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A solidarity platform to ease the COVID-19 impact: an API-first approach

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DEDICACE

All praise and thanks to Allah whose blessings make possible all good deeds, and may His prayers, be upon the Prophet Mohammed Peace be upon Him.

Lovingly we dedicate this dissertation to our parents and families for their unconditional support and for giving us the chance to prove and improve ourselves through our walks in life.

We dedicate it to our friends for being so close to us and those we found helpful whenever we needed them and have provided us with power to finish this work.

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INTRODUCTION

Covid-19 pandemic has put the world in front of an unprecedented challenge. Most countries have struggled to manage the consequences of this health crisis, particularly regarding the procurement of the necessary resources and means to fight the pandemic. This situation showed everyone the importance of solidarity on different levels.

Our country was also severely hit by the pandemic causing disastrous situations in many regions. The shortages make the situation worse and sometimes led to a total loss of control on the situation. This showed the weakness of the national solidarity and the absence of adequate mechanism that help to deal with such difficult conditions. In front of this situation, people turned to social networks to seek or to give help. Many groups and communities were formed and they set together a new digital form of solidarity.

The COVID-19 outbreak seemingly provides an idea of how the future will be and how digital technologies will invade all the shady corners. From education to businesses, everyone realized that digital transformation is, from now on, an obligation. Everyone is engaging in an adaptation process through the adoption of new technologies.

In front of this new reality emerging from the ongoing COVID-19 pandemic, new solutions needs to be developed to face the new challenges and get ready for similar or even harder crisis.

This project came from this perspective and tries to put a small brick and contribute in the global effort of adopting digital technology to get ready for the next challenge. Indeed, we contributed in the development of a digital solution that supports solidarity action and that allows an efficient exchange of resources between donors and people in need. In the context of the fight against Covid-19, those resources can be personal protective equipments like masks or any other necessary thing like test kits, respirators or medicines.

The proposed solution is not limited to crisis circumstances and can be used in general for the donation of objects between individuals. This helps to fight against waste by giving a second life to abandoned objects.

The whole project can be divided into three parts: an API based Backend system, the admin dashboard and the user mobile application. Our work consists of the

design of the solution, the implementation of the backend system with its Web API and a partial implementation of the mobile application features.

We followed the API-first approach in this work. The application programming interface (API) is built first to allow apps on various platforms to be independently built on top of it.

This document is composed of 4 chapters which are structured as follows:

- Chapter 1 investigates the relation between social solidarity and the digital technology.
- The second chapter presents the preliminary study we performed. In this part we analyzed similar apps and then we analyzed the data we collected from the interviews and the survey to define the user requirements.
- Chapter 3 represents the architecture of our system and fixes architectural design choices. The requirements for the project, both functional and non-functional, are specified and modeled with UML. After that, we develop the Rest API specification.
- In the last chapter we present the implementation details.

The conclusion comes at last and describes the conclusions and the future work.

1

DIGITAL TECHNOLOGY & SOLIDARITY

The world is faced with the most significant public health battle in modern day history. COVID-19 and the virus that causes it, SARS-CoV-2, have ravaged the world's population, leading the World Health Organization to declare COVID-19 to be a pandemic on March 11, 2020. Looking for the bright side, this crisis has strengthened the concept of solidarity between individuals, especially about providing the means and necessary resources to fight this epidemic, on the one hand, and on the other hand, it demonstrated the great need for modern technology during quarantine in various sectors. In this chapter, we're going to shed light on solidarity and digital technology in modern societies and how this two combine to achieve digital solidarity, especially in crisis times.

1.1. Solidarity in modern societies

Solidarity is one of the universal and fundamental values of human association that emphasizes the cohesive social bond that holds a group together (1). As a sociological concept, solidarity is an affair of the mutual relations of a group of individuals to one another (2). There are different motives for solidarity. For some, affection and shared norms and beliefs are motives, while for others; rational choice and self-interest are drivers (1).

Solidarity within a society is expressed, in particular towards the poorest or most vulnerable groups or individuals, in the short to medium or long term at the local

level or more broadly. It can take the form of financial aid, moral support, in-kind assistance (food ...), or housing for refugees ... etc.

1.2. Social and Solidarity Economy

The social economy, the solidarity economy, and the popular economy are all terms that refer to the people-centered economy, where the primary goal of economic activity, that is, the production of goods and services, is to satisfy the needs of the people and not to achieve maximum profits.(3)

In this context, Melissa Boudes, a researcher in management at Institute Mines-Telecom Business School, explains the social and solidarity economy saying that this structure is dedicated to serving human needs. For example, organizations that are part of the SSE are either non-profit or low-profit limited companies.

Organizations that are included in this economy are Cooperatives, mutual funds, and social businesses. She cited an example which is the cooperative Group Up that develops payment systems and management solutions that improve the vitality of businesses and regions, as well as the purchasing power and better living of employees and citizens while offering freedom of choice and use.(4)

Governments and other organizations support the social economy and the role of the private sector as a principal source of economic growth and job creation. Also, they work to support the SSE as a means of implementation of the Sustainable Development Goals.

1.2.1. SSE in Algeria

The A'AMAL project is part of the Youth Employment Support Program Le (PROGRAMME D'APPUI JEUNESSE EMPLOI - *PAJE*) that aims to support the reforms and actions taken by the Algerian Government in the implementation of youth-centered policies and co-financed by the Algerian Government and the European Union.

A'AMAL has been contributing to the enhancement of employability and professional integration of young people in Annaba and Khenchela, through direct technical and financial assistance to civil society organizations. This project benefits from the international labour organization (ILO) expertise in the areas of local economic development and entrepreneurship development.

A key feature of A'AMAL is the grant mechanism used to support community-based projects benefiting young people. (5)

1.3. Solidarity in emergency times

The international community has suffered a series of serious crises, including the escalation of poverty in large regions of the world, the crisis of climate change, which is now producing serious negative effects on the environment and development in many countries, as well as the refugee crisis that has worsened during the past years, let alone natural disasters that cannot be anticipated or planned to confront, so protecting lives and reducing suffering becomes an issue for practicing social solidarity and support to reach all who need help.

If international solidarity is a basic necessity to confront crises, then it imposes the necessity to revitalize the international frameworks for facing these crises, foremost among which is the "United Nations" and its specialized organizations entrusted with treating poverty and development crises in the third world countries and elsewhere. There is no doubt that The developed countries have a great role to play in supporting and assisting the poor countries and combating international crises because they have the material capabilities, expertise, experiences, and various alternatives necessary to stand up to these crises, which is what most poor countries lack.

Thus, organizations are found to assist the victims, particularly in the areas of food aid, access to drinking water, hygiene, construction of shelters, and emergency medical assistance. Next we list examples of international organizations solidarity programs and actions:

- Première Urgence Internationale : a non-profit, non-political, non-religious international NGO (Non Governmental Organization) that helps civilians who are marginalized or excluded as a result of natural disasters, war, and economic collapse. According to their official website (6), they had a lot of missions around the world: they intervened in Cameroon to meet the needs of Central African refugees in terms of food security, access to drinking water, camp management, etc. As well in the Central African Republic," The teams responded to the emergency in the food security sector with the distribution of food and with a support to the health system reinforcement." For their mission

in Sudan, "The operations consisted of supporting health centers, and deploying mobile clinics, in close collaboration with Ministry of Health."

— Action Against Hunger: an NGO that has been fighting hunger in the world. This organization has a lot of activities in different countries. According to the organization's official website (7), In Yemen, "Action Against Hunger worked to strengthen staff capacity within the ministry of public health and at health services level to improve the delivery of severe acute malnutrition treatment". Also, for Nigeria, they "implement the WaSH (Water, Sanitation and Hygiene) in Nutrition strategy, food security and livelihood interventions aimed at fighting the root causes of hunger by addressing production, access, and income issues through emergency, recovery and resilience programming, cash assistance to vulnerable people in Borno and Yobe and much-required policy initiate around social protection."(7)

1.4. Solidarity in time of COVID-19

The spread of the Corona virus has turned the world upside down, the death toll continues to rise, fear and panic in the souls increase with every second, all sectors are affected, migrants stuck in the affected countries, workers have stopped doing their work, and many more. Faced with all these challenges, the world's governments are unable to contain the situation and resort to imposing quarantines.

For this reason, the efforts of the countries joined together, and the role of international organizations, associations, and even individuals among themselves emerged in solidarity and volunteer work. Next, we will mention the most important aid and actions that have contributed to face the situation created by the pandemic.

1.4.1. International efforts to contain the crisis

China has provided medical supplies and facilitated their purchase, sending many artificial respirators, protective masks, and medical equipment, besides to medical teams, and contributing to the construction of hospitals.

As for Cuba, more than 500 health experts have been sent to the most affected countries by the disease.

Italy was one of the most affected countries by the Corona pandemic, so it benefited from more than one million medical masks from Austria, ventilators, field hospital equipment from Denmark, and protective suits from the Czech Republic.

While the African Union took the initiative to achieve the principles of solidarity, by mobilizing the various health sectors in African countries and coordinating with the Centers for Disease Control and Prevention, and providing social and economic support to the communities most in need. Meanwhile, Asian countries focused on intensifying efforts to save the economy.

The UAE also has participated in solidarity with several countries, by sending aid planes carrying various medical and preventive supplies to Italy, Colombia, Iran, Ukraine, and Kazakhstan, and also, establishing a preventive health center to provide curative care and conduct the necessary medical examinations for nationals of the affected countries who were evacuated from China to ensure their safety.(8)

1.4.2. Private sector role

The private sector on the other hand, actively contributed in the global efforts to combat the COVID-19 outbreak. A lot of companies have provided donations, services directed to those who deserve them, in-kind assistance, and some others directed most of their economic activities for the benefit of the state. Provide the necessary protective medical equipment, such as masks and protective clothing, to support the medical section.

For example, ZALL Smart Commerce Group, a leading business-to-business e-commerce group, donated emergency medical supplies, including surgical and N95 masks; medical protective clothing; protective goggles and gloves as well as disinfectant supplies. It has also set up emergency hospitals, and two quarantine facilities in China.

AstraZeneca is a global, science-led bio-pharmaceutical company that provided donating face masks to support healthcare workers around the world. And partnered with the World Economic Forum's COVID Action Platform.

General Motors has worked with Ventec Life Systems which is an American medical device company, to help increase the production of respiratory care products such as ventilators that are needed by a growing number of hospitals as the COVID-19 pandemics spreads throughout the U.S.(9)

1.4.3. Associations and NGO

There is no doubt that civil society organizations, charities, and community service activists must have a role and impact to overcome this global crisis. This role was represented in identifying urgent cases and organizing the work of volunteers and directing them, disseminating information and communications, establishing solidarity campaigns to distribute food products to poor families, and collecting financial aid for the benefit of other citizens who lost their jobs during the crisis. This solidarity, in which everyone joined, was not limited to one group without another.

- The African Medical and Research Foundation (Amref Health Africa) which is a non-governmental organization founded and based in Africa, provision health structures and communities with equipment, materials, and products such as hand-washing stations to be installed at health facilities, surgical masks for the protection of nursing staff, masks for community-based distribution, bottles of hydro-alcoholic gel.(10)
- The World Health Organization (WHO) set up the COVID-19 Solidarity Response Fund, an initiative allows individuals and organizations around the world to directly support the work of WHO and partners to help countries with greatest needs prevent, detect, and respond to the COVID-19 pandemic. As of July 2020, the Solidarity Response Fund collected more than 200 million USD from more than 500,000 individuals and organizations. WHO in collaboration with the World Food Program established the UN COVID-19 Supply Task Force for the Provision of medical supplies to countries. It has also shipped personal protective equipment and diagnostic tests to over 120 countries.(11)
- The Freedom Fund is an international non-profit organization dedicated to identifying and investing in the most effective frontline efforts to end slavery that has done many actions to respond to the current crisis, the most important is setting up a covid-19 Emergency Response Fund to offer immediate small-scale funding to the freedom fund partners working with vulnerable communities for three types of activities:
- Emergency relief (food, shelter, soap, protective equipment, etc)
  - The monitor needs and pushes for adequate government responses
  - Micro-grants to savings and loans groups, self-help groups.(12)

1.5. Digital Technologies

Digital technologies Also known as Information and Communication Technologies (ICTs) refers to all communication technologies, including Internet, wireless networks, mobile devices, computers, software, middleware, video-conferencing, social networking, and other media applications and services enabling users to access, retrieve, store, transmit, and manipulate information in a digital form. The past decade, we've seen ICTs progress with overwhelming speed.

Here are some major facets of this unique revolution:

CLOUD COMPUTING

Although cloud computing has existed for many years, it has not received much popularity due to a lack of awareness of the potential of technology, but at present, it has become a major requirement of modern society.

Nowadays, cloud computing evolved into several forms of service that be broken down into managed services, SaaS, Web services, utility computing, and platform as a service (PaaS).(13)

BIG DATA

The term "big data" refers to data that is so large, fast or complex that it's difficult or impossible to process using traditional methods. Big data has evolved from structured data that includes managing and storing data only, to semi-structured and unorganized data as a result of the web sweeping the world of digitization and the spread of IoT devices that are being embedded everywhere.

WEB

Despite the emergence of the Web in the nineties, it did not receive much attention until recent years, when it witnessed a technological revolution between "Web 1.0", which consists mainly of static pages and "Web 2.0" flexible with dynamic content that responds to user input, down to the third generation "Web 3.0" which revolves around the concept of decentralization of the global information network, meaning giving the user more power in data management and more privacy, so the data focus is transferred from companies to individuals.

AUTOMATION

For decades, basic automation is used to create simple triggers by basic "if, then" actions. The next phase is that of self-service automation, most of which is handled by chatbots that are only capable of understanding basic commands and following pre-determined decision pathways. Today, automation takes the concept of chatbots to the next level by introducing advanced technologies, like artificial intelligence, machine learning and natural language processing into the mix. They are also capable of learning, making their own decisions and executing complex tasks.

INTERNET OF THINGS

The Internet of Things, or IoT, is about extending the power of internet connectivity beyond computers to a whole range of other things, processes, and environments. Those connected, smarter, things are used to gather information, send information, or both, in order to help businesses and people to be more connected to the world around them and to do more meaningful, higher-level work.(14)

1.6. The importance of digital Technologies

The impact of technology is higher than that we expected, it plays an important part in the majority of our lives. The technology essentially harnesses the tools, technologies, and strategies used to solve problems, save lives and improve work. Further, technology helps some third-world countries to have a stronger infrastructure in place that also means better transportation, better schools, hospitals and other municipal services, and access to health care. (15)

Here are the key advantages:

- Digital technology makes it easy to stay in touch with friends, family, and work remotely through Social media, messaging, texting, laptops, tablets, and mobile phones.
- It enables the transfer of large amounts of information across the web almost instantaneously, sends large data files, and access data from virtually anywhere in the world.
- It provides more opportunities for working from home, as remote working becomes increasingly common.

- Anybody with access to the internet now has access to a huge proportion of the world's knowledge over the web. Lessons and courses can now be delivered virtually online.
- Digital technology enables the storage of massive amounts of information in relatively small spaces. Large amounts of media, as well as physical locations, data can also be stored online, enabling it to be accessed from any device which has internet access.
- One of the great advantages of digital technology over traditional media is that the information can be much easier to edit or manipulate.
- GPS services can now pinpoint any position accurately, update on traffic jams and road closures in real-time, and giving lots of up-to-date information.
- Digitalization has led to a revolution in financial matters. Bank users can now check their incoming and outgoing payments remotely, as well as arrange money transfers and bill payments. Outside of banking, other financial matters, such as buying and selling currency and shares can be dealt with online. (16)

1.7. Challenges for using digital technologies

DIGITAL LITERACY

It is essential to develop the skills to locate, comprehend and consume digital content. With the big spread of new technology, it becomes a basic thing in the daily life of citizens of all countries. As a result, the need to learn to use new technology hasn't been the only issue, but also to learn how to interact with one another. All skills that include these abilities have been combined under the term digital literacy. It describes how users find and evaluate information within digital environments. Digital literacy involves any number of digital reading and writing techniques across multiple media forms, including words, texts, visual displays, motion graphics, audio, video, and multimodal forms.

Using social networking sites such as Facebook, Twitter, and Instagram requires users to understand and manipulate information in multiple formats. Web 2.0 tools are social, participatory, collaborative, easy to use, and facilitate the creation of online communities. Being able to communicate digital content using mobile devices such as cellphones and tablets provides convenience and immediacy to the communication process for users.(17)

DIGITAL DIVIDE

The digital divide is known as a gap between people, demographic groups, or countries to access to or use ICTs. Whether is caused by socioeconomic status or the lack of access to the Internet that also leads to less practice of digital literacy skills or others. The social and economic factors that can have significant impacts on the digital divide are the differences between rural and urban areas, central and peripheral areas, and the level of Education, income, age, and gender. Lack of access can also be seen at the demographic level when certain demographic groups can spend more time on the Internet than other groups.

The ability to connect to major networks allows citizens to improve their quality of life and take advantage of the services offered by society. This capacity can be seen as a condition for the progress and well-being of the community.

Consequently, the absence, insufficiency, or marginalization concerning ICTs constitutes an obstacle to social inclusion and a constraint to the integration of society. We can distinguish three forms of digital divide:(18)

- Access divide: It means the ability to access to the internet since digitization requires very costly investments and infrastructure for less developed regions and rural areas.
- Use divide: It refers to the lack of digital skills, which impedes the handling of technology.
- Quality of use gap: Sometimes the users have the digital skills to find their way around the Internet, but not the knowledge to make good use of and get the most out of it.

COST OF TECHNOLOGY

Computers, software, and all components of telecommunication systems are forming the technology infrastructure which is considered of utmost importance in any country. (19)

The cost of digital technology tools and resources create a big challenge in emerging countries where it led to difficult access to telecommunications, hardware, software, and the Internet at reasonable prices and a large portion of the population is left behind.

1.8. How technology helps to manage the crisis

The COVID-19 pandemic has highlighted technology's importance to public health security and pandemic preparedness. Though technology is an unusual participant in the traditional public health sphere, it has turned out to be one of the star players.

Early in the pandemic, hospital systems became overwhelmed with capacity and inquiries. Thus, Screening and triage bots became an important tool to perform these activities at scale. Chatbots technology provided an effective and efficient means to recruit subjects for COVID-19 research studies and donation efforts.

PROVIDENCE has been using an A.I.-powered chatbot named Grace to help handle the huge influx of people seeking medical advice. The chatbots used its natural language processing capabilities to screen patients for COVID-19 symptoms and/or exposures by asking a series of questions based on the latest Centers for Disease Control & Prevention (CDC) guidelines.(20)

The spread of the infection, the widespread nature and aggressiveness of the virus began to stretch the limits of what hospitals alone could handle, for this reason, Oregon Health & Sciences University, a large academic tertiary care medical system, implemented a virtual Intensive care unit (ICU). The platform, integrated several disparate critical care data sources into a single platform, allowing for the remote management of critical care patients at scale. It provided a mechanism to disseminate not only technology, but also critical care expertise to areas where such capabilities were necessary and lacking.

Data Platforms provide the ability to manage this pandemic and future pandemics by enabling the exchange of information related to the virus and its impact on clinical parameters, resource availability, utilization, and access to other relevant data sets.

Exposure notifications can help knowing if someone has been in close proximity to someone infected with COVID-19, and contact tracing helps identify and locate individuals who have been in close contact with an infected person and who now may potentially be infected as well.

1.9. Conclusion

Solidarity is a human principle that is evident during crises and troubled times, as people seek to provide assistance to the needy, but when technology interferes, it gives solidarity a wider dimension and creates what is called digital solidarity that has begun to come out to life and receives great attention, especially in the current circumstances.

2

PRELIMINARY STUDY

The preliminary study is a fundamental step in any development process because it allows to assess the current situation and to draw the various consequences. This study should be sufficiently comprehensive to allow a reasonable assessment and will prepare a basis for subsequent steps. In our case, to build a clear idea on the local context we adopted an integrated approach of three elements. We first reviewed similar works. Then we did interviews with people in our entourage and finally we also conducted an on-line survey with local population.

2.1. Pre-Crisis activism

Solidarity and community impact are not short term interests. They require continuous, lifetime engagement. Even before the beginning of the COVID-19 outbreak, many organizations, associations and volunteer groups were persistently working to support vulnerable segments of society. In Algeria, many groups work continually in this field on the local, regional or national level.

ALGERIAN RED CRESCENT

- Providing urgent relief to victims of natural disasters and providing first aid.
- Providing medical aid (donating 12 tons of medicines to hospitals in Tamanrasset, Adrar, An-Naama and El-Bayd).
- Vaccinate children and donate blood to hospitals.

- Organizing voluntary outings for doctors and distributing eyeglasses to the poor.
- Providing material assistance to poor families during the month of Ramadan, and opening restaurants for passers-by.
- Prevention campaigns against epidemics, diseases and social damage, in addition to its international activities.

ORPHAN KAFIL ASSOCIATION

The association aim to provide support to orphan children and their families in need. Some of the effort realized by the association is listed here:

- Families without income benefit from financial grants according to the number of orphans.
- Circumcision of orphaned children.
- The distribution of school supplies.
- Each year, she supervises the "Weddings" project to marry off orphans with the help of benefactors.
- Paying medical expenses and medicines for widows and orphans.
- Preparing a Ramadan package from charitable donations and distributing it to the families of orphans.

2.2. DIGITAL SOLUTIONS TO FIGHT COVID-19

As the crisis worsened many barrier measures have been adopted. The social activism with the traditional way became no more possible because of social distancing constraints. For this reason, the social movements became increasingly relying on Internet technology and the opportunities it presents.

2.2.1. Social media activism

Social media provides spaces in which people share information communicate their worldviews, and reach a consensus about initiatives and what should be done to face the situation. Examples of how social media contributed in solidarity-based action are listed below.

- We Algerians: “WE Algerians! is an organically born group of Algerians, completely independent, that have one and only purpose: to help our country get through this unprecedented crisis of Covid 19”. This is how the founders of one of the most prominent active groups described it. The initiative was initiated Algerian elite inside and outside the country. They created a facebook page named "We Algerians" and a set related groups in the early days of the outbreak and launched many projects and activities:
  - Their first steps were awareness campaigns on their Facebook page "We Algerians", to respect prevention measures and provide medical advice.
  - Three workshops were installed in Algeria, Batna and Ouargla to manufacture masks and distribute them to hospitals, and citizens have contributed to this in response to the page's call for cooperation.
  - In response to the COVID-19 crisis in Algeria and its direct impact on the educational system, WE Algerians organized an Education week camp “WE Algerians EdCamp” that meets two objectives: introduce teachers and students to online learning and training and enable brainstorming about the future of Algerian education institutions, and how they can be more competitive.
- Dr. Riad Baghdadi Facebook page: Although he is a member of the "We Algerians" group, he also used his personal page to publish new developments of COVID-19 situation and awareness articles to deal with it. He also shared requests of people in need to reach a larger number of citizens, so that the needy might find help.
- Since the World Health Organization declared the Corona virus outbreak a public health emergency, The "Stay Home" hashtag is trending worldwide on all social media platforms.
- In the local context, Another hashtag was launched from Jijel Province with the name “ثيغنست_لجيج” which means “save Jijel”. This happened after the explosion in the number of infections, which caused the local hospitals to fail to receive additional patients and to take care of the admitted patients due to resources shortage during that period. The deficiency was mainly recorded in personal protective equipments, medicines and breathing aids. The distress call on social media received an important echo. People solidarity helped alleviate shortages. Indeed, by God’s help and strength, devices and protective clothing

for doctors and masks were collected and disinfection campaigns were carried out in several areas to limit the spread of the virus.

2.2.2. COVID response mobile applications

When the impact of the Covid-19 pandemic became clearer, people from the entire globe started to develop digital solutions and technical tools to control the dissemination of the virus. Most countries focused on the use of mobile apps. Most countries developed apps to aid contact tracing, to help people with self-diagnosis of symptoms, or to enforce containment measures (21). The table below shows a list of mobile applications that emerged to fight the pandemic and their corresponding purposes.

Jurisdiction	Name of application	Purpose(s)					
		Contact tracing/ Proximity Alert	Self-diagnostic	Containment check	Crowd control	Map travel patterns	Immunity pass-port
Andorra	In development		√				
Argentina	CuidAR		√	√	√	√	√
Armenia	COVID-19 Armenia	√	√				
Austria	Stopp Corona	√		√			
Azerbaijan	Watch COVID (COVİD izlə)	√					
Belgium	Coronalert	√					
Bulgaria	Virusafe – not BLE but GPS	√	√				
Croatia	Andrija		√				
Cyprus	COVTRACER	√					
Czech Republic	eRouška	√				√	
Denmark	Smittestop	√					
Estonia	In development	√					

Table 1 : Different purposes of mobile apps for COVID-19(21)

2.3. Analysis of selected applications

Despite the big effort made to develop mobile applications to fight the pandemic. We couldn't find applications that support people at need and teams working directly with communities during the pandemic. In our work we are interested in digital solutions that can make donation and assistance in relief work easier and more effective. However, there already exists charity mobile applications with all types of charitable acts that allow people to donate all kind of

items. With the rise of the pandemic, it's no surprise that charitable donations made via mobile devices are increasing.

Below are the results of an analysis of selected popular apps available in the Google Play and App Store. We'll present a set of widely used applications which share a number of common goals with our project.

2.3.1. Share the meal

Share The Meal is an initiative of the United Nations World Food Program (WFP) - the world's largest humanitarian agency fighting hunger. It's an application developed to fights global hunger and help hungry children everywhere around the world by donating cash amounts to feed hungry children around the world.

Application name	Features and functionalities
Share the meal	- User can choose where his donation will be sent. - User can select the donation amount (number of meals), and confirm his donation through any type of payment methods. - User can monitor the progress made collectively towards a specific fundraising goal. - The United Nations World Food Program receives the funds and provides the meals. - User can invite his friends. - User can join a monthly giving community called the table, which allows him to be connected to a unique family and receives updates. - User can also see trending fundraising operation, popular profiles and challenges created and supported by colleagues and local communities. - User can create his own challenge or join one and share it with others. - The user profile shows the shared meals and achievements.

Table 2: functionalities of application 'Share the meal'

2.3.2. Geev

Geev allow donations of objects and food between individuals, it helps reduce waste by giving away the unused food, objects that are not useful anymore or even share the location of abandoned objects found on the street. This solution gives these unused stuff a new life rather than throwing them out. So that anyone interested can easily have them. However, in order to keeps Geev fair for everyone,

each user has a stockpile of single-use bananas to use as credits for contacting other Geevers. Once he contact someone about an item he lose one. But he can get more bananas by purchasing them or by donating more items.

Application name	Features and functionalities
Geev	- Application for donating food and objects. - Location is required to find the nearby ads. - To contact someone for a donation, the user need a banana which is a single use contact credits. - The user benefit two bananas for a confirm donation. - To create an advertisement, have to select category, type, location, status of item.

Table 3: functionalities of application 'Geev'

2.3.3. Insen

Insen is an Algerian mobile application in donation context, it brings together donors and people in need of medicines from all over Algeria to help them communicate and help each other.

Application name	Features and functionalities
Insen	- The application provides only donations and demands of medicines. - Home presents a list of Medicines listed by publication date, from newest to oldest. - By selecting a medicine, it shows its details, overview and comments, type and post owner so the user can access to his profile and contact/add him to fulfill the donation or the demand. - A post can be searched by a keyword or filtered by Wilaya or by type (donation/demand) or both. - To create a new post, a few rules must be respected; they are made to monitor the donating/demanding process. - The user can rate other users.

Table 4: functionalities of application 'Insen'

2.4. Analysis summary

— Social media sites have become a mean of solidarity between individuals, launching campaigns, and spreading distress calls. They have witnessed a great turnout by the pioneers of social networking sites, but on the other hand, they

have become exploited by fraudsters to achieve their personal ends, and this is what made them lose their credibility with some. Thus, social media sites can't be totally adopted as solidarity platform.

- Although these applications contain good and useful functions on the charitable scale, they contain shortcomings that may make their use in Algeria very limited.
  - Share the meal is a global application, but its use in Algeria is not common, because of the donation method that relies on credit card payment, which is not a widely adopted means in Algeria. So the application is reserved to a limited part of users. Also, the application aims to eradicate the problem of hunger, but it only accept money (credit card payment), while all kinds of food can be donated directly to the needy.
  - Geev application has good functionalities yet it's not that popular in Algeria. In addition, it's not totally free, because to benefit a donation, the user must have "Banana" gained by inscription or donation, otherwise, he have to buy it, so neither the donation is free nor it's practical in emergency cases.
  - Insen, the idea of this application is pretty good and serves the needs of the Algerian society, but it lacks some featured. It is limited in only one category of objects which is medicines. Also, we observed little control over medicines exchange in terms of mention on drug name and expiration date (unconditional in the application), or constrained use of some drugs (medical prescription requirement). Finally, the application is available in English version only, which is not a fully adopted language in Algeria. This highly reduces the targeted users set.

2.5. Interviews and Survey

To collect more data we conducted interviews with people in our entourage (friends, family, colleagues …). The goal was to get a first idea on how people think about the problem to help us define our online survey. So we carried out the interview more like a conversation using the questions to drive the conversation forward and the questions wasn't strictly prepared before the interview. If needed new questions were added as new information was learned throughout the interview. This step allowed us to create an outline for what information needed to be gathered which we used to create a more extensive survey.

The survey was conducted online using the Google forms. Because the creation of a good survey requires getting answers from the correct population, we selected a set of online pages and groups in relation with COVID-19 solidarity action to spread the survey. At the end of the survey, 313 answers were collected. The survey can be consulted in the Appendix A.

2.5.1. Analysis of the user survey

This section contains an analysis and review of the survey results. The majority of the survey data was collected between 15.05-2021 and 21.06-2021.

QUESTION 01

In the first question we asked about the user profile to assess how is he related to the crisis.

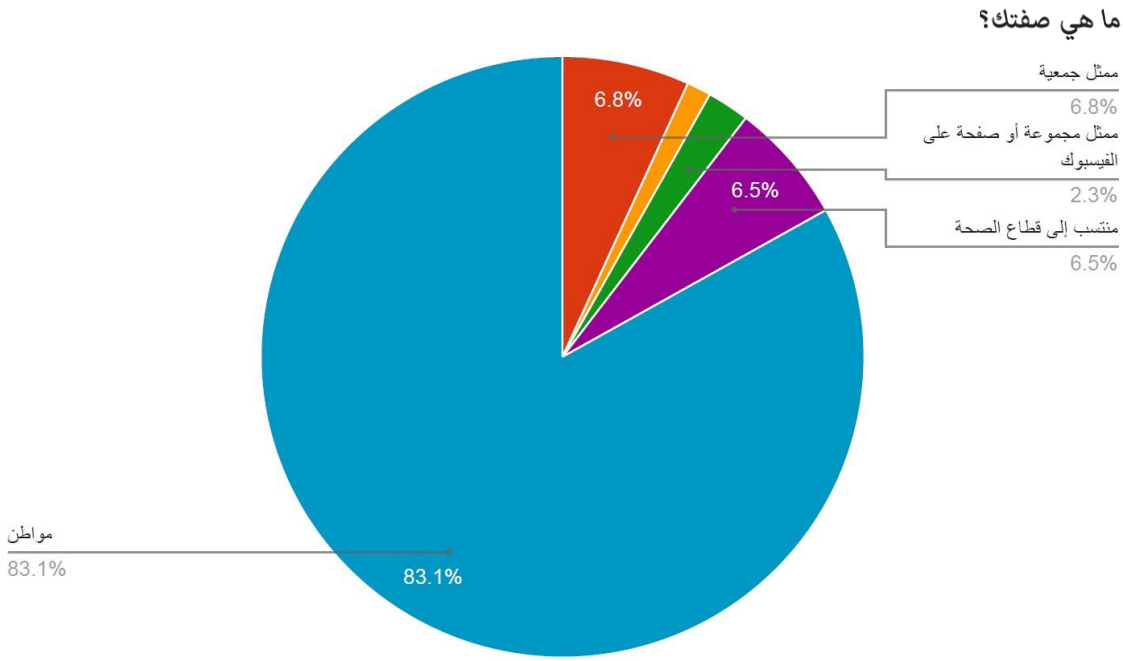


Figure 1 : Survey, user profile

Most respondents are people with no direct link with the crisis (83%). 6.5% are health workers, 9.1% represents a group of volunteers, social media groups or associations. Finally 1.3% represents companies whose activity domain is related to the global effort to fight the pandemic. The distribution looks realistic.

QUESTION 02

Do you know relatives (or entities) who urgently needed something specific and had a hard time getting it during a health crisis?

هل تعرف شخصا مقربا (أو هيئة) احتاج بشكل عاجل لشيء محدد وواجه صعوبة في الحصول عليه خلال الأزمة الصحية؟

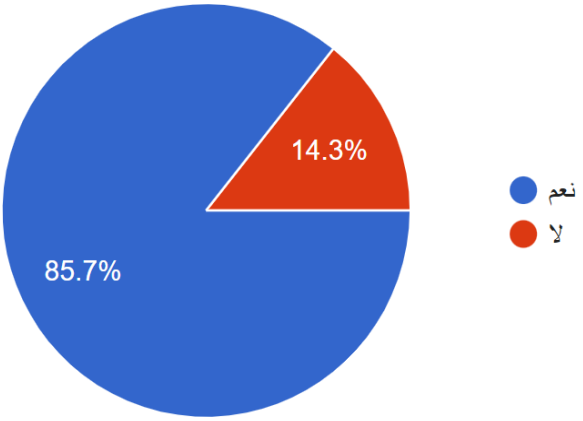


Figure 2 : Survey, shortages during the pandemic

85.7 % of the respondents confirmed they have relatives who needed something during the crisis and they found difficulties to find it. This means that shortages were so important.

QUESTION 03

After we asked if they could finally find what they looked for.

هل تم الحصول على تلك الحاجيات؟

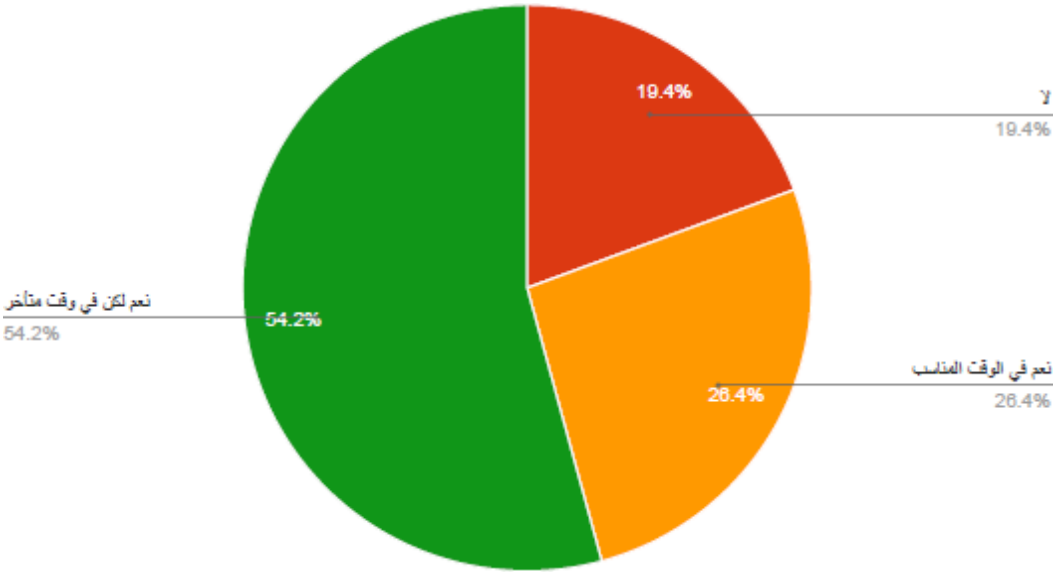


Figure 3 : Survey, shortages during the pandemic

19.4% couldn't get their need at all, 54.2% got it but late and only 26.4% got what they needed in good delays.

QUESTION 04

Then we asked about thing they couldn't find or couldn't find easily.

ما طبيعة ذلك الشيء؟

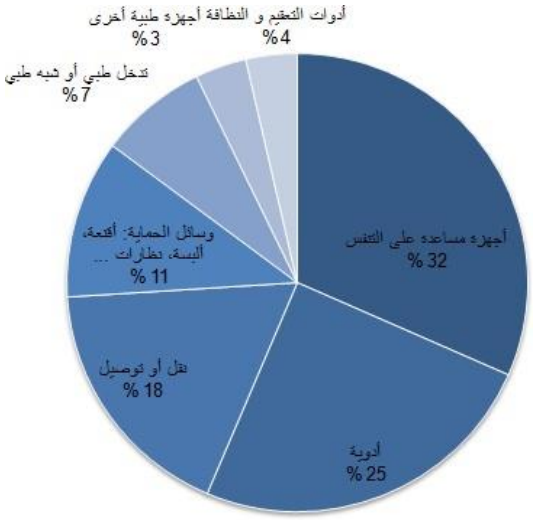


Figure 4 : Survey, main lacking resources

32% said they looked for ventilator medical devices that help to breathe. 25 % lacked medicines, 18% needed transport services and 11% lacked personal protective equipments. The rest mentioned various needs like medical services and devices, disinfection and hygiene tools and food.

QUESTION 05

We also asked if people are looking to buy their need or if they were looking for a donation.

ما نوع الاستفادة التي كان يبحث عنها؟

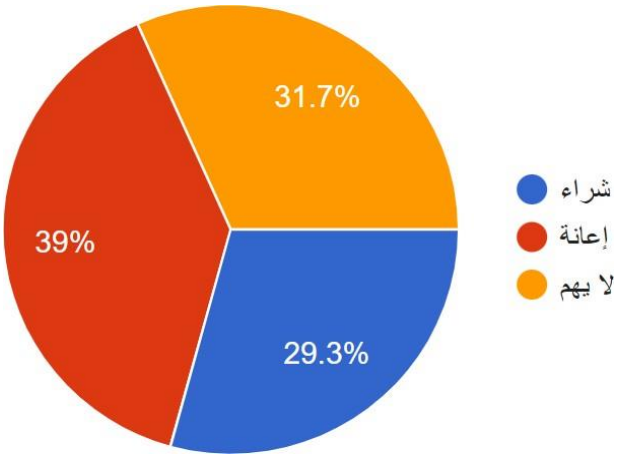


Figure 5 : Survey, sort of needs

QUESTION 04

What are the means that contributed to obtaining these necessities?

ما هي الوسائل التي ساهمت في الحصول علي تلك الحاجيات ؟

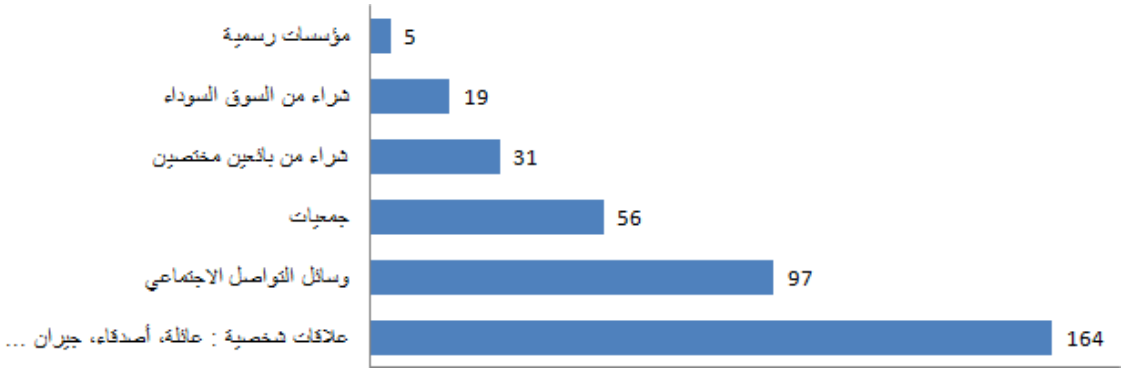


Figure 6 : Survey, action against shortages – the main outlets

62% of the respondents claim they got their needs through their acquaintances and personal network (family, friends, neighbors ...), 37% got help on social networks, 21% contacted associations and 19% bought them from the official or the parallel market.

QUESTION 07

Do you know a close person who was seriously affected by not getting certain necessities?

هل تعرف شخصا مقربا تضرر بشكل جدي بسبب عدم حصوله على حاجيات معينة ؟

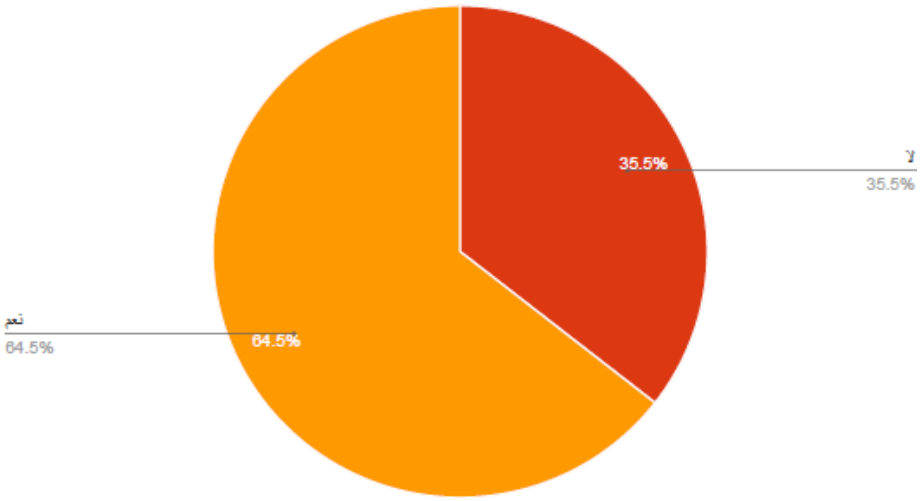


Figure 7 : Survey, the importace of the harms caused by the lack of resources

64.5 % of the respondents confirm they have relatives who was seriously affected by the shortage.

QUESTION 04

What is the nature of the harm?

ما طبيعة الضرر؟

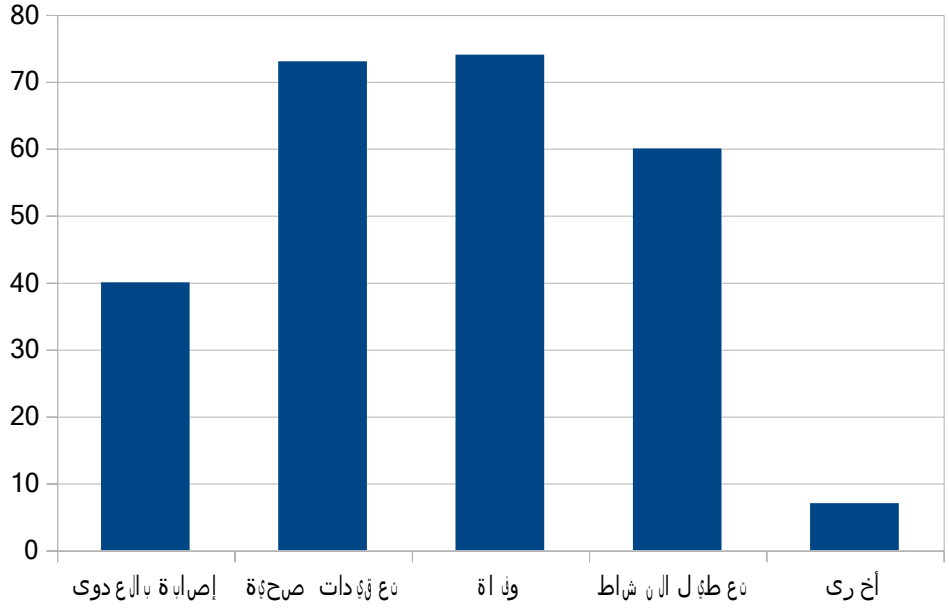


Figure 8 : Survey, shortages consequences

33% of the respondents witnessed that their relatives died because they couldn't get the needed help at time or at all. 32.6% said they witnessed health complications, 27% said their activity stopped and 18 % got infected with COVID-19.

QUESTION 09

We also asked people if they contributed in providing necessities for those affected by the pandemic.

هل ساهمت بشكل من الاشكال في توفير الحاجيات لفائدة المتضررين من الجائحة؟

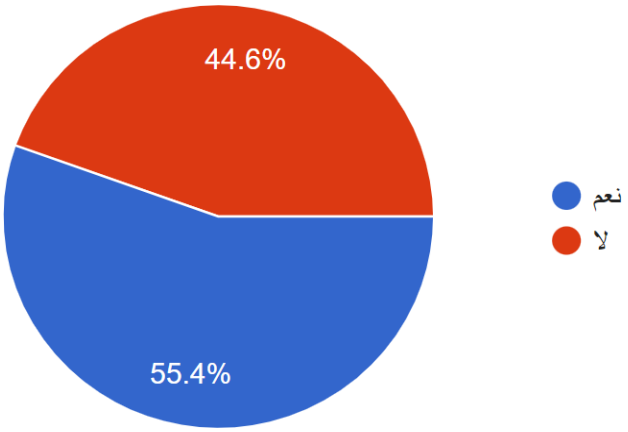


Figure 9 : Survey, users contribution

QUESTION 04

We also asked about the nature of their contributions and we got various answers like: donations, posting distress calls or information, transport and delivery, lending equipments, production of equipments and sale.

QUESTION 11

We asked people who had volunteer activities about the entities they dealt with in those activities. The respondents mentioned associations, healthcare providers and workers, official entities, vendors, transporters, hotels, various state institutions, public and private bodies, volunteer groups on social networks, mosques and donors.

QUESTION 12

What are the most important activities that have been done?

Here the respondents mentioned a very long list of activities like initiatives to buy lacking equipments to healthcare providers, spreading awareness, offering various services like transport, helping poor people, …

QUESTION 13

We are developing a digital system to support the solidarity process, what is your favorite interface?

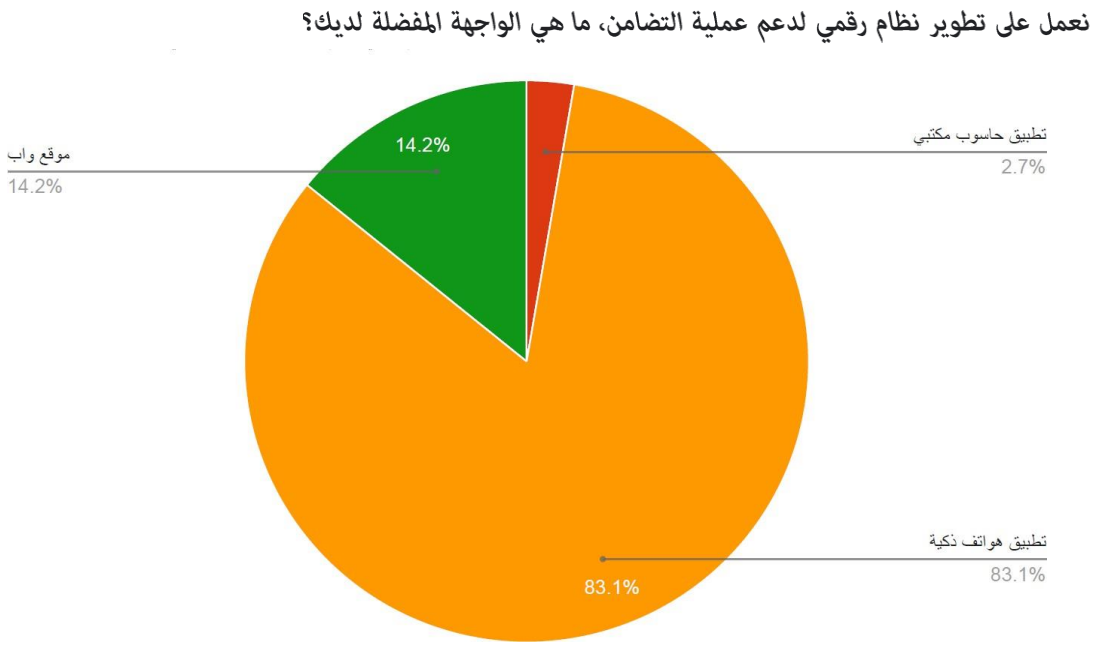


Figure 10 : Survey, favorite interface

83.1% of the respondents prefer mobile applications, 14.2% voted for a website and 2.7% for a desktop application. Consequently developing a mobile application first is the best option to reach the maximum number of users as possible.

QUESTION 14

Finally, what are the functions and information that the application should provide, according to your opinion, to achieve better effectiveness in facing similar crises and to strengthen solidarity work?

The respondents mentioned various technical and functional requirements they would like to see in the application. Most of them was practical idea and helped us better understand the user needs.

2.6. Wrapping up

Before deciding on the final functionalities set to adopt in our solution, it is relevant to analyze the answers provided by the survey. Here are the most important points extracted from the answers, which are the most frequent:

- The means of fundraising was through personal relationships, social media or charities.
- The most important shortcomings were in respirators, medicines, means of protection, medical intervention or transportation and delivery.
- The Contribution during the crisis was by donating, publishing distress calls, transferring and delivering or an advance.
- The difficulties were represented in the high price of the products in exchange for their scarcity in the markets, transportation and delivery, especially in remote areas.
- The most important charitable activities were in raising awareness, buying respirators, delivery, and disinfection campaigns.
- The users prefer the mobile application.
- Respondents also suggested the integration of geographical location.
- Trust is a big issue for many users especially for lending equipments and devices.

- The users also insisted on making all kind of information available in the application.

In the scope of this work it will be hard to answer all those needs because the limited time, however, it is possible to start with a first version and improve it until it answers all the needs. For now, we begin the journey with developing the backend API and some functionalities of the mobile application. However, our design will consider the collected information and mainly the following guidelines:

- Upgrade users to different badges if they can prove their identity.
- Any user can benefit from any donation, make a request or initiatives.
- The application is totally free.
- No money donation, selling or buying items will be allowed.
- The application is directed to all the country's states.
- Once a category is selected, all other related categories items are shown below.
- A user with "member of association" badge can launch a fundraising.
- Transport service is available.
- No ads.
- Any user can rate other users depending on their behaving in the application.

2.7. Conclusion

The study presented in this chapter allowed us to define the initial requirements for our application which is the first step of the application life cycle. Next chapter, we will move on to a more accurate description of these requirements and give a clearer picture of the solution that will be developed.

3

SYSTEM ANALYSIS AND DESIGN

In this phase, we give a clearer picture of the application to be developed, by identifying the functional and technical needs resulting from the study of the system. We present an API-based approach to application architecture design then we also describe how the client application will communicate with the server application and how to manage the server content.

3.1. System architecture

The proposed architecture for this project can be divided into three different schemes: Back-end, admin dashboard and the user application. Figure 11 illustrates an overview of the system architecture.

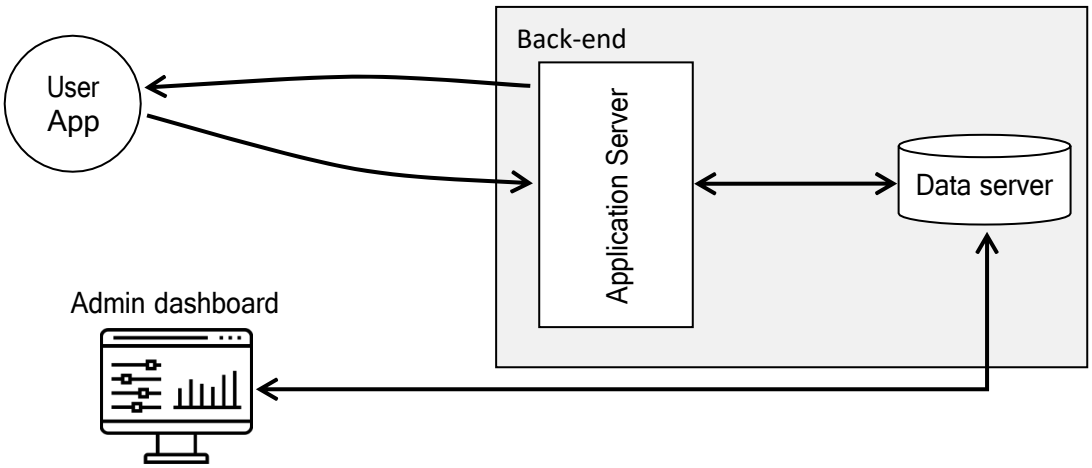


Figure 11 : overview of system architecture

The back-end consists of the server side of the system. It comprises an application server and a data server. Server side is responsible for allowing the client to access to the information and accomplish authorized tasks. In addition, it provides a set of tools that allows the administrator to manage the system content and settings.

The general architecture prototype corresponds to 3-tier client/server architecture. The concept of the client-server was developed in the 1990s to combine the advantages of centralized computing and personal computing. It is now a widely used model for building distributed applications. In a client/server model, the server is known to all. The clients send the requests to the server using its address and the server receives the requests and responds to the clients. The figure below illustrates the 2-tiets client/server architecture.

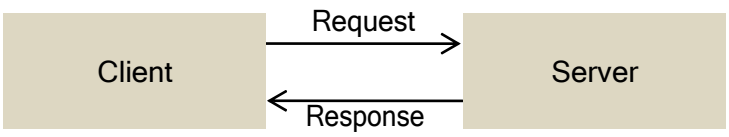


Figure 12 : 2-tiers Client/Server architecture

3.2. Architectural design choices

3.2.1. Database model

In this project we decided to use relational database for persistent data storage. We preferred this model for its popularity and use simplicity. Also, many open source relational database systems are available. They are powerful and have a strong reputation for reliability, feature robustness, and performance.

3.2.2. Client application

In the previous chapter we presented the results of our survey where we asked people about their application type preferences. Most answers (with a percentage of 83.1% - figure 13) selected the mobile application as no surprise. The number of mobile users today is greater than the number of desktop users and businesses have realized the need to use mobile technologies to reach customers because computing is now carried everywhere in mobile devices.

The importance of mobile technologies in our everyday life and activities is undeniable and the development of mobile applications has created a whole new

level and innovative mobile experience. For that reason, developing a mobile application first, is a good option to captivate the maximum number of users as possible. In our project we took this choice and our main client application will be a mobile application.

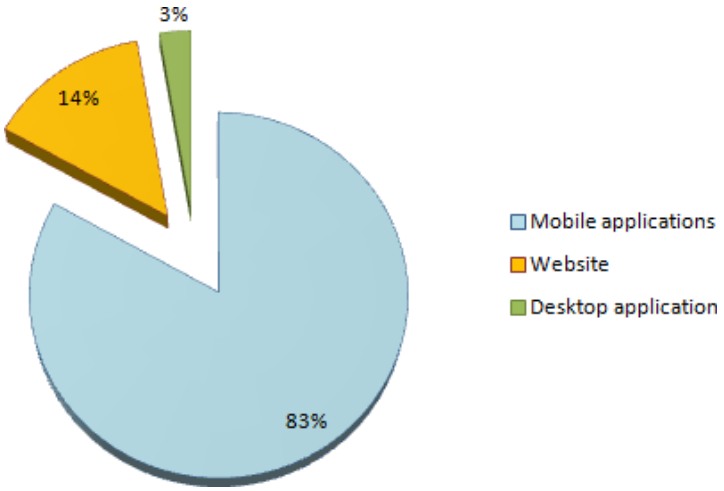


Figure 13 : users' favorite platform

3.2.3. Mobile Platform

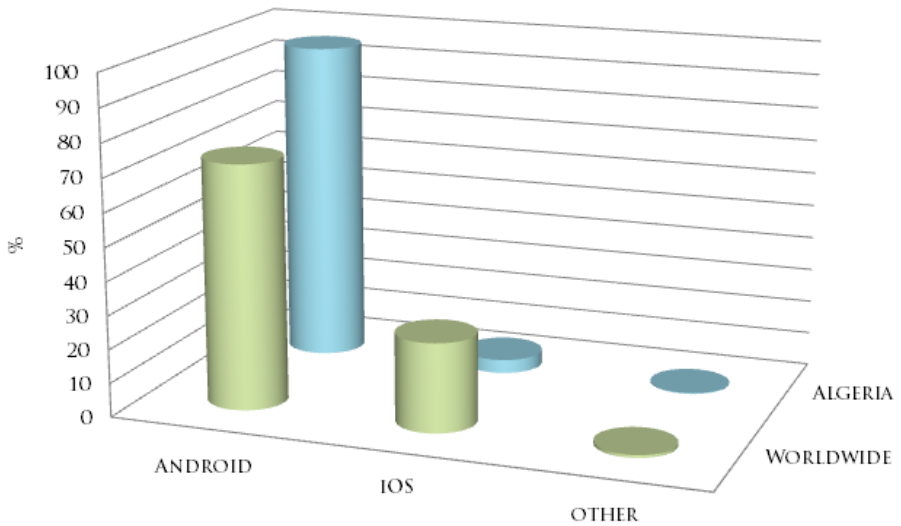
Technology Platform refers to the specific platforms on which technical architecture laid out and made to run, these platforms are very different in how they create network effects, interactions they enable.

According to the recent stats (August 2021) from Statcounter GlobalStats (22) there are two main players on the ground—Google's Android and Apple's iOS. Together, these two systems run on more than 99% of the world's smartphones. The most used mobile platform worldwide is Android with 72.73% compared to 26.42% for IOS (see figure 14).

Android's dominance is partially linked to its popularity in emerging economies. Unlike Apple, Android mobile devices manufacturers provide cheap and first-class devices for people all over the world. This allows consumers to find what fits to their budget from a variety of Android devices. In Algeria, which is the context of this work, the difference is more important and Android occupies the lead with 95.67%, compared to 4.08% for Apple iOS (figure 14).

This big success has definitely reasonable factors behind. Android has many advantages. It is a powerful and modern operating system characterized by simplicity and flexibility; it adapts to many different configurations. In addition,

Android is open source and offers powerful and free tools for developers. Its SDK offers full APIs, with a comprehensive documentation.



	ANDROID	IOS	OTHER
WORLDWIDE	72,73	26,42	0,85
ALGERIA	95,67	4,08	0,25

Figure 14 : Mobile Operating System Market Share(22)

For all those reasons, we have chosen Android as the preferred platform to develop our first mobile application.

3.2.4. Backend

In our system, the content is built by the users themselves and as they use mobile devices and given the use cases described in the previous section, there is a need to keep the data in a centralized way. This makes it possible for the user to access the content anywhere and from many devices.

It is common today to have clients interacting with an API layer representing the application on the server-side. The benefit of taking an API-based approach to application architecture design is that it allows a wide variety of physical client devices and application types to interact with the given application.

The back-end application creates an abstraction layer that simplifies the client application architecture, since these do not have to deal directly with the database. This abstraction allows developing a service oriented architecture where any client can request information from the database through the provided API which makes the client application independent from the back-end.

3.2.5. Client/Server interaction

In order to send requests to and receive responses from the backend, a communication channel between the client application and the server needs be established. Nowadays, we have various technologies for connecting remote systems so multiple approaches could be used.

In this work we opt for web services for their Interoperability over heterogeneous platforms and to take advantage of the web universality. Web services provides standard means of interoperating between different software applications, running on a variety of platforms. This will essentially make the system services available for all the users via whatever devices (with an appropriate client application on).

Also, the client and the server need not be coded in the same language or even in the same style of language. Clients and services can be implemented in object-oriented, procedural, functional, and other language styles which give high flexibility in the implementation stage. The complexities of stubs and skeletons, the serializing and deserializing of objects, give way to relatively simple text-based representations of messages exchanged over standard transports such as HTTP. The messages themselves are neutral; they have no bias toward a particular language(23).

In our solution, the API provided to the client application will allow the user to send requests to get a list of the items from a selection or search result, view the details about requests, donations or initiatives, add new items, among others.

The figure 15 provides a clear illustration of this client-server interaction.

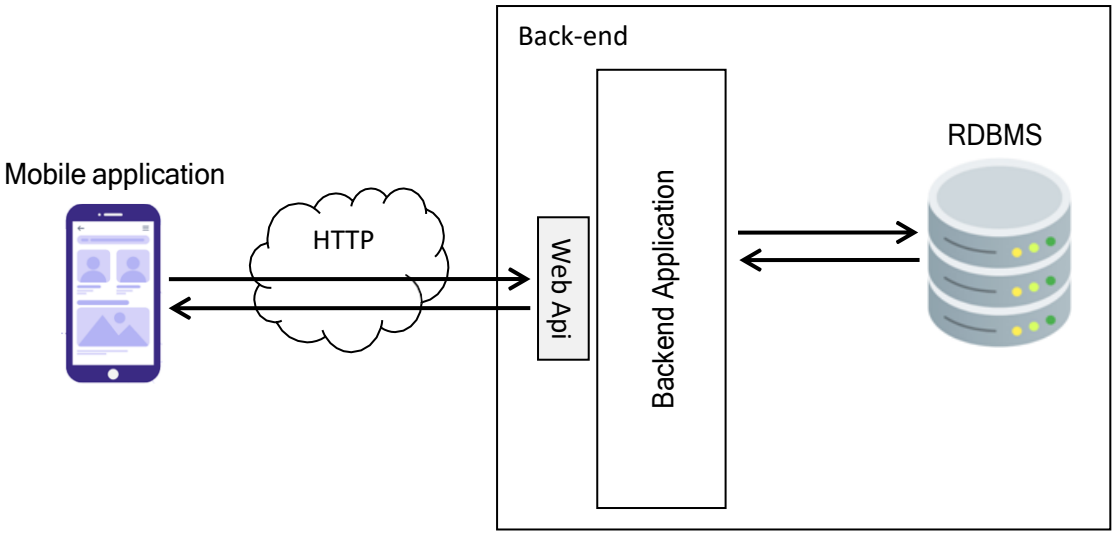


Figure 15 : client/server interaction scheme

3.2.5.1. WEB APIs

The Web API defines interfaces that provide an implementation-independent way to access the services and functionalities provided by the backend application and needed by the clients. The messages are exchanged using general-purpose protocols such as HTTP and can be in different formats. There were no generally accepted data formats. At first we used XML, which is still used but new formats appeared like JSON or binary formats such as Protocol Buffers and Thrift.

The most popular web APIs are SOAP, REST, and GraphQL. So a reasonable question to ask is, as designers, which one should we select to meet the requirements. To answer this question we need to understand the benefits and limitations of each of them.

SOAP

Simple Object Access Protocol (SOAP) is a protocol for exchanging information encoded in Extensible Markup Language (XML) between a client and a procedure or service that resides on the Internet. (24)

SOAP is typically used with the Web Service Description Language (WSDL). The significance of using WSDL is that developers and machines can inspect a web service that supports SOAP to discover the specifics of the information exchange over the network. In addition, the WSDL describes how to structure the SOAP request and response messages that the given service supports. Discovery via WSDL simplifies programming web services using SOAP.(24)

SOAP can be implemented using a variety of protocols, not only HTTP but SMTP and FTP as well. But SOAP also has its disadvantages. Messages can get quite large and their format is considered complex. The verbose nature of XML makes the protocol bulky and difficult to manage.

REST

REST is an acronym for Representational State Transfer. It is an architectural style devised by Roy Fielding in his 2000 Ph.D. thesis (25). The basic premise is that developers use the standard HTTP methods, GET, POST, PUT and DELETE, to query and mutate resources represented by URIs on the Internet. (See Figure 16)

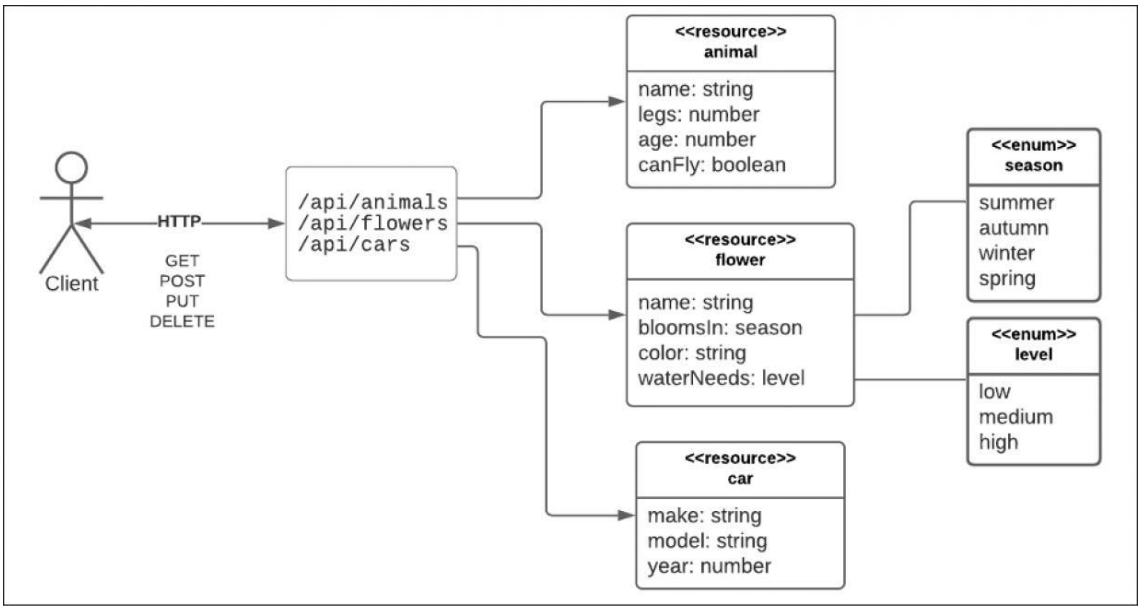


Figure 16 : REST uses standard HTTP methods to work with server-side resources (24)

REST is simple, well-known, and widely used. You make a call on a resource represented by a URL on the Internet using an HTTP verb and get a response back in JSON or XML. Productivity under REST is almost immediate.(24)

GRAPHQL

GraphQL is a query language and server-side runtime for application programming interfaces (APIs) that prioritizes giving clients exactly the data they request and no more. It was designed to make APIs fast, flexible, and developer-friendly. As an alternative to REST, GraphQL lets developers construct requests that pull data from multiple data sources in a single API call(26).

GraphQL API developers describe data as a graph. A GraphQL schema is made up of object types, which define which kind of object you can request and what fields it has. As queries come in, GraphQL validates the queries against the schema. GraphQL then executes the validated queries. From the point of view of the client, the most common GraphQL operations are likely to be queries and mutations. If we were to think about them in terms of the create, read, update and delete (CRUD) model, a query would be equivalent to read. All the others (create, update, and delete) are handled by mutations.(26)

GraphQL has many advantages. Calls are handled in a single round trip and clients get what they request with no overfetching. It also allows an application API to evolve without breaking existing queries. However, GraphQL presents a learning curve for developers and adds additional work of to the server side developers.

3.2.5.2. OUR CHOICE

Choosing the right API is an important decision that should consider both the need and the characteristics of each alternative. We think that REST is most convenient and fairly meet the need at hand. Its simplicity, wide use, smaller learning curve and closeness to other Web technologies in design philosophy makes it the more appropriate for our project.

3.3. Requirements analysis

Before we start the requirements engineering phase, let's first give a clear definition of what is commonly known as a system requirement. IEEE Standard for Application and Management of the Systems Engineering Process gives the following definition:

> Requirement: a statement that identifies a product or process operational, functional, or design characteristic or constraint, which is unambiguous, testable or measurable, and necessary for product or process acceptability (by consumers or internal quality assurance guidelines).(27)

The project requirements are the foundation for every successful design. They took into account the project goals and define what the user need and also what the system must do in order to satisfy that need. To be well understood by everybody they are generally expressed in natural language and herein lays the challenge: to capture the need or problem completely and unambiguously without resorting to specialist jargon or conventions. Once communicated and agreed, requirements drive the project activity and provide the basis for planning the development of a system and accepting it on completion (28).

With the introduction of agile methods, more importance is given to communication and close user relationships instead of complete documentation of the requirements specification. This is motivated by the fact that the most basic goal of requirements engineering is to make system designers understand what stakeholders want.

System requirements are usually classified into two main classes, functional and non-functional requirements. In our project we distinguished a set of both functional and non-functional requirements which we selected in accordance with the results of the survey presented in section **2.5** and the investigation of related works in section **2.2** .

3.3.1. Functional requirements

Functional requirements are statements of the functions the system should achieve. From the study presented in the previous chapter we identified the following constraints:

- To provide a significant added value and achieve the goals it was designed for, the system should be able to reach a wide range of users.
- The system deals with sensitive data which may have a big impact on user's health and safety therefore it needs to be monitored.
- The users should be able to add their requests or contributions instantly and in a flexible way.
- Since the system efficiency relies on the user's behavior, the system must offer the means to support constructive behaviors and in the same time disallow inadequate use or harmful activity.
- The system must allow users to find the items they look for in an efficient way.
- The system must manage user profiles and make them accessible to other users.
- Social networks have exploded in number of users. The solution should make it possible for the users to share information with their friends, a user may want to share his own items or other items he find interesting using at least one social network.
- To build, maintain and improve credibility and reputation, the system must allow different levels of user verification to help create a sense of trust from all sides and also prevent fraudulent activity. This is also useful to classify users in accordance with their verified attributes.

3.3.2. Non-Functional requirements

Non-functional or technical requirements are constraints on the system functions. The distinction from functional requirements is not always simple. For instance, limiting access to registered users appears to be a technical requirement as it falls under security requirements. However, it generates other requirements that are clearly functional, such as the need to include user authentication information.

For our system we have identified the following set of requirements:

- Security: The client application requires some of private information such as location and personnel information. This information must be kept secure.
- Traceability: Given that the items displayed in the application are not under strict surveillance, the occurrence of illegal violations is possible. If such problems arise, it should be possible to identify the source of the violation and responsibilities of the involved entities. For this to be possible, the system needs to keep a set of information as history for a defined period.
- Instant update : In case of emergency, updating the applications items become a critical feature, so every new event should be visible to other users in a relatively short time.
- Usability: It should be easy for the users to install and use the system. The functions should be easy to find and self-explanatory.
- Backward compatibility: Backward compatible refers to a hardware or software system that can successfully use interfaces and data from earlier versions of the system or with other systems.
- While android platform keeps upgrading fast and providing new features in each release, the system should support most recent android versions in order to allow the client application to be used on about 98% of android devices.

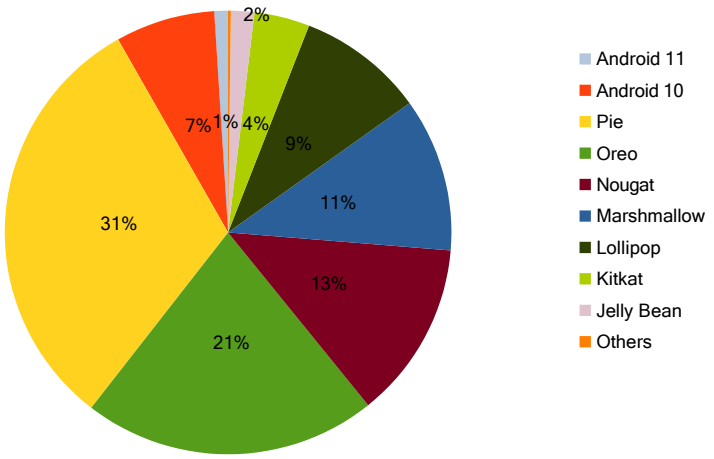


Figure 17: Android version distribution chart (29)

- Preferences: The system should allow the user to set the application in accordance with his preferences. For example, which category of items will

be displayed by default, which period of time, etc. This should be remembered by the application.

3.3.3. Actors identification

An actor specifies a role that some external entity adopts when interacting with the system directly. It may represent a user role, or a role played by another system, that touches the boundary of the system(30). In order to identify the actors, we need to consider who or what uses the system, and what roles they play in their interactions with the system(30). In our system, we identified three actors:

- Guest user: A guest user is a non-registered user who is given a limited set of permissions to access the features of the system. The guest user can browse the items and do a brief search as well in order to discover the content.
- Registered user: A registered user, once authenticated, will get permissions to use additional functions of the system. He can browse the system content but also can make changes. He can add or remove donations, requests or initiatives, rate other users, maintain his own profile or request the validation of attributes (badges).
- Administrator: One of our system features is requesting different badges, which requires from users to provide certain information; these latter needs to be authenticated, moreover, the different operations made by users need to be controlled to avoid any malicious or illegal manipulation, here comes the need for an administrator.
- The role of the administrator is summed up in managing accounts, categories, badge requests and items.

3.3.4. Use cases

A use case defines a sequence of interactions between one or more actors and the system. It models the functionality of the system as perceived by actors. A use case is a unit of functionality expressed as a transaction among actors and the system. The purpose of the use case is to list the actors and use cases and show which actors participate in each use case (31).

3.3.4.1. USE CASES SUMMARY

N°	USE CASE	
1	Register	
2	Search / Browse	
3	Refine selection	
4	View items details	
5	Delete item	
6	View user profile	
7	Rate user profile	
8	Add item	
9	View profile information	
10	Request badge	
11	Update profile information	
12	Login	
13	Process badge requests	reject request grant badge
14	Manage items	Search / Browse View items details Delete item
15	Manage categories	View categories Delete category Add category
16	Manage users	View users list View user profile Approve registration Add/Remove badge Delete user
17	Manage badges	View badges list Add badge Delete badge

Table 5 : All identified use cases

3.3.4.2. USE CASES DIAGRAMS

Modeling with use cases involves use case diagrams. A use case diagram depict the system from the perspective of the system user. It shows how the user uses the system to derive some type of beneficial service from it. This diagram can contain one or more use cases. Some use cases extend others, whereas others include others. Some generalize or specialize others (32). The figures 18, 19, 20 and 21 shows the global use cases diagram and the separated use case for each actor.

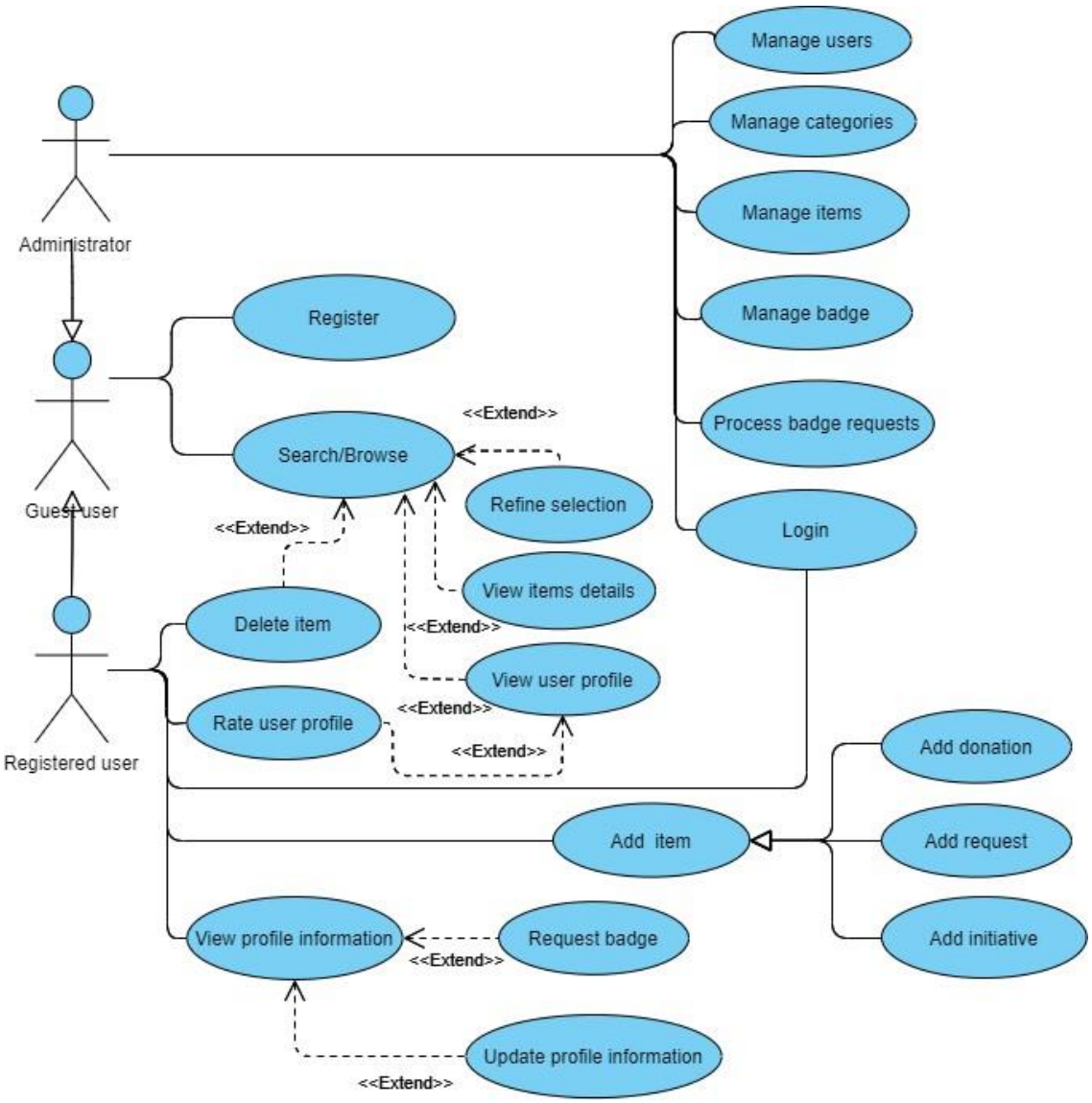


Figure 18 : All identified use cases on a single diagram

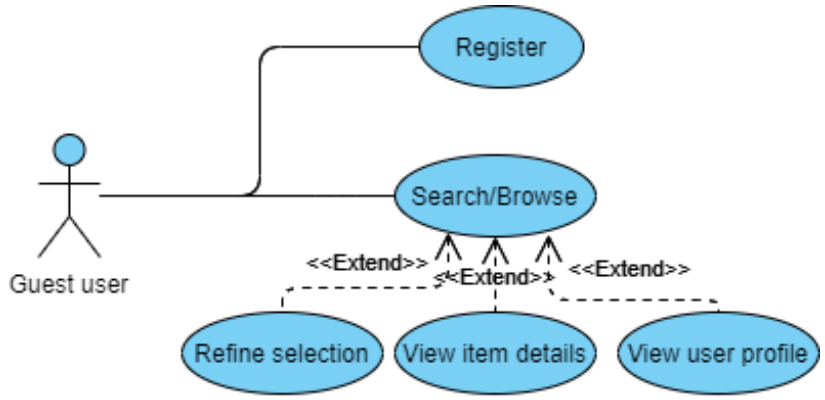


Figure 19 : Use cases diagram for "Guest user"

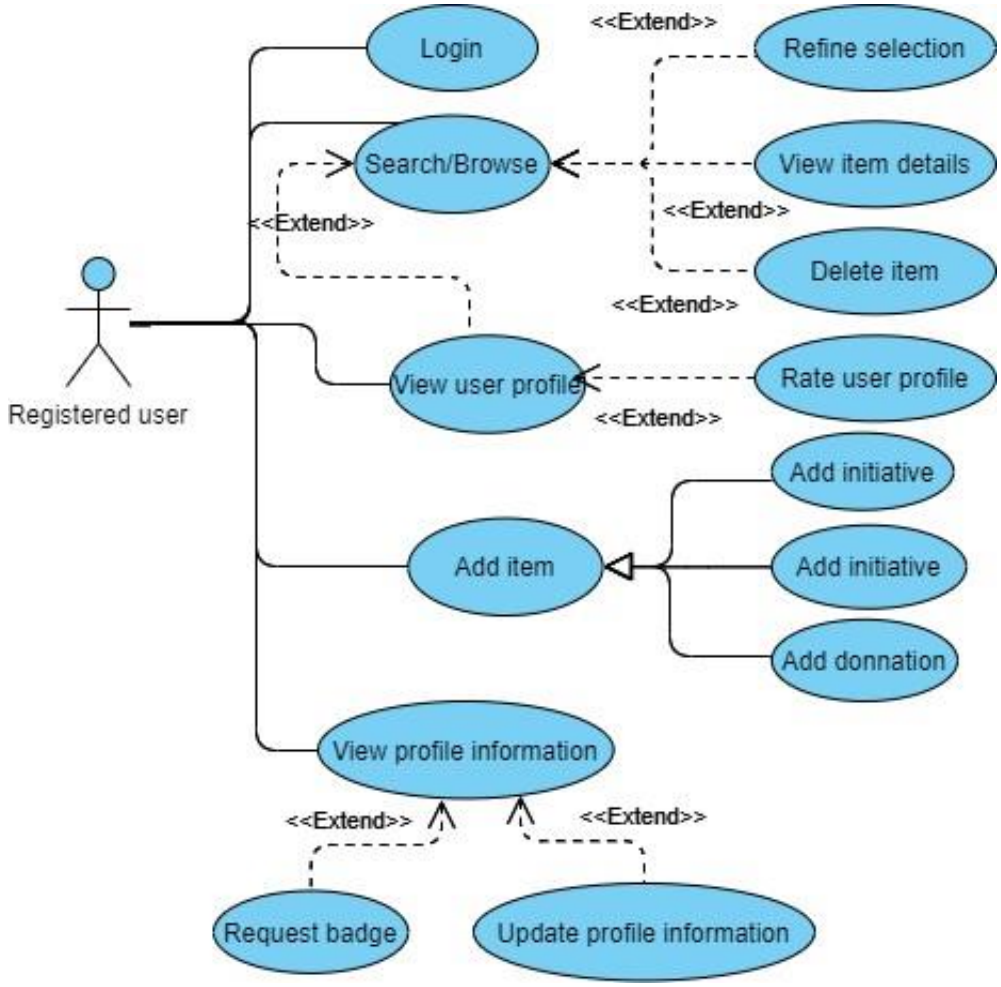


Figure 20 : Use cases diagram for "Registred user"

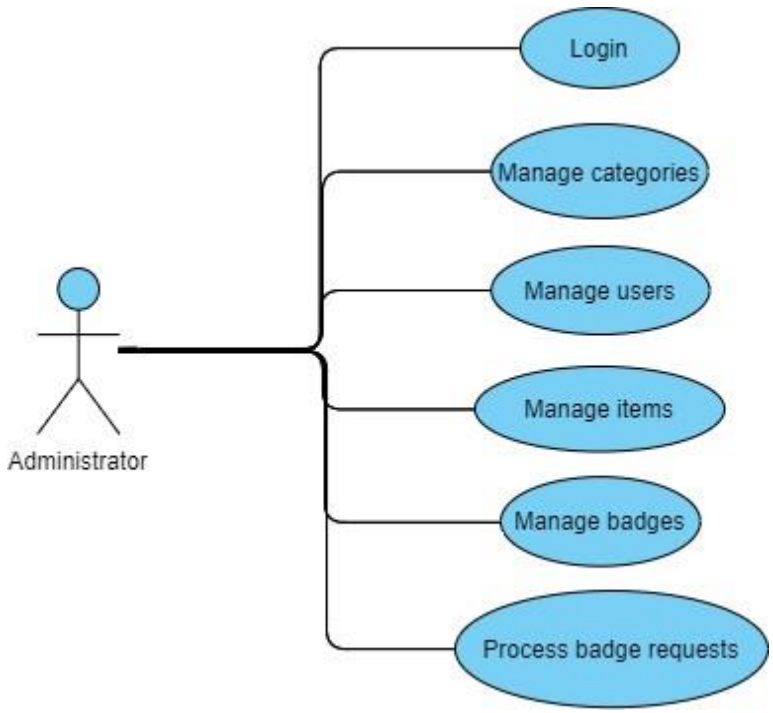


Figure 21 : Use cases diagram for "Administrator"

3.3.4.3. TEXTUAL DESCRIPTION OF USE CASES

REGISTER

Use case	Register
Actors	Guest user
Description	Allow the guest user to create an account and become a registered User.
Post conditions	User account is created.
Normal flow	- This use case starts when the User accesses the system feature that enables him to create an account. - The User enters the required Account information and submits. - The system validates the entered User Account information. - The User Account information are stored in the User's account. The system notifies the User that the account has been created.
Alternate flows	*The user enters invalid account information - The system describes which entered data was invalid and presents the User with suggestions for entering valid data. - Resume normal flow *The user cancels the request *The account already exists

Table 6 : Description of use case "Register".

BROWSE/SEARCH

Use case	Browse/Search
Actors	Guest user / Registered user / Administrator
Description	Browse and/or search among items (donations, requests, initiatives).
Post conditions	The system presents a result list of items (which meets with the given search or selection criteria) to the user.
Normal flow	- The list of all the items of the default category is displayed. - The user types a keyword in the search field and presses the "OK" button. - The system finds the items which meets with the selection/search conditions and presents the result to the user.
Alternate flows	*Refine Search Result - The user performs selection on category, item type and region attributes and/or types a keyword in the search field and presses the "OK" button. - The system finds the items which meets with the selection/search conditions and presents the result to the user. *View Item Details - The user selects an item from the presented list. - The user presses the "Details" button. - A window opens containing more information on the selected item. *View User Profile - The user selects an item from the presented list. - The user presses the "user" icon of the selected item. - A window opens containing profile information about the user.

Table 7 : Description of use case "browse/search".

VIEW ITEMS DETAILS

Use case	View items details
Actors	Guest user / Registered user / Administrator
Description	Allow the users to view all the information about an item.
Precondition	The user has accessed to an item.
Post condition	The detailed view of a selected item is displayed.
Normal flow	- The user selects items he wants to view and press “more”. - A window opens containing all the stored information about the selected item.

Table 8: Description of use case " View items details ".

DELETE ITEM

Use case	Delete item
Actors	Registered user / Administrator
Description	Allow Registered user to delete own item. Allow Administrator to delete an item.
Precondition	The user is authenticated.
Post condition	The item is deleted.
Normal flow	- The user selects items he wants to delete and press delete. - The system displays a confirmation message. - The user confirms the action. - The system removed the item and displays a confirmation message.

Table 9 : Description of use case "Delete item"

VIEW USER PROFILE

Use case	View user profile
Actors	Registered user / Administrator
Description	Allow the user to view other user's profile.
Pre-condition	The user is authenticated.
Normal flow	- The user selects an item from the presented list. - The user presses the "user" icon of the selected item. - A window opens containing profile information about the user.

Table 10 : Description of use case "View User Profile".

RATE USER PROFILE

Use case	Rate user profile
Actors	Registered user
Description	Allow the user to rate another user profile.
Pre-condition	The user is authenticated.
Post-condition	The user rating is added.
Normal flow	- The user presses on rate button. - The system displays the rating panel. - The user gives a value between 0 and 5 and confirms.

Table 11 : Description of use case "Rate user profile".

ADD ITEM

Use case	Add item
Actors	Registered user
Description	Allow the user to add a request, a donation or an initiative.
Pre-condition	The user is authenticated.
Post-condition	The system saves the new item into persistent storage.
Normal flow	- The user press on add button. - The user selects add request or donation or initiative. - The system displays a form to fill. - The user fills in the form and confirms. - The system displays "successfully added".
Alternate flows	*The user enters invalid item information - The system describes which entered data was invalid and asks the User to enter valid data. - Resume normal flow *The user cancels the operation.

Table 12 : Description of use case "add item"

VIEW PROFILE INFORMATION

Use case	View profile information
Actors	Registered user
Description	Allow the user to view his own profile information.
Precondition	The user is authenticated.
Post conditions	The system presents the user profile information.
Normal flow	- The user press on view profile. - A new window opens containing profile information about this same user.

Table 13 : Description of use case "View Profile information".

REQUEST BADGE

Use case	Request badge
Actors	Registered user
Description	Allow the user to request a badge. A badge corresponds to a verified attribute for its owner.
Precondition	The user is authenticated.
Post condition	The system adds the new request to be reviewed by the administrator.
Normal flow	- The user presses “request badge” button. - The system displays the request form. - The user fills in the form and confirms. - The system displays “Badge request added”.
Alternate flow	*The user enters invalid badge information - The system asks the User to enter valid data. - Resume normal flow *The user cancels the request

Table 14 : Description of use case "Request Badge".

UPDATE PROFILE INFORMATION

Use case	Update profile information
Actors	Registered user
Description	Allow the user to update his profile.
Pre-condition	The user is authenticated.
Post-condition	The system saves the new updates in the user’s profile record.
Normal flow	- The system displays the User Account information. - The User enters the desired values and submit. - The system validates the entered User Account information. - The values for the User Account are stored in the User’s account. The system notifies the User that the account has been updated
Alternate flow	If the form is not filled correctly, the system notifies the user about the related fields.

Table 15: Description of use case "Update Profile Information".

LOGIN

Use case	Login	
Actors	Registered user / Administrator	
Description	Allow the user to log into the System.	
Pre-condition	The user has an active account.	
Post-condition	The User is authenticated and the system displays all features available for the role the user is associated with.	
Normal flow	- The system prompts the User for his/her username and password. - The User enters his/her username and password. - The system validates the entered information, making sure that the entered credentials are valid for one user account in the system. - The User is signed in. The system displays welcome message.	
Alternate flow	New User	If the User does not have an account, the System will give the User the opportunity to create an account.
	User Fails Authentication	- The system describes the reasons why the User failed authentication. - The system prompts the User to re-enter the valid information. - The Normal Flow continues

Table 16: Description of use case " Login".

PROCESS BADGE REQUESTS

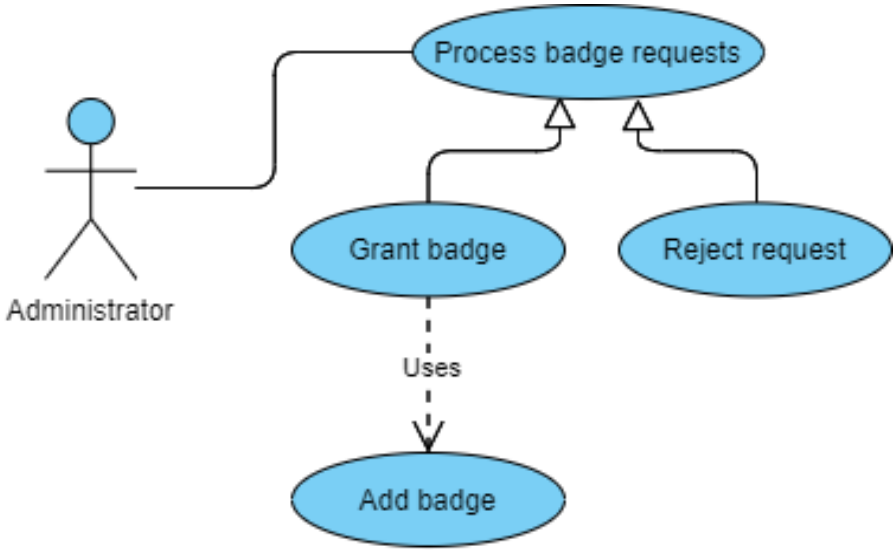


Figure 22 : Use case “Process badge request”

REJECT REQUEST

Use case	Reject request
Actors	Administrator
Description	Allow the administrator to decline a new badge request.
Pre-condition	The Administrator is authenticated.
Post-condition	The badge request is deleted.
Normal flow	- The system displays the list of non-validated requests. - The administrator selects an item from the list of badge requests. - The administrator presses “Reject” button. - The system displays “Badge request removed”.

Table 17: Description of use case " Reject request ".

GRANT BADGE

Use case	Grant badge
Actors	Administrator
Description	Allow the administrator to grant badges to users.
Pre-condition	The Administrator is authenticated.
Post-condition	The system adds a badge to the requesting user account.
Normal flow	- The system displays the list of non-validated requests. - The administrator selects an item from the list of badge requests. - The administrator presses “Grant” button. - The requested badge already exists and the system adds it to the Requesting user account. - The system displays “Badge granted”.
Alternate flow	- The requested badge is not recognized by the system and the system executes “Add Badge” use case which displays the associated form with the suggested badge filled in. - The Administrator edits the name and the description of the new badge and presses “Add” button. - The system saves the new badge and adds it to the requesting user account. - The system displays “Badge granted”.

Table 18: Description of use case "Grant badge ".

MANAGE CATEGORIES

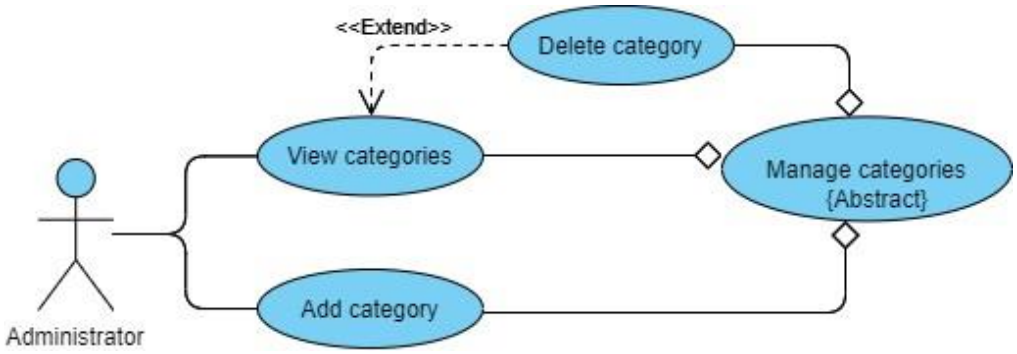


Figure 23 : Use case "Manage categories"

VIEW CATEGORIES

Use case	View categories
Actors	Administrator
Description	Allow the administrator to view the categories list.
Pre-condition	The Administrator is authenticated.
Post-condition	The list of item's categories is displayed.
Normal flow	- The administrator presses "categories" button. - The system displays the categories list.

Table 19: Description of use case "View categories".

DELETE CATEGORY

Use case	Delete category
Actors	Administrator
Description	Allow the administrator to delete a category.
Precondition	The Administrator is authenticated.
Post-condition	The list of categories is displayed.
Normal flow	- The administrator selects the category he wants to delete and presses "delete" button. - The system displays a confirmation message. - The administrator confirms the action. - The system displays "Category deleted".

Table 20: Description of use case "Delete category".

ADD CATEGORY

Use case	Add category
Actors	Administrator
Description	Allow the administrator to add a new category.
Precondition	The Administrator is authenticated.
Normal flow	- The Administrator selects add new category. - The system displays a form to fill. - The administrator enters the name and description and confirm. - The system saves the new category information. - The system displays “Category added”.

Table 21: Description of use case "Add category".

MANAGE USERS

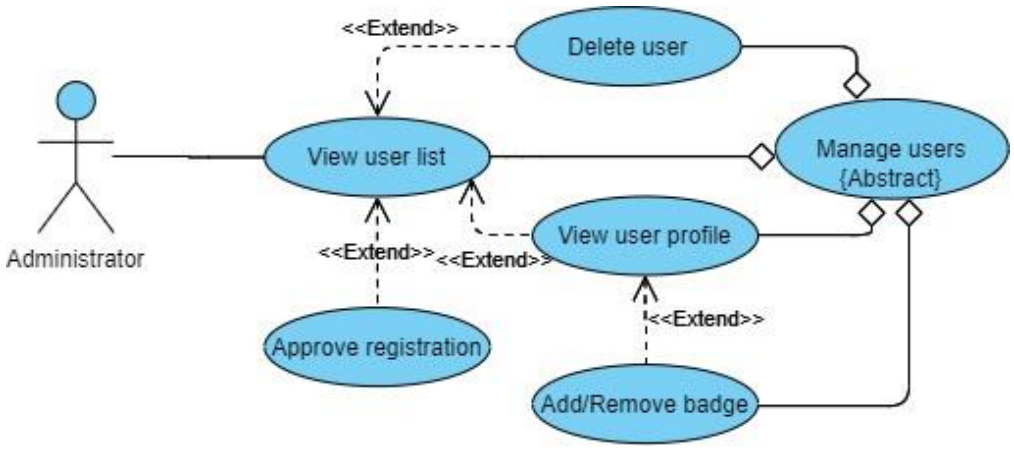


Figure 24 : Use case “Manage users”

VIEW USERS LIST

Use case	View users list
Actors	Administrator
Description	Allow the administrator to view the users list.
Pre-condition	The Administrator is authenticated.
Post-condition	The list of users is displayed.
Normal flow	- The administrator presses “users” button. - The system displays the users list.

Table 22: Description of use case " View users list".

APPROVE REGISTRATION

Use case	Approve registration
Actors	Administrator
Description	Allow the administrator to approve a new user registration.
Pre-condition	The Administrator is authenticated.
Post-condition	The user account is set to “Approved”.
Normal flow	- The administrator selects a user request and presses “approve”. - The system change the profile state to “approved” and save. - The system displays “User registration approved”.

Table 23: Description of use case "Approve registration".

ADD/ REMOVE BADGE

Use case	Add/Remove badge
Actors	Administrator
Description	Allow the administrator to add or remove a badge from a user profile.
Precondition	The administrator is authenticated.
Normal flow	- In the user profile the administrator presses “add/remove badges”. - A window opens containing acquired badges for this user - The administrator can check/uncheck the badges he want or add a new badge to the user.

Table 24: Description of use case "Add/ remove badge".

DELETE USER

Use case	Delete user
Actors	Administrator
Description	Allow the administrator to delete a user account.
Precondition	The administrator is authenticated
Post condition	The list of users is displayed.
Normal flow	- The system displays the user profile. - The administrator presses “delete user account” - The system displays a confirmation message. - The administrator confirms the action - The system displays “User account deleted”.

Table 25: Description of use case "Delete user".

MANAGE BADGES

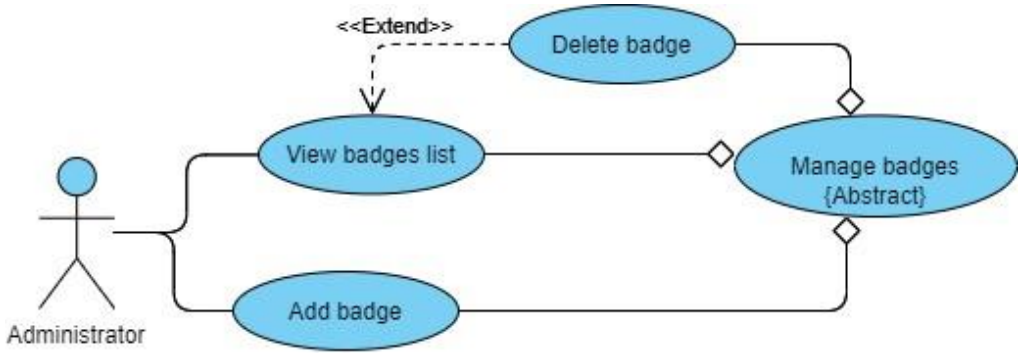


Figure 25 : Use case "Manage badges"

VIEW BADGES LIST

Use case	View badges list
Actors	Administrator.
Description	Allow the administrator to view the list of badges.
Precondition	The administrator is authenticated.
Normal flow	- The administrator press on list of badges. - The system displays the badges list.

Table 26: Description of use case "View badges list".

DELETE BADGE

Use case	Delete badge
Actors	Administrator
Description	Allow the administrator to delete a badge.
Precondition	The Administrator is authenticated.
Normal flow	- The administrator press on list of badges. - The system displays the badges list. - The administrator press on delete badge and confirms. - The system displays "Badge deleted".

Table 27: Description of use case "Delete Badge".

ADD BADGE

Use case	Add badge
Actors	Administrator
Description	Allow the administrator to add a new badge.
Precondition	The Administrator is authenticated.
Normal flow	- The Administrator selects add new badge. - The system displays a form to fill. - The administrator enters name/description of badge and confirms. - The system displays “Badge added”.

Table 28: Description of use case "*Add badge*".

MANAGE ITEMS

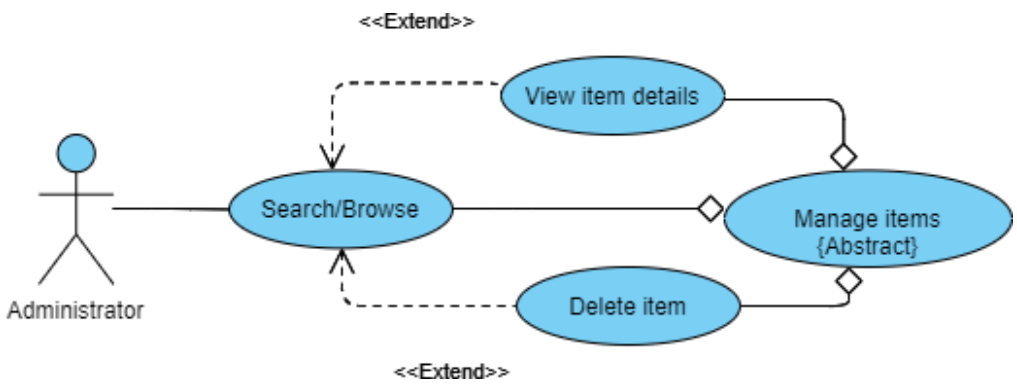


Figure 26: Use case “Manage items”

3.4. Class diagram

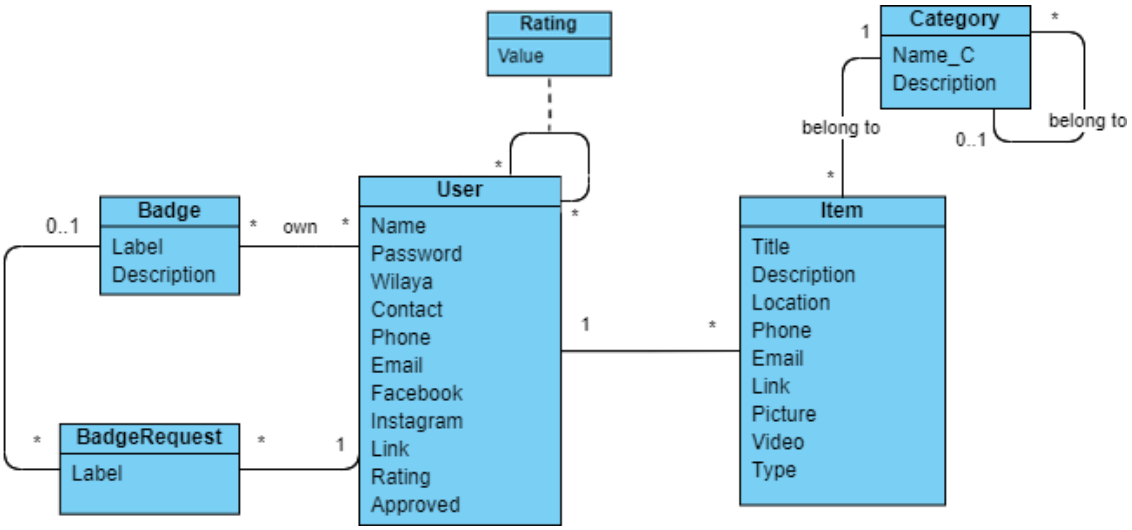


Figure 27: class diagram

3.5. Data dictionary

Classes	Attributes	Types
User	name password wilaya contact phone email fb_link insta_link link rating approved	String(50) String(50) String(20) String(50) String(20) String(100) String(100) String(100) String(100) Float boolean
Item	title body wilaya phone email link picture_link video_link type itemCategory	String(50) String(300) String(20) String(20) String(100) String(100) String(100) String(100) String(10) Integer
Category	name description	String(50) String(300)
Badge	label description	String(50) String(300)
BadgeRequest	Label	String(50)
Rating	Value	Integer

Table 29 : Data dictionary

3.6. Mapping to Relational model

The relational model (RM) for database management is an approach to managing data using a structure, where all data is represented in terms of tuples, grouped into relations. Transformation to this model must respect a set of rules. Next we present the resulting model for our system and the corresponding Entity Relationship diagram.

3.6.1. Entity Relationship Diagram (ERD)

When documenting a system, looking at the system in multiple ways increases the understanding of that system. ERD diagrams are commonly used to display the contents of a data store. They help visualize how data is connected in a general way, and are particularly useful for constructing a relational database. In a few words, Entity relationship diagrams are used to sketch out the design of a database. They show the relationships of entity sets stored in a database and by defining the entities, their attributes, and showing the relationships between them, an ER diagram illustrates the logical structure of databases.

The figure below shows the ERD which results from our design:

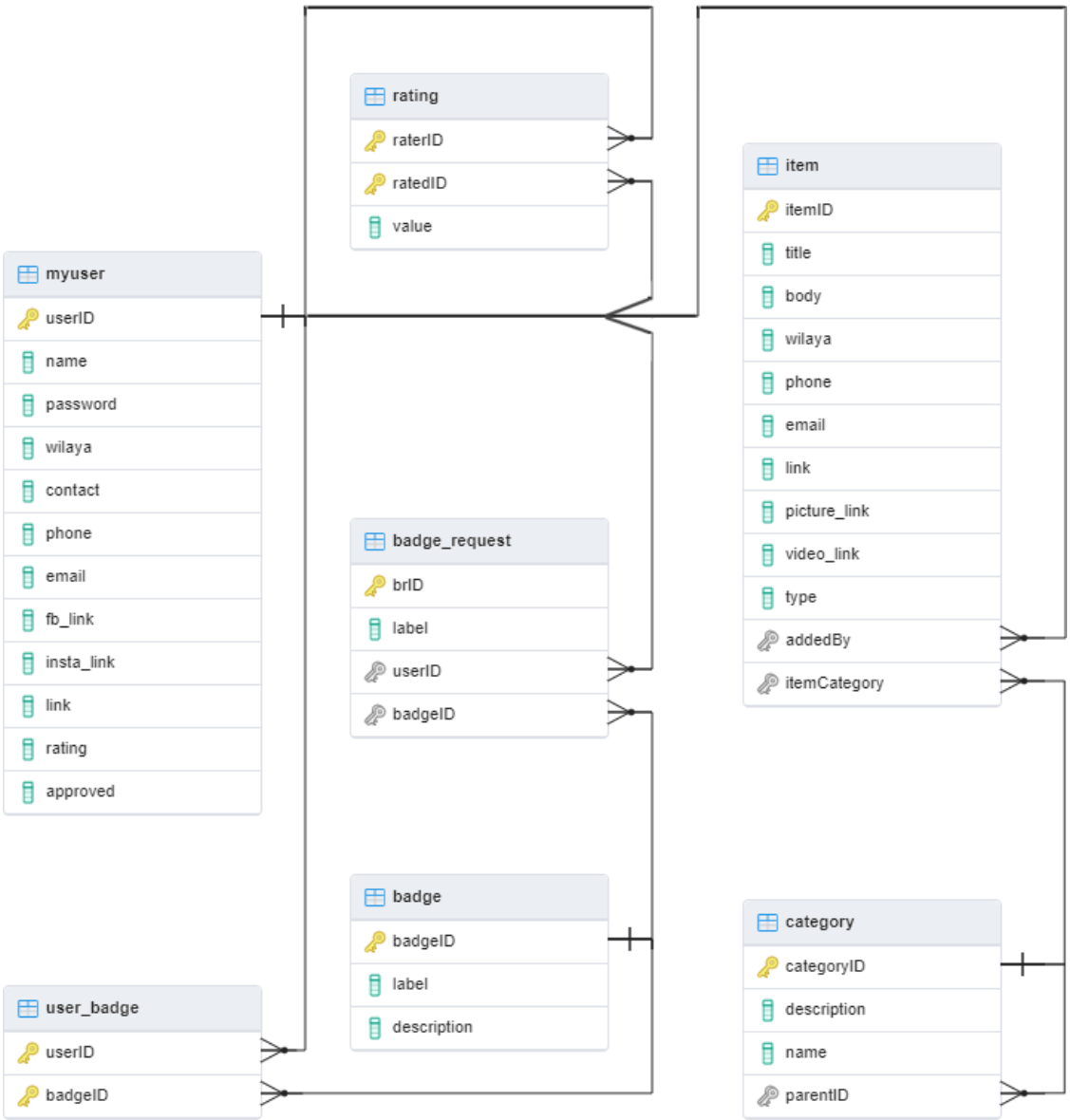


Figure 28 : Entity Relationship Diagram (ERD)

3.6.2. Relational database schema

USER

#	userID	integer	NOT NULL
»	name	varchar(50)	NOT NULL
»	password	varchar(50)	NOT NULL
»	wilaya	varchar(20)	NOT NULL
»	contact	varchar(50)	
»	phone	varchar(20)	
»	email	varchar(100)	
»	fb_link	varchar(100)	
»	insta_link	varchar(100)	
»	link	varchar(100)	
»	rating	real	NOT NULL
»	approved	boolean	NOT NULL

ITEM

#	itemID	integer	NOT NULL
»	title	varchar(50)	NOT NULL
»	body	text	
»	wilaya	varchar(20)	NOT NULL
»	phone	varchar(20)	
»	email	varchar(100)	
»	link	varchar(100)	
»	picture_link	varchar(100)	
»	video_link	varchar(100)	
»	type	itemtype	NOT NULL
»	addedBy	integer	NOT NULL
»	itemCategory	integer	NOT NULL
~	FOREIGN KEY (itemCategory) REFERENCES category (categoryID)		
~	FOREIGN KEY (addedBy) REFERENCES category (userID)		

CATEGORY

#	categoryID	integer	NOT NULL
»	description	varchar(300)	
»	name	varchar(50)	NOT NULL
»	parentID	integer	
~	FOREIGN KEY (parentID) REFERENCES category (categoryID)		

BADGE

#	badgeID	integer	NOT NULL
»	label	varchar(50)	NOT NULL
»	description	varchar(300)	

BADGE_REQUEST

#	brID	integer	NOT NULL
»	label	varchar(50)	NOT NULL
»	userID	integer	NOT NULL
»	badgeID	integer	NOT NULL
~	FOREIGN KEY (badgeID) REFERENCES badge (badgeID)		
~	FOREIGN KEY (userID) REFERENCES myuser (userID)		

RATING

#	raterID	integer	NOT NULL
#	ratedID	integer	NOT NULL
»	value	integer	NOT NULL
~	FOREIGN KEY (ratedID) REFERENCES myuser (userID)		
~	FOREIGN KEY (raterID) REFERENCES myuser (userID)		

USER_BADGE

#	userID	integer	NOT NULL
#	badgeID	integer	NOT NULL
~	FOREIGN KEY (badgeID) REFERENCES badge (badgeID)		
~	FOREIGN KEY (userID) REFERENCES myuser (userID)		

3.7. Rest API

This section describes the design of the Rest API of the backend system.

3.7.1. Resources

The first step in the design of Restful web services is the identification of the resources that are going to be accessible through the API. Every Resource will have at least one URI (a unique id). The URI structure should respect a set of rules:

- It should refer to a resource that is a thing (noun) instead of referring to an action (verb)
- Use forward slash (/) to indicate hierarchical relationships
- Do not use file extensions

A resource can be represented in any format, for example: XML or JSON representation. Accept / Content-Type HTTP headers are usually used to tell which format is request or returned in the payload.

From the analysis phase we pulled out the following resources:

- items
- categories
- users
- badges
- ratings
- badge requests.

3.7.2. API specification

Verb	URL	Description
GET	/categories	Display the root categories
	/categories/{id}/categories	Get categories related to a specific category.
	/users/{id}	Get a specific user.
	/badges	View existing badges.
	/items	Display all items available in the DB.
	/items/{id}	Display details of the item with ID = "id".
	/categories/{cat}/items	Display the items belong to a specific category. @**Queryparams** : recursion - Recursion = 0 >>> don't include sub-categories - Recursion = 1 >>> include recursively all sub-categories
	/items/search	Search an item by his name or part of it. Or by the content of the body. @**Queryparams** : keyword - region - type - category - recursion - Recursion = 0 >>> don't include sub-categories - Recursion = 1 >>> include recursively all sub-categories - Region : filter results with region - Type : filter results with type of item - Category: filter results with category - Keyword: text to look for in the title or the body of the item
POST	/users	Create account.
	/items	Add an item to donate it. Request an item. Declare an initiative.
	/badgerequests	Request a badge.
PUT	/users	Edit profile information.
DELETE	/items/{id}	Delete an item.

Table 30 : Rest API specification

4

IMPLEMENTATION

This chapter describes the implementation of our solution. The developed system accomplishes the functional requirements for this project as was described in the previous chapter. The implementation is divided in three main parts, the mobile application, the Rest API application and the database. First we will talk about the technologies we used to develop our solution and then we present the different application screens.

4.1. Physical architecture

The physical layout of our applications is illustrated on the deployment diagram on figure 29.

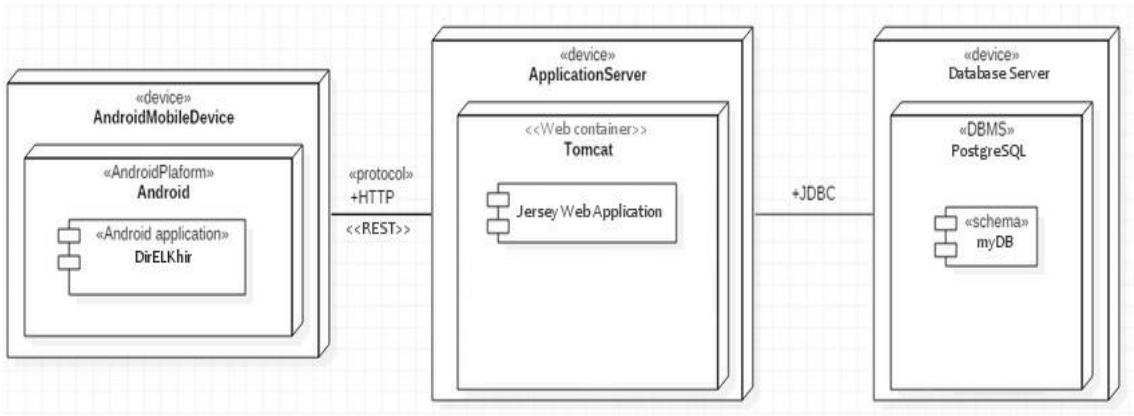


Figure 29: Deployment diagram

A deployment diagram models the run-time architecture of a system. It shows the configuration of the hardware elements and shows how software elements and artifacts are mapped onto those nodes.(28)

4.2. Development tools and technologies

4.2.1. Mobile application

4.2.1.1. Android Studio (33)

We used the integrated development environment (IDE) Android Studio to build the mobileapplication. Android Studio provides the fastest tools for building native applications on every type of Android device. It is the official Integrated Development Environment (IDE) for Android app development, based on IntelliJ IDEA . On top of IntelliJ's powerful code editor and developer tools, Android Studio offers even more features that enhance productivity when building Android apps, such as:

- A flexible Gradle-based build system
- A fast and feature-rich emulator
- A unified environment where you can develop for all Android devices
- GitHub integration to help you build common app features and import code
- Built-in support for Google Cloud Platform

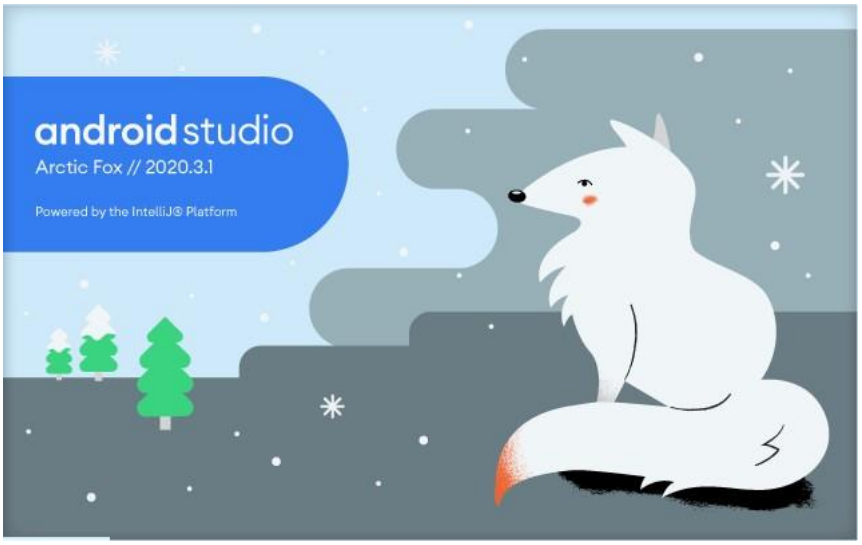


Figure 30 : Android Studio splash screen

4.2.1.2. Android SDK

In addition to the IDE, Android SDK which stands for Android Software Development Kit is also required to build applications for Android platform. It is a collection of libraries and Software Development tools that are essential for Developing Android Applications. To add the new features in the new versions of Android Software, a corresponding SDK also is released with it.

4.2.1.3. Programming language

To build mobile applications with android SDK, it is possible to use either Java or Kotlin as programming language. Java is a reputable programming language with vast open-source tools and libraries where Kotlin is the new default language for the platform. In our project we used java in both the mobile application development and the Web API.

4.2.1.4. Volley library(34)

Volley is an HTTP library that makes networking for Android apps easier and most importantly, faster. By providing built-in support for the features needed, Volley frees the developer from writing boilerplate code and allows to concentrate on the logic that is specific to the app. (12)

4.2.1.5. Glide library (35)

Glide is an Image Loader Library for Android developed by bumptech and is a library that is recommended by Google. Glide is a fast and efficient open source media management and image-loading framework for Android that wraps media decoding, memory and disk caching, and resource pooling into a simple and easy to use interface. Glide's primary focus is on making scrolling any kind of a list of images as smooth and fast as possible.

Figure 31 : Glide library logo

4.2.2. Backend

4.2.2.1. Eclipse IDE for JavaEE developers(36)

The Eclipse IDE is famous for our Java Integrated Development Environment (IDE). The javaEE edition include additional tools for Java *developers* creating *Java EE* and Web applications, tools for *Java EE* and JSF, Mylyn and others.

Figure 32 : Eclipse logo

4.2.2.2. JavaEE (Entreprise edition)

Our Web application that provides the Rest API is developed using JavaEE. The Java EE platform is built on top of the Java SE platform. The Java EE platform provides an API and runtime environment for developing and running large-scale, multi-tiered, scalable, reliable, and secure network applications. In a JavaEE Web application components are added to a J2EE servlet container in a package called a Web application archive (WAR) file. A WAR file is a JAR (Java archive) file compressed file. A WAR file usually contains other resources besides Web components, including server-side utility classes, static web resources (configuration files, HTML pages, image and sound files, and so on) and Client-side classes.

4.2.2.3. Jersey (37)

Figure 33 : JavaEE logo

We built our restful web service using Jersey library. Eclipse Jersey is a REST framework that provides a JAX-RS (Java API for RESTful Web Services) implementation and more. The interactions are carried on HTTP protocol and use JSON format.

4.2.2.4. Jackson library (38)

Jackson is an open source java based library to serialize java objects to JSON and vice versa. It has many features such as:

- Jackson API provides a high-level facade to simplify common use cases.
- The API provides default mapping for most of the objects to be serialized.
- Jackson is quiet fast and is of low memory footprint and is suitable for large object graphs or systems.
- Jackson creates a clean and compact JSON results, which is easy to read.
- Jackson library does not require any other library apart from jdk.

4.2.2.5. Apache Tomcat (39)

Apache Tomcat is a web application server in which Java code can run. Tomcat brings together a subset of the Java EE technologies—including the Servlet, Java Server Pages (JSPs), and Web Socket APIs—to run applications built on the Java programming language. These capabilities enable Tomcat to operate as a web application server while performing its primary function as a Servlet container.

It uses a web server to monitor incoming client requests and predefined APIs to interface with applications. Web applications typically use Servlets, which are full Java classes to implement functionality. The Servlets process the request and generate the response. From a high-level perspective, Tomcat provides a run-time environment in which developers can develop, test, and run their Java applications.

Figure 34: Apache Tomcat logo

4.2.2.6. PostgreSQL (40)

PostgreSQL is a flexible open-source object relational database management system with features meant to meet changes in workloads, from single machines to data warehouses to web services with many concurrent users. PostgreSQL uses

and extends SQL, and is broadly extensible to a range of use cases beyond mere transactional data. It comes with many features aimed to help developers build applications, administrators to protect data integrity and build fault-tolerant environments, and help manage data no matter how big or small the dataset. In addition to being free and open source, PostgreSQL is highly extensible. You can define your own data types, build out custom functions, and even write code from different programming languages without recompiling your database.

4.3. Rest API demo

4.3.1. GET Requests

GET CATEGORIES

GET http://~/webapi/categories

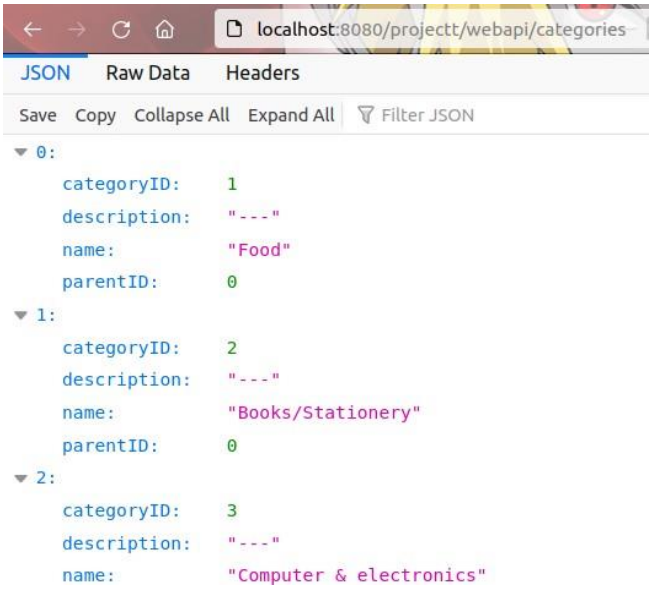


Figure 35: retreive categories' list

GET CATEGORY BY ITS ID

GET http://~/webapi/categories/12

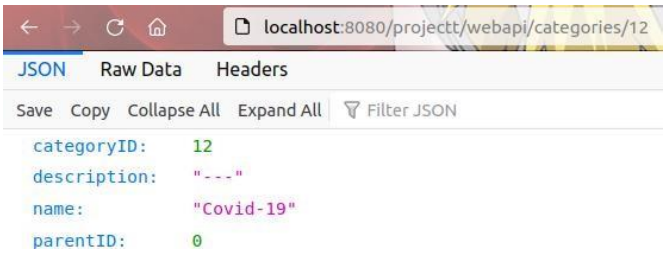


Figure 36 : Get category by ID

GET USER BY ITS ID

GET http://~/webapi/users/1

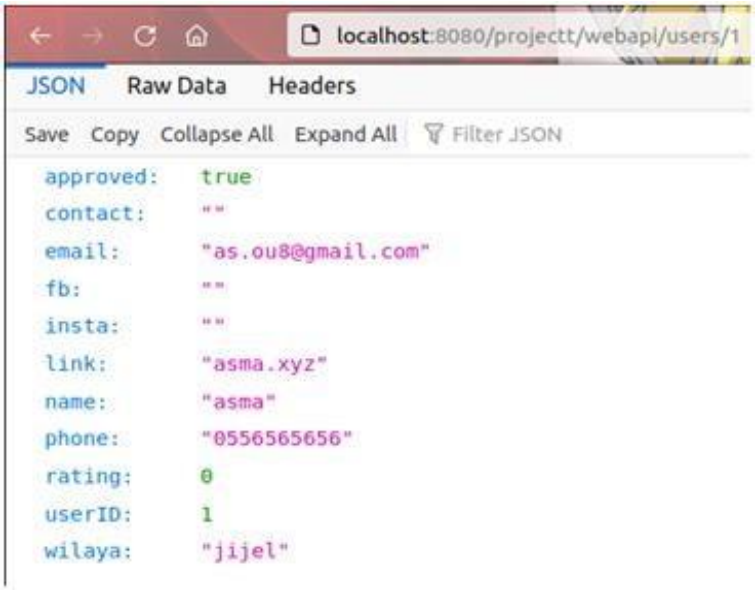


Figure 37 : Get user by ID

GET BADGES LIST

GET http://~ /webapi/badges

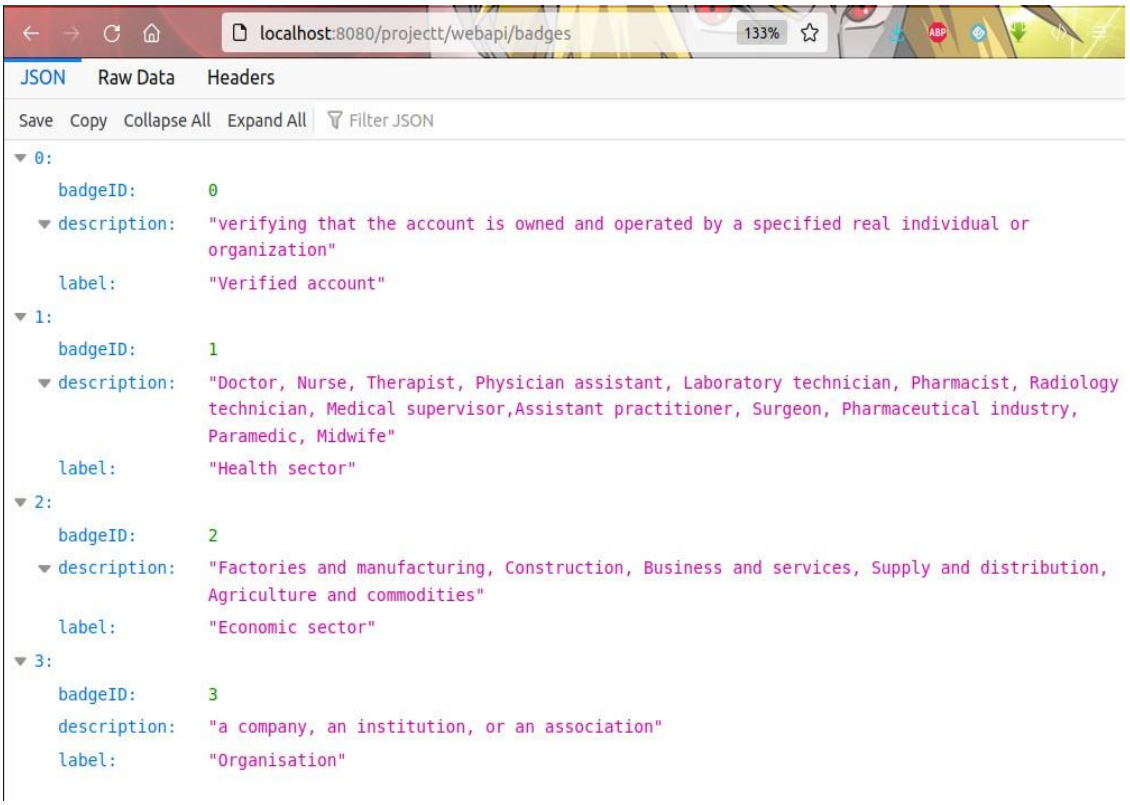


Figure 38 : Get badges list

GET ITEMSLIST

GET http://~/webapi/items


```
localhost:8080/projectt/webapi/items
JSON  Raw Data  Headers
Save  Copy  Collapse All  Expand All  Filter JSON
0:
    body:          "--"
    category:      39
    email:         "as.our8@gmail.com"
    itemID:        1
    link:          ""
    phone:         "0556565656"
    pictureLink:   "https://cdn.shopify.com/…700x700.jpg?v=1628129845"
    title:         "concentrator oxygen "
    type:          "Donation"
    user:          1
    videoLink:     ""
    wilaya:        "jijel"
1:
    body:          "--"
    category:      37
    email:         "mminoucha242@gmail.com"
    itemID:        4
    link:          ""
    phone:         "0656565656"
    pictureLink:   "https://www.savanna.tn/6…lis-avec-filtre-bleu.jpg"
    title:         "bavette "
    type:          "Donation"
    user:          2
    videoLink:     ""
    wilaya:        "jijel"
2:
    body:          "--"
    category:      37
```


Figure 39 : Get items list

GET ITEM BY ITS ID

GET http://~/webapi/items/3


```
localhost:8080/projectt/webapi/items/3   133%
JSON  Raw Data  Headers
Save  Copy  Collapse All  Expand All  Filter JSON
body:          "Cleaning campaign of Ekiti cemetery; Friday 24th September at 13:30 PM."
category:      0
email:         ""
itemID:        3
link:          ""
phone:         "0756565656"
pictureLink:   ""
title:         "Cleaning campaign "
type:          "Initiative"
user:          4
videoLink:     ""
wilaya:        "jijel"
```


Figure 40 : Get item by ID

GET ITEMS BY CATEGORIES

GET http://~/webapi/categories/12/items

localhost:8080/projectt/webapi/categories/12/items
JSON Raw Data Headers
Save Copy Collapse All Expand All Filter JSON

```
0:
    body:          "--"
    category:      39
    email:         "as.our8@gmail.com"
    itemID:        1
    link:          ""
    phone:         "0556565656"
    pictureLink:   "https://cdn.shopify.com/s/files/1/0148/5482/products/15582834688046_700x700.jpg?v=1628129845"
    title:         "concentrator oxygen "
    type:          "Donation"
    user:          1
    videoLink:     ""
    wilaya:        "jijel"
1:
    body:          "--"
    category:      38
    email:         "oussama@gmail.com"
    itemID:        2
    link:          ""
    phone:         "0654765432"
    pictureLink:   "https://upload.wikimedia.org/wikipedia/commons/6/6e/Harmon_Face_Values_Hand_Sanitizer.jpg"
    title:         "Hand sanitizer "
    type:          "Request"
    user:          3
    videoLink:     ""
    wilaya:        "alger"
2:
    body:          "--"
    category:      37
    email:         "mminoucha242@gmail.com"
    itemID:        4
    link:          ""
    phone:         "0656565656"
    pictureLink:   "https://www.savanna.tn/60561-large_default/pack-de-100-bavettes-masque-chirurgical-3-plis-avec-
```


Figure 41 : Get items by categories

SEARCH ITEMS – TYPE FILTER

GET http://~/webapi/items/search?type=Donation

localhost:8080/projectt/webapi/items/search?type=Donation 133%
JSON Raw Data Headers
Save Copy Collapse All Expand All Filter JSON

```
0:
    body:          "--"
    category:      39
    email:         "as.our8@gmail.com"
    itemID:        1
    link:          ""
    phone:         "0556565656"
    pictureLink:   "https://cdn.shopify.com/s/files/1/0148/5482/products/15582834688046_700x700.jpg?v=1628129845"
    title:         "concentrator oxygen"
    type:          "Donation"
    user:          1
    videoLink:     ""
    wilaya:        "jijel"
1:
    body:          "--"
    category:      37
    email:         "mminoucha242@gmail.com"
    itemID:        4
```


Figure 42 : Search items – Type filter

SEARCH ITEMS – REGION FILTER

GET http://~/webapi/items/search?region=alger

localhost:8080/projectt/webapi/items/search?region=alger 133%
JSON Raw Data Headers
Save Copy Collapse All Expand All Filter JSON
0:
body: "--"
category: 38
email: "oussama@gmail.com"
itemID: 2
link: ""
phone: "0654765432"
pictureLink: "https://upload.wikimedia.org/wikipedia/commons/6/6e/Harmon_Face_Values_Hand_Sanitizer.jpg"
title: "Hand sanitizer"
type: "Request"
user: 3
videoLink: ""
wilaya: "alger"

Figure 43 : Search items – Region filter

SEARCH ITEMS BY KEYWORD

GET http://~/webapi/items/search?keyword=xy

localhost:8080/projectt/webapi/items/search?keyword=xy 133%
JSON Raw Data Headers
Save Copy Collapse All Expand All Filter JSON
0:
body: "--"
category: 39
email: "as.our8@gmail.com"
itemID: 1
link: ""
phone: "0556565656"
pictureLink: "https://cdn.shopify.com/s/files/1/0148/5482/products/15582834688046_700x700.jpg?v=1628129845"
title: "concentrator oxygen"
type: "Donation"
user: 1
videoLink: ""
wilaya: "jijel"

Figure 44 : Search items by keyword

SEARCH ITEMS BY KEYWORD + FILTERS

Any combined search is possible using type, region, category, keyword, recursion

GET http://~/webapi/items/search?keyword=ve&type=Donation

GET http://~/webapi/items/search?keyword=ve&type=Donation&category=Covid-19

GET http://~/webapi/items/search?keyword=ve&type=Request&category=Food&region=Jijel&recursion=0

localhost:8080/projectt/webapi/items/search?keyword=ve&type=Donatio 133%

JSON Raw Data Headers

Save Copy Collapse All Expand All Filter JSON

```
0:
    body:          "--"
    category:      37
    email:         "mminoucha242@gmail.com"
    itemID:        4
    link:          ""
    phone:         "0656565656"
    pictureLink:   "https://www.savanna.tn/60561-large_default/pack-de-100-bavettes-masque-chirurgical-3-plis-avec-filtre-bleu.jpg"
    title:         "bavette"
    type:          "Donation"
    user:          2
    videoLink:     ""
    wilaya:        "jijel"
```


Figure 45 : Search items by keyword + filters

SEARCH ITEMS – TYPE FILTER

GET http://~/webapi/items/search?type=Donation

localhost:8080/projectt/webapi/items/search?type=Donation 133%

JSON Raw Data Headers

Save Copy Collapse All Expand All Filter JSON

```
0:
    body:          "--"
    category:      39
    email:         "as.our8@gmail.com"
    itemID:        1
    link:          ""
    phone:         "0556565656"
    pictureLink:   "https://cdn.shopify.com/s/files/1/0148/5482/products/15582834688046_700x700.jpg?v=1628129845"
    title:         "concentrator oxygen"
    type:          "Donation"
    user:          1
    videoLink:     ""
    wilaya:        "jijel"
1:
```


Figure 46 : Search items – Type filter

4.3.2. POST, PUT and DELETE Requests

POST, PUT and DELETE requests cannot be sent by a web browser, as web browsers only supports GET requests. This is why we need a REST Client, we used RESTED client in our tests.

Figure 47 : RESTED – Rest Client

ADD USER

POST http://~/webapi/users

POST | localhost:8080/projectt/webapi/users | Send

Headers

Content-Type | application/json

+Add header

Basic auth >

Request body

Type | JSON

name | amel

password | hecham

wilaya | alger

email | amel@gmail.com

+Add parameter

Response (0.018s) - http://localhost:8080/projectt/webapi/users

200

Headers >


```
{
  "approved": false,
  "email": "amel@gmail.com",
  "name": "amel",
  "password": "hecham",
  "rating": 0,
  "userID": 0,
  "wilaya": "alger"
}
```


Figure 48 : Add user

The response will be 200 OK, which means that the new user is successfully created in the database. And it is displayed is JSON as shown below.

UPDATE USER INFORMATION

PUT http://~/webapi/users

PUT

http://localhost:8080/projectt/webapi/users

Headers

Content-Type	application/json

+Add header

Basic auth

Request body

Type JSON

userID	3
name	oussama
password	menhour
wilaya	alger
phone	0654765432
email	oussama@gmail.com
link	oussama.xyz

+Add parameter

Response (0.32s) - http://localhost:8080/projectt/webapi/users

200

Headers


```
{
  "approved": false,
  "email": "oussama@gmail.com",
  "link": "oussama.xyz",
  "name": "oussama",
  "password": "menhour",
  "phone": "0654765432",
  "rating": 0,
  "userID": 3,
  "wilaya": "alger"
}
```


Figure 49 : Update user information

ADD ITEM

POST http://~/webapi/items

POST http://localhost:8080/projectt/webapi/items Send request

Type JSON

title	bags
body	20 school bags for children
wilaya	alger
email	amel@gmail.com
pictureLink	https://5.imimg.com/data5/AT/PO
type	Donation
category	2
user	7

Response (0.03s) - http://localhost:8080/projectt/webapi/items

200


```
{
  "body": "20 school bags for children",
  "category": 2,
  "email": "amel@gmail.com",
  "itemID": 0,
  "pictureLink": "https://5.imimg.com/data5/AT/PO/MY-17368652/school-bag-500x500.jpg",
  "title": "bags",
  "type": "Donation",
  "user": 7,
  "wilaya": "alger"
}
```


Figure 50 : Add item

DELETE AN ITEM

DELETE http://~/webapi/item/6

Request

DELETE http://localhost:8080/projectt/webapi/items/6

Response (0.027s) - http://localhost:8080/projectt/webapi/items/6

200

Figure 51 : Delete an item

4.4. Mobile application demo

4.4.1. Figma design and prototyping

For the frontend application, we first used Figma(41) to build an initial design of the user interface. Figma is a web-based application for graphics editing and user interface design. We designed the mobile application interfaces through it as shown below:

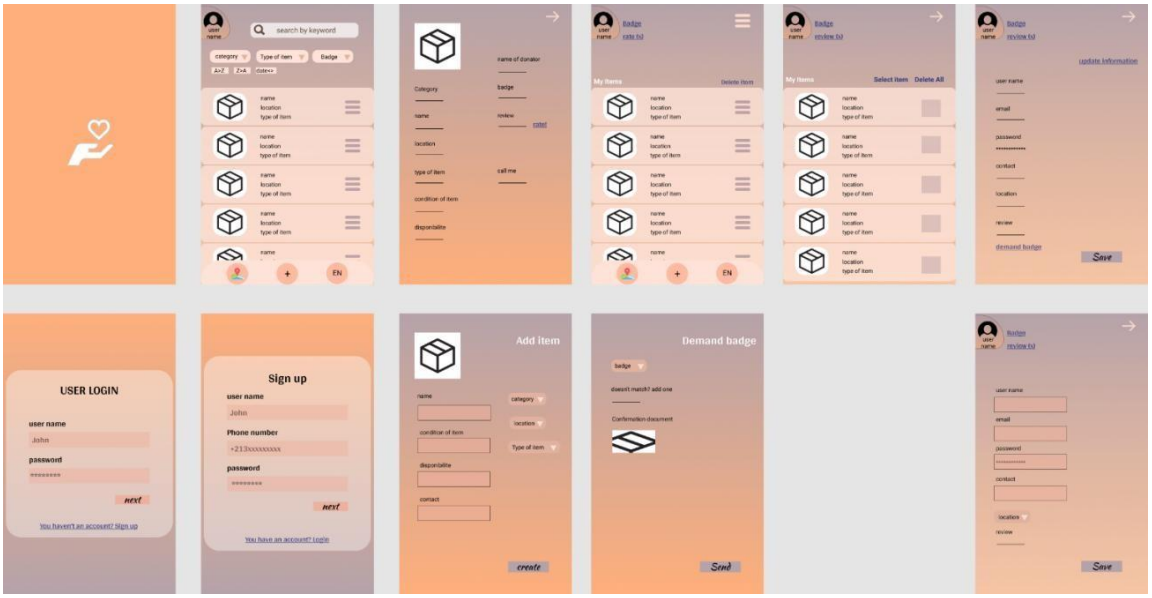


Figure 52 : UI design with Figma

Figma prototyping features allow us to create interactive flows that explore how a user may interact with our app design.

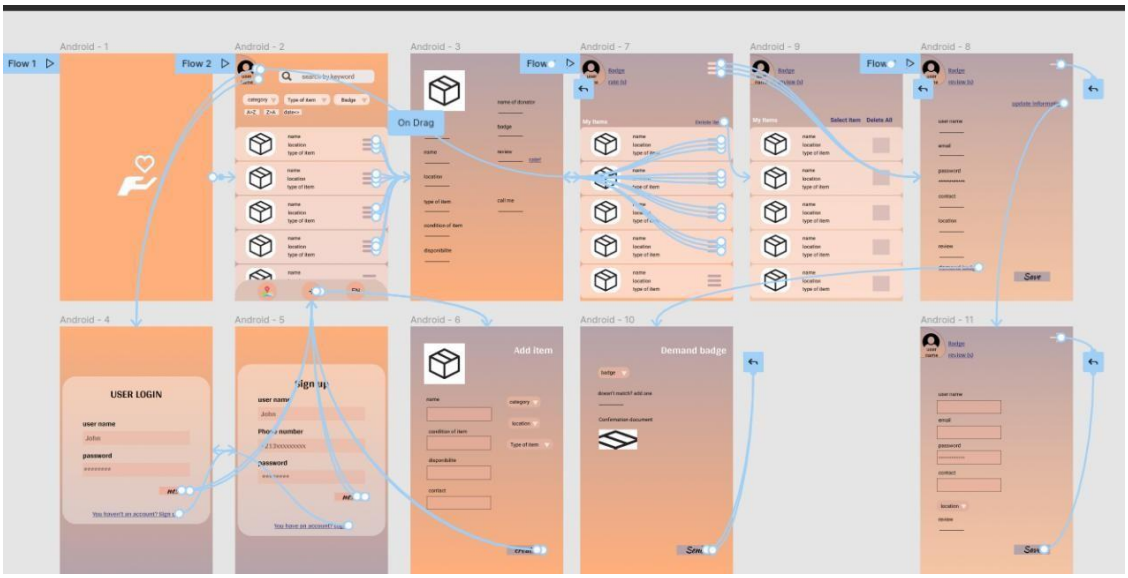


Figure 53 : Figma prototyping

4.4.2. Mobile application screens

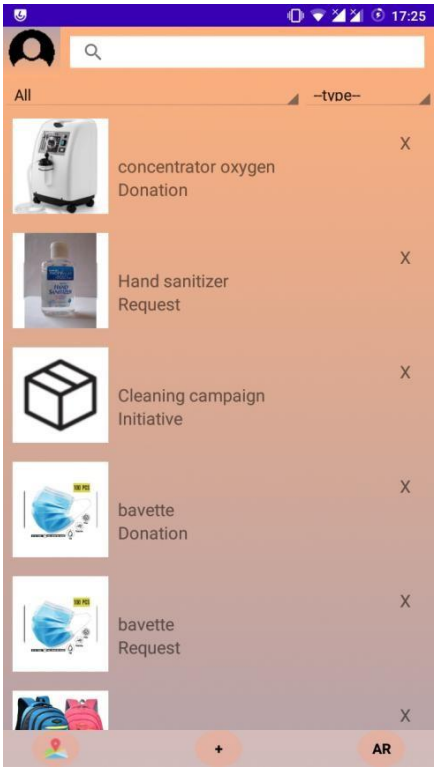


Figure 54 : Browse all items

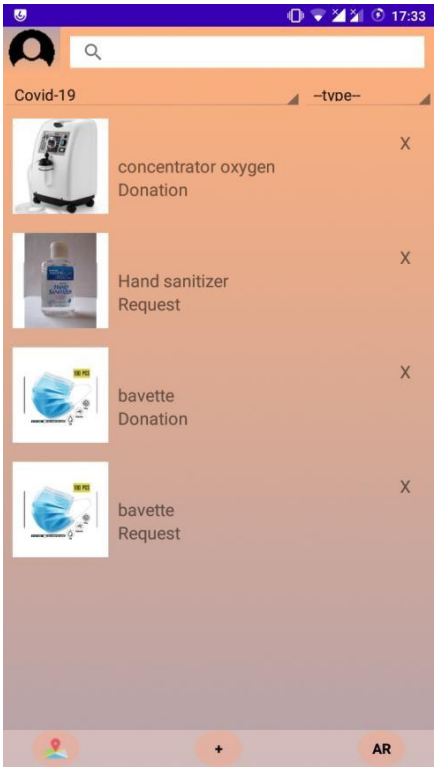


Figure 55 : Items of category Covid-19

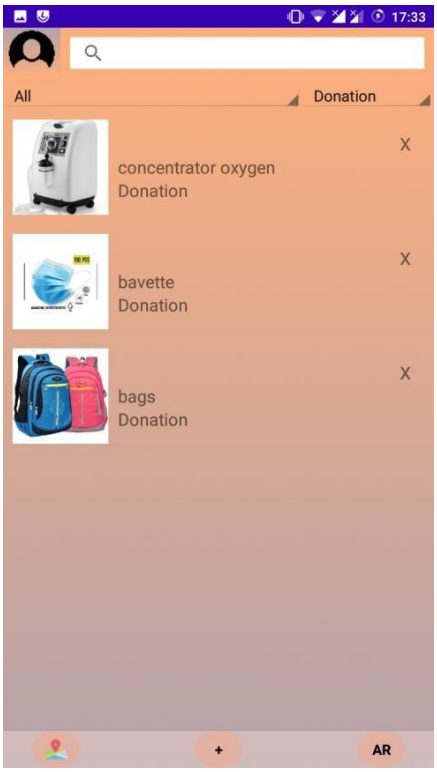


Figure 56 : Items of type Donation

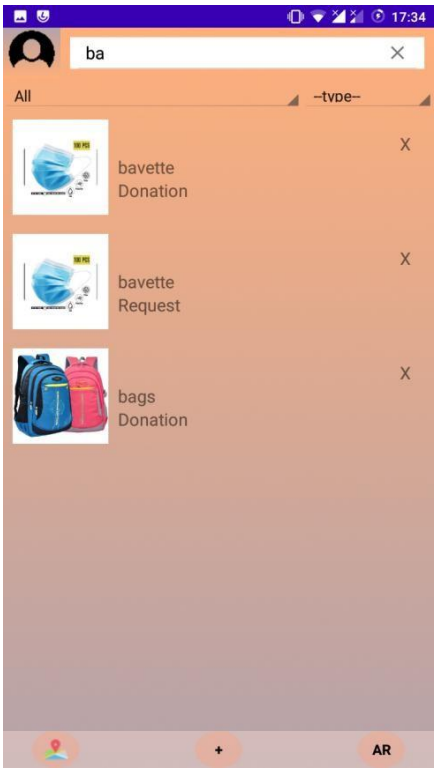


Figure 57 : keyword search

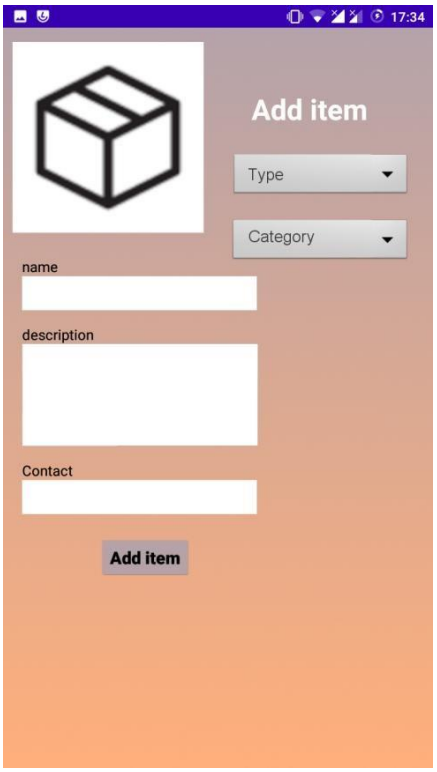


Figure 58 : add item

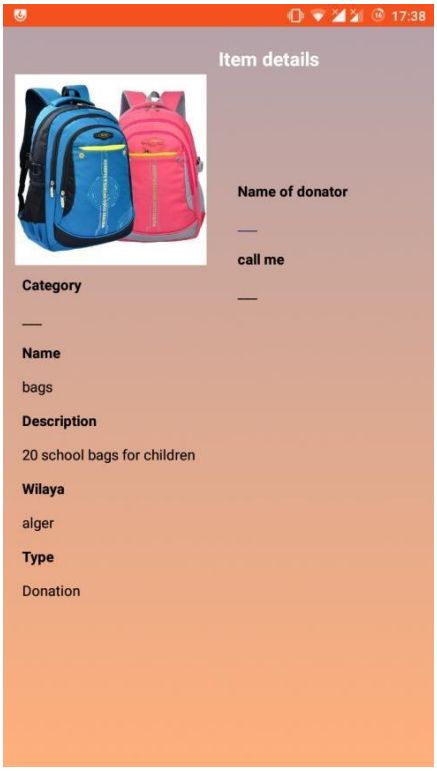


Figure 59 : Display item details

GENERALE CONCLUSION

At the end of this work, we would like to recall the conclusions and mention a certain number of perspectives that have emerged while working on this project. It is also important to briefly recall the objectives.

The objective of this project was the design of a solidarity platform following an API-first approach. We completed the design and the backend development with a REST API. We also partially developed the mobile application.

Our mobile application allows the guest user to explore items and browse the application with no registration required, which enable the user to get to know more about the application and take a comprehensive view before deciding to register. In addition, once the user register, it allows him to add items, make requests and initiatives. On the implementation level, the application was build using the Android Studio development environment, and using Java, the Object-Oriented programming language, as well as some internal and external libraries.

Although we have achieved an important part of the objectives set at the beginning of this project, the final product requires more time and work. We could certainly have achieved more if the conditions were more favorable. The main problems we encountered are the multiple COVID-19 infections of our team and family members.

But globally this project was a personal success and satisfaction for us. It allowed us to learn new concepts in many areas. Now, we plan to finalize this work and add other features we didn't include in this first design like messaging and fundraising.

APPENDIX A

SURVEY PRESENTATION

تبعا للظروف الاستثنائية التي مرت بها الجزائر جراء الأزمة الصحية، نعمل على تطوير نظام رقمي لدعم عملية التضامن و زيادة الفعالية في مواجهة الأزمات. هذا الاستبيان السريع يدخل في إطار الدراسة الأولية و يسمح بتشكيل قاعدة أساسية لهذا العمل لذا نرجو منكم المساهمة بالإجابة على هاته الأسئلة.

ما هي صفتك؟

- مواطن
- ممثل جمعية
- ممثل مجموعة أو صفحة على الفيسبوك
- منتسب إلى قطاع الصحة
- ممثل مؤسسة

هل تعرف شخصا مقربا (أو هيئة) احتاج بشكل عاجل لشيء محدد وواجه صعوبة في الحصول عليه خلال الأزمة الصحية؟

- نعم
- لا

ما طبيعة ذلك الشيء؟

- أدوية
- وسائل الحماية: أقنعة، ألبسة، نظارات ...
- أدوات التعقيم و النظافة
- أجهزة مساعدة على التنفس
- أجهزة طبية أخرى
- نقل أو توصيل
- تدخل طبي أو شبه طبي
- Autre : _____

ما نوع الاستفادة التي كان يبحث عنها؟

- شراء
- إعانة
- لا يهم

هل تم الحصول على تلك الحاجيات

- نعم في الوقت المناسب
- نعم لكن في وقت متأخر
- لا

ما هي الوسائل التي ساهمت في الحصول على تلك الحاجيات

- [ ] وسائل التواصل الاجتماعي
- [ ] جمعيات
- [ ] مؤسسات رسمية
- [ ] علاقات شخصية : عائلة، أصدقاء، جيران ...
- [ ] شراء من بائعين مختصين
- [ ] شراء من السوق السوداء
- [ ] Autre : _____

هل تعرف شخصا مقربا تضرر بشكل جدي بسبب عدم حصوله على حاجيات معينة

- ( ) نعم
- ( ) لا

ما طبيعة الضرر

- [ ] إصابة بالعدوى
- [ ] تعقيدات صحية
- [ ] وفاة
- [ ] تعطيل النشاط
- [ ] Autre : _____

هل ساهمت بشكل من الاشكال في توفير الحاجيات لفائدة المتضررين من الجائحة؟

- نعم
- لا

ما طبيعة تلك المساهمة؟

- بيع
- تبرع
- نقل و توصيل
- إنتاج
- سلفة
- نشر نداءات استغاثة أو معلومات
- Autre :

ما هي الصعوبات التي واجهتك في إطار مساهمتك؟

Votre réponse

إذا كانت لك(أو لجمعيتك، مؤسستك...) نشاطات تطوعية، ماهي الجهات التي تعاملت معها في هاته النشاطات؟

Votre réponse

اذكر الأطراف (جمعيات، مؤسسات، حملات تضامنية، مجموعات أو صفحات، ...) التي ساهمت بشكل فعال في العمل التضامني حسب ملاحظتك؟

Votre réponse

ما أهم النشاطات التي قامت بها حسب رأيك؟

Votre réponse

نعمل على تطوير نظام رقمي لدعم عملية التضامن، ما هي الواجهة المفضلة لديك؟

- تطبيق هواتف ذكية
- موقع واب
- تطبيق حاسوب مكتبي

أخيرا ماهي الوظائف و المعلومات التي ينبغي أن يوفرها التطبيق حسب رأيك لتحقيق فعالية أحسن في مواجهة أزمات مماثلة و تعزيز العمل التضامني

Votre réponse

Envoyer

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