



Politecnico di Torino
Master course in ICT for Smart Societies

Interdisciplinary Project

Find&Play



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1 Find&Play

1.1 Introduction

Nowadays, television, computer games and social networks are increasingly capturing the interest of kids. If we add to this also the advertisement and the pressing marketing to which parents are constantly subjected, it is clear that we're neglecting one of the most important elements of their development: time to play.

But why is playing so important? Play is critical for kids to develop the emotional, social and creative thinking skills they will need when they are adults. Play allows them to engage with their surrounding environment and with others in their community in a fun context. It enables them to explore ideas and different ways to behave, testing their boundaries and growing in the process.

One of the most common meeting points that can be found in society is certainly the playground. This space is a purposeful strategy that can help children to overcome some of society's most challenging issues like childhood obesity, early childhood learning and development, family cohesion and crime reduction.

With society's ever-increasing realization of the benefits of parks and recreation spaces, it is clear that parks and recreation spaces are places to grow healthy individuals, communities and environments.

The ICT field can intervene by easing and speeding up the enjoyment of play areas. It is no coincidence that many websites and applications have been developed about the possibility of finding the playgrounds and green areas available in your city.

By following this line of thinking, the project presented in this report wants to provide to Turin's municipality a tool helpful to its citizens to better their experience with playgrounds.

1.2 Project overview

This project, which is called "**Find&Play**", has the purpose of providing an innovative service for both the citizen and Turin Public Administration. Precisely for this reason, it consists of two main components, one for the user and one for the PA employee. The first is a *Mobile Application*, working for both main operating systems (Android and iOS), thanks to which the single user, once logged in, can localize himself, find the closest play area to him, filter and select preferred structures by the child. Moreover, he can check playground conditions as well as of its structures and, if there are issues that may affect children's safety, he can report everything, to inform the public administration as soon as possible.

The second is the *Web Platform*, intended for district delegates (whose definition is reported in Section 3.2.1), through which they can read all received reports and reviews sent by user via mobile application and stored in the database. Then, he will inform the Public Administration about all the pointed out issues to take action as soon as possible and solve them.

1.3 Project goals

The aim of this project is to create a connection point between the Public Administration and the inhabitants of the metropolitan city of Turin regarding the management and care of playgrounds. More specifically, to open a clearer and more immediate communication path between the two main recipients in order to improve the experience with the playground. In fact, thanks to the use of the mobile application, the citizen is able to report any type of inefficiency or problem linked to every single park, which, nowadays, turns out to be very difficult and unclear. On the other hand, thanks to the Web Platform, the Public

Administration will have a quicker way to receive reports and intervene fast to cope with any risks to the health of children.

2 Project Workflow

Before even starting to work on what would later become *Find&Play*, it was decided to analyze how much this project could actually be useful for the citizens of Turin. Precisely for this reason, the whole social aspect of the project was taken care of during the month of November 2020, through the dissemination of an online survey. Thanks to this, the team was able to learn how much the citizen actually had few means available both to contact the Public Administration directly about any damage to the playground structures and to view the park closest to him.

Clearly, while waiting for a response from the population taken into consideration, the location of the main parks of the city of Turin was carried out, as well as the creation of a first draft of what would later become the real database.

December 2020 was certainly the most critical. This is due to the fact that the team had to find a solution regarding the implementation of the database due to the fact that the Municipality of Turin was unable to provide data on the city's playgrounds. At the same time, the teamwork began on the design and development phase for both the mobile application and the web platform, leading to stop for about three weeks for the winter exam session.

Once the exam session was over, the project entered the real final rush, where mainly the development phase of both platforms took place as well as the beta testing on a sample population and the final fixing of all the bugs and alleged discovered malfunctions.

All in all, the timeline of the project has not undergone notable changes compared to the initial plans. In fact, the team has always tried to keep the initial ideas unchanged despite the countless problems found along the way, finding functional alternatives to always keep the work rolling. The main changes reported to the Gantt chart can be briefly recapped as following:

- an extension of one month at the end of December of the database implementation, due to the failed collaboration with the Municipality of Turin, from whom we would have had to obtain a large amount of data to populate the database;
- an interruption of the development phase of about three weeks in conjunction with the winter exam session;
- a legend was added explaining how the group was able to divide up the tasks throughout the entire duration of the project: one team for the mobile application and one for the web platform;
- an extension of one week of the testing phase, in order to collect as much feedback as possible.

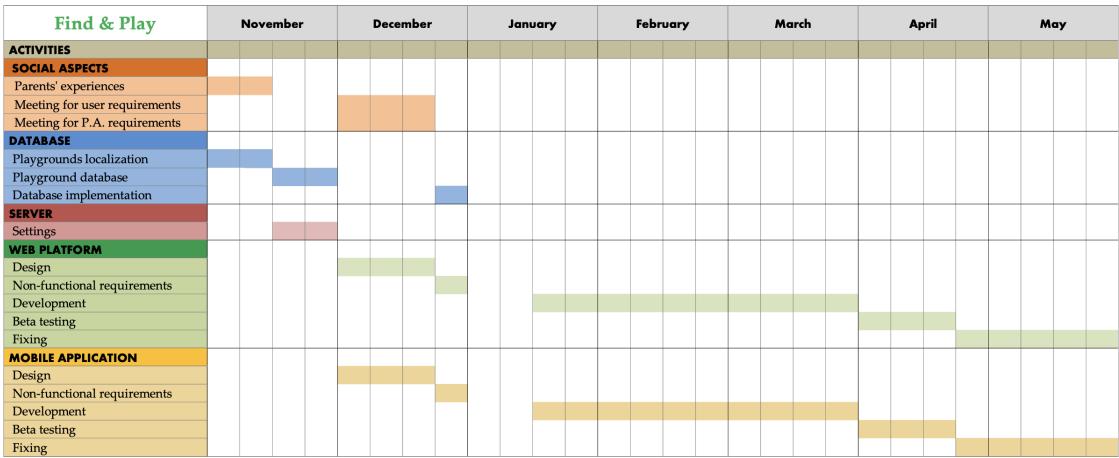


Figure 1: Initial Gantt chart

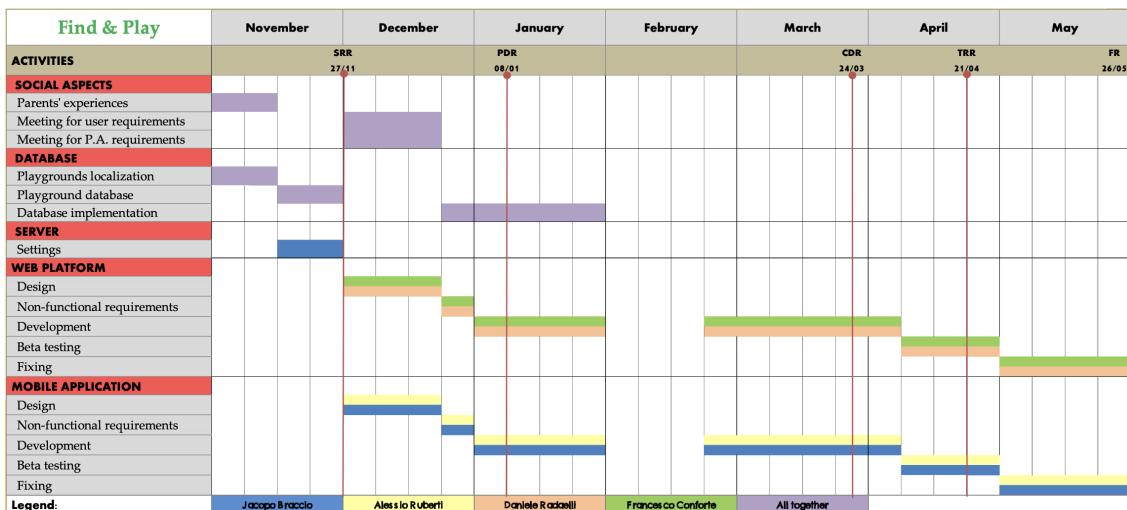


Figure 2: Final Gantt chart

Figure 1 and Figure 2 show, respectively, the initial and final Gantt chart and consequently all the changes listed above.

3 Functional requirements review

3.1 Parents' user requirements

To collect suggestions about user requirements, an online survey was designed, which remained opened for about 2 weeks. It contained 22 questions and was aimed to people interacting with children. It was shared via email with a flyer, shown in Figure 3, to contacts gathered in collaboration with the kindergarten of Politecnico, called "Policino-Micronido", to all ICT contacts thanks to the help of Prof. Marco Piras and Prof. Enrico Magli and to some others personal contacts.



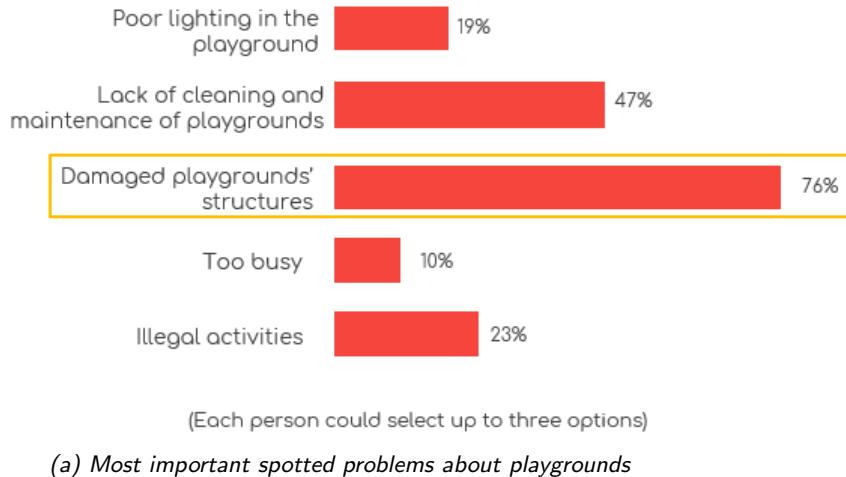
Figure 3: Flyer used to share the online survey

Goals of the survey were:

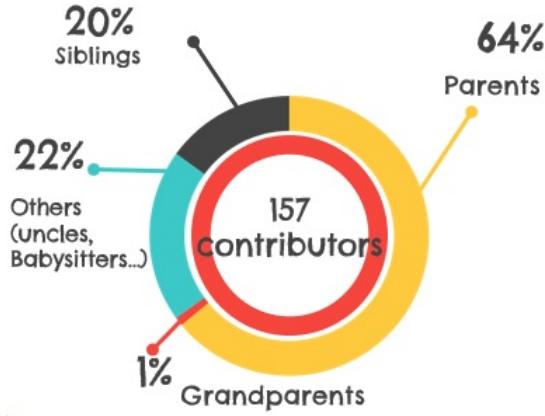
- to collect information about playgrounds' state of art and users' experience with playgrounds;
- to understand which were the usual methods to report damages and problems of a playground;
- to discover user requirements;
- to collect contacts of people who were willing to help developers during the testing phase of the Mobile Application.

The total number of people taking part in the survey was 157, of which more than 60% were children's parents (Figure 4b). It was pointed out that 52% of people was not happy with the state of art of play areas, especially because of the presence of damaged structures and the lack of cleaning and maintenance (Figure 4b). This allowed to make aware that problems regarding playgrounds really exist and therefore, the whole project Find&Play could be very useful at the improvement of people's experience with them.

Finally, 71 people were willing to help during the testing phase and left their email to be contacted again. Of them, 47 had an Android smartphone and 24 had an Apple phone.



(a) *Most important spotted problems about playgrounds*



(b) *People participating in the survey*

Figure 4: Results obtained from the survey

3.1.1 Final chosen requirements

Some of suggested requirements, such as the possibility to see weather forecast or possibility to find dog areas, soccer and basket fields, were out of the scope of the project, therefore they were not implemented. Nevertheless, they may be added in future to a new version of the Mobile Application, maybe with a further and more commercial scope.

The list of all the selected and implemented functionalities is:

1. possibility to find all play areas on a map of Turin;
2. possibility to find all fountains (Toret) on a map;
3. possibility to connect to Google Maps and find the path to the selected playground;
4. possibility to filter the shown parks by:
 - (a) accessibility or inclusiveness for children affected by handicap;
 - (b) minimum age for structures: above 3 or above 6 years old;
 - (c) preferred structures.
5. possibility to read reviews about parks and their structures, opening hours, list of structures for each park with their pictures;
6. possibility to see a 360° photo of the whole play areas;

7. possibility to register for rating each park, by inserting email and password;
8. possibility to register for sending reports about each play area and/or their structures, catalogued by typology (maintenance, cleaning, vandalism, lighting, security, other);
9. possibility to attach a photo to each report.

3.2 Public Administration's requirements

Find&Play, in addition to being a new tool to improve the experience of parents and children in public playgrounds, aims to simplify and reduce the work of public administration. For this reason, the initial goal was to create a web platform with these main objectives:

- remote control web based platform;
- management of the city's playground (create, update and delete);
- check complaint and damages reported by parents.

In order to find new possible Public Administration requirements, different people in charge of green areas for Turin municipality have been contacted. A first meeting with a municipal councilor of the city of Turin allowed to understand more deeply how maintenance of the parks and reports of the citizens are managed. Moreover, new important information emerged:

- there is not a standard way to do a report about playgrounds in Turin municipality;
- there is a complete database with all the information and data regarding the playgrounds;
- the city of Turin is divided into 10 districts and for each of them there is a delegate who collects reports regarding the playgrounds.

Subsequently, a second meeting was held with the person who, in the past, was in charge of collecting the data and who knew the district delegates. This would have allowed to speed up the programming work and have the certainty of working on real data. However, the data was not provided due to privacy concerns. At this point, to stem the problem, the web platform requirements were hypothesized. Thus a new database was created and the platform was developed with hypothesized requirements.

3.2.1 Final requirements

The platform was created by making it available only to the district delegates of the municipality of Turin. *District delegates* are normal citizens that are in charge of reading and managing all the reports regarding the playground being into the district they live. They can only be elected by a general manager (e.g. mayor) who is also the main manager of the platform and they are the only one able to interact directly with all the aspects of the platform, like managing the data stored into the database, adding or removing users able to access the platform. Since there are 10 districts, the number of representatives was decided to be 10. Each of them will have the ability to:

- view the list of playgrounds belonging to that district and their related information;
- check the reviews of the playground;
- check the reports about playgrounds sent by citizens through the Mobile Application and their typology;

- view the list of structures belonging to each playground;
- check the reports about structures catalogued by typology.

At the end, the delegate will inform the Turin Public Administration asking to intervene for the maintenance.

4 Non functional requirements

'Find&Play' platform is made of three main components: server, web platform and mobile application.

A simple schema, graphically explaining how the platform works, is shown in Figure 5.

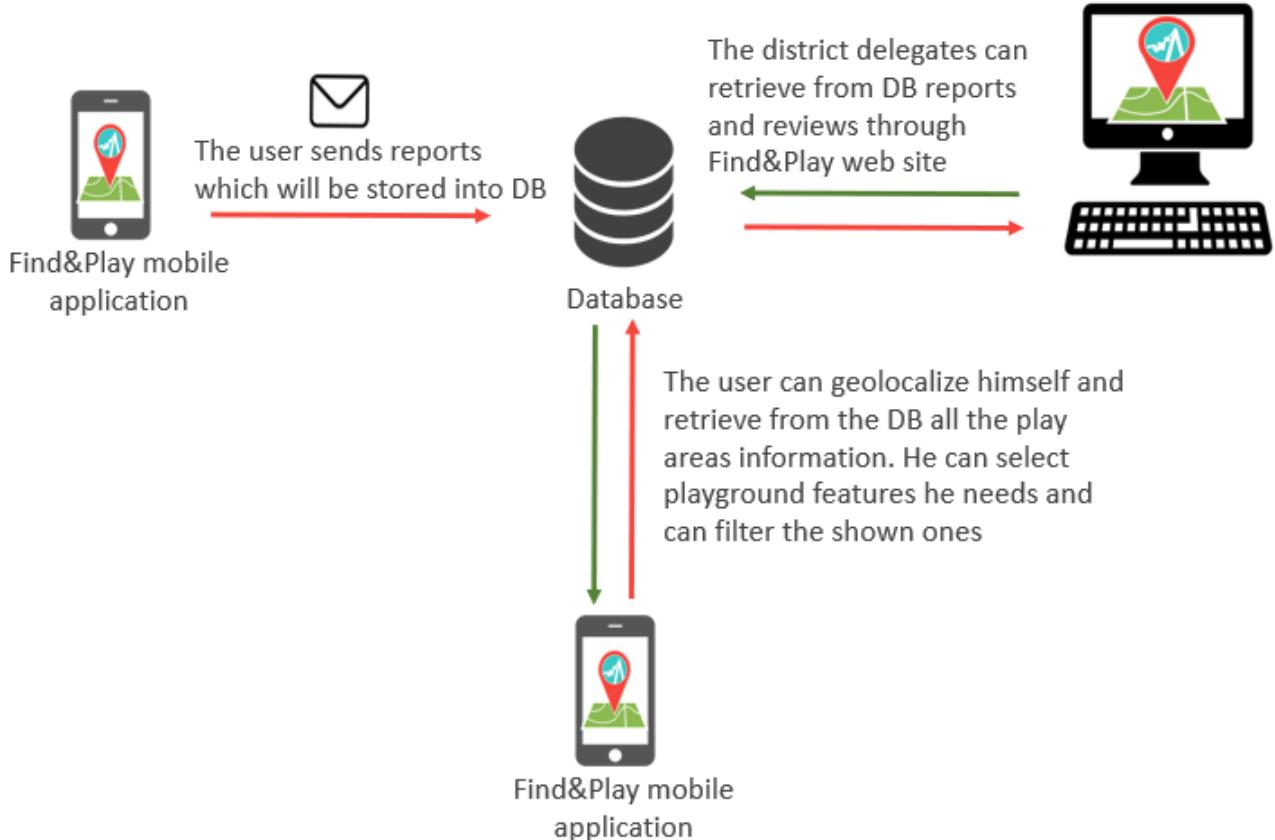


Figure 5: Find&Play platform

4.1 Server

The server is the core component of the platform. It allows to store data and enables the communication among the database, the mobile application and the web platform. The server used is an *Intel NUC8i7BEH*, powered by an *Intel Core i7-8559U* processor and equipped with 8 GB of RAM and 256GB of internal storage. As foundation of the server is the LNMP stack, i.e. the Linux, Nginx, MySQL, Python software stack. The four layers of the stack are:

- **Linux:** the operating system (OS) makes up our first layer. Linux sets the foundation for the stack model. All other layers run on top of this layer. As Linux distribution, Ubuntu 20.04 is chosen;
- **Nginx:** The second layer consists of web server software, Nginx. This layer resides on top of the Linux layer. Web servers are responsible to process requests and transmit information through the internet, using HTTP;
- **MySQL:** is a DBMS that allows you to manage relational database;
- **Python:** main programming language used.

The communication between the server, the web platform and the mobile application, is done through REST API and therefore, through the exchange of JSONs.

4.2 Web platform

The main technologies used to develop the web platform are:

- **HTML**: is a markup language for the layout of web pages;
- **CSS**: is a language used to define the formatting of web documents;
- **Flask**: is a web micro-framework written in Python, used to create the web app. It allows to manage routes and REST API requests.
- **JavaScript**: is an object-oriented and event-oriented programming language, used to implement scripting in the front-end side.

4.3 Mobile application

The mobile application was built by using **Cordova** [1]. It allows the use of standard web technologies (HTML5, CSS3 and JavaScript) for cross-platform development. Applications execute within wrappers, targeted to each platform, and rely on standards compliant API bindings to access each device's capabilities such as sensors, data, network status, etc. Therefore, the developed applications can be installed both on **iOS** and **Android**. The user interface was built by using **Onsen UI** [2], that is a large set of rich UI components specifically designed for mobile applications. Onsen UI enriches app users' mobile experience with native designed UI elements: components change their aspects according to the platform on which they are running, so it is perfect to develop hybrid apps by using Cordova or to develop mobile web apps (also referred to as Progressive Web Apps). The playgrounds' map visualization has been done by using the **Cordova Google Maps plugin** [3], which enables to create, update, and manage maps with fluidity and ease.

5 Project implementation

5.1 Database

In order to design the database and to understand the entities and existing relationship between them, a work of research has been done. After consulting Turin's green areas website [4], 10 playgrounds were chosen, located into 'Circoscrizione 1' and 'Circoscrizione 2'. They are reported in Table 1. For each playground, information like address, position, opening hours and regulation were collected through the use of Turin's open data.

A distribution of 10 chosen playgrounds is reported in Figure 6.

Codice	Nome	Indirizzo	Lat	Long
gBER	Area centrale via Bertolotti	Via Bertolotti / C.so Galileo Ferraris	45.069	7.67461
gBOC	Giardino Boccioni	Via Paolo Gaiadano	45.0382	7.62785
gCOL	Giardino Colombo	C.so Re Umberto / Via Filangeri	45.0551	7.66809
gFAN	Giardini del Fante	Corso Rodolfo Montevicchio	45.0614	7.66533
gFER	Giardino Passante Ferroviario	Corso Re Umberto, 130	45.5029	7.6611
gGUG	Giardini Guglielmetti	Via Carlo Promis 7	45.0709	7.67285
gMENNE	Area Pietro Mennea	Piazza Marmolada / Corso Racconigi	45.0541	7.64865
gRIG	Parco Rignon	Corso Orbassano, 200	45.0436	7.63815
gVAM	Giardini Valperga	C.so Turati / C.so Tirreno	45.0498	7.66365
gVEN	Parco Cavalieri Vittorio Veneto	Corso IV Novembre	45.0457	7.65403

Table 1: Chosen playgrounds.



Figure 6: Parks distribution over a Turin's map

Finally, physically in each playground, further information were collected such as a picture

of each structure and a playground 360° panorama view, by using **Google Street Map**. The previous data collected were used to create the final Find&Play database. The main entities, that are going to correspond to the table in the database, are the following:

- **Playground:** represents the playground. Its attributes are related to the playground information:
 1. *code_pg*: table primary key. It is the playground ID code (varchar);
 2. *pg_name*: it is the name of the playground (varchar);
 3. *pg_address*: it is the address of the playground (varchar);
 4. *pg_lat* and *pg_long*: they are latitude and longitude degrees of playground (float);
 5. *pg_circos*: it is the number of district in which the playground is located in (integer);
 6. *pg_avg_score*: it is the average score between 0 and 5 of playground review (integer);
 7. *pg_tot_equip*: it is the total number of equipment of the playground (integer);
 8. *pg_age*: it is the minimum age to enjoy playground structures (integer);
 9. *accessible*: it indicates whether the playground can be accessed by disabled (integer);
 10. *inclusive*: it indicated whether there are structures usable by disabled (integer);
 11. *opening_hour*: it indicates the opening hour of play area (varchar).
- **Equipment:** represents a single structure inside a playground. Its attributes link the structure to the playground in which it is located and describe its type:
 1. *code_pg*: table primary key. It is the playground ID code (varchar);
 2. *id_equip*: table primary key. It is the equipment ID code (integer);
 3. *type_eq*: it is the name of the equipment (varchar);
 4. *category*: it is the category which the equipment belongs to among: 'palestrina', 'scivolo', 'girello', 'molla', 'altalena', 'castello', 'dondolo'. (varchar)
- **User:** represents a user registered to the platform. Its attributes are needed for the user to be recognized inside Find&Play so that he can login and leave reviews. It is worth noticing that a user is verified once he confirms his account by clicking on an invitation link sent by email at registration time:
 1. *user_ID*: it is the ID code of the user (integer);
 2. *user_name*: it is the user name (varchar);
 3. *user_surname*: it is the user surname (varchar);
 4. *user_email*: it is the registered user email (varchar);
 5. *password*: it is the hashed password registered by the user (varchar);
 6. *confirmed*: it indicates whether the user verified its email or not (tiny-integer).
- **Global report:** sent when the user find problems regarding the entire playground such as lighting, cleaning or dangerous situation. The attributes link the report with the target playground, the user sending the reports and the description of the report:
 1. *code_pg*: table primary key. It is the playground ID code (varchar);

2. *user_id*: table primary key. It is the ID number of the user sending the report (integer);
 3. *creation_date*: table primary key. It is the date at which the user sent the report (datetime);
 4. *type*: it is the typology of the reported issue among: 'manutenzione','pulizia', 'vandalismo','illuminazione','sicurezza','altro' (varchar);
 5. *subject*: it is the report object written by the user (varchar);
 6. *description*: it is the body of the report (text);
 7. *status*: it is the flag saying whether the report has been read or not (integer).
- **Target report**: sent when the user finds problems regarding a particular equipment inside a playground. The attributes link the report with the target equipment, the playground in which it is contained, the user sending the reports and the description of the report:
 1. *code_pg*: table primary key. It is the playground ID code (varchar);
 2. *user_id*: table primary key. It is the ID number of the user sending the report (integer);
 3. *id_equip*: table primary key. It is the structure ID number of the report (integer);
 4. *creation_date*: table primary key. It is the date at which the user sent the report (datetime);
 5. *type*: it is the typology of the reported issue among: 'manutenzione','vandalismo', 'sicurezza','altro' (varchar);
 6. *subject*: it is the report object written by the user (varchar);
 7. *description*: it is the body of the report (text);
 8. *status*: it is the flag saying whether the report has been read or not (integer).
 - **Review**: reviews a playground. Its attributes link the review with the playground and the user posting it:
 1. *user_id*: table primary key. It is the ID number of the user sending the report (integer);
 2. *code_pg*: table primary key. It is the playground ID code (varchar);
 3. *content*: it is the body of the review (text);
 4. *creation_date*: it is the date at which the user sent the review (datetime);
 5. *score*: it is the score assigned to the review between 0 and 5 (integer).
 - **Representatives**: it represents one of the district delegates that are responsible for collecting the reports and forwarding them to the public administration. Its attributes are used to identify the delegate itself:
 1. *fiscal_code*: table primary key. It is the username to access to available data (varchar);
 2. *name*: it is the name of the user (varchar);
 3. *surname*: it is the surname of the user (varchar);
 4. *password*: it is the hashed password used to access to available data (varchar);
 5. *circ*: it is the number of district that the user can access to (integer).

The E/R diagram of the created database is shown in Figure 7.

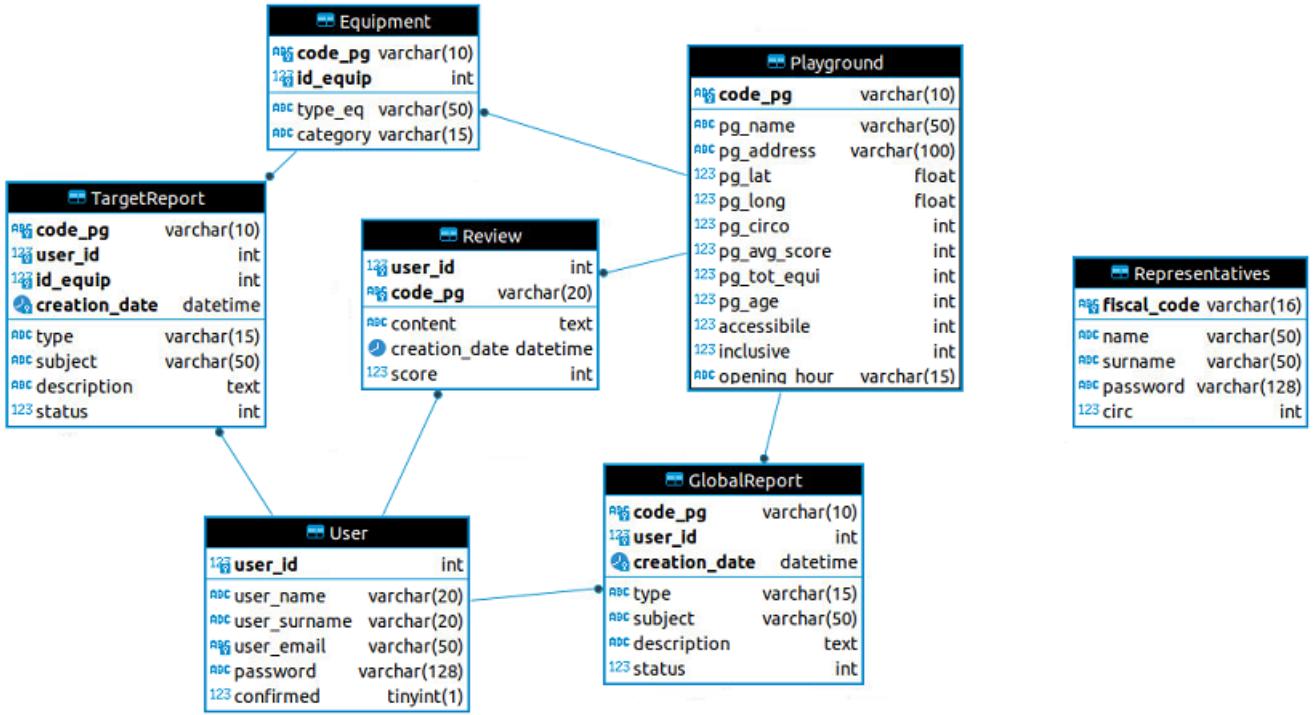


Figure 7: E/R diagram of 'Find&Play' database.

5.2 Mobile application

The mobile application is the part of the platform that is accessible by anyone. It is developed for both iOS and Android, so that the major coverage of the smartphone market is reached. The application structure is described in the following sections.

5.2.1 Main view

The main page of the mobile application is shown in Figure 8. It contains the map with all the playgrounds mentioned in Section 5.1. The view of the map is bounded only to Turin's border, so no scrolling outside Turin's zone is allowed. When tapping on one of the markers representing the playground, a pop-over containing some information about the playground are shown. According to the defined user requirements, on the button-left corner, a button used to show the fountains is present, whereas, on the top right corner, once the search button is clicked, filtering options appear (see Figure 9). The user can search the name of a playground or it can query the database by selecting the filter criteria described in Section 3.1.1. In this way he will be able to find the perfect playground for its necessity. Finally, on the top-left corner, a user section button is present for those who logged in the platform.



Figure 8: Main page

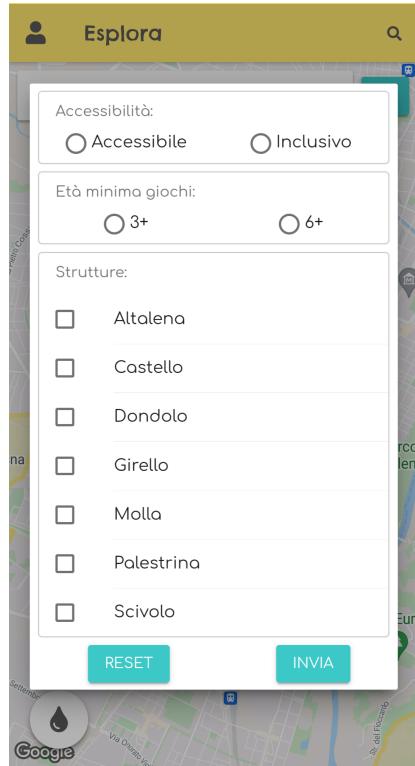


Figure 9: Filter section

5.2.2 Playground page

By clicking on one of the pop-over mentioned in 5.2.1, the related playground's information page opens, where information like address, opening hour, accessibility, minimum age are shown. In order to give the user a nice preview of where he is going, a nice 360° panorama view is located at the top of the information page and, furthermore, in the "Strutture" section, all the structures installed in the playground are reported with a picture. Two pages are also accessible: '*Recensioni*', in which all the reviews of the selected playground are shown and '*Segnala*', from which registered users can send report (more on Section 5.2.3). Figure 10, 11 and 12 show the previous described features for the 'Giardini Guglielminetti' playground area.

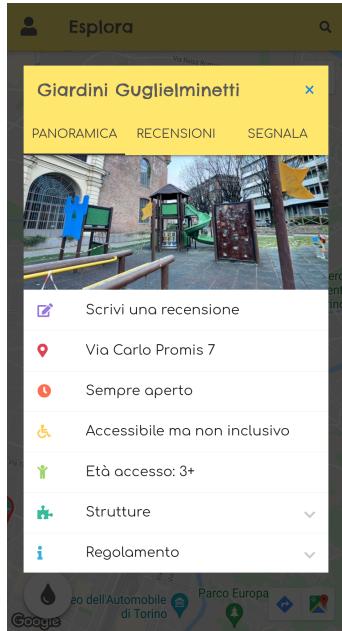


Figure 10: Playground information page.

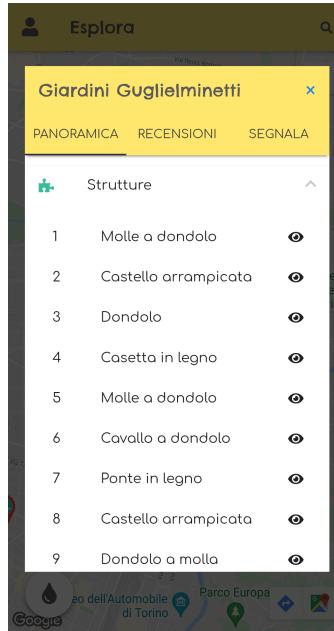


Figure 11: List of all the equipment.



Figure 12: 'Molla a dondolo' picture.

5.2.3 User section

To unlock the full functionalities of the app, a user is invited to register to the platform: this makes possible the review and report sending functionalities. Registration is done filling the form shown in Figure 13. After verifying that the inserted user email address and password are valid, a confirmation email is sent. Once the user confirm its identify, it can login into the platform by filling its credential in the login form in Figure 14.

Figure 13: Registration form.

Figure 14: Login form.

Once the user is logged in, it can access its personal page (Figure 15). By default to each user, at registration time, a funny animal icon is chosen as profile picture, but it can be changed with a personal profile picture by tapping on the yellow border circle.

From the personal page, a user can access: '*Le mie recensioni*', containing all the made reviews (Figure 16); '*Le mie segnalazioni*', containing all the reports sent along with the status of the report (Figure 17); '*Contattaci*', from which it can contact Find&Play team members.

Figure 15: Personal page.

Figure 16: 'Le mie recensioni'.

Figure 17: 'Le mie segnalazioni'.

A registered user can both post reviews (Figure 18) and send reports to public administration (Figure 19). While sending a report, a user is prompted to indicate the subject of the report, to choose whether it is addressed to a particular playground or a particular equipment installed in a playground and the type of the report (e.g. maintenance). The possibility to attach a photo is also present. The reports will be collected into Find&Play's database and accessible from the web platform where the public administration members can read it.

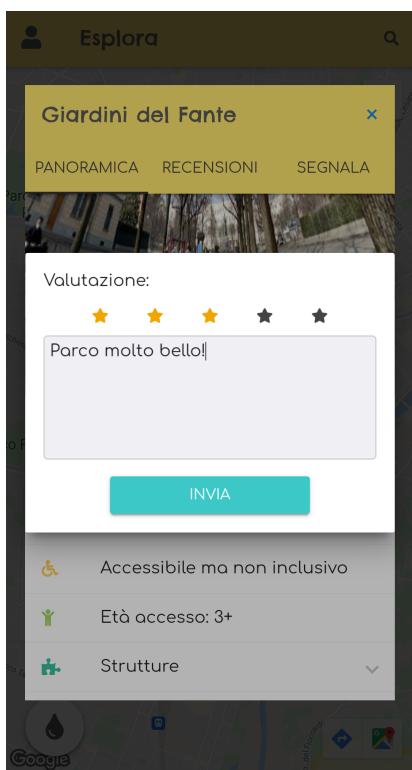


Figure 18: Send a review of a playground.



Figure 19: Send report to public administration.

5.3 Web platform

The site has been structured in such a way as to be easily navigable even by those who are not very familiar with technology and the web world. It has been organized into 6 pages, structured as shown in Figure 20.

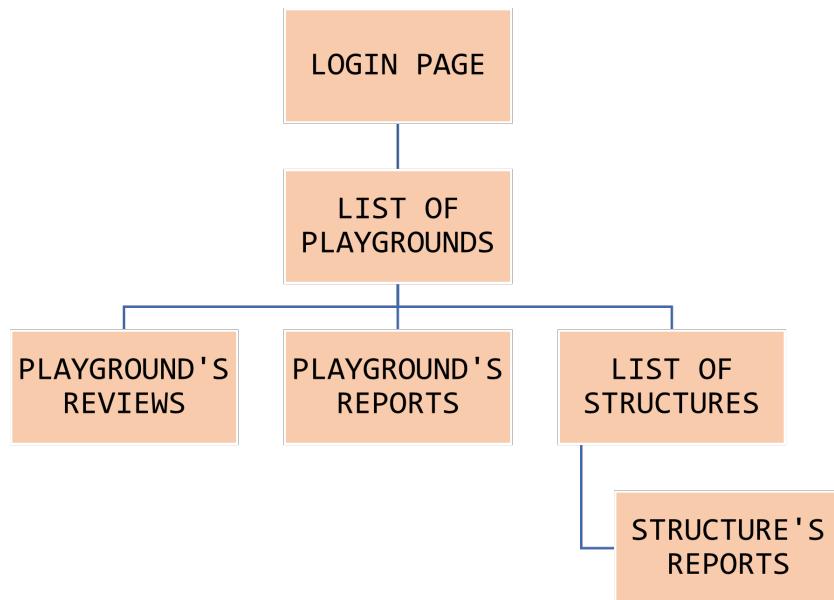


Figure 20: Structure of the website

The login page of the site, shown in Figure 21, can be reached at the url: <https://findplay.ddns.net/findplay>. Each district delegate can access through its fiscal code and a password, assigned to him by the main manager (Public Administration).

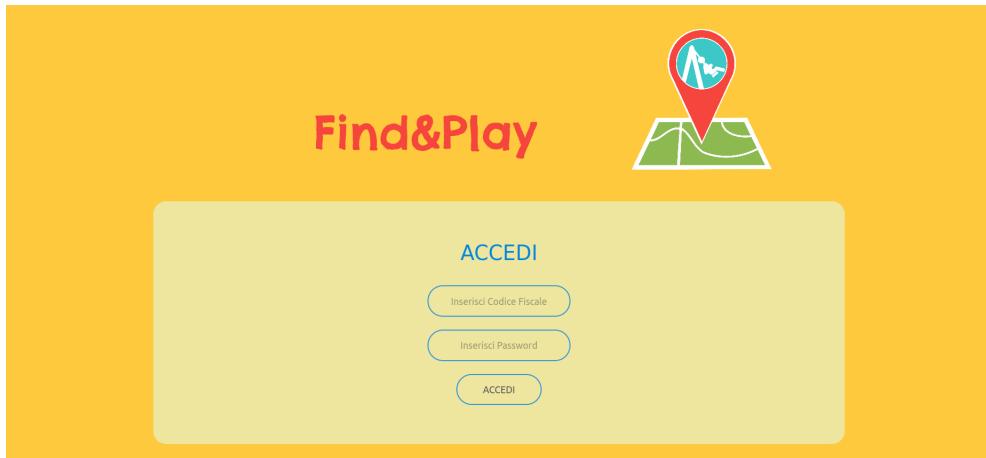


Figure 21: Login page of the web platform

Once logged in, a page is shown, which lists all the playgrounds in the district in which the logged in person lives. The playgrounds are listed in a table, as shown in Figure 22, which contains various information:

- **Codice parco:** code to uniquely identify the playground;
- **Nome:** public name of the playground;
- **Indirizzo:** address of the entrance;
- **Voto medio:** average rating based on user reviews;
- **N. strutture:** the number of structures inserted and reviewed;
- **Nuove segnalazioni:** new reports not read yet;
- **Totale segnalazioni ricevute:** the total number of reports received for that playground.

Elenco parchi circoscrizione 1						
Codice parco	Nome	Indirizzo	Voto medio	N. strutture	Nuove segnalazioni	Totale segnalazioni ricevute
gBER	Area centrale via Bertolotti	Via Bertolotti / C.so Galileo Ferraris	★★★★★	9	0	0
gCOL	Giardino Colombo	C.so Re Umberto / Via Filangeri	★★★★★	7	0	1
gFAN	Giardini del Fonte	Corso Rodolfo Montevicchio	★★★★★	12	0	1
gFER	Giardino Passante Ferroviano	Corso Re Umberto, 130	★★★★★	3	0	0
gGUG	Giardini Guglielminetti	Via Carlo Promis 7	★★★★★	10	0	0
gVAM	Giardini Valperga	C.so Turati / C.so Tirreno	★★★★★	6	0	6

Figure 22: List of playgrounds for district 1

By clicking on the playground's code, the page dedicated to that park will be opened. At the top of the page, there is an interactive map indicating the location of the park. Below two tables, one for reports about the playground in general and one for reviews posted by users, are shown. Columns of "Recensioni" table show: the serial number of the review, its description text, the publication date and the average score.

Whereas, columns of "Segnalazioni Parco" table show: the serial number of the report, the object (title) of the report, the publication date, the typology of the report and a flag about the occurred reading. Each time a report is sent, the "Letto" column will indicate "No" by default, meaning that such a report has not been read yet. Once it gets read, it will be automatically updated to "Sì", also modifying the "Nuove segnalazioni" field in the previous list of playgrounds. Finally, there is a table of structures belonging to the playground, as shown in Figure 23. Its columns are about: ID code number of the structure, name of the structure, new reports about each structure and the total number of received reports.

Nº	Oggetto	Data di pubblicazione	Tipologia	Letto
1	Segnalazione di prova	08/04/2021 13:16:23	pulizia	Sì

Nº	Descrizione	Data di pubblicazione	Punteggio
1	Area verde ottima per passare il tempo. Manca area cani.	07/04/2021 17:09:15	★★★★

Codice struttura	Tipo struttura	Nuove segnalazioni	Totali segnalazioni ricevute
1	Girello piccolo	0	0
2	Girello grande	0	0
3	Scivolo grande	0	0
4	Cavalletta a molla	0	0
5	Moto a molla	0	0
6	Altalena doppia	0	5

Figure 23: Overview of the selected playground and list of structures

Moreover, as for the playgrounds, it is possible to click on the code of the structures and find all the reports that belong to it as you can see in Figure 24. Shown columns are about: serial number of the report, the object (title) of the report, the publication date, its typology and a flag about the occurred reading. The mechanism for the "letto" column is the same as previously described.

Struttura: Altalena doppia cod. 6 LOGOUT

Segnalazioni struttura Altalena doppia:

Nº	Oggetto	Data di pubblicazione	Tipologia	Letto
1	Altalena	07/04/2021 18:49:44	manutenzione	Si
2	Altalena	07/04/2021 17:10:21	manutenzione	Si
3	Altalena staccata	07/04/2021 18:33:33	manutenzione	Si
4	Altalena (prova)	08/04/2021 10:24:54	manutenzione	Si
5	Altalena	07/04/2021 19:42:25	vandalismo	Si

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Figure 24: Reports for the selected structure

Finally, by clicking on the object, a modal is shown, where the user can read information about the clicked report. He can see the attached picture as well, if the reporter has sent it. An example of the modal is shown in Figure 25.

Struttura: Altalena doppia cod. 6 LOGOUT

Segnalazioni struttura Altalena doppia:

Oggetto
Altalena

Descrizione
L'altalena è stata staccata dalla struttura.

Data
07/04/2021 17:10:21

Immagine
Nessuna immagine inviata dall'utente

Pagina 1 di 1 Successivo

Figure 25: Modal to read the report information

6 Testing and Validation phases

After completing the implementation of both platforms, a 3-weeks testing phase was performed, in order to:

1. discover possible bugs and flaws of the platforms;
2. prove the robustness of chosen implementations;
3. get a feedback by the users for possible improvements.

6.1 Mobile application

During the first survey took place in November, which was used to collect user requirements, people were asked if they would like to be contacted in the future for further help. Of the 71 people contacted, 47 owned an Android smartphone and 24 an iPhone. At this point a web page has been created that can be reached at the url: <https://findplay.ddns.net>, through which the apk file to install the application on android phones can be downloaded. Unfortunately the possibility of publishing the application on Google Play Store and App Store, was not possible because publishing on these two stores required a developer licence which costs in total more than 100€. Since it was not possible to download applications from Apple devices outside the dedicated store, the test was aimed only at owners of Android devices. In any case, the application was tested on Apple devices, through the phone of one of the members of the Find&Play team. Initially, all 47 people with Android phones who agreed to help in the continuation of the project were contacted. However, even among the owners of android phones a problem was found during the application installation phase: the operating system sent a warning message about the source of the apk file. To overcome this problem it was simply necessary to select the 'unknown installation sources' filter on the device's security and privacy settings. Unfortunately, the number of feedback was scarce and for this reason it was decided to extend the possibility of downloading the app to friends and relatives of the team members.

This allowed to have the following advantages:

- deploying the application faster;
- friends and relatives knows who are people behind the app, so that they are not afraid of possible dangerous apps;
- they can contact the team directly and quickly;
- more variety of ages and needs.

6.1.1 Results

After 10 days from the distribution of the mobile app, a new questionnaire was created and sent both to people previously contacted and to acquaintances.

It contained 11 questions, which users could answer in less than 2 minutes.

The goals of this survey were:

- discovering whether people have downloaded or not the mobile app and why;
- becoming aware of encountered problems;
- discovering some possible upgrades;
- collecting feedback about the user interface and the usability of the app.

Positive feedback	Negative feedback
Attractive and easy User Interface	Bug when filtering playgrounds
User feedback collected in the questionnaire	Profile picture is sometimes not uploaded
Pictures of the playground and structure	Limited number of features available in the app
Possibility of adding reviews/report	
100% of the people would recommend the app to their acquaintances;	

Table 2: User feedback collected in the survey

After 3 weeks of testing, 21 people were involved in the survey.

The obtained results are collected in Table 2. The testing was useful at gathering information on necessary improvements and bugs, which were quickly resolved. Most of the people also suggested to broaden the horizons of the project, for example adding soccer fields, basketball courts, cycling lanes and dog areas but they do not match with the main focus of the application.

6.2 Web platform

After the difficulties met in collaborating with the public administration, two trusted people were chosen to test the web platform. By trying to better understand if there could be any misunderstandings in the use of the site and for an impartial evaluation, they were chosen from different age groups and with different levels of computer knowledge. The first person was Martina, a 21-year-old girl who works as a red cross volunteer. For this reason, he is always in contact with other people and has a good knowledge of the web and average familiarity with technology. The second was Claudio, a 59-year-old man who works as a mechanic and has little knowledge of the web. A few minutes' conversation was held with both of them. Initially they were explained the functions and purpose of the site, while in conclusion they were left the freedom to make criticisms and suggestions.

6.2.1 Results

After 10 days, a second interview was held with Claudio and Martina, who were completely satisfied with the experience with the platform and no major problems were encountered. They also provided some advice about things that should be improved, such as the possibility to see the total number of reports for parks and structures, in addition to the number of unread ones. Indeed, this feature was subsequently added.

7 Conclusions

The final goal of this project was to provide to Turin's citizens a platform that improved their security and would get closer the two final users which the platform is addressed to: Public Administration and children's parents. To achieve these goals, a Mobile Application and a web platform were implemented. Currently, the whole system Find&Play is running on a temporary server that at the end of the project will be shut down. The Mobile application for Android systems is currently downloadable at link <https://findplay.ddns.net>. Whereas, the Web Platform is reachable at <https://findplay.ddns.net/findplay> and is ready to be used by district delegates.

In order to keep this new service for citizens still working, the final solution would be to transfer the whole system on PA's servers. Moreover, it would also be great to upload the Mobile Application on the two biggest online application stores (Google Play Store and App Store), to share them easily and more quickly.

About future developments, thanks to the testing phase and to people who participated in it, several ideas about new possible features were collected. The first thing to do would be enlarge the list of stored playgrounds, by adding all the missing ones and their structures. In this way, to whole city would be covered. Moreover, the possibility to show a list of dog parks and ice risks as well as sport areas like soccer or basket fields, in addition to playgrounds, would speed up the success of the application. This because the amount of users who the system is addressed to would rise significantly. Finally, another suggestion would be including cycle paths useful to reach all the above mentioned places.

The implementation of this work, which lasted about 8 months, allowed to improve the method and organization skills, by strengthening problem-solving skills already acquired during each single course. Furthermore, the possibility of being in contact with the staff of Turin Public Administration and with parents who helped in the preliminary phase and testing phase has improved the ability to approach likely end-users, which may be encountered in future job opportunities.

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