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AdvCon, Beacon devices and electronic advertisement

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APPLIED TECHNOLOGY GROUP PROJECT

AdvCon, Beacon devices and electronic advertisement

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**B.Sc. INFORMATION TECHNOLOGY - COLLEGE OF COMPUTING
TECHNOLOGY DUBLIN.**

ABSTRAC

Technology is increasingly becoming an important ally for business, so it is important to develop studies and research that bring innovation to the market.

This report is about implementation of an app that utilizes a Bluetooth communication as a way of send low data information to a mobile device as an advertisement and how it would help on the business growth.

The research that were carried out in order to bring more knowledge about the beacon technology that is being the basis of our project and mobile devices app development.

It was found that there is still more to be explored in relation to this technology and much can be done using beacon devices.

the technology we seek to implement aims to solve the problem of companies with regard to the lack of visibility of their stores and the possibility of reaching a greater number of customers.

ACKNOWLEDGEMENTS

We would like to thank the teacher Ken Healy, for all his help and support during the development of our project, always encouraging us and extract the best of us and for sharing with us all his knowledge and experience.

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Chapter 1: Introduction

1.0 How to attract more pedestrians to your shop.

There is currently a big race among traders seeking to increase their competitive ability, Being a more attractive seller or service provider to the end customer with good quality of products at a good price is no longer enough if the consumer of these products and services does not know if such a trade or product exists, so it is somehow necessary to attract end customer attention.

Companies spend a lot of money to make their stores more attractive whit a good location, nice colours, electronic windows display, and a nice and well-designed storefront, the companies are trying to do everything to get more foot traffic in the store, this can mean a big investment all to attract the customers who pass in front of the shops.

Nowadays with the rush of everyday life we ended up not noticing the things that are around us, sometimes we are on ours phones checking Facebook new, select playlist or even answering a message on WhatsApp yes, I now nowadays we can't get out home without our phones.

Let's thinking about it, can companies reach this kind of customers and how those companies can make it possible?

The solution would be to somehow send electronic messages to pedestrians every time they pass in front of a particular trade, and it could be messages containing information about new products or offers.

Most people nowadays are always on their phones, their families, friends and more important people are always in contact with them through a phone. Is there a notification on their phone people are more likely to stop and look at it or at least look at their phones while they are walking which by the way is not a real save thing to do but people still do it?

According to research made by (Lauren Cahn, 2019) an approximate number of 11,000 Injuries a Year are caused by walking and texting at the time.

This project is about an innovative technology that aims to use a Bluetooth electronic device as a way of sending electronic advertisements for cell phones and other mobile devices that have Bluetooth technology through android and iOS applications, the technology that we going to use during this project is a device called beacon.

After some research and case studies we decided to use this technology as an electronic marketing form. The beacon will be used as a way to send small data packets to the user's mobile phone, which will then have access through an application

to offers and discount club and thus facilitating for merchants to inform their customers about any promotions increasing the level of consumer loyalty.

Also (Wordstream.com, 2019) they think that the possibilities of beacon technology in proximity marketing and location-based technology are numerous. As data gathering tools, beacons offer Google a chance to better understand businesses that use their services, as well as the users themselves, in order to improve their algorithm.

Beacons use 2 protocols in order to work with mobile devices, the first one is the IBeacon which is the one developed by apple and there is the EddyStone which is the one developed by Google which is the one we are going to implement in our project.

We have decided to implement the Eddystone as it would be suitable for both android and IOS which means that both users would be able to download and work with the app we are planning to develop.

1.1 Beacon

Have you ever thought about receiving information about new restaurants coffee Shops and more on the way home or work and even during a walk in a shopping mall?

Have you heard about the Bluetooth low energy (LE) devices that can communicate with other Bluetooth Devices allowing an interaction by a small amount of data and help send with higher accuracy of the object's global position? If not, we will be introducing you to the beacon technology.

A beacon as describe by (U of Digital 2018) is designed to send Bluetooth signals, it sends about 10 signals per second and any device passing by, if their Bluetooth is enabled, the devices will get the signal from the beacon with the information it is trying to display.

It is really important to understand that users would not have to be worried about security or about the beacon stealing their data from their phones as Beacon only sends signals, they are no design to interact or communicate with devices. According to (Pulsate HQ, 2015), they send a signal but will not be able to get a message back from any device therefore stealing data is no a task a Beacon will be able to perform.

Beacon is Bluetooth low energy transmitter device that connects with nearby mobile electronic devices such as tablets, cell phones, smartwatch even busses.

This technology is applicable for any function, some public transport company uses this kind of technology to measure the distance from the bus and the bus stop

also the stop's number where this bus is close by that way the traffic control of that company can calculate how long going to take for a bus to arrive from the last bus stop.

According to (Wordstream.com, 2019) each beacon device contains a CPU, radio, and batteries, and it works by repeatedly broadcasting out an identifier. This identifier is picked up by your device, usually a mobile, and marks out an important place in your environment. The identifier is a unique ID number that your Smartphone recognizes as unique to the beacon. Once connected, the beacon will carry out whatever function it has been programmed to perform.

1.2Name given to the application and company.

the name was inspired by the problem that we thought to solve that would be how to attract customers to a shop by sending electronic advertisements, also the solution that we as a group decided to be using which is Bluetooth connectivity used by the beacon device and then we decided to unite the word electronic marketing and connection, after a group vote.

The name given to this app is **AdvCon** a short way to say **Advertisement connection**, its name can explain or pass the feeling what the company is about.

According to (R. Barstow, The Importance of Business Names, 2020) A business name can help communicate your business strategy. Banks often want to communicate an air of conservatism and prudence, while dance clubs want to communicate an air of fun, pleasure, and enjoyment. In both situations, the business name can help reinforce these values. Names such as National Trust Dance Club or the Crazy Lizard Bank may not attract the kind of clientele you seek.

(R. Barstow, 2020) also wrote in the same article that A business name is often your first impression with customers. They see a sign with your name, and they either remember it or they don't. Either way, this is often your first impression with business owners and investors. Investors like to select businesses for their business potential, but some have more faith in qualitative factors such as marketing and the right business name. The right business name can also help differentiate you among potential investors.

knowing this we noticed how important it would be to have a name that shows what our app is about and how it would help in online search made by users of apps and companies interested in this type of service.

Chapter 2: System Analysis

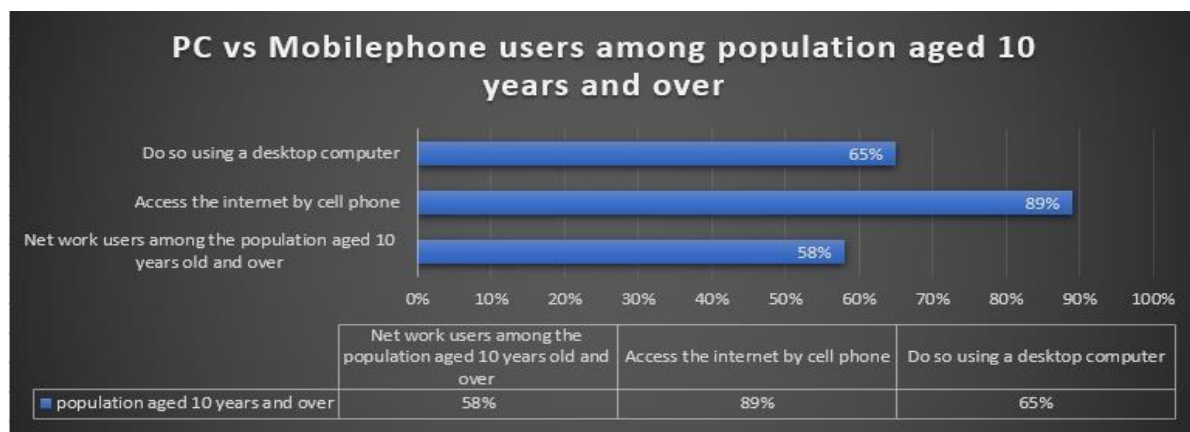
2.0 Marketing analysis

Market analysis is essential when creating an app, this type of analysis makes it possible to know what your target audience thinks about the app and whether they buy online. So, whenever they buy if they feel safe using the app as a way to search for offers. what is your percentage of potential customers and how to access them more effectively, it is very important to have this kind of information?

Knowing the market better, we can better know our competitors their weaknesses and strengths, avoiding making the same mistakes as our competitors, and thus we can shape ourselves to be more effective.

Some questions were crucial to have an idea of how our app would be useful for the users, what are the percentage of people which buy things online end people which prefer to go to a physical store, and how to bring those people together with one app.

The graphic below which shows us a survey made by Sao Paulo university (USP), one of the most important university in south America. According to the survey the use of mobile phones surpassed the number of desktop and laptop computer users.



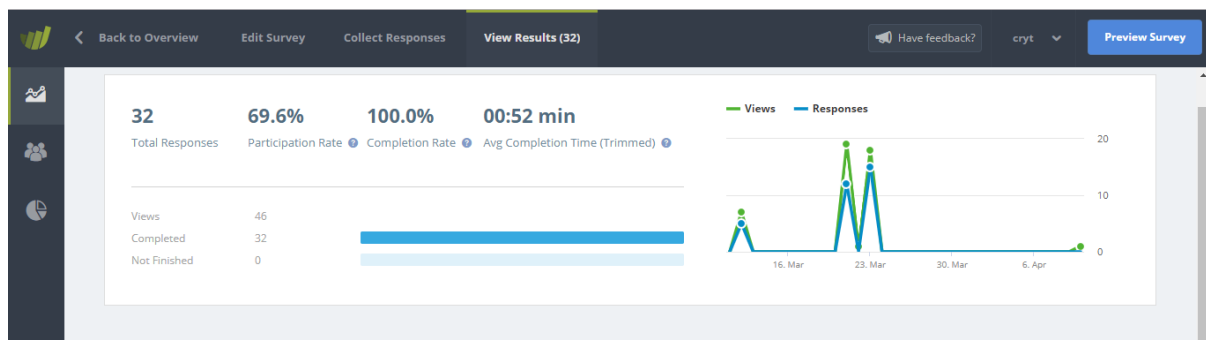
According to the survey made by ICT Households of the Internet Steering Committee in Brazil (CGI.br), among network users, who correspond to 58% of the population aged ten or over, 89% access the internet by cell phone, while 65% do so using a desktop computer, laptop or tablet . In the previous survey, it was 80% by computer and 76% by cell phone. In 2015, 35% of internet users accessed the network by cell phone alone; in 2014, this proportion was 19%. Another survey data shows that the exclusive use by cell phone occurs especially among users from less favored social classes and those from rural areas.

Nowadays people are more adept at making their purchases online than ever before, and they are using their cell phones much more for this, as some of them think the offers made by online stores are more reliable where they can compare prices with other stores, this shows us that promoting offers and services by cell phone can be a promising path.

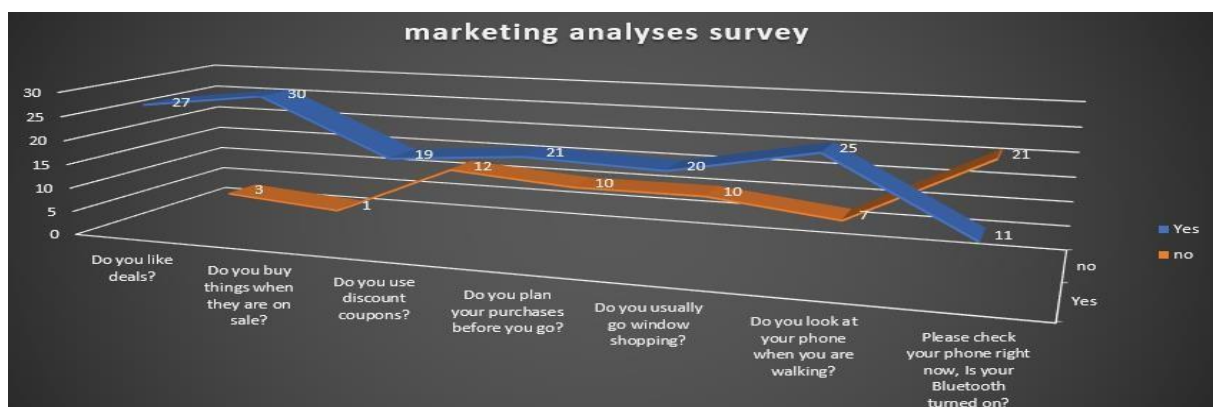
In the research carried out by (Mobile eCommerce Statistics (Updated 2019) Percentage of Mobile mCommerce Shopping Trends, 2020) During last year's busy Christmas shopping season, a third of all online purchases came from smartphone users. Not even Black Friday (6.2 billion online revenue in 2018) was immune to the mobile fever, as nearly 40% of sales on the traditional brick and mortar shopping day were made via a mobile device. On Cyber Monday (\$ 9.2 billion in online revenue in 2019), 54% of visitors came from mobile devices, while about 33% shop on their mobile devices, more than 40% over the previous year.

2.1 In college survey

When we did the survey, we asked random questions about our project focused on beacon technology people around the college, work, friends, and family. We did simple questions as simple is beacon.



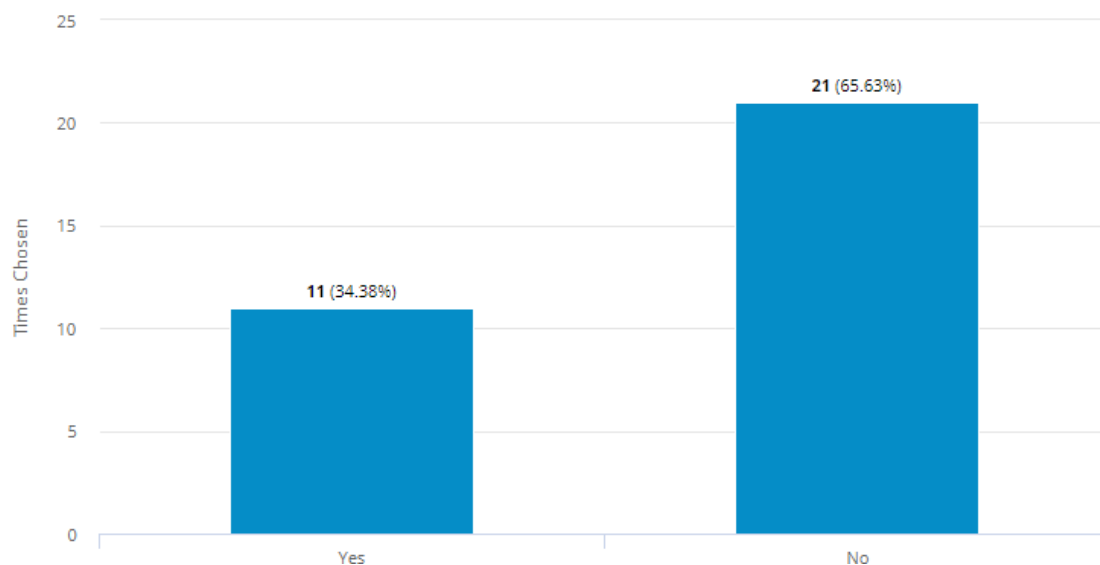
As we have already explained, the beacon is a uniquely Bluetooth device that allows information to be transmitted to any mobile device that is on the Bluetooth that is nearby, establishing a relationship between technology, proximity, and marketing.



According to a survey carried out a few days ago, with no definition of sex or age, we only focused on some colleagues and close people that most of them are always doing shopping. We did just seven simple questions, but the key to our beacon technology system, with these seven questions we realized that our beacon technology system can be implemented in any establishment. According to the survey, the results were as follows:

Please check your phone right now . Is your Bluetooth turned on?

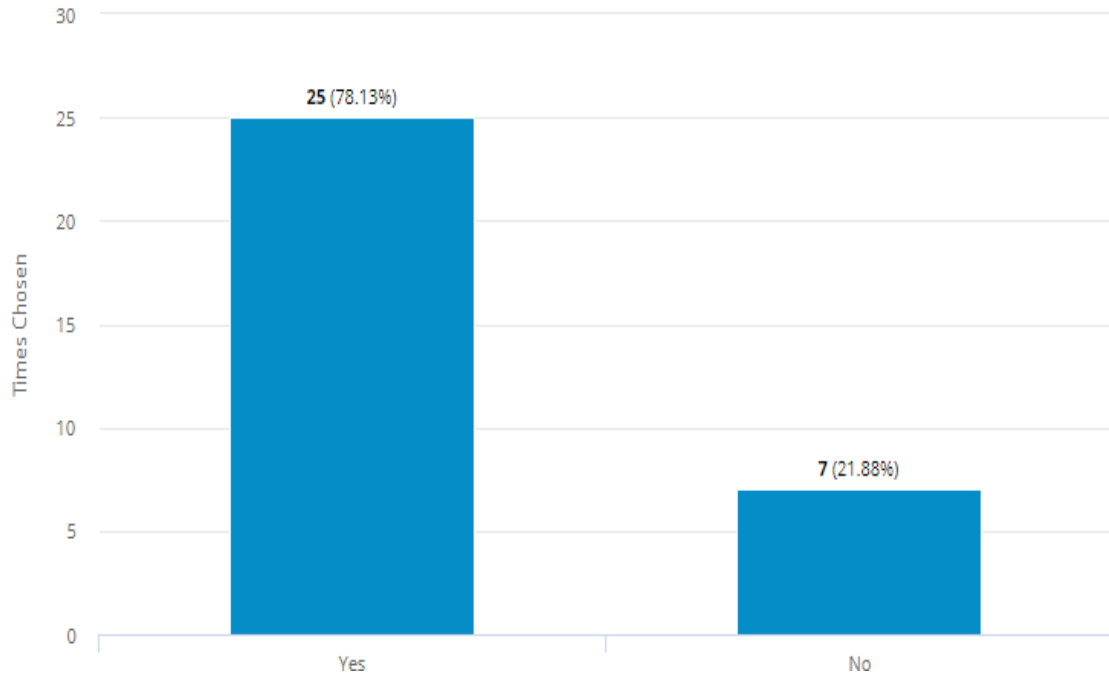
Number of responses: 32



Analysing this table when the respondents were asked if they had the Bluetooth on in their Smartphone at the moment they were keeping the account, the answer was as follows: Of the total of 32 answers obtained, 11 people, that is, 34.38% had Bluetooth turned on at that time and 21 of the respondents which represents 65.63% had Bluetooth off. Here is the key of our system, because we depend on Bluetooth to send all the signals to any mobile device that is any mobile device, taking into consideration that all the users that are at a distance less than 50 meters around where they can find the beacon

Do you look at your phone when you are walking?

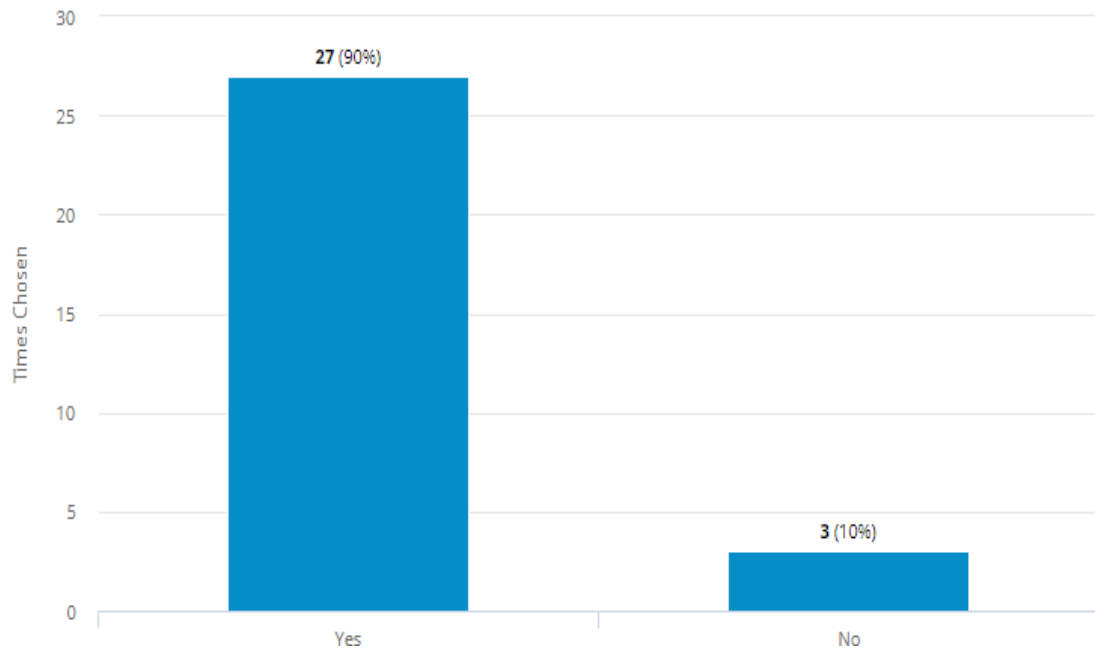
Number of responses: 32



In this table, one of the key questions was to ask the respondents if they were looking at the phone every time they walked down the street, and the answer was very positive in general, since 25 of the 32 respondents check the phone while walking, which represents 78.13%, while 7 of the respondents do not look at their phone while walking, represented with 21.88%. This question also favours us even more because a big part of the users is awaiting the notifications of their phones, and we as beacon technology could be a notification of those.

Do you like deals?

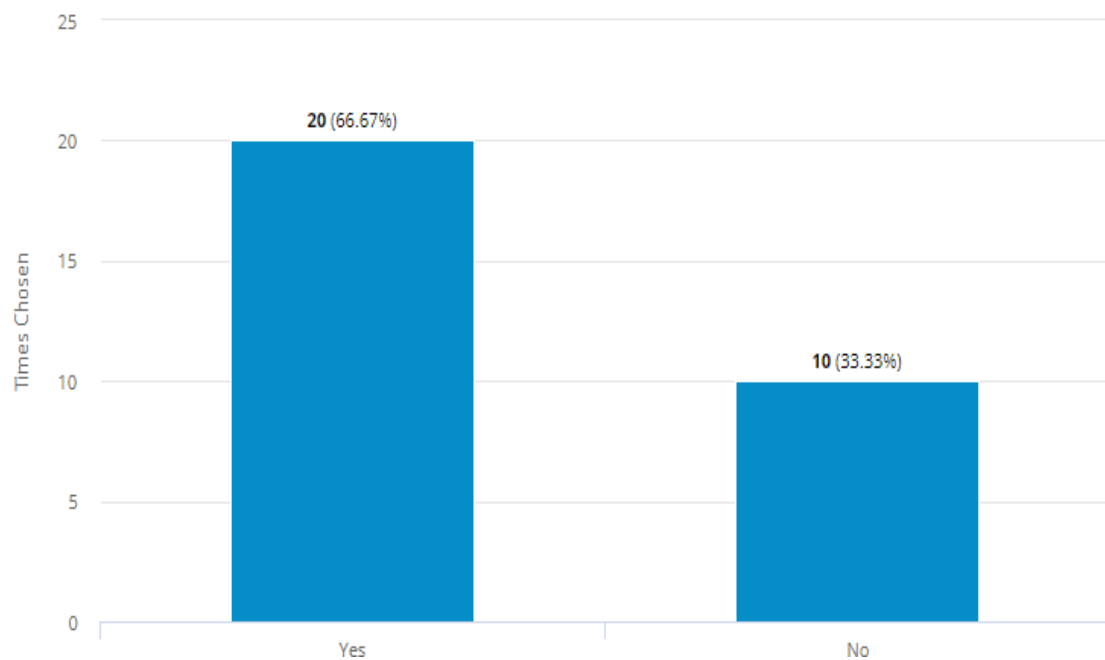
Number of responses: 30



In this table respondents were asked if they like deals, and as expected 90% of respondents like deals, representing 27 respondents and the other 10% (3 respondents) do not like deals. Again, our survey is very positive because our technology beacon offers through our app deals with scheduled time and every day of the year.

Do you usually go window shopping?

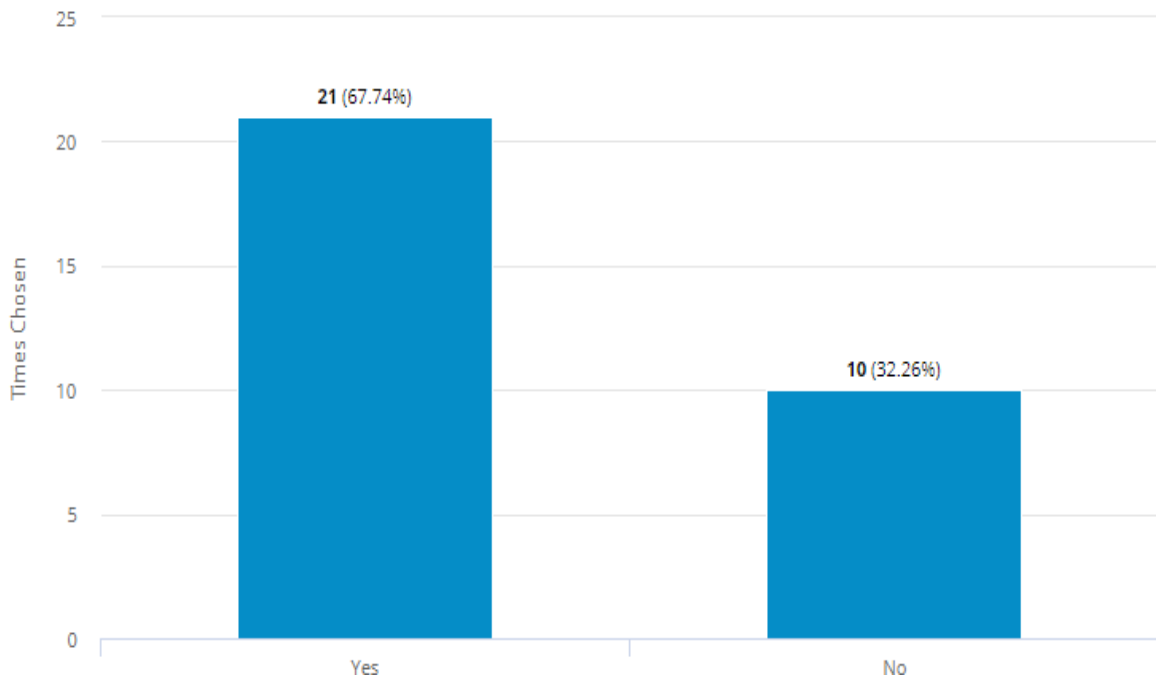
Number of responses: 30



In the table that is observed at the top, another of the questions to our respondents is if they go to window shopping, because the result was that 66.67% (20 respondents) if they go window to window that without them knowing they are exposed to any deals, and 33.33% (10 respondents) do not go to the windows but go strictly to buy something. That is to say, that 66.67% according to this survey if you compare something that you saw just a few minutes before without having planned it

Do you plan your purchases before you go?

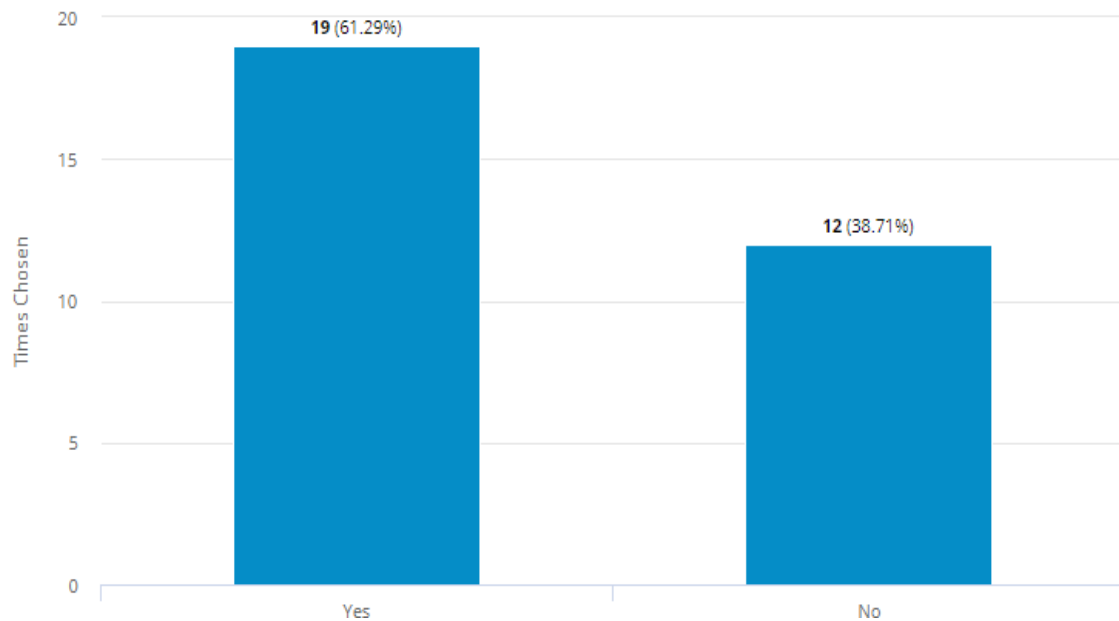
Number of responses: 31



In the table above with this question we wanted to confirm if the customer is really willing to buy anything on the street, that seems attractive at the time, we wanted to know if customers really plan to shop or just buy what they are going looking, and we obtained the following results according to the respondents 67.74% of the respondents plan their purchases and 32.26% do not plan their purchases, according to this survey leaves us an open letter to reach all our users with beacon technology.

Do you use discount coupons?

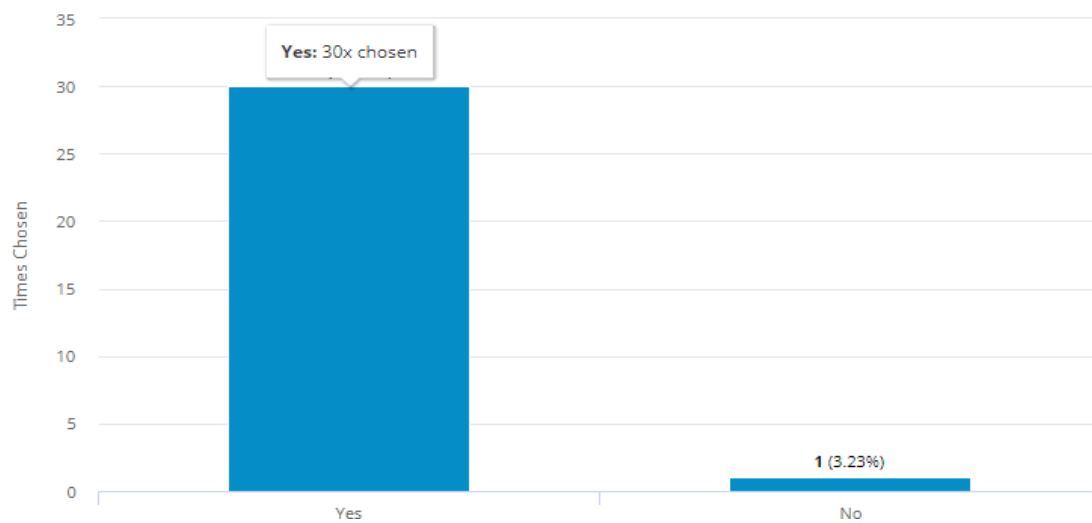
Number of responses: 31



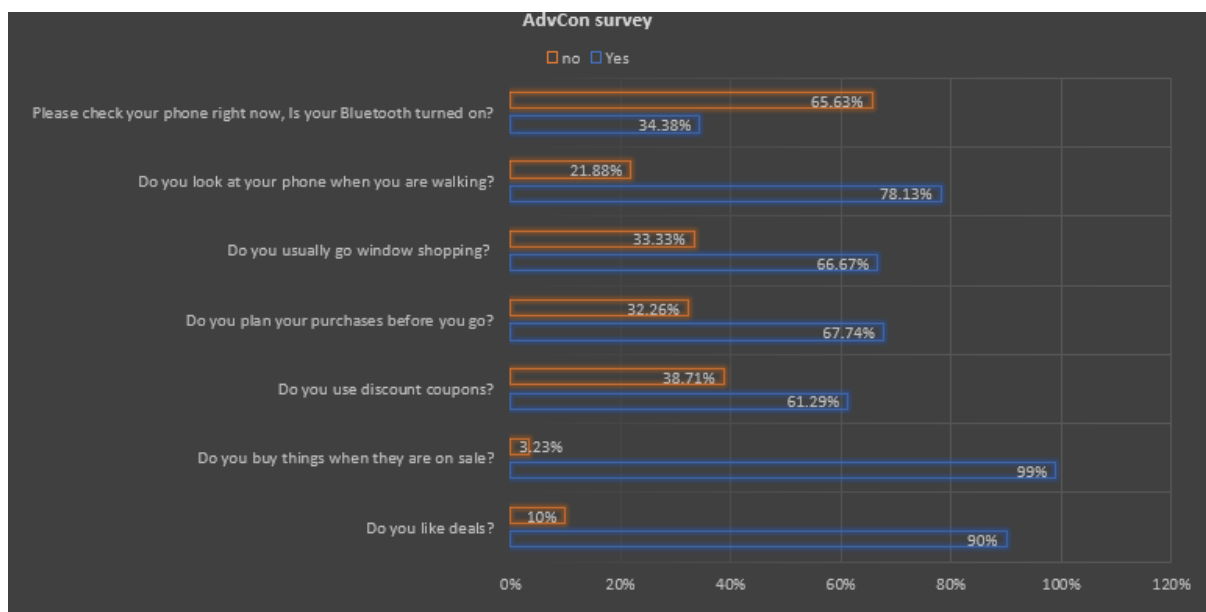
Respondents were asked in the table above if they use discount coupons, and the survey found that 61.29% of respondents love discount coupons, and 38.71% definitely do not like discount coupons. Discount, this question is very similar to one of the previous ones, we just wanted to confirm that users really use their discount coupons when they are granted, taking advantage of the fact that our technological platform is in charge of granting the best discounts authorized by the company that is delivering them. From technology beacon simply with the alert of a notification on your smartphone

Do you buy things when they are on sale?

Number of responses: 31



In this table we decided to ask if everyone compares on sales since many or most of the companies were going to sales either to dispose of old, devalued, or almost unsold products or simply change stock. The truth is that 96.77% of respondents buy on sale and 3.23% do not dare to buy on sale. To close this account, specifically with the results obtained, we realize that any company can definitely sell as long as it has good deals and discounts, since customers are willing to buy what they like, and this is what beacon technology allows every any company through our application connected to the beacon offers its customers the best deductions.



2.2 What would be the main target of our project?

The project we are developing is very practical and useful which benefits everyone who wants to use it. The operation of a Beacon is very simple, practical, and accessible to all types of people.

Because these types of devices are placed in strategic areas of the establishment, you can already use the amount that the company manager wants, in which you want to interact with potential customers, although it can only work if mobile phones have Bluetooth enabled. In addition, applications are vital to the mobile device from which they are available can read the content of the signals are emitted through Bluetooth.

The good thing about these signals is that you can customize the contents of the messages you want to send, depending on the type of company you have and the discount or coupon you want to give your customers. Having said this, our project will not just be useful for retailers who want to advertise their deals but for customers who are trying to save some money in the daily basis.

We have planned out project to be done in a period of 24 weeks. In this period, we should be able to get every module of the project done as it should. The plan has been broken down into tasks by week. The image below shows how our work is going to be developed and how it should progress

2.3Initial objectives:

As it is specified below, we got some objectives to guide and help us to approach the objectives:

1. Get the app to recognize the beacon by an id or URL.
2. Get beacons in a range only.
3. Write a piece of code to allow the app to be able to get a link from the beacon.
4. Write some code with the aim of loading a web page.
5. Working on a firebase database to be able to add users (A company owner) through android studio.
6. using java programming.
7. Getting a login form to work using a firebase database Getting the client.

2.4 Project planning by week

	Project name	Duration	Project start date	Project end date	Weeks																											
Task	Description	Weeks	Start Date	End Date	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22.1	22.2	23	24	25		
1	Research	1	October 15, 2019	October 22, 2019																												
2	Planing	1	October 29, 2019	November 5, 2019																												
3	First submission ready	1	November 6, 2019	November 26, 2019																												
4	Data base designing	1	November 27, 2019	December 3, 2019																												
5	App Analisgs	1	December 4, 2019	December 11, 2019																												
6	App Designing	1	December 12, 2019	December 19, 2019																												
		2	Christmas Break																													
7	Connection to the devise	1	January 02, 2020	January 09, 2020																												
8	App development (AD)	3	January 10, 2020	January 31, 2020																												
8.1	AD•Testing of the app	1	February 01, 2020	February 08, 2020																												
8.2	AD•Testing • Supervision	2	February 09, 2020	February 23, 2020																												
8.3	App development (AD)	6	February 24, 2020	April 03, 2020																												
9	App Functionality Testing	0.5	April 04, 2020	April 07, 2020																												
10	Fix app issues	1,5	April 08, 2020	April 18, 2020																												
11	App final test	1	April 19, 2020	April 25, 2020																												
	Total number of week	24																														

2.5 Technology to be used for this project:

In order to develop an app, there are few technologies and tools we need to use with the aims of getting things done.

The first tool or technology we need is **a physical Beacon** which we already have 2 of them. One of them did not work with a piece of code we have already developed but we are not sure if it is broken or not as only a small blue light shows up for a couple of seconds and it then disappears.

This has been a group concern. Another possibility is that it does not support the Eddystone protocol which is the protocol we are using in order to develop the app for android and IOS. We have got a second beacon which comes with instructions on how to use and everything which the previous one did not have at all, so we must try it out.

We have already started as the schedule outlines to work on our project. There are a few things we have already done in order to progress.

One of the things is learning how to program **android** which is what we are going to use to develop our app. This is pretty new to everyone in the group as we have not been taught how to program android however, **java** is the main language used to program android and we have developed few projects during the last 3 years using this programming language so it would be a little bit less complicated as we are already familiar with it

We are using **a firebase** Firestore database to go with our app. It is something completely new for everyone as we have been using MYSQL for the last 2 years but we will be able to learn how to use it and at the same time we get new knowledge which will be useful for our future carriers.

2.6Google firebase:

We had to familiarise ourselves with the software Development platform known as Google Firebase. Firebase is a free to use (for testing) software development platform used in the development of mobile apps. It has a function Firestore which is a cloud-based database service that will be using for our project.

This was chosen because it's cloud and will be useful for as no member of our group will have to do any hosting for the database on their laptops. It also allows authenticating entry as well as set a password complexity on our app which we may also be useful to us for security for our app.

It was also chosen because prior to knowing which type of beacon we would be using for our project we knew that the firebase would with either a swift ibeacon or an android Google beacon our two main choices.

2.7App graphic user interface designer

The design for an app is very important, so it is the way to provide to the user a great experience and also de design can be the reason for the user to keep or delete the app that's why it's so important to make the user interface as more user friendly, easy to work with, visually attractive, comfortable and as possible.

So, in this case, we first decided to use the tool Figma which for us was very straightforward with a nice graphic, but after that, we started to work with android studio to code the app's program, and then we decide to use android studio to do the app design also as it is a more complete app development tool.

According to (Webfx.com, 2019) When your audience visits your site, it gives the first impression of your business. They will judge your business in seconds. In those first few seconds, you want to make a positive impact on your audience.

If your site looks unpleasant or outdated, your audience will immediately have a negative impression of your business. They will not find your site attractive, which prevents them from your page. You will lose leads because they will leave your page to a competitor's page.

Web and app design are important because it affects how your audience perceives your brand.

The impression you make on them can make them stay on your page and learn about your business or leave your page and turn to a competitor. Good web design helps keep your leads on your page.

2.8 Functional requirements

The system requires specific functions that will allow our application to perform a pleasant, safe, and consistent experience always seeking to satisfy the user without becoming complicated.

These functions are, create the home screen that the user, if it is a manager, can do his sign in or log in, in the first time that the manager is using the app he will need to fill up a registration form, the system going to show a registration screen where the manager will register his shop input the shop category, address name of the establishment, etc.

After the complete registration, the system must have a screen where the store manager can register a new beacon device, so then the manager can register a new offer after all the steps regards to the shop all the data is sent to a database.

In relation to the customer the system will offer a field where the user will be able to set up its preferences which means gender, clothes, food, accessories, sports, and so on. After selecting the options, the system will allow the stores with the preferences indicated by the customer send offers using the beacon to the customer, once the customer phone receives or in other words detects the signal from the beacon device, the application will show the offer message from the shop, then the customer will be able to click and the system will show a Satnav radar screen with the location of the store where the beacon devices are.

2.9 Use case Functionality and diagram as a system analysis

A use case is a way to analyse, develop and test systems, it describes how the system will suppose be working or interact to the users doesn't meter if it is an existing system or proposal system, this method for system analyses should be part of every project manners as a permanent toolset.

This system analysis tool was really helpful for the development of the project, so that way we could visualize and improve it during the development and implementation of our project at the same time it is useful to decide what are the main fictional requirements and the secondary.

According to(Use Case Diagrams - Use Case Diagrams Online, Examples, and Tools, 2020)A use case diagram is a dynamic or behavioural diagram in UML. Use case diagrams model the functionality of a system using actors and use cases. Use cases are a set of actions, services, and functions that the system needs to perform. In this context, a "system" is something being developed or operated, such as a web site. The "actors" are people or entities operating under defined roles within the system.

2.10 AdvCon use case.

Use Case Name	Functionality of AdvCon system
Create By:	Thiago
Date Created:	19/3/2020
Primary Actor:	Shop manager
Secondary Actor:	Customer
Descriptions:	<p>This use case shows the functions that the system has to have and the interaction between users and the system. The steps for the Shop manager are:</p> <ol style="list-style-type: none">1. Sign in or log in.2. 1 if it is a sign in the system send the manager to the Register Shop form page. 2 if it is a Login go to the Managers menu.3. After the Shop manager registers the Shop or logged in, the system shows the Manager menu.4. Manager menu: where the manager can select: 1 register a new beacon device. 2 Upload or update a deal.5. After everything was set up all the data is saved on the database on the cloud and the beacon is activated. <p>The few steps that customer has to take are:</p> <ol style="list-style-type: none">1. Select the preferences e.g. Men's clothes, toys, Sports, Restaurants, or coffee Shops.2. The app receives the beacon sign and if it is related to the Customer preferences it shows the deals notification.3. If customer accept the notification select yes or no to hide the offer.4. Offer selected, show the deal and radar (like a Satnav) it shows the way to the shop (shop location).
Preconditions	Users have to select the deal's preferences to get a specified offer.
Postconditions:	The system will show all the offers if the customers do not select the preferences else if select the preferences system just shows the related deals.

2.11 AdvCon use Case diagrams.

AdvCon app Use Case Diagram

Thiago Ameida | March 22, 2020

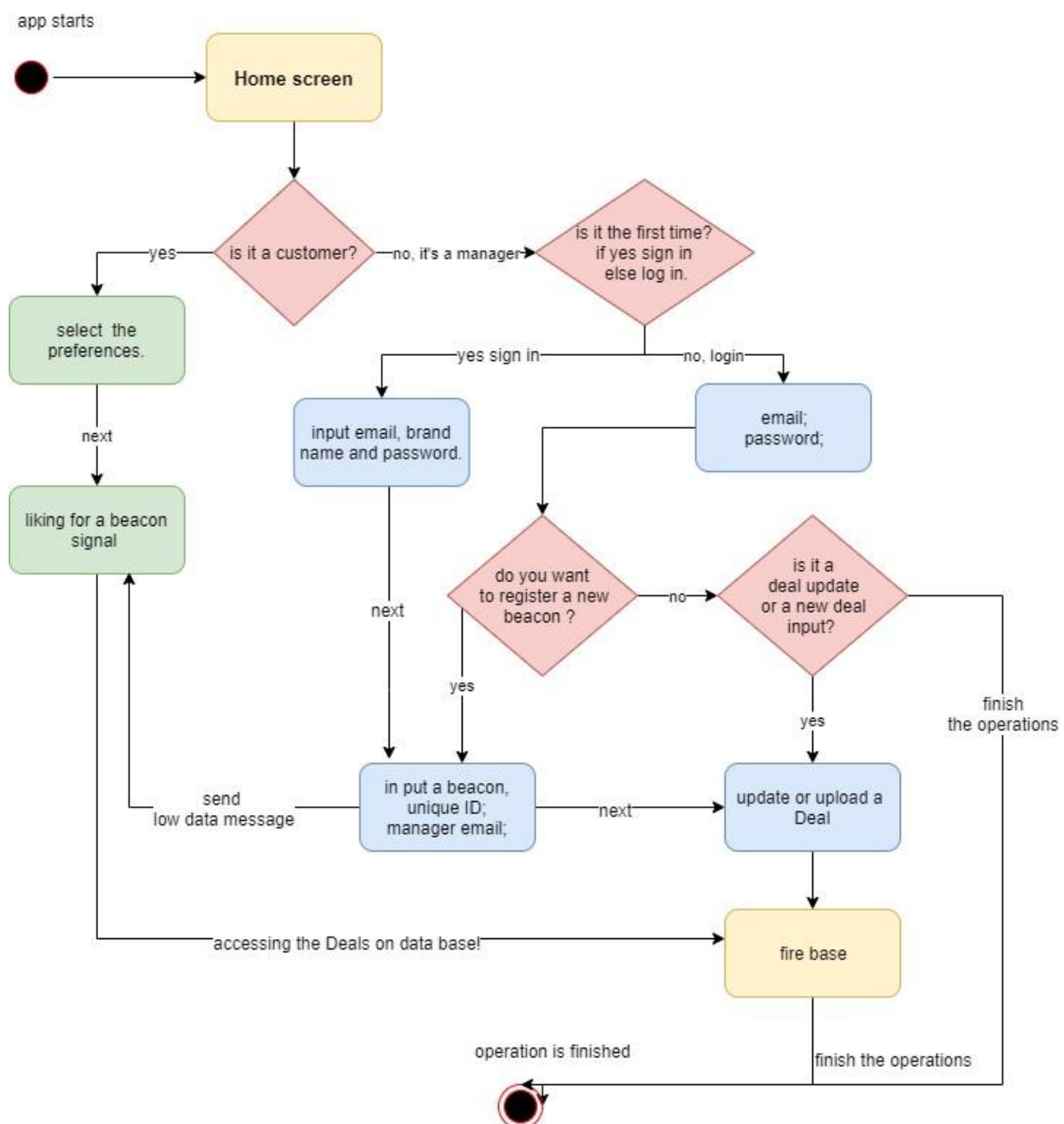


The use case diagram shows the functionality of the program where we can analyse how the user daily life would be when using our app, and find out where we are getting it right and where possible errors may occur.

2.12 State Diagram

A State diagram was used to illustrate the dynamic view of our system, it is very useful to understand and visualize the app before it is implemented. It shows us the possibilities for modelling the behaviour of the interface and classes.

On the word of (A simple guide to drawing your first state diagram — with examples | Cacoo, 2020) A state diagram is a graphic representation of a state machine. It shows a behavioural model consisting of states, transitions, and actions, as well as the events that affect these. It's also one of the 14 Unified Modelling Languages (UML) used for specifying, visualizing, constructing, and documenting software systems.



Chapter 3: System Design

3.1 Logo

For the logo development, we used a graphic design tool, one that we choose to do this job was CorelDraw which is a great instrument that makes possible to develop beautiful drawings with high graphic quality, it is a tool for intermediate to advanced users, for beginners is not a very easy instrument to work with but after a few hours of work, it is possible to obtain great results.

As our work is to develop an application that informs the user about stores around him that are present or services that are in offer, we were thinking of something that makes the user aware of Shopping and connectivity.

On the word of (The Importance of Logo Design for Business | Chrysalis Communications, 2020) A logo is much more than just an image; it is a point of recognition for clients and an important foundation for the branding of your company. It is often said that customers form an opinion about a company within seconds. A well-designed logo is an easy way to convey to potential customers that your business is professional, trustworthy, and provides quality goods or services.

Down below are some examples of attempts to arrive at the most appropriate logo for our app.



3.2 User interface designs.

To develop the design of our app graphic user interface we used a tool for system designing development provided by the website mockflow.com, this tool helps in the development of prototype designs for application, where you can find all operations system packs with examples of components used on android, apple windows and other systems, Mackflow is an online wireframe software for designers planning, this means that with it we can develop a sketch of what our user environment would look like, it is a practical and easy-to-learn tool, it already comes with all the components that the user environment needs, making it easier to see what the application would be like.

In line with (A simple guide to drawing your first state diagram — with examples | Cacoo, 2020) MockFlow is a cloud-based wireframe mock-up software solution designed for website and software developers, designers, UX professionals, and marketers. It lets them perform tasks, design user-interface prototypes for websites and mobile apps, and collaborate with projects in real-time.

Home screen:

So, on the first screen will be the welcome message screen where are the logo of our company and on the bottom will have a start button, once the button is pressed, the application goes to the function selection screen or in other words the options menu.

Menu:

The menu page will have the following options login/ register, help, radar, and settings.

login/ register:

If the user presses the first option which is login/register the system going to show the login form where it will have two text input one for the email and other for a password under it will have a log in button to confirm once it is pressed sends the user to the admin dashboard, also the login/register page will have a signup button which sends the user to the signup form page, where the user going to be able to register itself, if it is a manager.

Registration page(manger):

The user registration page contains a form container with four text input field one for company name, manager email, password and confirm password, under it there is a confirm button once it is pressed goes to admin dashboard page.

Help (manager and customer):

When the help button is pressed the system open the help screen which can have a how can I help input field where the user can insert its doubt and the system will show the closest answer in regards to the user question or it going to send to help web page, it is a thing that we remain deciding.

Admin dashboard:

On the admin dashboard page there are two buttons one is for the new deals page and the other is for the New Beacon page. The new deal page will have a form

where the manager will be able to set a new deal or just update a previously inserted deal, on the new beacon page is where the manager will register the beacon by inputting the beacon UID (unique identification) number.

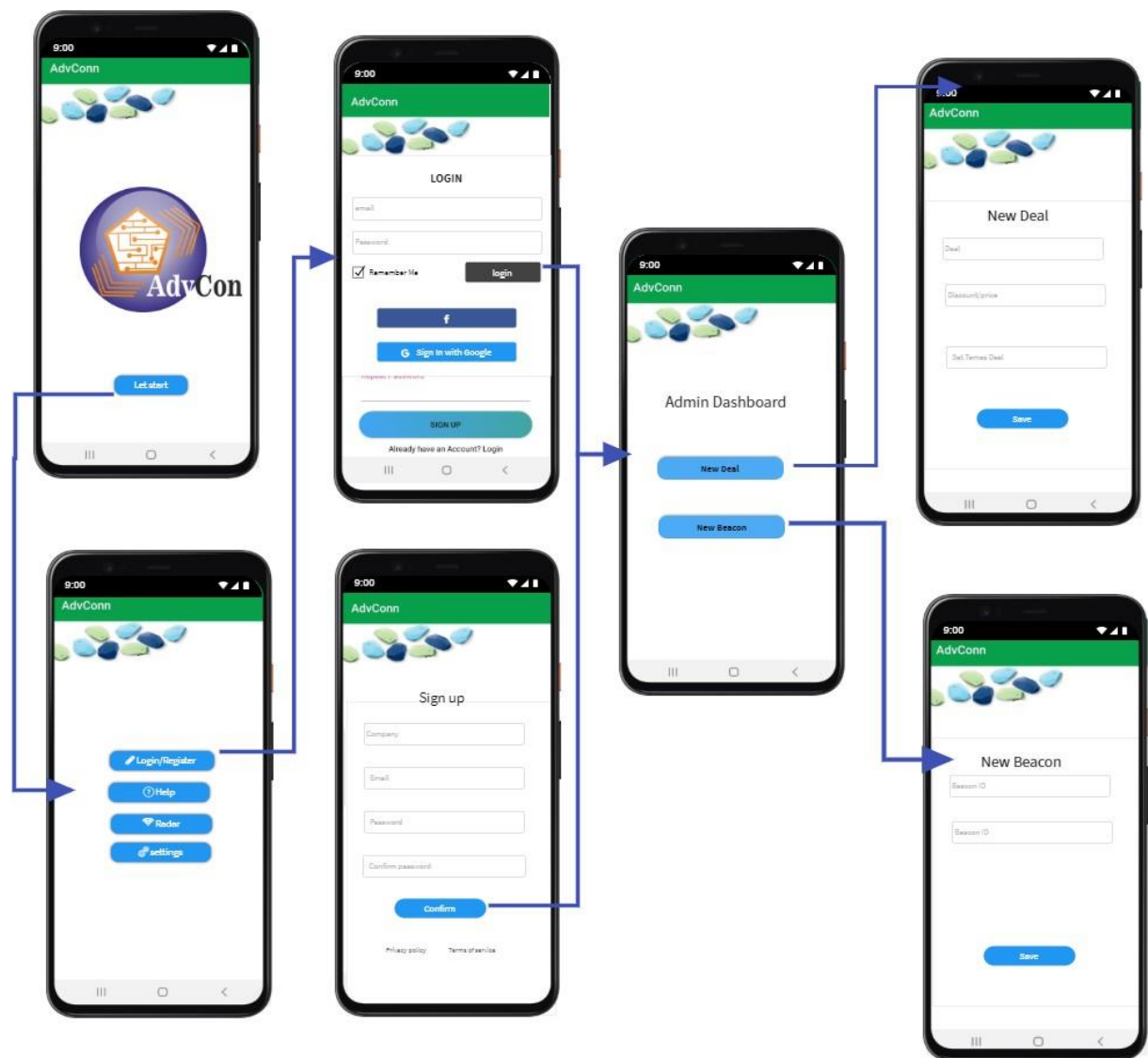
Radar:

When this button is pressed the system will show to the customer a Bluetooth radar which will be looking for any beacon signal if there is any beacon in the phone range it will show on the screen.

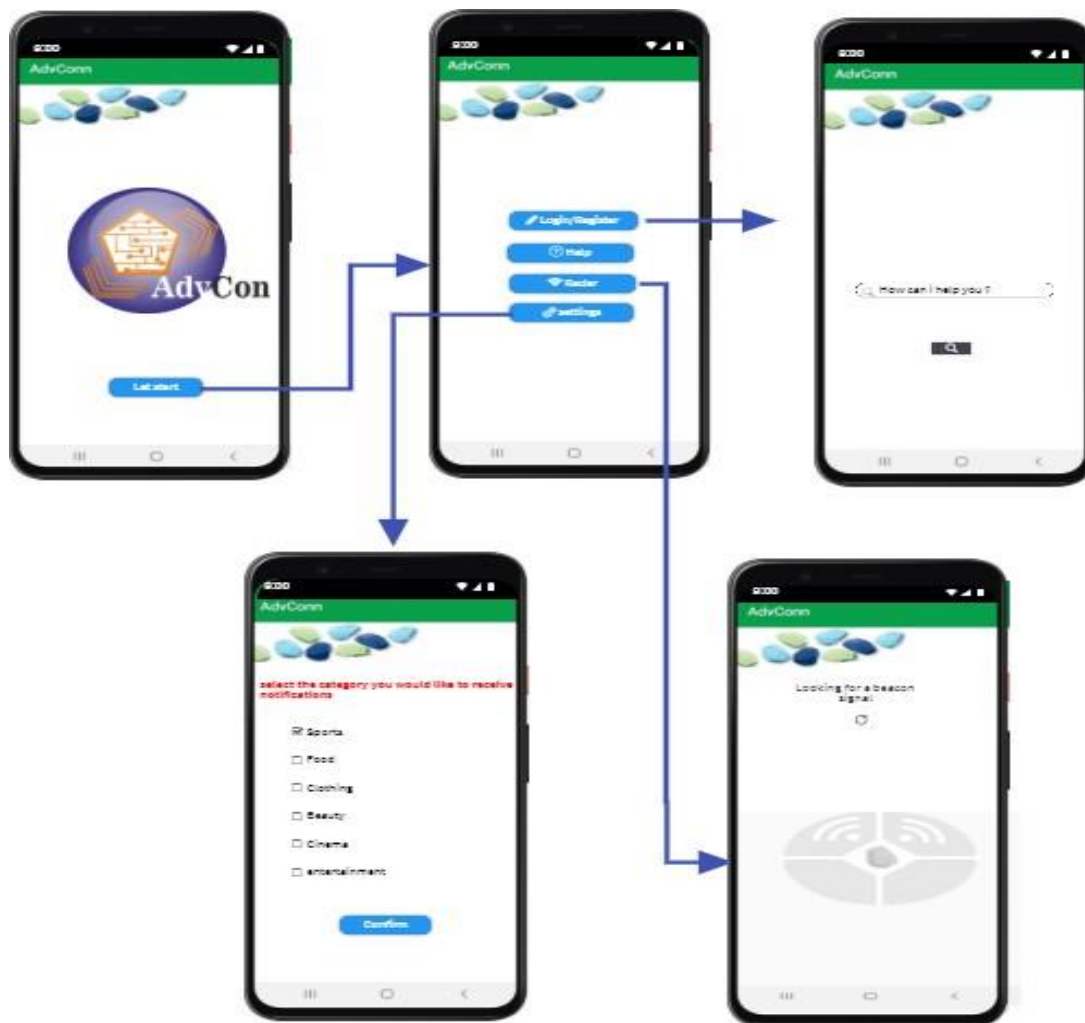
Settings:

It is the button which will send the customer to the preferences menu selection, on this section is where the customer will select the kind of shop notification that he wants to receive in regards to his preferences.

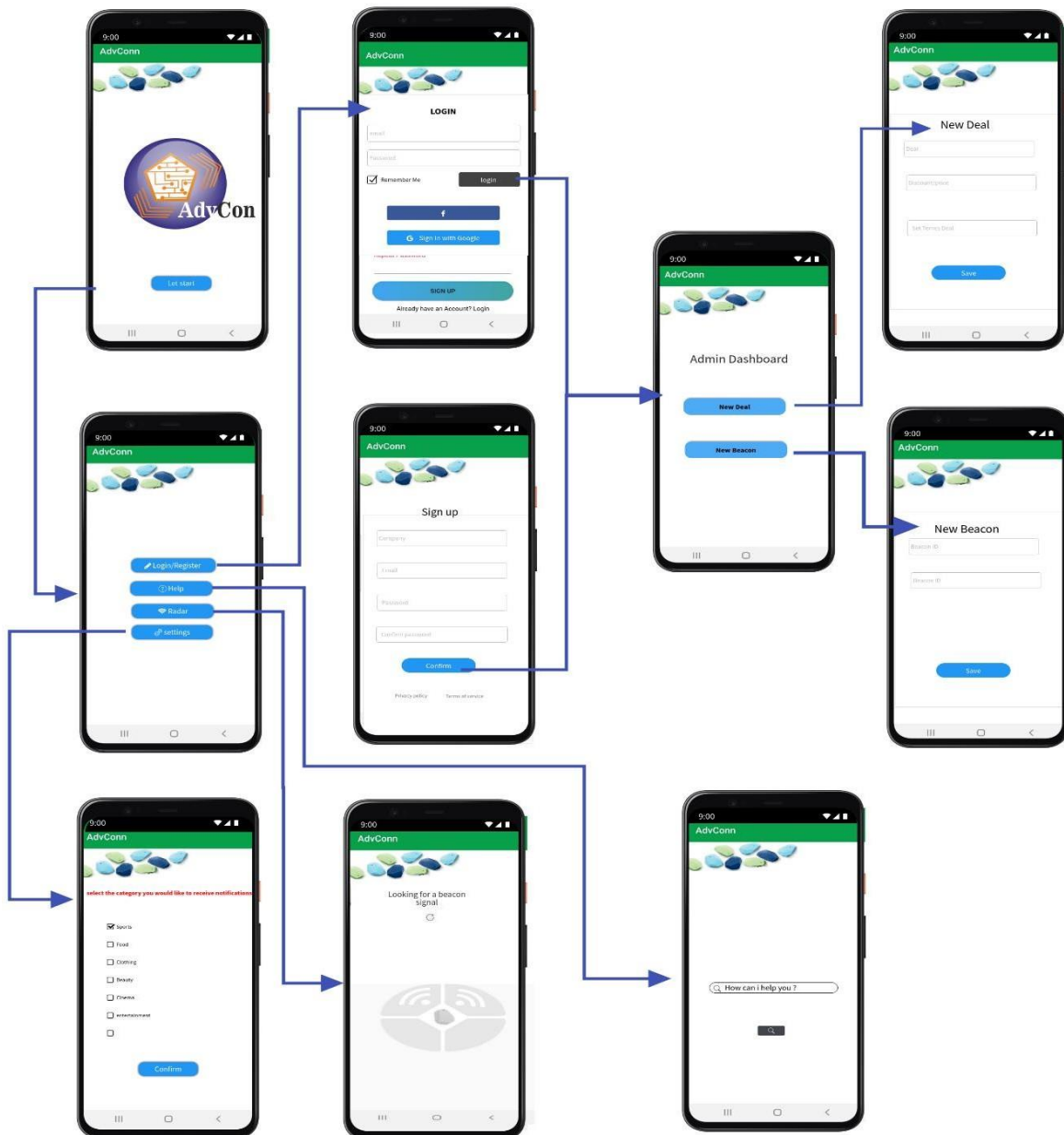
3.3 Diagrams – Screen designs, Manager path.



3.4 Diagrams–Screen designs, Customer path.



3.5 wireframe mock-up



3.6 FAQ

What is Beacon?

Beacon is Bluetooth low energy transmitter device that connects with nearby mobile electronic devices such as tablets, cell phones, smartwatches, even busses.

How Beacon Works?

This technology is applicable for any function, some public transport company uses this kind of technology to measure the distance from the buss and the bus stop also the stop's number where this bus is close by that way the traffic control of that company can calculate how long going to take for a bus to arrive from the last bus stop.

Is secure use Beacon?

Yes, is a completely secure technology platform that is evolving globally.

Why chose this technology?

Because it is secure for our app cloud and will be useful for everybody allows authenticating entry as well as set a password complexity on our app.

What do I need to connect to a beacon?

Just need a device (Smartphone, tablet, etc) with Bluetooth on and be close to the beacon.

Do I need the Internet to get a connection to the beacon?

If you are a user, you do not need the internet, just need Bluetooth on. If you are an administrator you need the internet.

Can I get deals every day?

If you walk close to any beacon with your Bluetooth on, and the company has the deal, for sure you are going to get.

Administrator

How Beacon Works for Administrators?

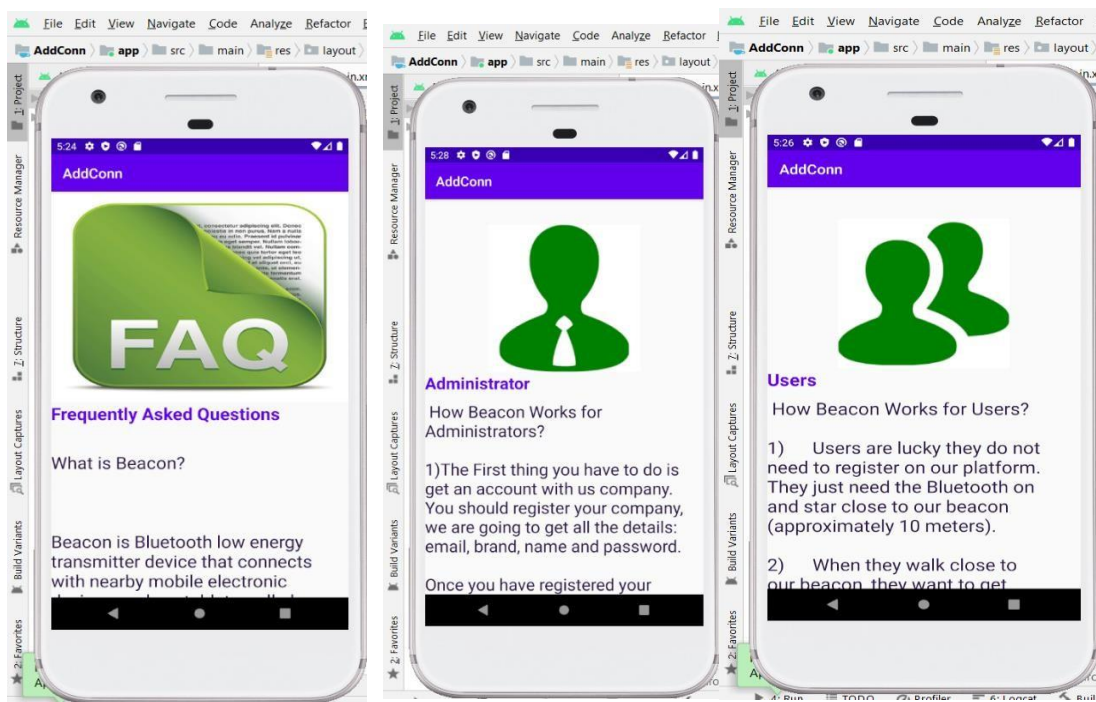
1. The First thing you have to do is get an account with our company. You should register your company, we are going to get all the details: email, brand, name, and password. Once you have registered your company, we will create a profile for you that you can enter whenever you want, anytime with the details you have proportioned to us.
2. The second thing you must do is select one of the options that will appear in our list of categories, according to the activity that your company carries out. The categories that we offer are the following: technology, cinema, sports, clothing, food, beauty, and fun.

3. The third thing you must do is register the beacon by pressing a button on the device you want to use, keep in mind that the device must be within a few meters for activation.
4. The last step, but not the least important is the creation of your own deals, keep in mind that your deals want a name, price or discount coupon and it is programmed for the time that you want to start and finish it. It also has an option to completely delete the deal.

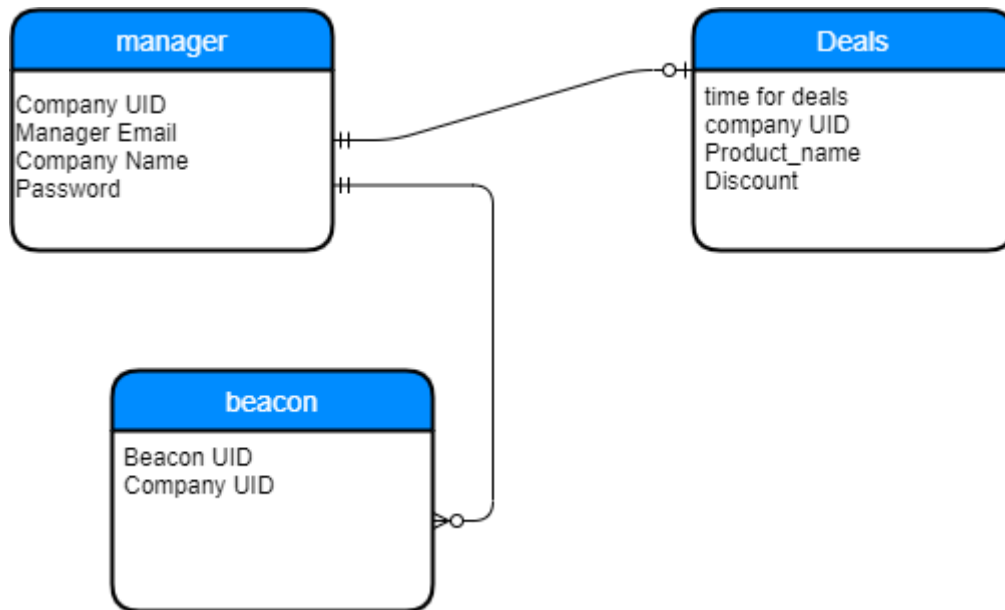
Users

How Beacon Works for Users?

- 1) Users are lucky they do not need to register on our platform. They just need the Bluetooth on and stay close to our beacon (approximately 10 meters).
- 2) When they walk close to our beacon, they want to get notification about our services, once you get these notifications just go into the setting which one are you interesting? We have seven categories: food, technology, clothing, fun, cinema, beauty, and sports).
- 3) According to the category you have select, you want to get notifications about your preferences.
- 4) Once you get notification go into that link and get your deals, according with the policy of each company.



3.7 Data Design

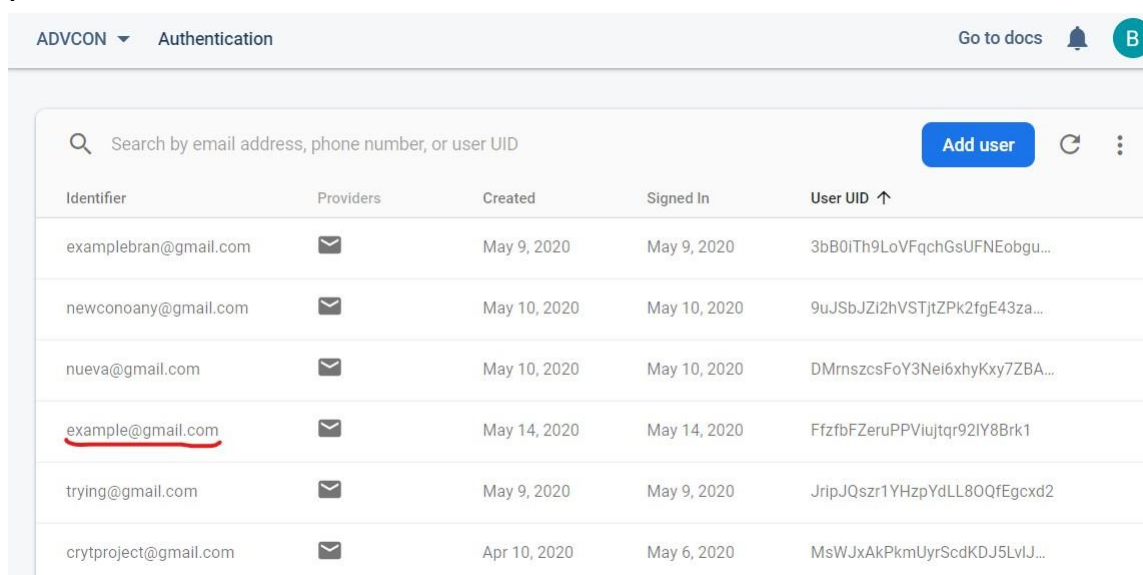


The database we have chosen to use for our project is the Firestore service on the Google firebase platform. It's a NOSQL JSON file-based database that it's based on the cloud rather than on one of the team machines so that any member could access it at any point.

The database stores an account for each manager who can sign themselves up from the sign-up page in the app. It makes the user type the company name, the manager email, and a password for the manager's account.

The screenshot shows the 'Sign Up' screen of the AdvConn application. The screen has a green header with the text 'AdvConn' and a decorative graphic of colorful stones. Below the header, the text 'Sign Up' is displayed in a cursive font. The form consists of four input fields labeled 'Company', 'Email', 'Password', and 'Repeat Password'. A blue 'SIGN UP' button is located at the bottom of the form. Below the button, there is a link that says 'Already have an Account? Login'. The bottom of the screen shows a mobile navigation bar with three icons: a hamburger menu, a home icon, and a back arrow.

When it saves the user data its stores the email and the password in the Google firebase authentication feature and provides the user with a unique randomly generated uid

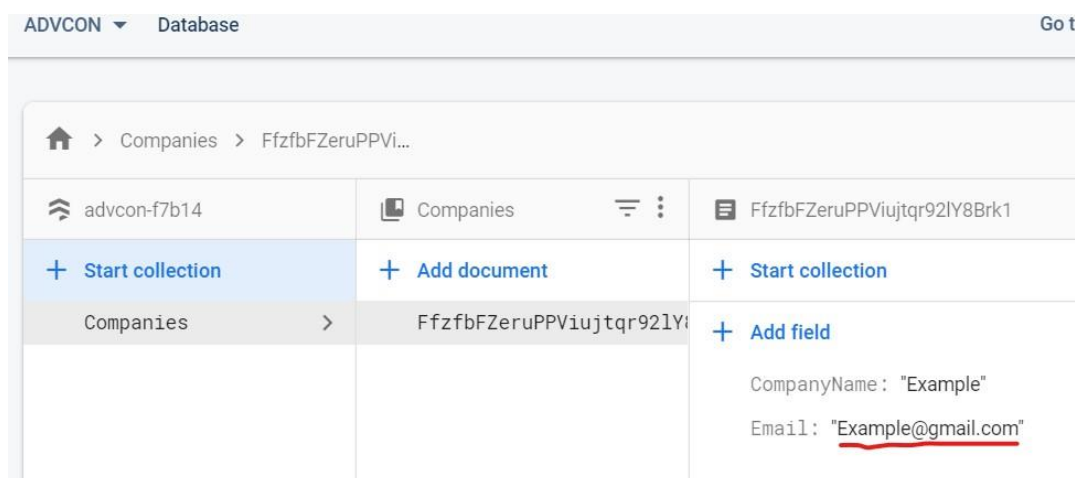


ADVCON ▾ Authentication Go to docs

Search by email address, phone number, or user UID Add user

Identifier	Providers	Created	Signed In	User UID ↑
examplebran@gmail.com		May 9, 2020	May 9, 2020	3bB0iTh9LoVFqchGsUFNEobgu...
newconoany@gmail.com		May 10, 2020	May 10, 2020	9uJSbJZi2hVSTjtZPk2fgE43za...
nueva@gmail.com		May 10, 2020	May 10, 2020	DMrnszcsFoY3Nei6xhyKxy7ZBA...
<u>example@gmail.com</u>		May 14, 2020	May 14, 2020	FfzfbFZeruPPViujtqr92lY8Brk1
trying@gmail.com		May 9, 2020	May 9, 2020	JripJQsyr1YHzpYdLL8OQfEgxcd2
cryptproject@gmail.com		Apr 10, 2020	May 6, 2020	MsWJxAKpkmUyrScdKDJ5LvlJ...

After successfully adding the user to the authentication it stores the company name and the email into the Firestore database, with the document having the same UID as the user. The user info will be stored into the document collection set as Companies



ADVCON ▾ Database Go to

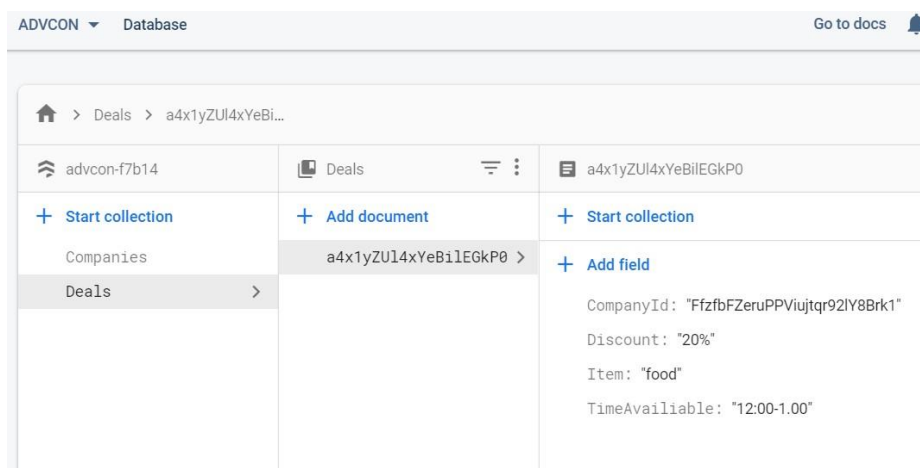
> Companies > FfzfbFZeruPPVi...

advcon-f7b14	Companies	FfzfbFZeruPPViujtqr92lY8Brk1
+ Start collection	+ Add document	+ Start collection
Companies >	FfzfbFZeruPPViujtqr92lY8Brk1	+ Add field
		CompanyName: "Example"
		Email: <u>"Example@gmail.com"</u>

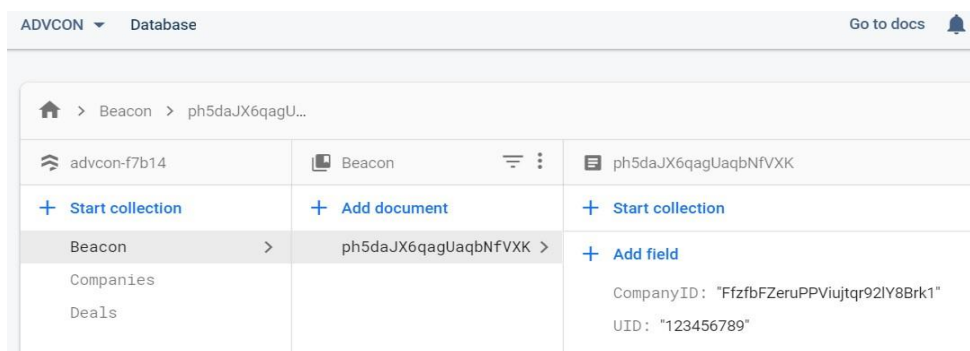
The database only allows users whose account is in the authentication feature to add in anything to the database.



If the user has successfully registered themselves this will allow them to register their deals and their Beacons. The deals they store will contain the name of the product, the time available, the discount as well as a reference to the manager they were registered by. All Deals are stored in the document collection deals. We have set the database to automatically add the parameter company id and its value is always the UID of the user that registered the deal.

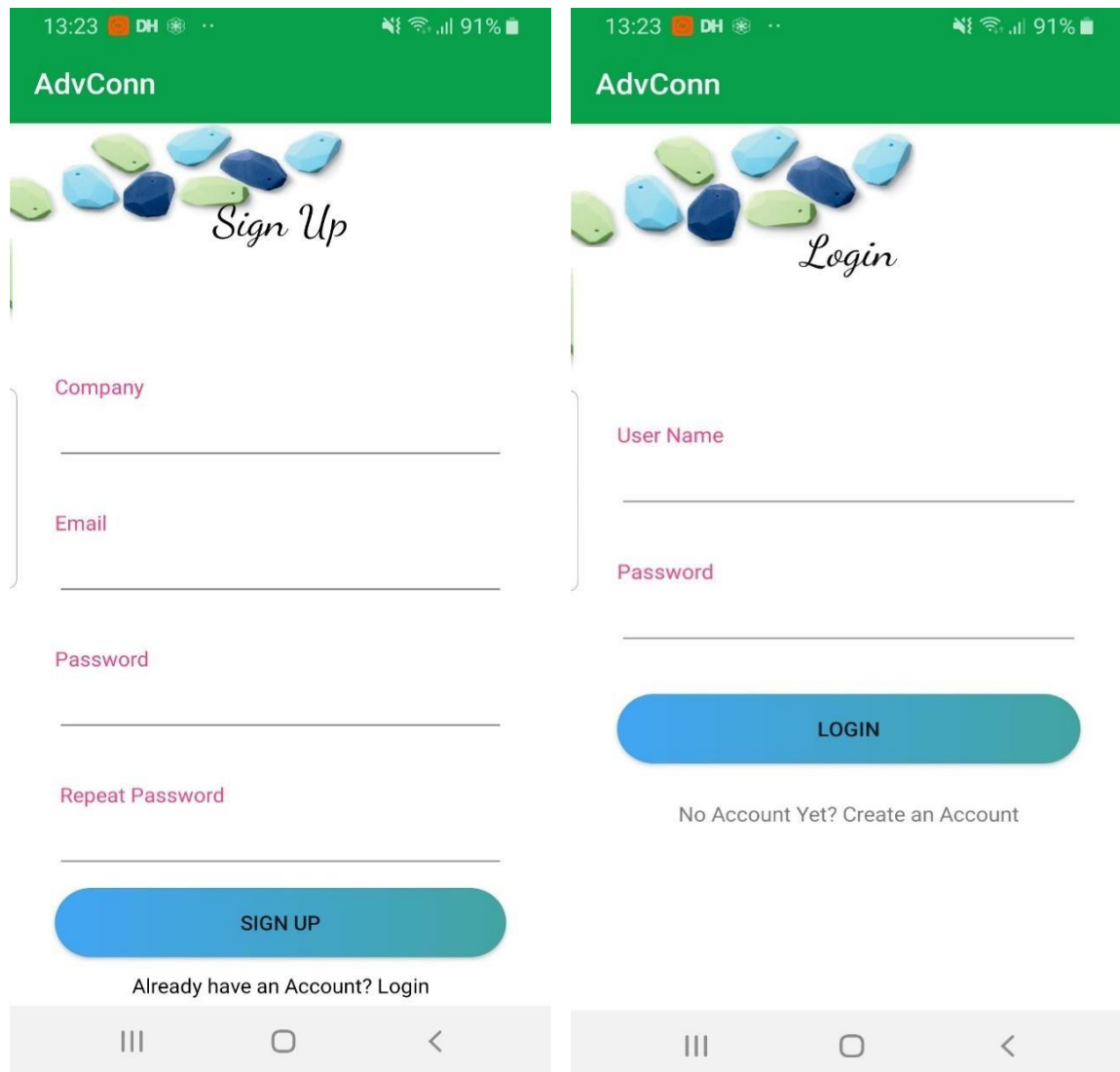


The beacons registered will be in the document collection the beacon documents will store the beacon built in UID as well as the company id it's registered to. We have set the database to automatically add the parameter company id and its value is always the UID of the user that registered the Beacon.



Chapter 4: Implementation of the system

During the implementation managed to create a registration and login activity for the users. After hard work from Ben working on the background of the app. I have implemented some new layout so it looks better; however, it is not yet finished. The images below are screenshots of the app with a registration, login and dashboard activities. Although they are not finished, they already work.

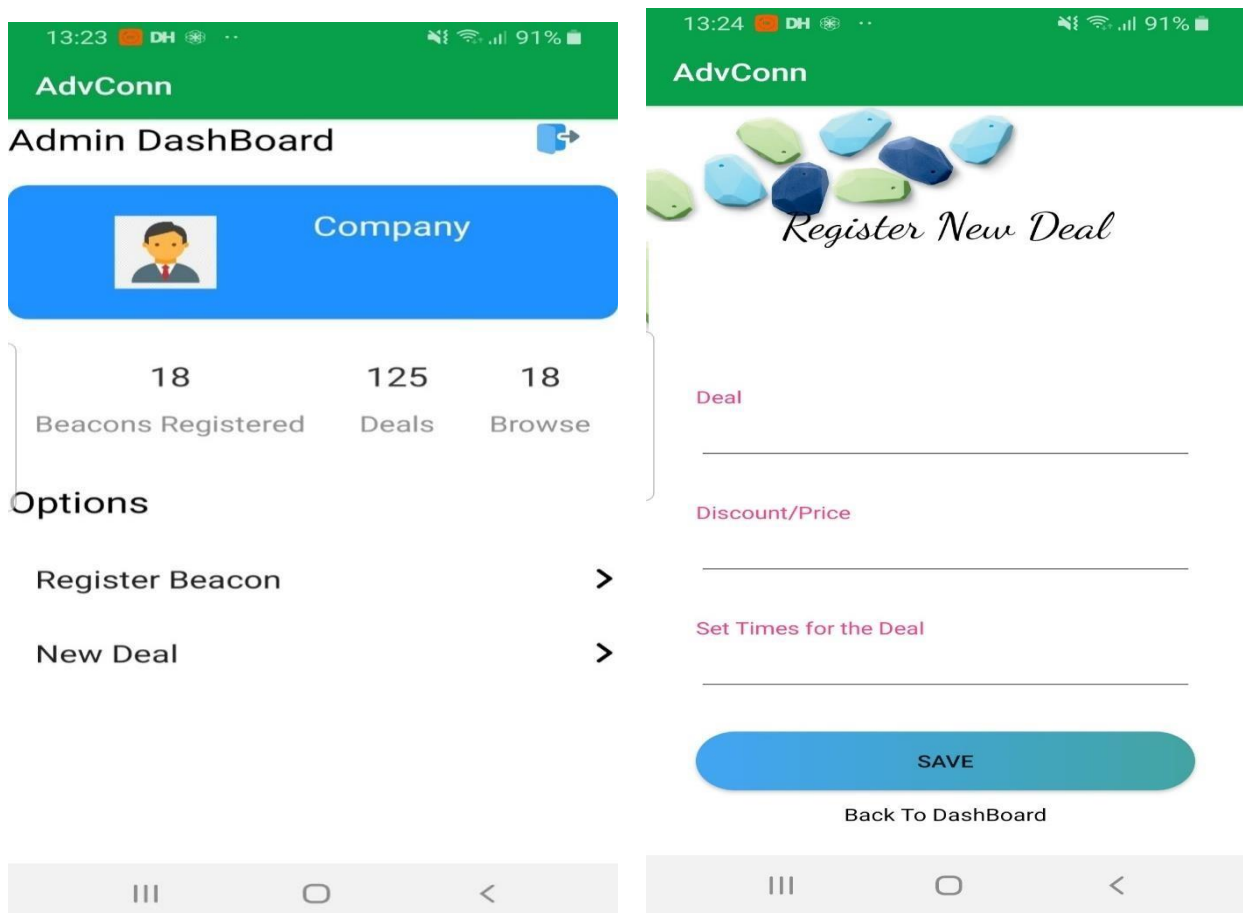


These both above register and log A business owner into the system. We are using a firebase database. This gives the business owner the ability, so far of adding new Beacons to the company as well as deals. This is going to be shown below, In the next images.

The next image is what the Manager dashboard is so far. It does not contain real information now, instead everything is hardcoded. It is a bit plain now and does not contain too many options, but it will later. The picture of the company should be displayed in the future. It has not been implemented yet. It allows the user to logout of the app, as well as adding new information or items to the app. This item could be a new beacon or a new deal.

Another important thing to mention is that once a user is logged in. The session will not be destroyed unless a log out button (which is an image that clearly indicates an option to log out) is pressed.

The deal will have a name or type, A discount or a fixed price and a time to be displayed at.

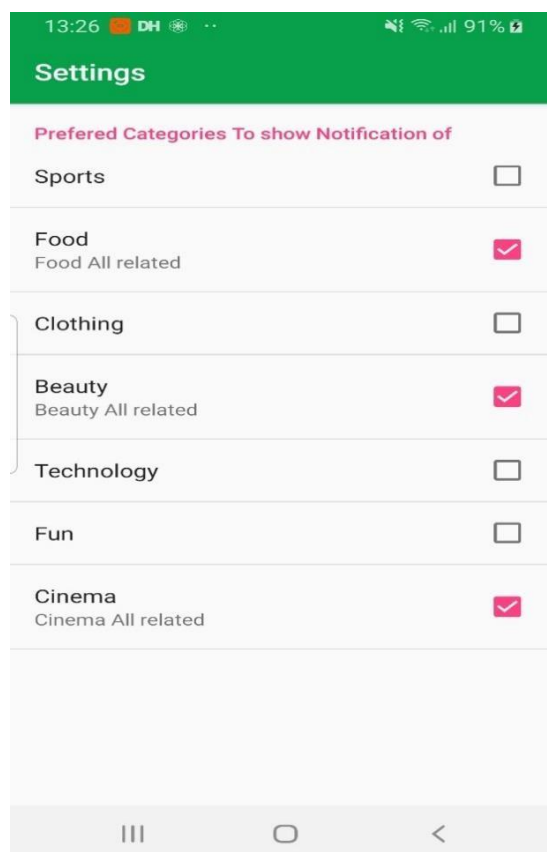


If a deal is registered to be displayed at 2 pm every day. It will not be displayed at 4 because it is out of the range.

The Register deals activity also has a part to come back to the Dashboard if the user decides not to register a deal anymore

Moving on, the setting is now working so the user can set his preferences in what to be notified of.

The way it works is: every time the users checks one of the Checkbox Preferences, it will save into an array called **mPreferences** a string with the name of the preference which is going to allow the app to check the preferences of the user based on the content in the array. Every time the user unchecks a Checkbox Preference, the string related to the preference, gets removed from the array, so an example will be, if a user checks **Food** a String Food will be added to the array and when the app detects a beacon it will check if it has a Food category, if it doesn't, the app will ignore it, otherwise it will show it to the user as a notification. If the user unchecks the Checkbox Preference with the word Food, even if the beacon with the category food gets detected, it will not be shown anymore because it is not in the array as it used to be



The main idea of the app is pleasing the user showing notifications of their likes. Only things the user will be interested in, otherwise the app will turn out to be annoying, sending notification in which the user is not interested.

4.2 Issues we are having

1. We are having a hard time trying to get the app to work as background service so it works even when the user closes it. What I mean by this is, we always want the app to detect beacons once the Bluetooth is turned on. The app can work in the background, this is going to allow beacons around to be detected.

This might be the easiest thing to do, but as this is our first time developing with android, we are having a hard time and spending hours trying to get it to work.

2. Versions of android and dependencies are issues we are also having. Every time one of us develops a new piece of code, it is a bit of a hard work to get it to run in all the computers because sometimes we need dependencies, however, it is quickly solved by communicating with teammates

3. As we are working with no really popular device in Ireland as Beacons are, one of us is able to test the app. So, I am the only person who can test the app while everyone is writing code. This means every time someone wants to try a piece of code directly related to the Beacon, I need to do it.

4. Layouts in android are a bit different from the layout we are used to when using HTML and CSS.

In android it is a bit more complicated for developers like us who have never worked with android before.

Issues we have already solved

1. The app can detect beacons now

2. The app can detect beacons based on a category

3. The app can register a user and log him in which we weren't able to do before

Chapter 5: Testing and Evaluation

15-01-2020

We are still no able to connect get the app the detect beacons
We have tried different methods

20-01-2020

We are still trying to get the app to detect Beacons.

27-01-2020

We have finally got the app to detect Beacons

28-01-2020

The app detects beacons in a 30 meters range, the signal will disappear when exiting the 30 meters range

15-02-2020

Trying to get the app to react to events when mouse clicking on the navigation views

16-02-2020

Now we have a navigation bar that works properly

22-02-2020

Notification does not work yet when finding detecting a beacon.
Trying to build notification channels

25-02-2020

Notification channels built and working properly

05-03-2020

Having a hard time trying to set the user preferences when detecting a beacon

07-03-2020

Still trying to set preferences. I have tried a few methods, but I does not work, still trying to do it

10-03-2020

Trying to use the built setting Manager built by Android studio to get the preferences to be set

15-03-2020

Preferences still not working, trying with preferences fragment built

16-03-2020

Preferences working effectively, using preferences fragment and a settings activity

10-04-2020

Upgraded to the newest version of Android studio and few modules broke. Trying to fix stuff

15-04-2020

Some of the content made by Ben does not work as meant because of the new version of Android Studio

20-04-2020

Notification channels no working, trying to fix them

02-05-2020

Notifications still no working, trying to fix them. The app is now able to add Deals and Beacons

05-05-2020

Able to retrieve Beacons and Deals using a Recycling View

07-05-2020

Notification still no working, having a hard time trying to fix it

12-05-2020

Notification still no working, but the app is now able to get delete Beacons and deals

Chapter 6: Conclusions

As we choose to work with beacon a relative new technology as the basis of our project, at the beginning we had no idea how to use this device and neither the necessary tools to develop an app that used beacon technology, but we knew about the potential of this device and what it could offer as a raw material and with a huge range of applicability in different modalities of app.

The development of this project led us to research a lot about beacon technology and the tools that we used during the development process, which was very good for absorbing new knowledge and learning more about Bluetooth technology, android Studio, firebase and CorelDRAW which are tools that we had not worked with before. We also had the opportunity to use everything that we learned during those years of college becoming a very reward experience, even though we had to work remotely which made the group work difficult.

We were working with android which is a very complete platform that allows us to decide which programming language to use java or kotlin. We decided to program in java because we feel more familiar. However, we did not know how the emulator works or we would always have to use a physical phone connected through an USB cable. At first, we got many errors from the Android Studio installation to the emulator installation and of course managing to run our application.

In the development process of our application we discovered and learned how to make a functional application connected with beacon technology and in turn with a database, capable of being managed by an administrator and reaching all of our users.

The app itself we had to change some functions and design during the development from what we idealised, this changes was for the better functionality and a way to troubleshooting some issues, we had some problems to connect the app to the database and to a phone device that we solved and was great to learning how to deal with it.

Something still needed to be implemented or improved as the graphic user interface design which needs a bit of improvement and some more details, the sac webpage as well need some modification and the other thing are some function that we want to implement on the app which we couldn't do it because we didn't have time enough to implement, like the radar that would show the way and distance from the shop that is sending the beacon signal to the user, and the other function is to make the app work on the background service getting offers even when the app is closed.

To make part of this project as a group for us was a great experience to learning and grow as a person enabling us extend our knowledge on the information technology area which going to make a huge difference in our lives.

Individual Contribution.

Individual contribution: Edwin Garces 2017012

The last year and we have a project to work on. Ideas come and go but no one has a really good idea that can work as a last year's project until Beacon Technology in Retail came across.

This is a way to attract customers into a shop despite of its visibility on the street. It could be hidden and not many customers passing by but if the customer is as close as 30 meters to it, a notification can be sent to his phone. This has been a really good idea. It is being used in the USA and people seem to like it. It is not in Ireland yet so why not introduce it.

It was not the easiest thing in the world as there is not much content about it on the internet however, we managed to get it done. I personally enjoyed working on it as it is a new experience and a new skill to add to my CV. It was the first time to work with android in addition to working with a new technology for me. I had never heard about beacons until now, so it was a challenge.

It was not easy all the way through, since the beginning I was chosen as the project manager, this includes getting my classmates to do work I thought was needed, listen to opinions, trying to get my class mates to get things done on time.

I was also the main programmer, so I had the ideas of how to do stuff, I was guiding the project to what I wanted it to be in the end however, there is still things we would have loved to include but there is not any more time for now. I was proposing ideas and getting my team mates to work on some code while I was developing some other. It is was not the easiest thing, trying to gather code written by different people but we got it in the end.

I was also in charge of settings meetings with the supervisor. This allowed me to get more engaged with the project as I was responsible of keeping things going, so when things were not happening the way they should have, I had to make them happen that way.

I struggled but managed to get our app to detect beacons using the Beacon Library. Our project detects three types of beacons which are Eddystone Layout UID, Eddystone Layout URL, Eddystone Layout TLM.

It detects it by getting its UUID, major, minor Id and a distance. In this project we are only working with the minor value. This allows the beacon to be unique.

The user will have preferences to be shown notifications of. Example, if a person is interested in food, they will select food as one of his preferences, this will give him the possibility of getting notifications about companies which category is food.

I also built this notification which will show a deal, a price or discount for such deal, times in which the deal is available. This notification is also clickable so a business owner needs to assign a link to a website or blog in which they will have a better description of what they are offering. The beacon works in a 30 meters range so a person passing 20 meters away from the shop can still get a notification of the deal a certain business is offering. The users have the freedom to stop and start the app when they want, this way they decide if they want to receive notifications or not.

I have developed a deals page in which the business owner can look at their deals, this was developed using a recycler view and a card view. This was a bit challenging, but I managed to get it done and learned from it. The business owner can delete a deal when it is no longer available. They can have as many deals as they want throughout the day

After a company registers, it needs to register a beacon at least. They can have as many beacons as they want. I developed the functionality of registering a beacon by scanning when the beacon is close by, otherwise it will not work. This is so the user does not register any beacon that does not belong to the company

The Users can navigate through the app using the navigation view which I also developed.

They can access to the settings, the help page, Login if they are registered as a company and come back home which is the main screen. Also I did the Screencast with my college Eduard.

I am not the best at designing, only because I do not really have the skill to choose the right colours however, I helped a little bit with the layout. I developed the piece of code that allows the company to change its profile picture

I have collaborated in this project in different ways. At first I was responsible for the design with one of my colleagues, personally I was using an application called figma. But in a short time it was discarded in view of the fact that Android Studio has more advantages in our project, as previously mentioned we are working with beacon technology. Initially I was working with a website that was directly linked to our application. This website was developing it with php, html and css. Which initially had a menu four options: AddConn, About us, Contact us, and the last session but no less important Help, which was originally designed in two parts: help for users and help for administrators. This last part was focused on helping all people who use our application to both users and administrators.

I personally decided create an online survey, to identify what kind of people we were facing when our technology beacon will put on the market. In this case, I designed and analysed seven basic questions, but they were the key to our project. There I particularly realized that we were on the right track for the execution of our project.

The survey was carried out without definition of sex or age, I only focus on some colleagues, friends and close people that most of them are always shopping. The questions I asked were represented in graphs as shown in this report at the top. These questions were: Please check your phone right now, is your Bluetooth turned on? Do you look at your phone when you are walking? Do you like deals? Do you usually go window shopping? Do you plan your purchases before you go? Do you use discount coupons? Do you buy things when they are on sale?

According to the analysis that I made of all the graphs of these questions placed at the top of this project and the responses obtained by the remarkably positive respondents, I realized that customers are willing to buy anything that is at a discount or has a good price and in sight, and this is what beacon technology allows any company connected to the platform, be successful in any type of sales, as long as they have people walking around their stores.

A few weeks ago it was decided that the website would be better implemented within the android studio without the need to use a link from another page but the help page would be connected directly to the rest of the application.

This time and definitively I decided to put three sessions in our help

application how it was at the top of this report: FAQ, Users and Administrator.

FQA frequently questioned answers, there are the most common questions about our beacon technology, some people wondering what is beacon? Beacon is Bluetooth low energy transmitter device that connects with nearby mobile electronic devices such as tablets, cell phone, smartwatch even busses.

How Beacon Works? Is secure use Beacon? Why chose this technology? What do I need to connect to a beacon? Do I need Internet for get connection to the beacon? Can I get deals every day? These are the most common questions that anyone would ask about our beacon technology. Then analyse the most common questions that a user would ask about our technology and explain a little more about how our technology works in the real world: Users How Beacon Works for Users? As wrote at the top this project, Users are lucky they do not need to register on our platform. They just need the Bluetooth on and star close to our beacon (approximately 10 meters).When they walk close to our beacon, they want to get notification about our services, once you get these notifications just go into the setting which one are you interesting? We have seven categories: food, technology, clothing, fun, cinema, beauty and sports).According to the category you have select, you want to get notifications about your preferences. Once you get notification go into that link and get your deals, according with the policy of each company.

Finally I decide to write some instructions and one of the most important parts is our support to all our administrators: Administrator, How Beacon Works for Administrators? The First thing you have to do is get an account with us company. You should register your company, we are going to get all the details: email, brand, name and password. Once you have registered your company, we will create a profile for you which you can enter whenever you want, anytime with the details you have proportioned to us. The second thing you must do is select one of the options that will appear in our list of categories, according to the activity that your company carries out. The categories that we offer are the following: technology, cinema, sports, clothing, food, beauty and fun.The third thing you must do is register the beacon by pressing a button on the device you want to use, keep in mind that the device must be within a few meters for activation. The last step, but not the least important is the creation of your own deals, keep in mind that your deals want a name, price or discount coupon and it is programmed for the time that you want to start and finish it. It also has an option to completely delete the deal. Also I have

collaborated with the original design of some images of our app such as the design of the transparent background image of our application, the images of the header of our application.

Initially I was working with a website that was directly linked to our application. This website was developing it with php, html and CSS. Which initially had a menu four options: AdvCon, about us, contact us, and the last session but no less important Help, which was originally designed in two parts: help for users and help for administrators. This last part was focused on helping all people who use our application to both users and administrators.

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Also I did the Screencast with my college Edwin.

According to the analysis that I made of all the graphs of these questions placed at the top of this project and the responses obtained by the remarkably positive respondents, I realized that customers are willing to buy anything that is at a discount or has a good price and in sight, and this is what beacon technology allows any company connected to the platform, be successful in any type of sales, as long as they have people walking around their stores. I think we did a great job.

I was responsible for preparing the documentation and report during the elaboration of our project, which included all the academic content research and research content done by companies that added value to our project, as well one of my activities was to absorb all the information obtained during our meetings, and content shared by my group colleagues and included in our documentation during the development of our project.

I was also responsible for researching and elaborating UML diagrams where I showed the entire structure of the project to be developed with respect to the functionality that we would require for our application.

Elaborate research related to marketing analysis elaborating graphs based on research from major universities where we analysed the market statistics regarding the users of applications showing the relationship of these users with e-commerce and among them those who consume this type of service using mobile phones.

I developed the logo used in our application and logo of our possible business where I had to learn how to use Corel draw.

I Was responsible develop research where I obtained information about beacon technology and the application possibilities that this technology can offer to the business market and what is different from other technologies available in the market, this research also includes some important topics such as how this device communicates with cell phones and other mobile devices and also about companies that use this technology today and how these companies use it.

in my opinion, what was more challenging was working with a technology that was not widespread in the market today, and I also had difficulty finding a lot related to this beacon technology, like programming language used to develop compatible software with this device and how configurate and etc. I wish I had found more content related to beacon technology.

During the development of all documentation, I always tried to obtain the maximum information regarding what my group colleagues were developing during the elaboration of our project, to make sure everything that was implemented in our application was documented, all the information included in the documentation of this project was included with the consent of all participants in this group.

My main contribution to the project was the database was the planning and creation of the database and the code to interact with the database. I also helped with the project report looking over it for spelling and grammar errors.

The table diagrams were all created by me using draw.io. This was not the first time I've had to use this technology as we had to draw similar plans during our database class in our second year. By the time I had created the first one my hands-on experience with firebase was limited. A lot of changes were made after we, as a group, discussed what we needed to do as well as more hands-on experience with the firebase platform.

The main changes from the first few drafts include the absence of the shop and the entrance tables which we decided were irrelevant to us as all we cared about was being able to set up an account for a business, register a beacon and register some deals for the beacon to broadcast. The location of the beacon was irrelevant to us, and was entirely up to the business owners. We also decided that we didn't want people who downloaded the app who didn't have a business not to have to log in. Only people with businesses that are registered with us should have to log in.

The Database is on a cloud-based database service called Firestore which is included on the mobile development platform Google firebase. It was my first time using this technology and it was the first any of our group had used it. It was the first NOSQL database I had worked with as well as the first cloud-based database, I had worked with at the time I started. I created a group Google account for the Google firebase.

My role involved doing some coding as well. All of my coding was done on android studio. For the actual functionality of the code I used java and for the styling I used XML. On my own android studio on my personal computer I made some very basic layouts for the login, sign up, register beacon and register deal. In total I did about 7 java classes and another 7 XML layout pages. The Login page, the sign-up page, the client page, the manager page as well as shop page that later became redundant. A few YouTube tutorials video helped me set up the Firestore as well as the authentication feature. Android studio has a built-in tool that connects to firebase however the tutorial code it provided to test the connection did not work for me, forcing me to look elsewhere for a solution. I started with the login and signup pages, followed by the beacon page and the deals page then followed by a basic home page.

With amount of the classes in the project I had made I was forced to move the minimum android system requirement from android 4.0 to android x (5.1) as it had a built-in compressor that was necessary for my code to work.

Once the code was functional, and all the classes were working, I gave it to our group manager Edwin who was working on the beacon its self and getting the app to talk to the beacon. Some difficulties occurred during our attempts to pass the code on to one another. He too was using android however we using two different versions making it difficult to get the two pieces of code to cooperate. I tried sending the whole project by zip by email and by WhatsApp, I even had all the code copied on to a word document, a .txt format, but it still wasn't working. We ended up using team viewer to copy and paste the code into Edwin's android studio project. All we needed to change in the

java were the imports. Once in the new project Edwin we did some improvement on the XML layout pages making them look a bit more appealing.

However, an issue with the android studio meant the database wouldn't work. The user would be able to register themselves into the firebase authentication feature meaning they could successfully login but none of the data would store in the Firestore its self, so they couldn't register a beacon or a deal. This led to an attempt to update the android studio because it was working on my project on my computer and I believed if it was the same version as mine it would work. Unfortunately, it didn't work and the code crashed, forcing us to move the code over to another project entirely. The issue was never resolved due to unfamiliarity with android studio as well as time restraints. However, the code worked in the new project allowing us to move ahead. After this my role was more focused on checking the report for errors in the spelling and grammar, as English was my first language my teammates gave me this responsibility. I used Grammarly to help to speed it up as there are 40+ pages in the report.

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Link github:

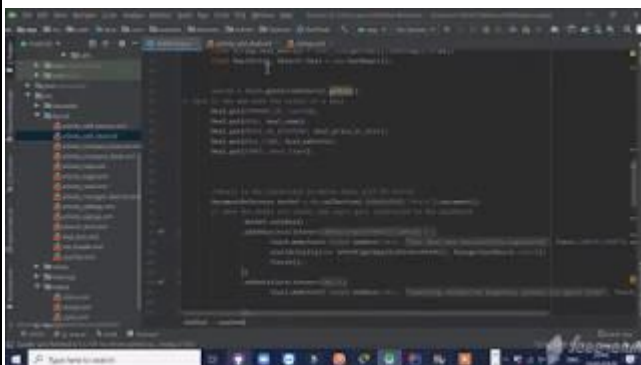
<https://github.com/EdwinLaplaseliere/Beacons.git>

Link Youtube:

<https://youtu.be/Dw8Cs01An0A>

Zona de los archivos adjuntos

Vista previa del vídeo screenCastAdvConn de YouTube



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- <https://www.youtube.com/watch?v=TwHmrZxiPA8>
- The test database : Email advconproject@gmail.com | password : Beacon2020
- <https://console.firebase.google.com/project/advcon-f7b14/overview>