WET - Water Efficiency Tool

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I - Abstract

House owners that have tight schedules or have a busy lifestyle tend to forget to monitor their houses properly. For example, they forget to close a water tap after using it. To check every water tap is closed properly or to make sure you are not using your water recklessly consumes time and requires a family member to be at the house. Therefore, our team is trying to develop an application (app) that monitors the water consumption in real time. The app not only provides real time monitoring but also provides users with consumption history, consumption limits, leakage detection, and consumption forecast. The primary goal of this app is to enable a user to monitor the water usage through a mobile application. This would help people structure their water usage more efficiently and change habits of consumption.

II - Role Assignments

Role	Project Member	Description
User	Oumniya	Users are people owning a home equipped with appliances that include the necessary sensors and internet access. The User role should help the team better analyze what features are actually useful and to judge the current user experience.
Customer	Takara	A home appliance company that wants to give their users the possibility to manage their appliances by using WET would be our customer. This role will help in creating a product that could actually be sold and generate profit.
Software Developer	NIklas	The software developer thinks, designs, and realizes the software in general. Their goal is to implement all the requirements.
Development Manager	Hugo	Developer Manager is the person in charge of supervising their team's work throughout the app's development. They should have a good overview over what features are being worked on and by whom.

III - Introduction

-Motivation:

Managing water consumption is vital for life preservation. Better knowing one's water consumption at home can have a great impact on water saving. Even families could change habits of consumption. Reports have warned of an impending global water crisis due to surging population growth, climate change, reckless consumption, and chronic waste. We hope to help people to use water more responsibly to help stop the global water crisis.

While trying to do some research on similar apps, we were not able to find that many existing projects. Thus, we are motivated to provide a solution to this problem.

Our application provides some features that help the user to monitor their water consumption in real time, let users know their consumption history based on day, weeks, etc. Also, the app let users limit their usage so that they could save water and money and even gave them the consumption forecast, so that they could change their habit if they are using water recklessly. As a result, we hope that this application will help the problem of the water crisis that is currently happening in the world right now.

-Problem Statement:

The Water Efficiency Tool is a project hoping to help people monitor and manage their water consumption. In this form we envision the application user to actively monitor their water consumption, and if there is any water running for an unusual duration the app will give you a notification about it, and you can remotely close the central water supply to make it stop. In other words, the Water Efficiency Tool is a project that aims to assist people in tracking and controlling their water usage. In its current form, the application allows users to actively monitor their water usage. If any water is left running for a length of time that is unusual, the app will notify the user and allow them to remotely shut off the main water supply to stop it.

Saving water or using water with responsibility is something that has been going on for years, but to actually do it or to encourage people to do so is a hard thing to do. Because excessive water use can go unnoticed. Water bills are relatively cheaper than other utilities. Compared to other problems, benefits of reducing water consumption are not necessarily felt by the individual. And many people don't believe that individual actions can make much of a difference compared to the amount of water lost through leakages. As a result, some other parts of the world are having a water crisis and shortage.

-Related Software:

1. *Dropcountr*[1]

This app lets you know how much water you are using and sets benchmarks for conserving with this new web and mobile app that tracks water usage in real time and sends a usage warning to your device or smartphone if you're nearing overuse. In addition to that, the app connects to local utility companies and water districts to help users track water consumption. Adding to the daily tracking feature, the app sends users alerts on rebates and other preventative water-waste actions. App downloaders can also take advantage of the utility poke, which locates your water district and contacts them requesting user data.

2. *Drip Detective*[2]

Drip Detective is an application tells you how much water and money is going down the drain by timing leaks or measuring volume, then calculating the cost of your water leak by day, week, month, and year, in other words, by timing leaks or measuring volume, the application Drip Detective estimates how much water and money are being wasted. It then calculates the cost of your water leak by day, week, month, and year.

3. *Klima*[3]

Klima is a climate app that allows you to offset your emissions, reduce your carbon footprint and multiply your carbon impact. To do that, the app calculates a member's annual carbon footprint by asking them 9-10 lifestyle questions, including how they eat, whether they have a car, or how often they take a flight. These factors are used to calculate the user's estimated carbon footprint. It is not exatcly what our app will look like, but the purpose of the app is quite similar, which is trying to help the world.

4. *Kill-Ur-Watts*[4]

It is an application that permits residential customers to view, track, and manage their residential electricity use over time. This application utilizes common industry-based concepts and third-party data to empower residential users to make informed decisions on energy reduction strategies and implement common-sense energy efficiency improvements. Kill-Ur-Watts allows users to view hourly, daily, and monthly home energy consumption profiles and use social media outlets to challenge other users to reduce energy consumption. These 2 features are quite the same features that we are going to have on our application, which are to track our water

consumption as well as our gamification, where we could share our achievement that we get for using water with responsibility to our social media.

5. *Nest*[5]

Nest is an app that lets you control the thermostat, alarm system, and camera. The approach of this app is quite similar to our app, which is trying to control the unused water. For example, from an unclosed water tap.

IV - Requirements

1. User Registration

A new user should be able to register themselves on the app. To do that they need to provide the following information:

- Full Name
- Address
- Country
- Phone Number
- Email
- Password

The user's email or phone number should be verified to ensure their authenticity. The set email or phone number together with the given password will be used to authenticate and login the user.

2. User Login

After a user has been successfully registered they should be able to log in to the app with their email or phone number together with the correct password. Only when logged in should the user be able to access, manage or change their home's information.

3. Device Registration

Home appliances that include the necessary wifi capability as well as the sensors to capture the information relevant to the system should be able to be registered in the app. To add a new device, the user must be logged in and connected to the same network as the appliance to be added.

4. Modifying unit and language settings

The user should be able to modify the unit settings. For the volume of water, the user can change the metric by liter, cubic meter or gallons. The user can also choose which currency to display, and the app language.

5. Real Time Monitoring

A user should be able to monitor their water consumption in real time. The App should be able to display what devices are currently using up water and at what rate. This would give the user the comfort of knowing that there is no unexpected or wasteful water usage.

6. Consumption History

The App should display and visualize the homes past water usage over different time periods:

- 1 day
- 1 Week
- 1 Month
- 1 Year
- All

The user should be presented with the hard numbers as well as visual representations in the form of charts and graphs.

7. Consumption Limits

To help the user save water and money, they should be able to set a limit for the time frames:

- daily limit
- weekly limit
- monthly limit

They should be able to set the limits based on the amount of water or cost.
Once a limit is reached, the user should be notified of that.

8. Leakage Detection

The Application should alert the user if an appliance is using up water for an unusual duration or at an irregular rate.

9. Remote Control

When leaving for a longer duration of time, the user should be able to remotely close the central water supply to not use any water. If appliances can be separately disabled, the user should be able to disable them separately.
If any water is used despite the appliance or the central water supply is dissabled, the user should be notified.

10. Consumption Forecast

This feature helps the user to predict its water consumption for the next week. When the user clicks on this, they should be able to see the

volume of water they will most likely consume the next week based on the previous week's water consumption.
The user can also click on the cost prediction button that will display the predicting cost of their water consumption for the next week based on their previous week's water consumption.
The user can also select the time frame of the prediction and get either a week, a month or a year prediction.
This feature will help the user to adapt its consumption to prevent over consumption usage of water.

11. Gamification

When the user is clicking on the badges button, it will display all the badges and achievements they made using the apps. These can be earned by using the app through the time. The badges and achievements will reward the user for consuming water responsibly, according to government laws and international recommendations (COP21, GIEC, etc.). The user will be able to share their achievements and badges on social media such as Twitter, Instagram and Meta.

V - Development environment

1. OS

We are going to develop applications on Windows using mac OS and Windows as our main development platform. Windows is a good choice for programming since it provides many programs, language, and also has a really good IDE, Visual Studio. And the whole Windows development stack is amazing. However, MacOS is also a good option for someone that works on a back-end server because it's based on Unix and runs nearly all Linux software.

2. Services

One Service that will be used is a server hosting provider. The backend software, as well as the database would be hosted online.

3. Languages

We have decided to use GO to create an API to manage a SQL database. For the main application, Flutter and Dart were selected. With Flutter, a cross platform application is possible.

4. Development Environment

We have not yet decided on any specific Development environment for the front and or backend

5. Software In Use

Since we have not yet started development, we have not yet used any software.
The following software will probably be used:

- Database Management
- Mobile Phone Emulator

VI - Specification

1. User Login page

When the user opens the app, he will get the login page. They can either create a new account by choosing the register option, or login if they already have an account.
To log in, the user has to fill in his mail address or phone number, and his password. They can also check the "Remember me" mark to stay connected every time the app is closed and reopened.

2. User Registration page

When choosing the register option, a user should fill in personal information such as full name, address, country of residence, phone number, email, and finally choose a password. They will receive a SMS confirmation to confirm the creation of their account.

3. Modifying unit and language settings

After registering a new account, the user will have to select some settings according to its country and metrics regulation, such as litter, cubic meter or gallons for the volume metric. They also have to choose the language they want to use as well as the currency such as US dollar, Euro, KRW, etc.

4. Device registration page

After choosing the settings, the user will have to register its house and the home appliance devices into the app. In order to do that, the user has to be connected to their Wi-Fi network, and then the app will automatically find all the compatible devices connected to the house's network. Then, the user can manually remove any device if it's not a relevant one.

5. Main page

After finishing registering everything or logining in, the user will get to the main page. On this page, the app will display a statistical overview of the relevant happenings. This overview should include:

- That days water usage
- Appliance status
- Overview if daily, weekly or monthly usage goals have been failed or how far away from failing the user is.

On the bottom part of the screen, there are multiple tabs that allow the user to switch between the different pages. These are all other pages described in this document.

6. Consumption History page

The first tab in the bottom bar is the consumption history page. The user will see a line chart showing water consumption over the time. The user can modify the time frame of the chart: last day, last week, last month, last three months, and last twelve months. The user can also choose the graph type among: line chart, histogram, and stacked area chart. Finally they will be able to click on a checkbox that shows the consumption of each device connected to the app, by giving a different color for each. The consumption is shown as float numbers and the graphs are updated every 10 minutes.

7. Consumption limits page

The second tab is the consumption limit page. On this page, the user can select a global consumption limit (integer only) and the limit time frame among one week, one month, three months and one year (one month by default). They also can choose how to get the notification when consumption is going over the limit: by phone notification and/or by email (phone notification only by default).

8. Leakage detection page

On the third tab, the user can select a time frame according to the period of the day when nobody is using water at home (during the night, during work hours, etc.). They also can select a holiday period. In both situations, if water usage is detected by the app, the user is notified by application notification or by mail. On this page we also can see the history of the previous alerts of water usage.

8. Remote control page

On the fourth tab, the user can see a single button that allows him to turn on and off the central water supply remotely.

9. Consumption forecast page

The fifth tab shows the user the volume of water (integer) that they will most likely consume at the end of the week as well as a line chart that shows the evolution of their water consumption.This consumption forecast is calculated by an algorithm based on previous week's consumption and current week's consumption.

10. Real Time Monitoring page

The last tab available is the real time monitoring tab that allows the user to check their real-time water consumption (updated every minute). It will show the water volume (integer) as well as a line chart that shows the evolution of the water consumption over the last three hours.

11. Sidebar menu

On the left hand corner of the app, the user can click on a home button that opens a sidebar menu where they can access on the profile page and settings page. There is also a red button to disconnect from the account.

A. Profile page

On their profile, they can see a summary of their statistics. Under this summary, the user will be able to see all the badges and achievements they made since they started to use the app.

B. Settings page

On the settings page, the user can modify all of their settings, such as the languages, the currency, or the metrics. The user can also modify his private information such as the password, the phone number, the address and the country. Finally the user can choose to disconnect from their account or even delete it.

Citations

[1] ”Dropcountr.” Dropcountr, https://www.dropcountr.com/
[2] “Drip Detective.” DevPost, https://devpost.com/software/drip-detective
[3] “Klima.” Klima, https://klima.com/
[4] “Kill-Ur-Watts”, DevPost, https://appsforenergy.devpost.com/submissions/7967-kill-ur-watts
[5] “Nest.”, Nest, www.nest.com

TODO List

- Backend Infrastructure:
  - Decide what provider
    - None, do local first
  - Decide what language
    - Go + some DB
- Frontend
  - Decide what framework
    - Flutter + Dart
- Repo
  - Create repo → done
  - add everyone → waiting for oumya to send email
  - create README → done
- Documentation
  - Move to latec
  - Move to github repo
  - Development environment
  - Spécification
    - metrics
    - number of measurements
    - number format
    - etc.

Check on AWS EC2 services

Start checking the UML and the functionality

Gantt graph -> maybe later?

Make weekly updates on github

Prof needs to see code and screen, we should go to his office

We agree on tools we want to use

Prepare highlights -> the best function, the most uncommon, the one we want to show first (for example don't show about login function cause it's not impressive, everyone has it)

Prepare for a demo with the highlights

Use a login function/module that already exists and not build a new one (big loss of time)

Using WebOS? (only for TV?) -> VS Code extension

No need to be perfect (it's ok if not professional)

Specification: about metrics, number of measurements, how often do we measure, using floating numbers or integers?