room / per day). Ex.: 22 wash for the whole house/hotel a week.



THE CHALLENGE

How might we... use ATTRACT technologies to enable all stakeholders in the laundry industry to know the necessary temperature of water in order to clean their textiles?



CONCEPT DEVELOPMENT

TARGET MARKET

Laundry is done in a vast variety of different settings, businesses and industries - and saving energy and costs is certainly of interest to all of them.

- Hotels
- Spa & Wellness
- Restaurants
- Sports clubs
- Hospitals
- Campings
- Nursing homes
- Public sector institutions
- Laundromats
- Apartment buildings
- Industrial laundries
- Universities
- Cleaning companies
- Marine

Average laundry temperature varies from industry to industry, mostly depending on the types of soils and stains that occur on the textiles.

CURRENT STATE OF THE LAUNDRY INDUSTRY

We have found that each industry in which laundry takes place has different best practices for cleaning processes and the types of stains and soils on the fabrics. One common trend we see in the laundry industry is information hubs and documents. Laundry detergent producers have also hopped on this trend by starting to create new detergents that supposedly work better in cold water.

- New product lines with detergents designed for cold washes
- Partnerships with external partners to help spread the word (NFL, National Geographic, etc)
- Information hub on websites about cold temperature washing
- Social media campaigns promoting the initiative (hashtags, sweepstakes and contests)

THE SUSTAINABILITY CONSORTIUM™

CDC CENTERS FOR DISEASE CONTROL AND PREVENTION

aci american cleaning institute® for better living

AHLA AMERICAN HOTEL & LODGING ASSOCIATION

- Best practices documents promoting sustainable washing and cleaning
- Digestible websites with regulations laid out in an understandable manner
- Annual reports on sustainability and usage statistics
- Resources available to organizations on how to improve sustainability and/or improve cleanliness

EXISTING SOLUTIONS

Throughout our extensive research on existing similar solutions on this topic, we have only found two relevant solutions already on the market:

AQUEOUS OZONE SMART LAUNDRY SYSTEM

System that can be attached to any laundry machine that mixes organic solution with cold water to replace laundry detergent

SMART WASHING MACHINES

Washing machines that can suggest the time and temperature needed for washing based on fabric selection and weight

OUR SOLUTION

POSSIBLE SOLUTIONS

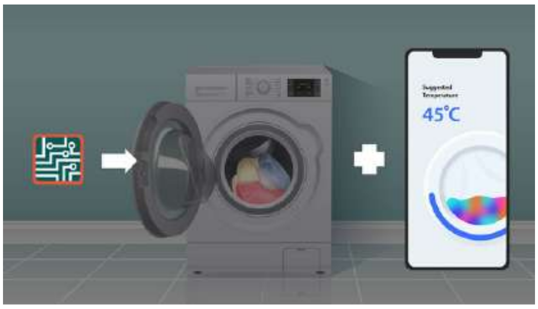
We foresee the technological solution to be possible in the following three ways:

No. 01 – Perforated Sphere & App

This solution is the least technically complex, compatible with any existing laundry machine, and can be reused from machine to machine. It includes a sphere that houses the sensors and an app that relays information and suggestions to the user.

No. 02 – Installed Sensors

This solution requires installation by a mechanic into the hole of a drum of an existing washing machine. The sensor will sit inside the machine and work with an app that relays information and suggestions to the user.

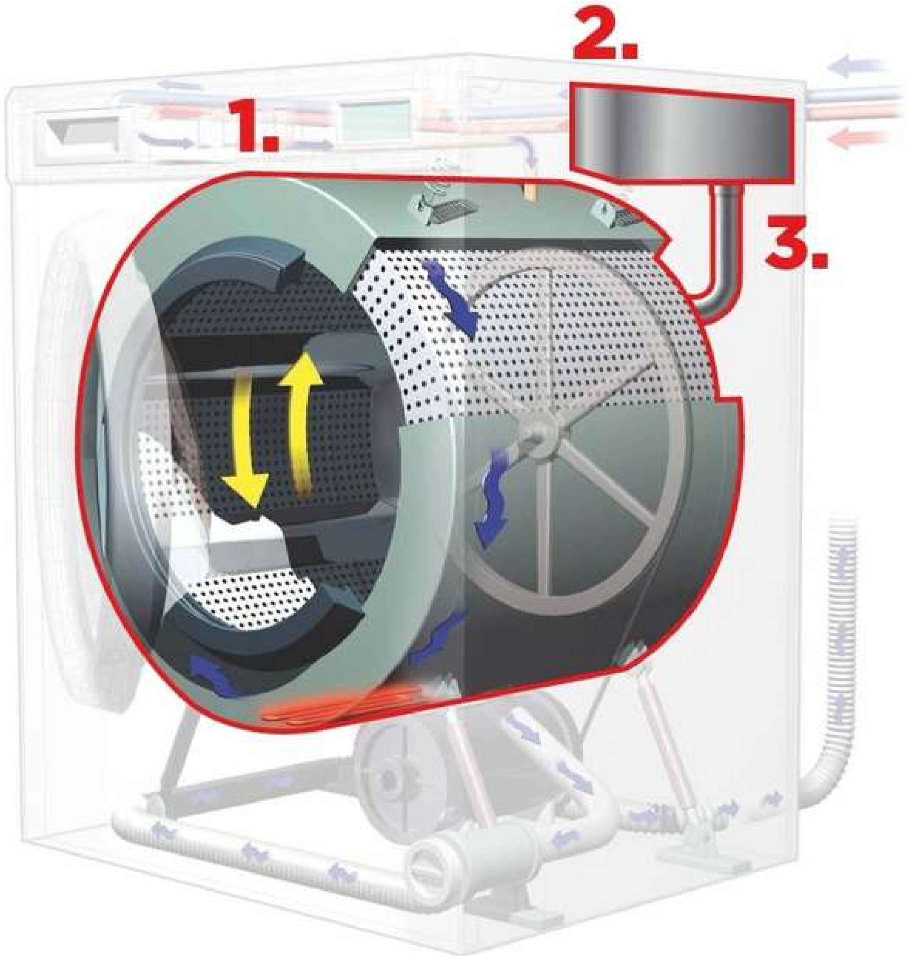


No. 03 – Smart Washing Machines

This is an intrapreneurship solution that would involve selling our technology to washing machine companies. They would integrate the solution into their machines, and sell the machines with the app that would relay information and suggestions to the user.

HARDWARE

The most feasible solution consists of integrating washing machines with the SNIFFDRONE sensor. A tube (3) connects to the drum (1) of the washing machine through which the gasses can detected by the sensor (2). The tube can close during the washing as not to damage the sensor with water.
The sensor streams the data it finds to a micro computer which can, using an efficient AI determine what pathogens are present in the laundry within mere seconds. The micro computer can then set the optimal temperature for this specific laundry.



NEXT STEPS

In order to successfully deploy the proposed technology, a handful of testing phases need to be passed. These are described below.

No. 01 — Research on pathogens

More research and mapping are needed to get a good overview of all pathogens and how to best tackle them in the laundry. Different pathogens secrete different kinds of odors, which need to be well understood before being able to detect them with an odor sensor.

No. 02 — Training AI

The AI component of the technology needs to be trained too. As the sensor will be exposed to sniffing out multiple odors, the machine learning models that might be employed have to be trained on multiple inputs. At the same time, as the technology is managing the temperature based on four different types of pathogens, it needs to make predictions for each of these. Therefore, not one, but multiple models might be employed, which might not all be of the same nature (I.e., one can create decision trees, linear regressions, statistical models, or neural networks). These need to be trained and fine-tuned in order for them to be deployed.

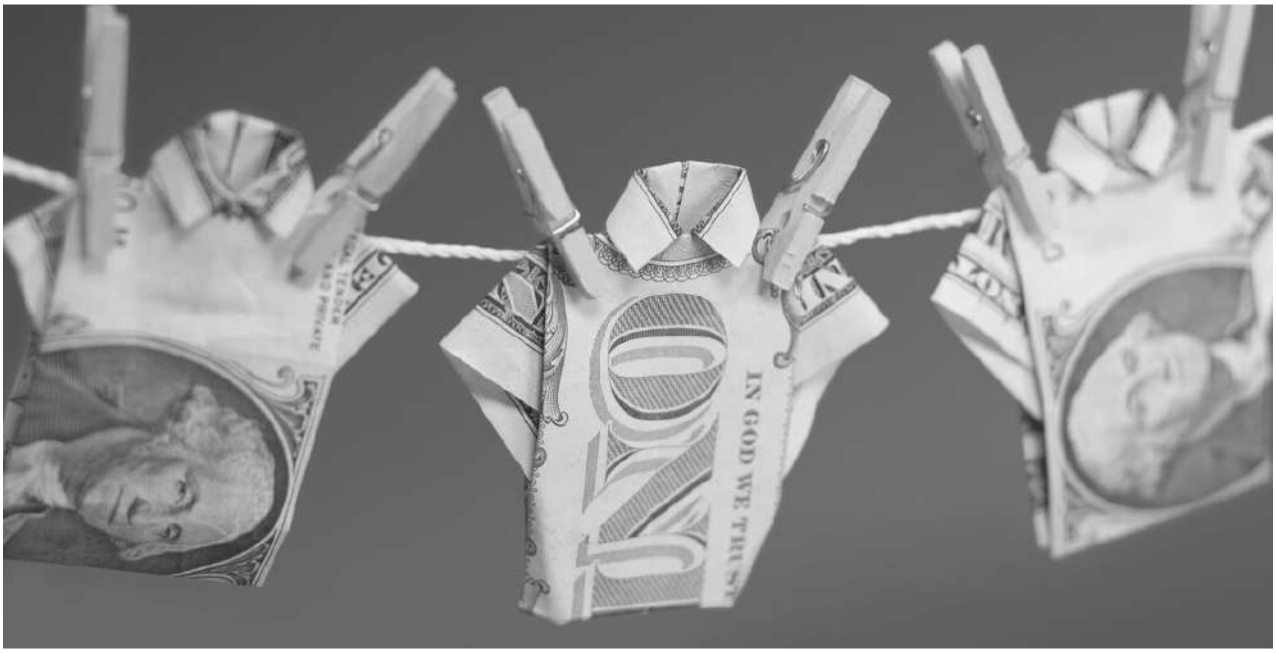
No. 03 — Testing

There needs to be rigorous testing in order to be assured of the required inactivation of all pathogens. This might be dependent on the specific sector in which the sensor is used, it simply does not make sense to employ a technology that is geared towards hotel workers in a restaurant, where meat related bacteria are more prominent

No. 04 — Optimization

As lowering the temperature of a wash might imply longer washing time, a trade off needs to be found between temperature and time. It should be obvious that a wash of 30 degrees that takes 3 hours costs more energy than a wash of 90 degrees that takes 1 hour

BUSINESS PLAN



SOAP: AI Laundry Solution
CBI4AI 2022

BUSINESS MODEL CANVAS

Key Partners

- Software developers
- Hardware development companies
- Investors
- Supply chain partners
- Designers
- AI Experts
- Marketing Team

Key Activities

- Software development
- Hardware Develpoment
- Sales
- Post. Sales Services

Key Resources

- AI Experts
- Life Sciences Experts
- Software Developers
- Hardware Developers
- Engineers and workmen for maintenance

Value Propositions

- Reduction in carbon emissions
- Reduction in water consumption and water pollution
- Reduction in consumption of electricity

Customer Relationships

- Customer Service post sales
- Long term
- Using consumer data

Channels

Sales
- Direct Supply from Manufacturer to customer
- Differrent channels ship/air/truck depending on locvation of customer and consignment size

Post Sales Services
- Office
- Workshop

Customer Segments

B**2B**
- Hotels
- Hospitals
- Industrial laundries
- Spa/wellbeing centres
- Sport Centres
- Nursing homes
- Laundromats
- Cleaning Companies
- Camp sites
- Apartment buildings
- Universities
- Marine
-

B2C
- **Retail Customers**

Cost Structure

- Software development
- Hardware Develpoment
- AI experts and Engineers on Payrolls
- Selling Activities
- Post sales services
- Prototyping

Revenue Streams

- Device Sales
- Service part sales

VALUE PREPOSITION

No. 01 — Reduction in carbon emissions

As described earlier, washing clothes at unnecessarily high temperatures and for longer periods, leads to high amounts of electricty concumption thus emmiting more carbon emissions

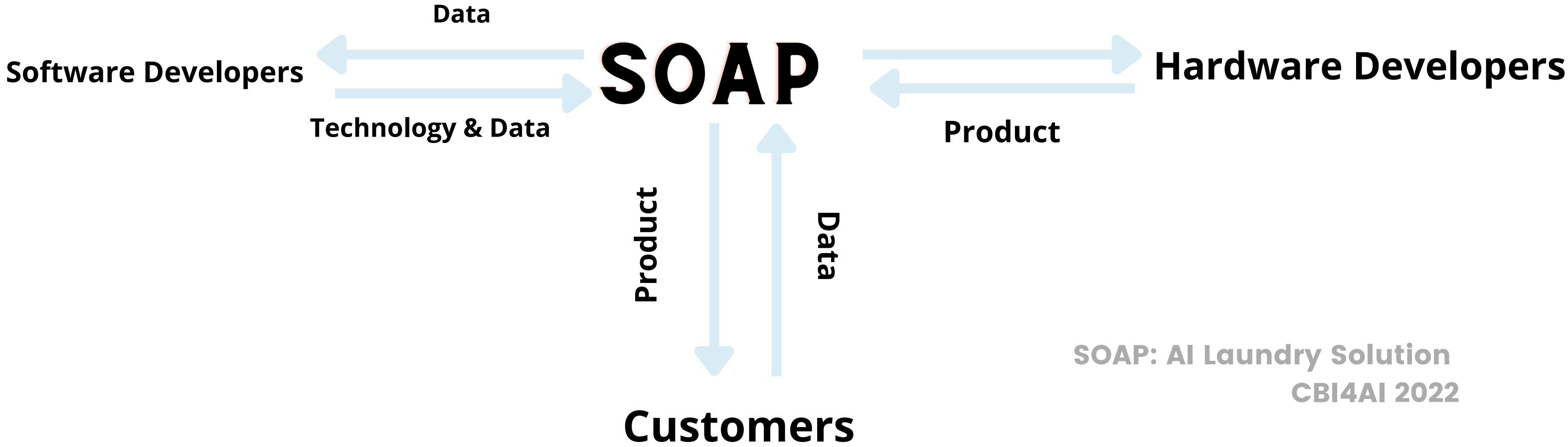
No. 02 — Reduction in water consumption and water pollution

To help give your audience an overview, this section can include a brief description of the goal, its relevance to your sector or industry, and the specific sub-targets your organization is addressing.

No. 03 — Reduction in consumption of electricity

To help give your audience an overview, this section can include a brief description of the goal, its relevance to your sector or industry, and the specific sub-targets your organization is addressing.

BUSINESS MODEL DIAGRAM



REVENUE STREAMS

To sustain a new product and company, it is essential to have multiple streams of revenue. Therefore, following are our planned channels of revenue

No. 01 – **Sales of Device**

The primary revenue stremas would be from sales of device target consumers

No. 02 – **Subscription Fee**

After a certain free trial period, we intend to charge the customers a periodical fee to continue using our technology service

No. 03 – **Post Sales Service**

Service of the product and sales of spare parts once the product is in continuous usage

No. 04 – **Tech and Data Sharing**

Our patented technology to detect bacteria and the data collected fro various consumers can be shared with other companies to generate data

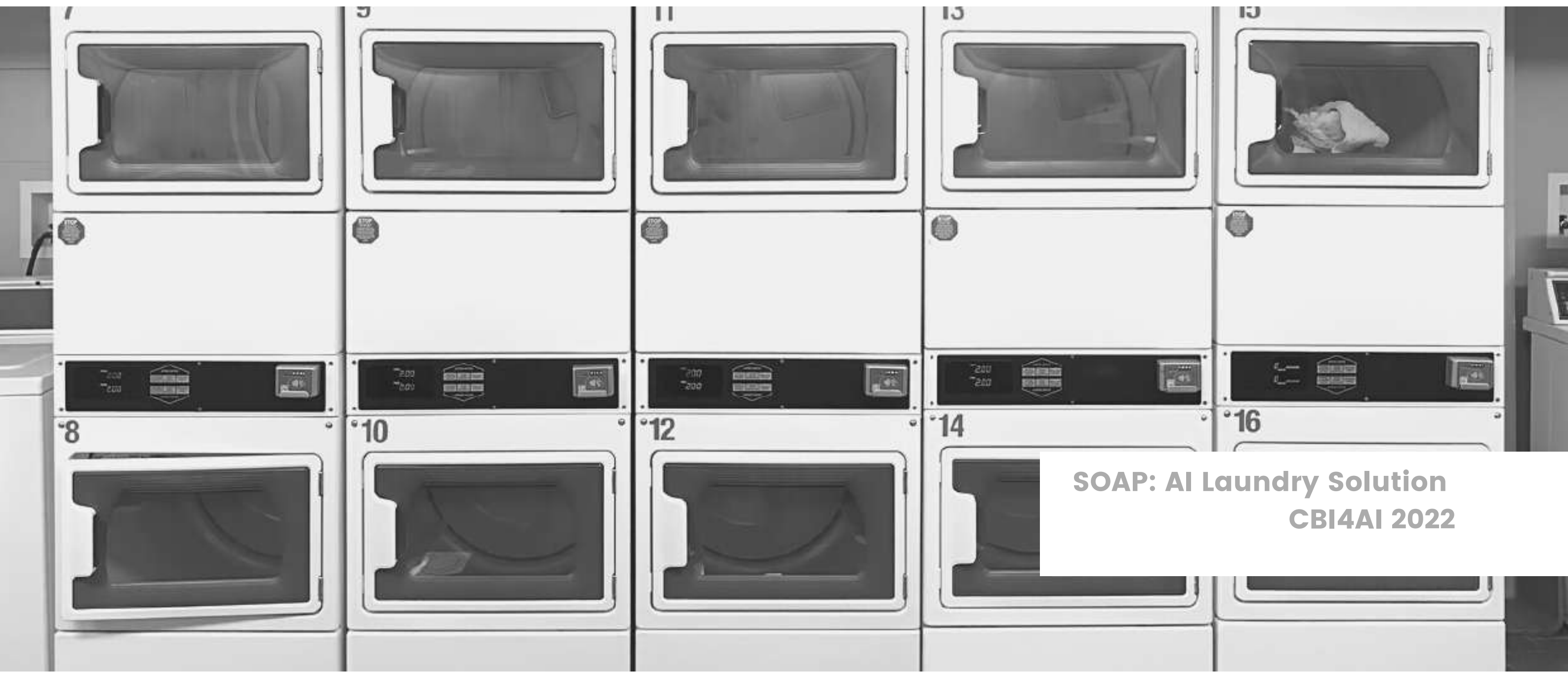
BENEFITS & BARRIERS

BENEFITS

- No other similar product
- Can be used very easily with existing machinery
- Economical solution
- Solution to an untapped problem

BARRIERS

- Reluctance from workers to make an extra effort to use our system
- literacy level of workers in the laundries to operate monile applications level
- communicating to the people the need of our product



PRODUCT ROADMAP

1

Q2 - Q4 2022

- Concept and Technology Development
- Prototyping Device

2

2023

- Hardware Development
- Technology Refinement
- Scaling up the scope of the technology

3

2024

- Development of User mobile App
- Beta Testing
- Commercial Production of Device

4

2025

- Commercial Launch

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE

IMPACT

Our solution addresses our Sustainable Development Goal (#9: "Industry, Innovation & Infrastructure") because it focuses on a variety of industries that are reliant on cleaning textiles for various purposes. Additionally, this solution is impactful not only in the industry scope but can also be used in a household context in order to allow consumers to optimize their energy use as well.

0.5-0.9% of global emissions can be saved by making washing more efficient

After a certain length of washing, the energy needed to run the washing machine outweighs the energy saved from washing on cold

Another suggestion would be to measure the impact of using the newly created cold-temperature laundry detergents in combination with our solution

With the implementation of our solution, we see a brighter and cleaner future ahead. Many different industries can save energy and money by being able to better predict the necessary washing temperature of their textiles, which will in turn decrease worldwide CO_2 emissions.

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