Application assisting tourists with integrated information from certain areas of interest

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Travelling often involves the contact with a wide range of information from many sources. Organizing a vacation in a city like Bucharest, relatively chaotic and quite unfriendly to those who are not familiar with its rhythm and characteristics, especially if they are not Romanian speakers, can be an unpleasant process. Thus, this paper aims to develop an application that will serve as a tool in conducting a vacation in Bucharest in accordance with the needs, desires and preferences indicated by the user. The knowledge and activities of a local tourist guide, the promptness of a personal advisor, the availability of an expert and reliable friend are the activities that will represent the core of the application.

1 Introduction

Bucharest, the city of all possibilities, the one that never sleeps, impossible to know entirety and that can offer anyone the most diverse experiences, has started to become more and more attractive. Its contrasts, diversity, picturesqueness, fun, culture have made it more and more attractive for tourists in recent years.

Intense economic life and low prices are other reasons why tourists choose to come to Bucharest.

Official statistics show that Bucharest is the most visited city in Romania, in recent years the annual number of tourists is around 2 million people, with an average length of stay of 2 days. Only a third out of them come for relaxation, most arriving here for business, congresses and conferences. Most foreigners arrive in the capital from Israel (almost 170,000). 104,000 tourists come from the USA, from Italy - 92,000, from Germany - 82,000, from Great Britain - 80,000 and from France - 72,000. [1] [3]

In addition to being the capital of the country, Bucharest is also the "capital" of Romanian IT, with the largest number of companies and employees in the field and a dynamic growth trend.

In addition, we can boast about a very good internet speed and the first steps towards testing 5G technology, a technology that will increase the speed of the current 4G technology. A well-known company, Vodafone Romania, activated in the spring of 2019, in several areas of Bucharest (Unirii and Pipera), its own 5G network, a network that will be extended to other areas in Bucharest and other cities in Romania. [2]

The motivation for designing an IT application in the field of tourism for Bucharest, designed according to the type of tourist arriving in Bucharest, taking into account the characteristics of this segment and its potential needs, arose due to the non-existence of an application to focus on the end user, on his wishes, needs and interests as a visitor.

The "BucharEST" application is therefore designed taking into consideration certain characteristics of tourists, paying attention especially to the middle class, for which time and price are two of the most important reasons to buy. The application will interact with the user and will provide information on the various ways of spending free time in the city, depending on the interests he will indicate and ordered in descending order according to the time the tourist intends to spend in Bucharest.

2. Presentation of functionalities

The purpose of the application is to maximize the satisfaction generated by the trip and in order to do this, it will provide the most appropriate suggestions to

positively influence the user's choices, based on his needs and personality.

The application will focus on the user's statements related to his wishes during his stay and his likely needs and will provide a series of information about the most beautiful places in Bucharest and the activities that can be done here, grouped into two categories: " Recommended for you "and" Good to know ".

The "Good to know" section contains useful information that responds to needs that exist or have arisen during the visit, needs related to:

- health (112, emergency hospitals, pharmacies)
- beauty salons
- childcare services
- pet services
- weather information, including the most appropriate time for travel
- safety
- traffic
- local customs
- ATM
- free or almost free activities

GPS location services are used to improve the experience, in order to highlight the user's location and the objectives of interest.

In addition, the user who declares that he is coming to Bucharest for business purposes will also have information on certain useful services for business (consulting or various services for expats).

In the "Recommended for you" section, the application will respond to the user's wishes and will generally suggest the most suitable 6 locations for:

- food & drinks
- outdoor walks
- museums
- coffee & bars
- sports & spa
- shopping
- casino

- nightlife
- transport
- local guide

The information and implicitly the personalized tourist offer will be calibrated based on the user's answers to a questionnaire with a number of 11 questions, addressed in the form of a questionaire. After completing the test, the information can be viewed at any subsequent access to the application. If the user changes his mind about the answers initially provided, the test will be able to be repeated to provide other answers and to benefit from other suggestions.

Each question will allow the user to choose one of the approximately 4 answer options and will indicate the tourist's preferences regarding the following areas of interest: dining places, outdoor activities, cafes, museums, sports & spa, casino, shopping, nightlife, local guides and transport services. Each area of interest will bring to the tourist's attention about 6 offers, ordered in descending order, either according to the assessments obtained on the Trip Advisor application, or according to the developer's assessment, so that the tourist can make the right choice, taking into account the time available and their own inspiration.

Regarding the field of dining places, the tourist will be able to choose one of the 4 categories: Romanian cuisine, fine international cuisine (fine dinning), fast food or home delivery services.

The offer related to cafes and bars will bring to the user's attention luxury cafes, cafes with a good quality/price ratio or that offer "coffee to go" services, and if he answered that he is not a coffee lover he will be tempted with 6 of the the most beautiful teahouses in town.

In terms of outdoor activities, you the user will be able to choose from the parks in Bucharest, impressive streets and facades, bike trails or a City Tour, if his option indicates the desire to walk less.

Bucharest museums will be presented taking into account their variety and specificity - art for the art-loving respondent, those with

Romanian specifics for the curious interested in the uniqueness of the place, various for the declared lover of museum visits and virtual tours for the skeptic who does not think a visit to a museum might be a good idea for him.

Visitors interested in sports and spa will have a choice between locations where they can find both services or just some of them and those who declare that they are not interested in sports or spa will be able to view locations where they can play bowling, darts, billiards or other such games.

The transport options will allow the user to choose between public transport, taxis, rental cars or a simple City Tour, and shopping options between traditional gift shops, malls or shops with elegant outfits. Regarding the nightlife, the visitor of Bucharest will be able to choose between clubs with a lively atmosphere, clubs more suitable for socializing and drinking

a cocktail or bars where he can have dinner or participate in karaoke. If the user's statement is that he is used to falling asleep early and then he will still be curious to see what he could do later in the night, the Old City Center will be the offer that will be presented to him, as the most suitable location from the perspective of diversity, for an undecided person. Gambling lovers will have a choice between the most attractive casinos in Bucharest.

In addition, the visitor will be able to choose if he wants a personal guide for the period in which he visits Bucharest or if he will be his own guide using the application "BucharEST", Google Maps and a tourist guide in pdf format.

3.Analysis and design

The use case diagram will be used as a tool for identifying and modelling the functional requirements provided by the application.
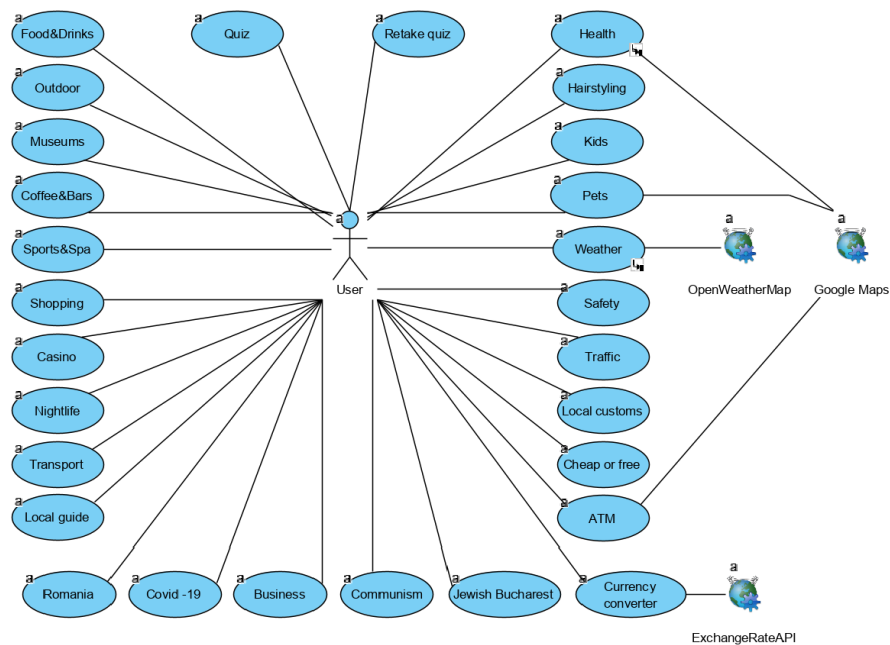

Fig. 1 – Use case diagram

According to the general use case diagram, we can identify a single actor, the user of the application, who after

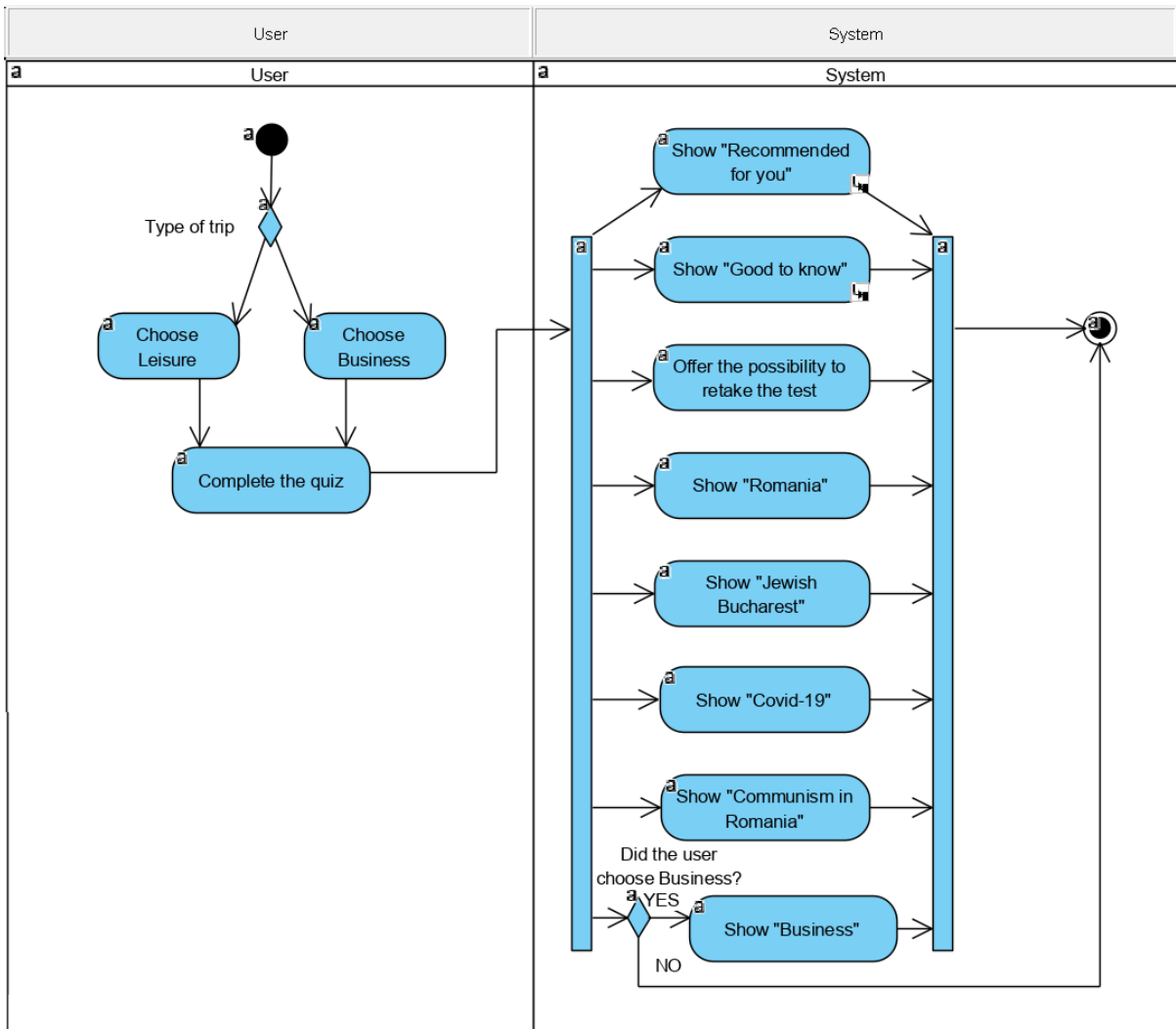completing the quiz will have a wide range of information available for consultation.

Fig. 2 – Activity diagram

This diagram highlights the course of a user's actions.

The user indicates the type of vacation he will spend in Bucharest, respectively Leisure or Business. He then completes a personality test, at the end of which he is brought in front of a menu from which he can view the "Recommended for you" section, the "Good to know" section, a section with information on activities that can be done outside Bucharest, a page with information on the situation of Covid-19, a page containing information about the story of communism in Romania.

In addition, the application provides the user a link to a website that contains information about the Jewish culture in Bucharest.

If the user has chosen Business trip, the menu will display an additional section with options of interest to him. Also, the user has the option to retake the personality test.
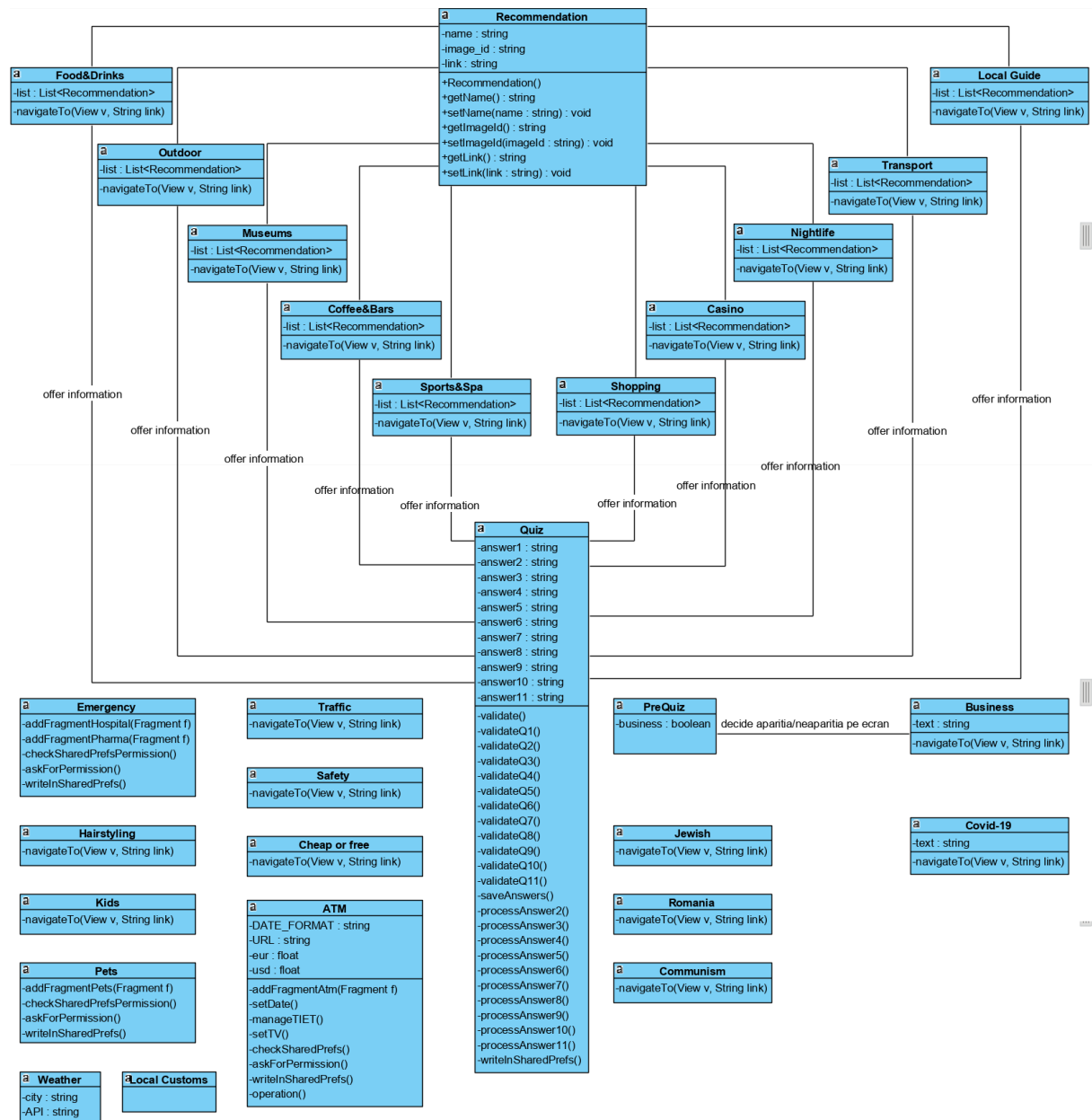
Fig. 3 – Class diagram

The class diagram presents the structure of the system, by including the classes and the relationships between them.

The purpose of this diagram is to highlight the attributes, operations, and associations between classes.

4.Implementation

After the user has answered the questions in the personality test, his answers are persisted in a preferences file. At the same time, a query is made to the firebase database and the data is brought in a map structure in which the key is of String type and represents the possible answers to the questions in the questionnaire, and the value is of List type parameterized on objects of type Recommendation and represents the list of recommendations for each response variant.

When the user selects a specific topic (for example Food & Drinks), a topic that is technically transposed into the application as an activity, this activity contains a list retrieved based on his answer from the preferences file, which is the key in the map data structure, which simulates a data caching mechanism. This list is displayed

to the user.

When the application is closed, the user's responses remain in the preferences file. This ensures that the user is not required to complete the questionnaire on subsequent access to the application. However, if the user wants to change his answers in the personality test, he will be able to do so through an additional functionality ("Do the test again"), through which, from a technical point of view, certain entries in the preferences file are overwritten.

5. Database design

The application uses as persistence level a non-relational database, implemented using Google technology - Firebase. It uses a multi-level hierarchical JSON file. Thus, there is one node for each category of activities. These nodes contain four other nodes that correspond to the interpretation of the user's answers in the personality test. Each of these nodes generally contains six elements, which include information relevant to the front-end pages. The information is based on the location name, as well as two additional fields: the image id and the URL to the official website.

6. Technologies

Android SDK – Android Studio

Android SDK (Software Development Kit) is the essential tool for developing Android applications. It contains useful libraries for programming mobile applications and the means necessary to run applications on different emulators, to perform the debugging process, to monitor the logs of running applications (LogCat console) and others. In addition, the kit contains the Gradle plugin, a system that deals with satisfying project dependencies by purchasing external libraries.

Android Studio is a standard integrated development environment (IDE) that provides the functionality needed to implement applications for the Android operating system. It is based on the IntelliJ development environment and offers the possibility to write applications in Java,

Kotlin or C++. The development environment provides a user-friendly interface with an easy-to-follow directory structure. Thus, the files are organized as follows: the AndroidManisfest.xml file (application configuration file) is included in the "manifest" directory and the .java files are integrated in the "java" directory. In addition, for all resource elements, the development environment has a "res" directory in which various images and icons will be included in "drawable", fonts in "font", menus in "menu" and other files needed for the application in the "values" directory. There is also a directory called "layout" which will include all xml files, files disconnected from Java code, which define the interface objects such as buttons, textviews and the like. [4]

Java

Java continues to be one of the most widely used programming languages even 24 years after its release. One of the main advantages it brings is the independence of the platform, being able to run on almost any platform.

This programming language has 3 editions: Standard Edition, Enterprise Edition and Mobile Edition. It is mostly an object-oriented language, in which the general conventions for naming packages, classes, constants, methods, and variables are used. [5]

Firebase

Firebase is a service created by the Google team and is intended for both web and mobile platforms. Its capabilities are vast and involve the persistence of data in non-relational databases, real-time notifications regarding the updating of tables or the structure of the database. In addition, the service provides cloud storage for binary files, the most common being images. In order to ensure an extra security, but also a communication flow free from threats, the authentication of the application to the service is done through an encrypted token. [6]

In this project, the capabilities of the Firebase service were exploited only in

terms of authentication between application and service, persistence of data in the non-relational database and real-time notifications. An important aspect from the point of view of the communication flow between Firebase and BucharEST app is the data format, structured in JSON files, characteristic of REST services.

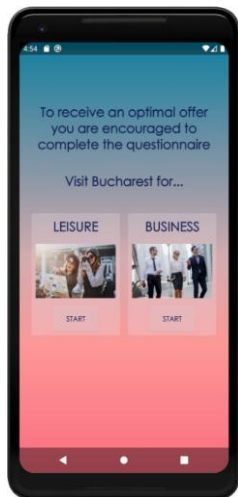## 7.Visual presentation of the application

Fig. 1 - Possible user choices

Upon entering the application, the user indicates the purpose of his trip: relaxation or in the interest of business.

Fig. 2 – Example of a question in the quiz

He then receives a set of questions with a single answer. To move on, the user is required to answer all questions. After completing the test, the user reaches the main page.

For each category of interest, the user will receive results according to his answers in the personality test.

The results are materialized by a location name, an image and the possibility to navigate by clicking on the image, to the official website of the location, if it exists, or to another relevant website (for parks for example, Google Maps).

The application has a navigation drawer menu with which the user can navigate through the application.

The "Good to know" section contains information of an informative nature, some of general interest, others relevant to certain, specific situations.

For example, the "Emergency" section informs the user of the questions that a caller will need to answer when dialling 112, so that he can get help as quickly as possible. A map of emergency hospitals and a map of pharmacies is also included. Because Google Maps requires the location of the user's device to provide complete information, the user is required to be allow the app to access his location. If he offers it, his device will be able to be located on the map in a visible way, the user being able to see the hospitals or pharmacies and his current location. Otherwise, the locations of hospitals and pharmacies will be displayed without positioning on the map the location of the device. Thus, although the user does not allow access to his location, he will still be able to use an important part of the functionality of this section.

The "Pets" section similarly displays the locations on the map for veterinary emergency hospitals and pet shops.

In the "Weather" section, the user can see the current location, current temperature, minimum and maximum temperatures, weather description, sunrise and sunset times, wind, pressure and humidity data. Also, by clicking on the "Best time to travel" button, he will be able to discover short descriptions related to the weather in Bucharest over the course of a year.

The "Safety" section expresses some general tips to avoid possible problems in Bucharest and presents a map that illustrates the perception of the inhabitants regarding the degree of safety depending on the area.

The "Traffic" section describes the situation of Bucharest in relation to daily traffic and provides the link to 2 useful websites in case the user wants to see the traffic situation in real time or if he wants to find a parking space.

The "Local Customs" section describes some of the customs and holidays celebrated by Romanians.

The "ATM" section displays a map on which the ATMs are highlighted and contains a currency converter which, when it receives input from the user, calculates the value entered by him for other currencies. Specifically, if the user enters an amount in RON, the equivalent of that amount will be displayed for EUR and USD.

The "Cheap or Free" section presents some activities that can be done in Bucharest cheap or even for free.

The "Communism in Romania" section briefly presents the story of communism and provides a link to the "Ferestroika" website, which includes the possibility of purchasing a tour of a preserved apartment from the communist era.

When selecting the "Jewish Bucharest" option from the navigation drawer menu, the application will redirect the user to a website with information relevant to Jewish culture in Bucharest.

When selecting the "Romania" option from the navigation drawer menu, the application will display some places of interest for tourists who want to spend some time outside Bucharest.

When selecting the "Covid-19" option from the navigation drawer menu, the application will display information regarding the situation generated by this virus in Romania.

By selecting the "Do the test again" option from the navigation drawer menu, the user will be able to retake the personality test if he wants to provide other answers.

8.Further developments

The future development of the application could take into account other functionalities that could be useful in the field of tourism, including business. It could add some features for photography, accessible itineraries for people with disabilities, a link to Google Translate, social and professional interaction or games. A further development that allows feedback and sharing experiences with other users can contribute to the success of the application, increasing the number of downloads or comments. The feedback could be rewarded in a certain way (a frame or a suggestive filter for the most memorable photo taken in Bucharest, perfect for sharing on social media).

9. Similar applications

Booking is the most used and well-known application, with offices in 70 countries, which assures users that it will offer them stress-free travel experiences, to help everyone know any corner of the world. Mainly, Booking is an intermediate between accommodation providers and users, the providers being the ones who provide all the information about properties, availabilities, prices and other information. The properties offered for rent can be filtered according to several criteria: price, scores resulting from comments and price, only scores resulting from reviews, number of stars, distances from the center or favorites Booking, the latter being a filter based on a algorithm that takes into account the interests of the application related to the percentage of commission received as a result of listing the property, prompt payment of commissions, other data related to reservations. In addition to accommodation, Booking also offers information on flights, car rentals, taxis to and from the airport, or tours and activities

and attractions near the accommodation. [7]

Foursquare is an application launched in 2009 that uses GPS technology to provide search results and promises users to discover places that their friends and experts love. Users can connect with Facebook accounts and searches can be done according to the criteria: Food, Breakfast, Coffee, Shopping, Nightlife, Trending and Top Picks. Search recommended locations take into account other users' ratings and price levels, and certain comments about these locations are also displayed. [8]

Tripadvisor is the most complex tourism application in the world that offers travelers the opportunity to discover a wide variety of information about the place visited. The basic information is supplemented by millions of user opinions and reviews, the application becoming a kind of collective wisdom. Searches are made from the sections Hotels, Vacation Rentals, Restaurants, Things to do, Shopping, Tour & tickets, Location, Airlines. Search results are displayed based on ratings. [9]

For a busy traveler who does not have much time to read and make comparisons, the large amount of information managed by the application becomes a weak point.

10.Conclusion

Nowadays, when planning a trip, tourists are increasingly relying on their smartphones and travel applications have become extremely useful for everything related to travel management. For any tourist, smartphones have become real travel partners, ways to access a huge amount of practical information, useful addresses, locations, opinions and tips. In addition, the desire of tourists to get as well informed as possible before leaving for a destination, to move easily or to optimize their consumption at the destination has increased. Also, the access

to the Internet has progressed. Tourists are attentive to the existence of Wi-Fi networks, they want to be able to connect permanently and have the services they perceives as useful at a fair price. The use of mobile applications has become widespread, becoming a habit in all areas, including in the tourism industry.

However, most applications focus mainly on managing an impressive amount of information from which the user has to make his own choice, even though his knowledge of the local offer is limited. When the time available is limited to a few days, exploring any destination, and Bucharest in particular, can make choosing the most suitable locations and activities difficult, without detailed documentation or without the knowledgeable advice of connoisseurs. For these situations, the idea of "**B**uchar**est**" was developed - an application that offers the best that the city has to offer to users meet through the answers they provide in a questionnaire.

The purpose of the project was to create an application dedicated to the tourists visiting Bucharest, to improve their travel experience, a free application, easy to use, to respond quickly to the personalized needs and desires, through truly relevant information and offers, gathered in a single application.

Knowing that the application name and description are key factors for a successful application, a suggestive wordplay was chosen for the name to suggest to the user as clearly as possible that using this application will give him destinations for memorable experiences.
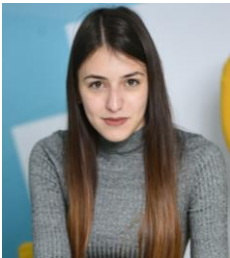
Before starting the project, a short documentation was made about tourism and tourists in Bucharest in order to identify and provide offers for the most common or for possible needs and desires that may arise during a visit to Bucharest.

In conclusion, the purpose of the application has been achieved, the application allows users to discover, at their choice, the best face of Bucharest. The application brings together useful

functions, under a friendly interface, easy to use by a wide and diverse segment of users, deserving to be downloaded by every type of traveler. "**B**uchar**EST**" is an inspired application that can be the heart of a memorable tourist experience and that could stand out even in a competitive market.

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