



**eTEACHER**  
**Empowering Energy Education**

eTEACHER

**D3.5: Advisor Smartphone**

*WP 3, T 3.*

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eTEACHER

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**Disclaimer**

*The information reflects only the author's view and the Commission is not responsible for any use that may be made of the information it contains.*

**Technical References**

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<sup>1</sup> CO = Confidential, only for members of the consortium (including the Commission Services)



### Versions

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## 0 Introduction

The eTEACHER concept consists of encouraging and enabling energy behaviour change of building users by means of continuous interventions displayed through a set of empower tools to drive informed decisions in order to save energy and optimise indoor environment quality. These empower tools are a set of ICT solutions that ensures friendly connection in between end-users and building systems, implement continuous behavioural change interventions and provide tailored advice.

The tools can be classified into:

- The **BACS add-ons** (What-if-Analysis, data processing and universal BACS/monitoring system interface)
- The **user-friendly solutions**

The user-friendly solutions are energy efficiency and comfort advisor apps for end-users devices, like mobiles or web, which are developed in WP3. These apps show the ECMs identified by BACS-addons and integrates ICT-based behavioural change techniques such as gamification (games, challenges, bonus system, energy literacy, energy visibility, etc.). It implements innovative, interactive, user-friendly and customizable empower tools to encourage behavioural changes and to facilitate the execution of tailored energy interventions which result in a significantly enhancement of energy efficiency. As in WP2, WP3 received knowledge and support from WP1's social experts.

This deliverable is about the final prototype of Task 3.2 Energy Efficiency and Comfort Advisor Devices and partly the UI functionality of T3.4 Gamification Aspects and Energy Reduction Bonus System in WP3. The user friendly advisor is the result of all tasks in WP3, orchestrated by T3.2. T3.2 is mainly communicating with the prototype described in this deliverable. Both prototypes work closely together to share a joint code base. Task 3.1 focused on the creation of the advisor core elements. It is fully independent of the device and transfers core recommendations based on the WP1-2 outcomes. Based on this, task 3.2 created platform specific versions.

The advisor can be used on multiple devices and can be accessed through the following possibilities:

- Website: <https://eteacher-app.ascora.eu/>
- Android PlayStore: <https://play.google.com/store/apps/details?id=de.ascora.eteacher>
- iPhone AppStore: <https://apps.apple.com/us/app/eteacher-project/id1485405835>

### 0.1 Deliverable Purpose, Scope and Context

The purpose of this deliverable is to accompany the prototype implementation of T3.2 and the visual part of the gamification from T3.4. As such, its main purpose is to briefly clarify the scope of the prototype and to show the download and installation instructions of the software. The document is limited in length as the main focus of the task is the software itself rather than its accompanying document.



### 0.2 Document Status and Target Audience

This deliverable is qualified as confidential in the Description of Action (DoA), for this reason the information gathered and their distribution is mainly for the consortium members.

### 0.3 Document Structure

This deliverable is broken down into the following sections:

- Section 0 (Introduction) provides an introduction for this deliverable including a general overview of the project and outlines of the purpose, scope, context, status and target audience of this deliverable.
- Section 1 (Scope and Relationship) clarifies the context and scope of the software prototype deliverable and its relationship with other architectural modules.
- Section 2 (State of the Prototype) gives a brief overview about implemented features and the current state of the provided prototype
- Section 3 (Requirements and Preparations) outline the prerequisites, installation instructions and methods to use the software component
- Section 4 (Limitation, Research and further developments) shows the limitations of the current prototype
- Section 5 (Summary and Conclusion) gives a brief summarization about the component and this document.





## 1 Scope and Relationship

The Advisor (T3.2) works as a visual central entry point for eTEACHER users. It mainly interacts with the core module (T3.1), which provides a lot of functionality, which can be accessed by the Apps of T3.2. Figure 1: eTEACHER Software Component Overview is showcasing the general structure and the Advisor App is located.

After the successful authentication as an eTEACHER user, it provides access to the data and recommendations produced by other eTEACHER components. Thereby, it does reduce and convert the information and make certain things more accessible and further limits the information to data, where the user is allowed to see them.

Further, real time push notifications are received from the Advisor, and shown in the app or if the app is closed as heads up notifications. So a user can react directly, if a recommendation is created by WP2 WiA. Further, informations like gamification and so on are shown as well.

The different modules of this component are shown in Figure 3 and Figure 4. In case of T3.4, just a part of it is part of this deliverable and that part got highlighted in the diagram. The provided diagram shows an UML Package Diagram and shows the inner architecture of the component and its connections to other external components. The website on the other side is hosted in the UI docker container, which is illustrated in the server infrastructure of WP3 in Figure 2. In that picture, the instances where the component is running is shown, as well as the used frameworks of that component.

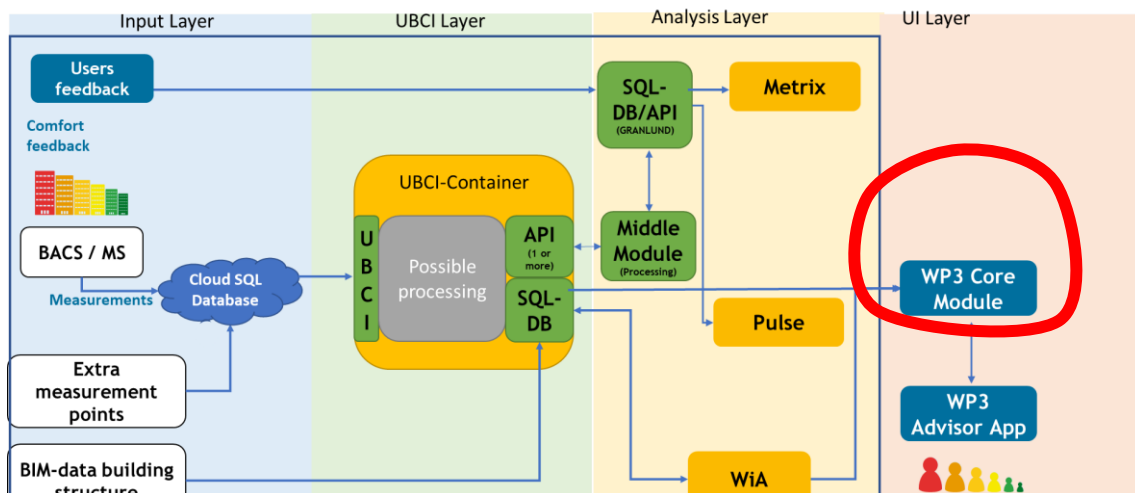


Figure 1: eTEACHER Software Component Overview

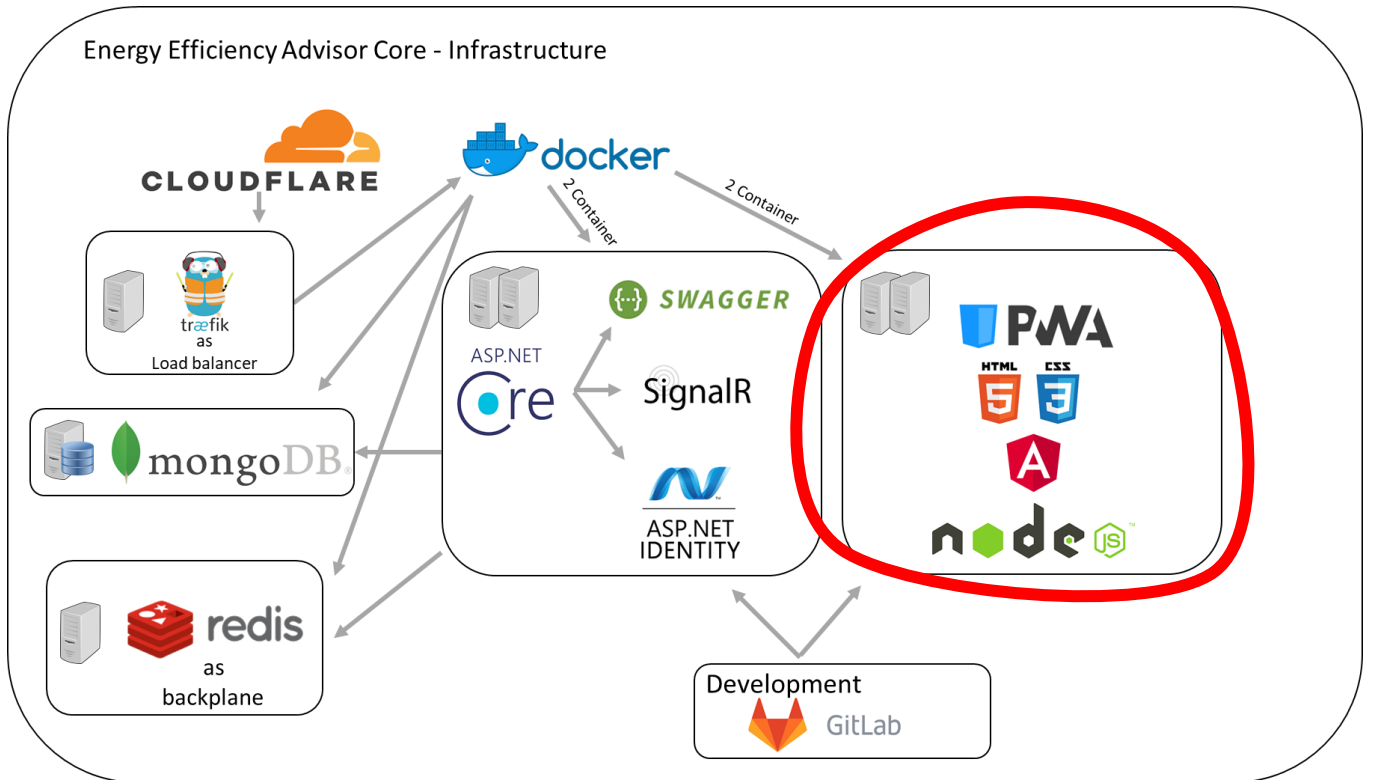


Figure 2: Frameworks and Server Infrastructure

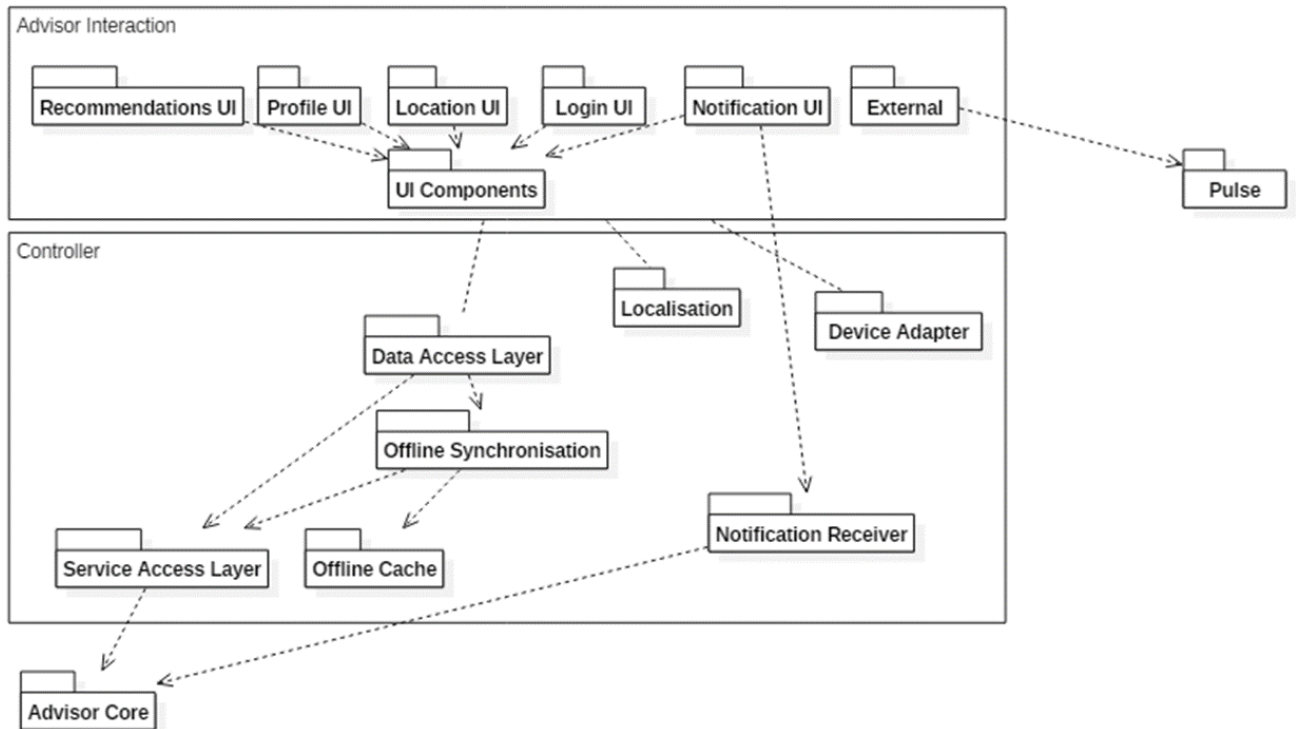


Figure 3 – UML Package Diagram of the Smartphone Advisor

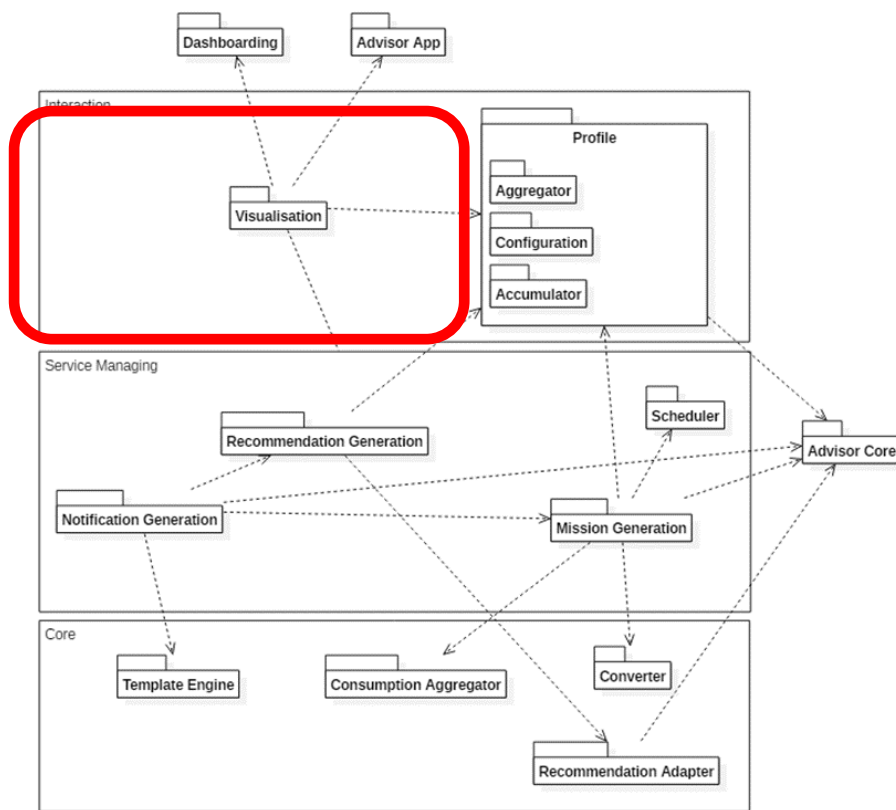


Figure 4 - UML Package Diagram of the Gamification Component

## 2 State of the Prototype

The final prototype can be accessed through the web<sup>2</sup>, PlayStore<sup>3</sup> and AppStore<sup>4</sup>. Further releases and updates will be done in WP4 and will consist mainly of bugfixes and smaller improvements, like for example performance optimizations.

Part of this app, is the integration of the different parts of the eTEACHER system and to make the functionality accessible from an app. This is done by the integration features. One part is for example the integration of the T3.4 features. Further, parts of the integration are the adaptations of charts and the dashboard component, to visualize gamification related data in the ranking, energy distribution and carbon charts. The Real Time Notification Service runs in the background and reacts on newly created notifications/recommendations. If the app is visible, the notification is shown in the app (notification bell) and if the app is not active, they are shown as heads up notifications. If the device is not connected to the internet, the service connects on the next connection to the internet and receives notifications, which were created while being offline.

The app was created, that it fits multiple screen sizes (smartphone, phablet and tablets) and had to be responsive because of that. Further, an iOS as well as an Android App got created for the regarding store (and got deployed there as well). Further a web interface was created, so that users can access the app on other devices than iOS and Android as well. A multilanguage support was added. This is quite unusual for a research project but was necessary to increase the acceptance in the testing phase of the project. Further, a deployable docker container was created, to make the installation of the software easier. The feature to configure the profile of the user were provided in multiple ways. First, the user can personalize their account with a username, password, chosen language, as well as a picture for their profile (this picture is also used for the ranking). Secondly, the user can add different locations to his profile and personalize them with pictures and names. A sharing functionality for WhatsApp, Twitter and Facebook was added as well. With the sharing functionality, users will help the project in their dissemination efforts. With it, other people are able to inform themselves about the project or if they are eTEACHER users themselves, they are able to connect to each other and see each other in the ranking.

The following table lists the key features of the Energy Efficiency Advisor Smartphone and their status accordingly.

Feature	Status
<b>Integration of Advisor Core</b>	<b>provided</b>
<b>Integration of the Dashboard Component and Adaptions</b> <ul style="list-style-type: none"> <li>• <b>Ranking</b></li> <li>• <b>Energy Distribution</b></li> <li>• <b>Carbon</b></li> </ul>	<b>provided</b>

<sup>2</sup> <https://eteacher-app.ascora.eu>

<sup>3</sup> <https://play.google.com/store/apps/details?id=de.ascora.eteacher>

<sup>4</sup> <https://apps.apple.com/us/app/eteacher-project/id1485405835>



<b>Real Time Notification Service</b> <ul style="list-style-type: none"> <li>• In App</li> <li>• Heads Up Notifications</li> </ul>	provided
<b>Responsive Design</b>	provided
<b>iOS App (iPhone/iPad)</b>	provided
<b>Android App (Smartphone/Tablet)</b>	provided
<b>Web Interface</b>	provided
<b>Multilanguage Support (English, Spanish, Romanian)</b>	provided
<b>Docker Container</b>	provided
<b>Integration of Feedback Component</b> <ul style="list-style-type: none"> <li>• Metrics</li> <li>• Pulse</li> <li>• Virtual Building</li> <li>• Feedback</li> </ul>	provided
<b>Recommendation/Advices Interaction</b>	provided
<b>Profile Configuration</b>	provided
<b>Add Locations/Apartments</b>	provided
<b>Sharing Functionality</b>	provided

Table 1: Feature Matrix



### 3 Requirements and Preparations

This section provides information about what administrators and software developers need to prepare in order to use the functionalities of the deliverable prototype. And how to deploy the website. It will only work in conjunction with T3.1, so you have to follow the instructions in D3.3 as well, beforehand. But you can use other existent installations of D3.3 as well, and do not have to provide them.

The server-side part will be executed by administrators, whereas building of the solution is more interesting to developers.

#### 3.1 Server Side (System Administrators)

The Energy Efficiency Advisor App Service Repository manages the storage and provisioning of Proxy Service Wrapper objects. It consists of one Docker images:

##### 3.1.1 Requirements

Some preparations to install the Advisor App subcomponent must be set to run a stable instance of it. It is recommended to use the Linux distribution Ubuntu 14.04 as the operating system, due to dependencies of the used Docker version 1.12.1. Any other operating system can be used too, but it cannot be guaranteed that it will work successfully with the Docker version, which is used in eTEACHER. According to this, Docker must be installed with the extension Docker-Compose. Furthermore, it must be ensured to have access to the Linux root user, as resources are used that are in need of root privileges.

The following commands are required to set up the Docker Engine on Ubuntu 14.04:

```
1. sudo apt-get update
2. sudo apt-get install apt-transport-https ca-certificates
3. sudo apt-key adv \
  --keyserver hkp://p80.pool.sks-keyservers.net:80 \
  --recv-keys8118E89F3A912897C070ADBF76221572C52609D
4. echo "deb https://apt.dockerproject.org/repo ubuntu-trusty main" | sudo tee
  etc/apt/sources.list.d/docker.list
5. sudo apt-get update
6. sudo apt-cache policy docker-engine
7. sudo apt-get install docker-engine=1.12.1-0~trusty
8. sudo apt-mark hold docker-engine
```

The following commands are required to set up the Docker Compose on Ubuntu 14.04:

```
1. sudo curl -L
  "https://github.com/docker/compose/releases/download/1.8.1/docker-
  compose-$(uname -s)-$(uname -m)" > /usr/local/bin/docker-compose
2. sudo chmod +x /usr/local/bin/docker-compose
```



To increase security, privacy and limit the access to Docker resources to the eTEACHER environment, it is necessary to create a password file respectively to the affected users, who shall have access to the system<sup>5</sup>.

### 3.1.2 Installation

For installing the Advisor App, the user has first to download the required docker-compose.yml by using the following download link and password:

- Link: <https://box.abelssoft.de/d/2a291654b29b16-4962345>
- Password: PVYWEW

First, an optimized version of the project needs to be built. This will include bundling, tree-shaking, dead code elimination and other code optimizations. For that, the used frameworks have to be used as well.

```
$ npm install
$ npm install -g @angular/cli
$ npm install -g @capacitor/cli
```

After all requirements are fulfilled, the file docker-compose.yml can be used to setup the eTEACHERs Advisor WebApp. The docker-compose.yml file contains all necessary instructions to have a secure and stable service management system. Docker Compose is used to install the software component via a console command. To execute this command, the current location must be the folder /eteacher.ngx/. The command to install this component is `docker-compose up`.

Before starting, the configuration has to be setup, to define, where the different servers are running. This can be done by changing in the subfolder eteacher.ngx and opening the settings.json. In it, you can configure the different servers and accounts to access them. If everything is configured like mentioned before, the provided configuration should work, besides the AdvisorCore backend adress, which have to be added to the uri string, in the following configuration:

```
"AdvisorAPI": {
  "Uri": "https://127.0.0.1:44337"
}
```

The AdvisorAPI instance is required to communicate with eTEACHERs other software components.

The next step is to build the Docker image. A shell to the server is required – e.g. via an active SSH connection. The component source code contains a Dockerfile to build a new Docker Image. In detail, the Docker image will fire up a nginx-webserver and delivers the component automatically. The following commands must be executed from the eteacher.ngx folder to build and run the eTEACHER WebApp image: As everything is prepared in the repository, this step is very easy. This step will take about 5 minutes.

```
docker build -t eTEACHER.ngx
```

<sup>5</sup> <https://httpd.apache.org/docs/current/programs/htpasswd.html>



Finally, to run the main server process, the following command with no arguments to the Docker instance can be executed

Under normal circumstances and compliance with the requirements, the Advisor WebApp component should be running after this command.

```
docker run -p <PORT>:80 -name eteacher-ngx -ti eTEACHER.ngx
```

This can be tested with the command `docker ps`. After executing this command, a list with running containers is displayed with their current status. Therefore, on container called “eteacher-ngx” is running with a given uptime of the container.

In this case, the WebApp can be accessed (using HTTPS at the address for the docker instance and the external port specified) after approximately 20 seconds, which corresponds to the time the Advisor WebApp process takes to start up within the Docker container. The address should be `<server-address>:<PORT>`, where `<PORT>` should be an available port on the server (e.g. 8080). To access the page, the corresponding URL needs to be called via a web browser.

An already deployed version can be found online<sup>6</sup>.

This version can be used with no specific installations, as it can be accessed with a regular internet browser with JavaScript being fully enabled.

The component has been tested on the 2019 versions of the following web browsers:

- Google Chrome (Windows, Mac, Linux)
- Firefox (Windows, Mac, Linux)

The installation of the Android/iOS App are described in D4.4.

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<sup>6</sup> <https://eteacher-app.ascora.eu/>





## 4 Limitations, Research and Further Developments

This section provides a brief overview about the limitations and possible further developments of this prototype outside of the project duration.

The Advisor App component is fulfilling the requirements to reach eTEACHER's goals. It is dependent on the input of the Advisor Core component from T3.1 and is integrating T3.3, T3.4 and T3.5 visually. Users can interact with the eTEACHER solution through the app.

It is working on Smartphones/Tablet with Android and iOS and for other operating systems through the web. Currently, some performance optimizations could be done. The gamification part could be improved as well. For example, messages could be sent, if someone else just surpassed your rank. Further functionalities could be added as well, like an issue management. This could help facility manager, to get informed about issues in certain apartments. More futuristic, Google and Apple are currently working on indoor navigation systems. With those, it would be possible to located the user directly, instead of using QR codes. This could make the app more accessible to new users.

But mainly, the last year in the project and the pilots will help to collect some feedback and see, what works good and what does not.



## 5 Summary and Conclusion

This deliverable presents and describes the scope of the prototype and setup of the Advisor Smartphone App.

With this prototype, users are able to access the functionalities of the eTEACHER eco system in a central point.

The advisor can be used on multiple devices and can be accessed on multiple platforms:

- Website: <https://eteacher-app.ascora.eu/>
- Android PlayStore: <https://play.google.com/store/apps/details?id=de.ascora.eteacher>
- iPhone AppStore: <https://apps.apple.com/us/app/eteacher-project/id1485405835>

From it, the feedback system (T3.3), gamification mechanics (T3.4 and part of this deliverable), recommendations/advices (WP2 WiA) and energy consumption information (WP2 BACS) can be accessed. Users can monitor different KPIs regarding energy efficiency.

Moreover, all the required steps to install, deploy and execute the Advisor Smartphone App are described.

