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Annotation

This report will describe the main steps, intermediate goals on the way to achieving the main goal, as well as a technical description of the methods and functions used.

Immediately it is worth noting that our main goal is to create a loyalty system for food restaurants, so that in the future there will be more and more frequent and satisfied customers. On the way to the main goal, we decided to share in order to perform a less huge task alone, and the customer also asked us, if possible, to create a mobile application with a business card website, on an equal footing with the loyalty system. It is also worth adding that we decided to slightly increase the range of tasks and added a chatbot that works on the basis of machine learning. This was done in order for the customer's business to keep up with others, as well as in order to save the business owner's money.

In this report, we will first write about the creation of a mobile application and why it was necessary, as well as describe a number of technical characteristics and describe how the mobile application itself works. Next, we will talk about the technical side of the business card site and a description of its characteristics. Last but not least, a description of the work and technical functions of the server. At the very end, we will make a conclusion where we will write in detail about what we have learned and how all of the above functions will help improve the work of restaurants.

Basic Terms and definitions

Database - is a collection of data stored and organized in a specific manner, making it easy to retrieve, update, and manage the data.

Web server - is software and hardware that uses HTTP (Hypertext Transfer Protocol) and other protocols to respond to client requests made over the World Wide Web.

.Net - is an open-source, cross-platform framework for building modern applications that can run on Windows, macOS, and Linux. [1]

Dart - is a client-optimized programming language for fast apps on any platform. [4]

Flutter - an open source mobile UI framework for building modern cross-platform mobile applications from a single code using the Dart programming language. [2]

MySQL - is an open-source relational database management system that is a fork of the popular SQL database system. [3]

Mobile application - is a software program designed to run on smartphones, tablets, and other mobile devices.

1. Introduction

In today's environment of intense competition among businesses that represent the service sector, customer retention is the key to success. The expense of acquiring a new client is supposedly ten times greater than the cost of attending to his expectations. Numerous loyalty programs are developed by businesses to keep consumers' enhanced attention as well as to increase the conversion of new customers in specific situations.

A business approach known as a loyalty program rewards and offers discounts to customers who remain loyal and frequent visitors to the company. This helps companies in both increasing product sales and customer retention. A specific membership in the rewards program is made available to customers who make frequent purchases from the company.

If a business has a loyalty system, the majority of customers will choose it. If customers feel appreciated, they are happier and more willing to stay with the business. The greater the client retention, the longer the customers stay. It is crucial to develop techniques to retain frequent consumers because they tend to make higher purchases.

When a business offers a loyalty program, it motivates its loyal consumers to spend more money and buy additional products so that they can earn incentives. The outcome is that the business generates a significant profit.

Sales of products and customer lifetime value have increased as a result of an effective loyalty program. A well implemented reward program and associated incentives give business owners the chance to create interaction with clients. Developing trust improves a company's credibility and transparency.

Since it costs time and money to acquire new clients, it is typically preferable to keep your current ones. Creating a loyalty program is a fantastic method to do this. It aids businesses in lowering the rate of client attrition. Additionally, repeat customers spend more money. You will be able to draw in new customers if you have a stable base of devoted clients. The majority of customers value referrals from friends. Consumers that are happy will freely share information. They will spread the word about your company and its top offerings to their friends.

1.1. Relevance

The relevance of the need to create a loyalty system can be called unconditional and understandable. After conducting customer development and related afterwards 5 Zoom interviews with business owners, we realized that the main "pain" of business owners is the lack of regular customers and the inability to leave reviews about the restaurant, dishes and service.

1.2. Goal

Our main goal during the execution of this project was to study languages such as C# and Dart[4], along with this we learned how to work with MySQL Workbench database. An equally important point is the study and training of a chatbot based on artificial intelligence, and we also learned how to work with the Flutter[2] framework.

1.3. Tasks

Our tasks for putting this idea into action have become quite rational and understandable considering such a big goal.

Firstly, a loyalty system prototype should be created using a catering company as an example. A system like this should enable you to gather customer service quality ratings and inform clients of the business's promotions and unique offerings. In order to tell customers about the fundamental information, it was crucial to create a business card website. Last but not least, the need to make a mobile application with a convenient user-friendly interface. Technically loyalty programs are typically conducted through websites or mobile apps. Because of this,

the mobile app is the most useful. This enables you to use client communication at the business's desire.

Alexander Pak was responsible for creating a business card site and ensuring the operation of the server on it. Alexander Pak also made a chat-bot that is linked to the business card site itself and a chat-bot for telegram social networks. The high-quality operation of the server was provided by Vlada Voronina. Anna Golubkova made a mobile application, and also ensured the operation of a chat-bot in the application itself.

2. Mobile Application (Golubkova Anna)

2.1. Description

A mobile application is software that is installed on mobile devices such as smartphones, tablets and other mobile devices. It is developed specifically for different mobile platforms, among which we can find such systems as, for example, iOS or Android.

Nowadays it is very difficult to imagine life without phones. Almost every person has their own mobile phone, which is used every day on an ongoing basis. Modern mobile applications have essentially limitless potential. Customers may use these mobile applications more frequently to make purchases or place orders because of their simplicity of use and attractive user interface, which boosts revenues for business owners. That is why mobile applications are necessary in almost all spheres of human life, from reminders to mobile banks, as this greatly simplifies our lives. It is important to note that the purpose of developing a mobile application may vary depending on the ultimate goal of the business. It can be both the main product of the business and an additional channel for attracting customers. However, with any strategy, a mobile application benefits: it helps to develop a business and increase sales.

2.2. Advantages of the mobile apps

Among the many advantages of mobile applications the most obvious are the following:

1. Simplified user interaction. The application can send push notifications and is located on the device, which simplifies communication with the user.
2. The possibility of more accurate personalization. Since the application is already installed on the device, if necessary, a more accurate analysis of user actions is possible, saving the data entered by him and remembering the password with the login.

3. Using the unique functions of the device. A mobile application can use the unique functionality of a smartphone or tablet, increasing the convenience and comfort of the user.

It is important to note that the advantages of the mobile application can also include a user-friendly interface, with which the user can increase loyalty to the business. The concept of "interface" implies a set of tools through which two systems interact: a user and a program, a program and an operating system, a program and a program, a device and a device. That is, it is a kind of conductor whose task is to help in the exchange of data between two objects. The interface allows you to enter information and receive feedback, manage different applications, and exchange data. It is very important to create a user-friendly, simple and at the same time intuitive interface to make it easier for the user to navigate the mobile application. It can also be important because the user does not have to spend time searching for instructions for a mobile application, but instead he will buy or order something.

2.3 Customer Development

2.3.1. Customer Development description

Customer Development is not just an in-depth interview with a client, it is a customer-oriented approach to creating, designing and constructing a product, that is, studying the needs of a potential consumer before creating a product to the stage of scaling sales. The goal is to create and adapt goods or services to the needs of the market and as a result, we can achieve their guaranteed demand from customers at the stage of scaling sales. Thus, using Customer Development, we can reduce the risk of investing in the creation and development of a product and company.

2.3.2. Customer Development methodology

First of all, we need to follow the methodology of customer development. Among all important steps, these are those which are considered to be necessities:

1. At the center of everything is the needs and desires of the client. It is extremely important to form a portrait of our client with all the so-called pains and requirements, making hypotheses for this.

2. No hypothesis can be the ultimate truth. Even if the founder believes that the idea is brilliant, a check will be required: and the ideal product, from the point of view of the creator, may not be successful in the market.
3. Iterative: first, the search for a customer, then — the development of a product for the buyer and scaling of the company; if the customer is not found, the process repeats.
4. Testing the hypothesis "out of the office" — the product should be valuable from the position of the buyer, not the developer.
5. The basis of any successful business is understanding human psychology, identifying patterns of behavior and finding insights.

2.3.3. Customer Development collecting the data and information

It was very important to ask the right questions and get informative answers at the first steps of our project. We managed to conduct Customer Development using 5 surveys with completely different owners of restaurant businesses, as a result of which we were able to find the so-called "pain" of the client. Customers complained about the lack of reviews, as well as the lack of information about such things as "menu", "prices" or "address directions". Thanks to this conversation, we understood the main purpose of our mobile application.

2.4. Choice of the final goal

Creating a mobile application is not a matter of one day, or even one month, since the process itself is very long, painstaking and complex. That is why it was extremely important for us to understand exactly what the client wants to get as the final result, that is, the goal, what is the purpose of our mobile application and what effect it should potentially bring.

Through the use of Customer development technologies, we were able to determine the final goal of our project. After the surveys, we realized that, firstly, business owners complained about the lack of an opportunity to leave reviews so that the restaurant could understand what could be improved or corrected. And secondly, all restaurants do not have a mobile application, and nowadays, as I explained above, this point is critically important and it should not be overlooked under any circumstances.

2.5. Intermediate Targets

In addition to all the above advantages of mobile applications, we can also highlight several specific advantages in our particular case and make it as our intermediate targets:

1. Report on important events in the restaurant and other news.
2. Open access to your personal account in order to offer personal discounts or deduct / accrue points for purchases.
3. See the driving directions or the nearest restaurant places nearby.
4. The ability to communicate with a chatbot, the technology of which is based on artificial intelligence.

It is worth noting that our mobile application is made specifically for the needs and requirements of Kazakhstani restaurants, which is why the key competitive advantage is the lack of a mobile application from competitors.

2.6 Applied technologies

2.6.1 Flutter

Flutter[2] is an open source development kit and framework for creating mobile applications for Android and iOS, web applications, as well as desktop applications for Windows, macOS and Linux using the Dart[4] programming language, developed and developed by Google Corporation. Flutter[2] simplifies the process of creating uniform, attractive user interfaces for an application on the six supported platforms.

Since Flutter[2] is a development platform that supports multiple platforms, we will first compare development on it with development for specific platforms. Then we will look at the functions unique only to Flutter[2] and other competitive advantages.

The development of an application for a separate platform, for example iOS, is called the development of platform-dependent applications. Cross-platform application development, on the contrary, is the creation of applications for multiple platforms with a single code base.

Since when developing platform-dependent applications, developers create software for a specific platform, they have full access to the built-in functions of the device. This is usually due to the fact of higher performance and speed of platform-dependent applications compared to cross-platform ones.

On the other hand, if we want our application to run on multiple platforms, then more code and developers will be needed to develop a platform-dependent application. It is widely believed that cross-platform applications are more frequently used, since the number of people who use iOS or Android is clearly less than the total number of such people, which

means that all people will be able to use our application, regardless of the platform used on the phone. Cross-platform application development gives developers the opportunity to use one programming language and one code base to create an application for multiple platforms. If you are releasing an application for multiple platforms, cross-platform development will require less costs and less time than developing a platform-dependent application. This process also allows developers to create more uniform interfaces for different platforms.

In addition to that, platform-dependent applications are more difficult to run on different platforms with a uniform user interface. In this case, a platform for developing cross-platform applications, such as Flutter[2], will be very useful.

Consequently, based on the above factors, we can highlight the following advantages of Flutter[2]:

1. The performance is close to that of platform-dependent applications. Flutter[2] uses the Dart[4] programming language and is compiled into machine code. Devices understand this code, which ensures fast operation and high performance.
2. Fast, uniform and customizable display. Flutter[2] does not rely on platform-dependent display tools, but uses the open source Google Skia graphics libraries to display the user interface. This provides users with uniform visual elements, regardless of the platform used to access the application.
3. Convenient tools for developers Google has created Flutter[2] with an emphasis on ease of use. Thanks to features such as hot reloading, developers can preview what changes in the code will look like without losing state. Other tools, such as the Widget Inspector, make it easier to visualize and solve problems in user interface layouts.

All of the above factors give us reason to believe that Flutter[2] is the best option for us to create a mobile application, that is why we decided to choose it.

2.6.2 Client server

A personal account is a personal page of a website or a section of a mobile application with the user's personal data. The personal account stores customer data, such as: first name, last name, contact information and the number of bonuses. Here, the client also sees the history of purchases and withdrawals of funds, the loyalty system. From a business point of view, a personal account helps:

1. Communicate effectively with customers;

2. Improve the user experience, which has a positive effect on brand loyalty;
3. Quickly collect the customer base: users make contacts themselves;
4. Personalize offers based on customer preferences;
5. Track the conversion.

The personal account in the Web and mobile application complement each other. Usually the personal account in the mobile application is created in addition to the main one. To do this, the full functionality is implemented in the Web version of the personal page, and in mobile software - only the most important. The adaptive design of mobile software has a positive effect on conversion: the application is convenient to use, customers make decisions faster and place an order faster.

Despite the fact that the personal account does not directly affect sales, it can influence the demand of the clients. If the buyer needs a certain product, he will buy it by any means.

Another thing is working with loyalty. Customers tend to return to the company if the experience of buying or ordering services has given them pleasure. And a convenient personal account affects the quality of the user experience in the same way as the design of the site and the description of product cards. The personal account helps to simplify business processes, save time and effort of employees and money of the company.

It was this reason that prompted us to make it possible for the client to save his personal data and get access to the loyalty system. The basic information about the client's data (database) is stored and presented in our server, and the mobile application uses data from this database in its functionality. With the help of Flutter[2], we were able to present this data in a mobile application.

2.6.3 Chat-bot based on artificial intelligence

Creating a chat-bot based on artificial intelligence is a very difficult and tough task. To begin with, it is worth explaining what "based on artificial intelligence" means. Usually bots are used by businesses to answer routine and similar questions. Such bots have buttons with the selection of questions and answers from the user in advance, which greatly limits the possibility of selecting questions and, accordingly, answers to them. However, we managed to bypass this significant drawback by using machine learning. As a result, our bot can simulate the answer itself, based on the trained data, as well as recognize the question.

The use and creation of a chatbot gives a number of competitive advantages, among which the following can be noted:

1. A great way to reduce customer service costs, since you do not have to hire a special person who will answer the same type of questions.
2. Helps to communicate with the audience in several languages at once.
3. Provides round-the-clock support and offers customers solutions to their issues at any time of the day and as soon as possible.
4. Improving marketing activities, as well as reducing advertising costs.
5. A convenient way to increase sales.
6. The ability to stand out among competitors and keep up with them.

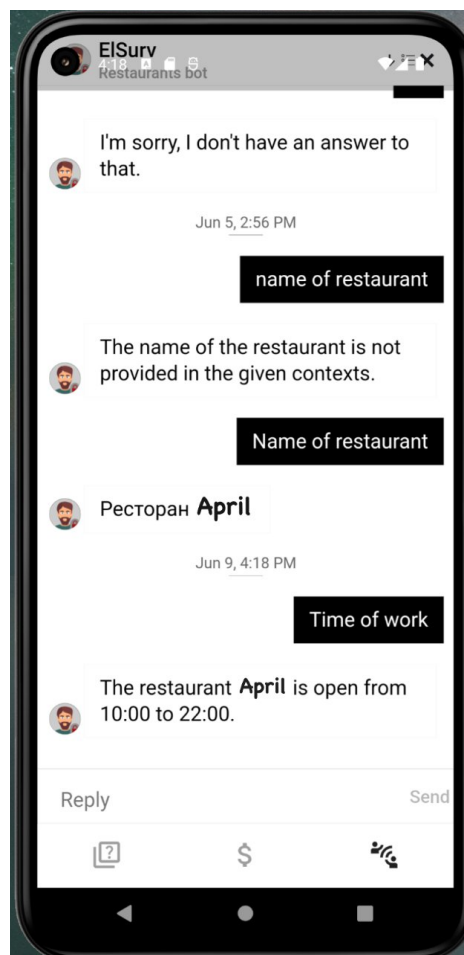


Figure 1. Chat-bot

Thanks to the above functions and competitive advantage, the chatbot is a very good tool for increasing sales and familiarizing our potential customers with the restaurant menu and other important information.

2.7 User-friendly interface

As we mentioned earlier, it is very important to have not only a number of useful functions in a mobile application, but it is equally important to have a user-friendly interface. The mobile application we have created will serve as examples of such a simple but user-friendly interface.

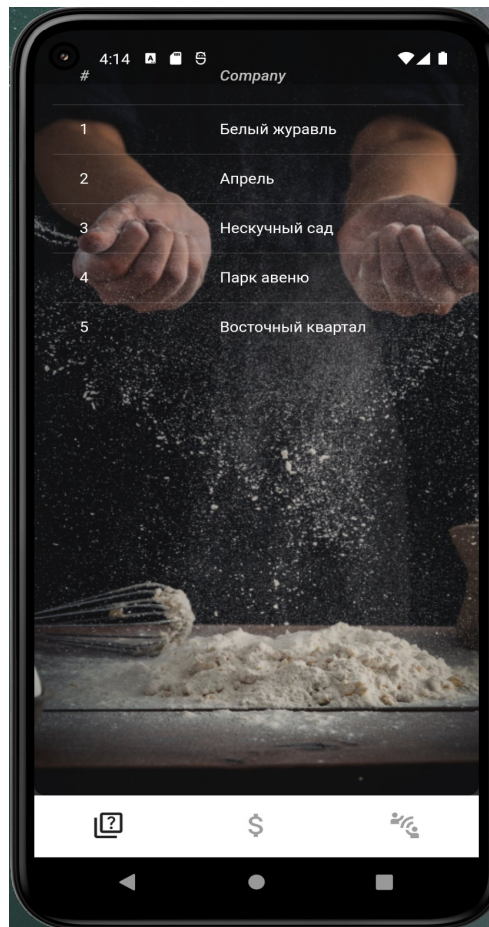


Figure 2. Main Page

Figure 2 shows the main page, where a list of all available restaurants is open. After clicking on any of the above restaurants, a window opens where you can take a survey for the selected institution (Figure 3).

In total, there are 3 menu buttons available to us, which we can click to make further actions happen. The very first button - the main menu button - opens a window with a list of all restaurants. The next button is the login button to your personal account. By clicking on it, the user gets the opportunity to view their history of accrual and withdrawal of bonuses. The rightmost button is a chatbot that works on the basis of artificial intelligence. The user gets the opportunity to ask any question about the restaurant at any time of the day and quickly get an answer.

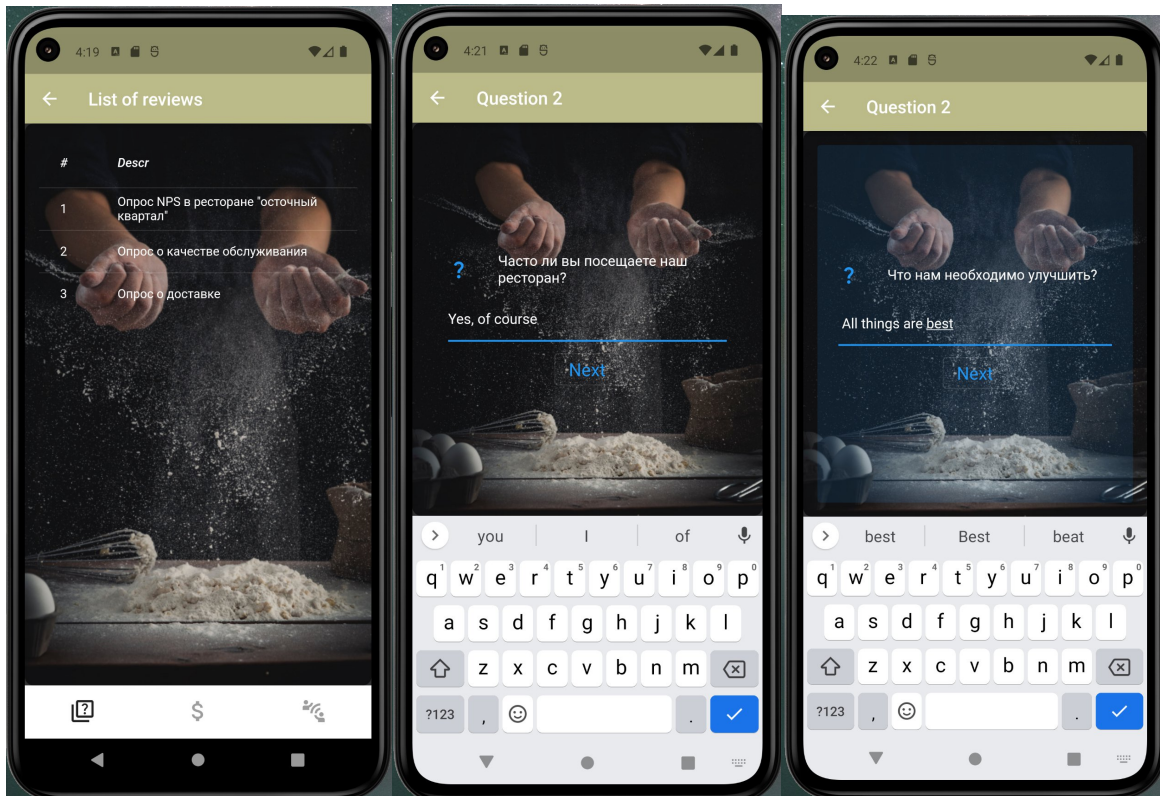


Figure 3. Review & Question List

At the next stage, we see the answers to all the questions, but already on our server (Figure 4). As we can see, all our answers that we entered in the mobile application are now visible on our server, which means everything works fine.

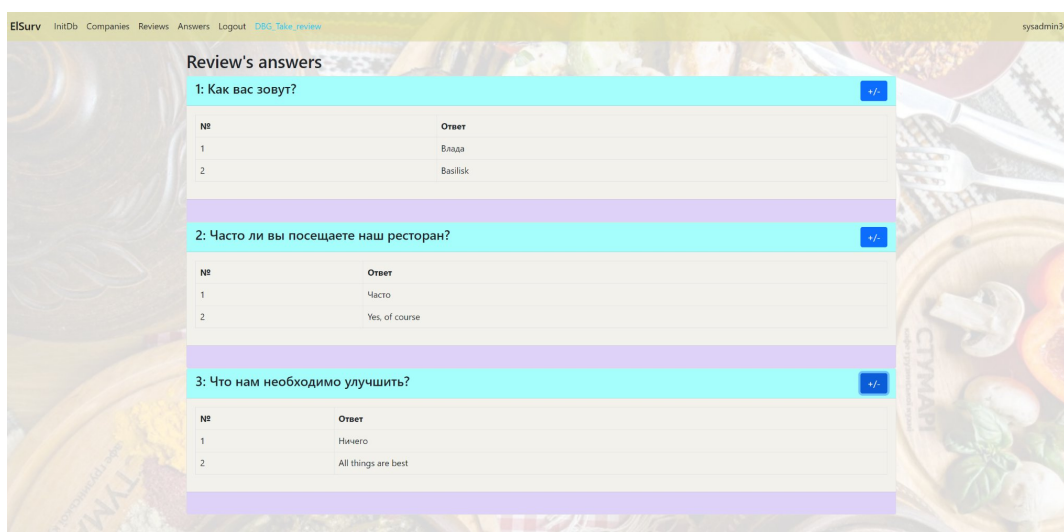


Figure 4. Answers on the server

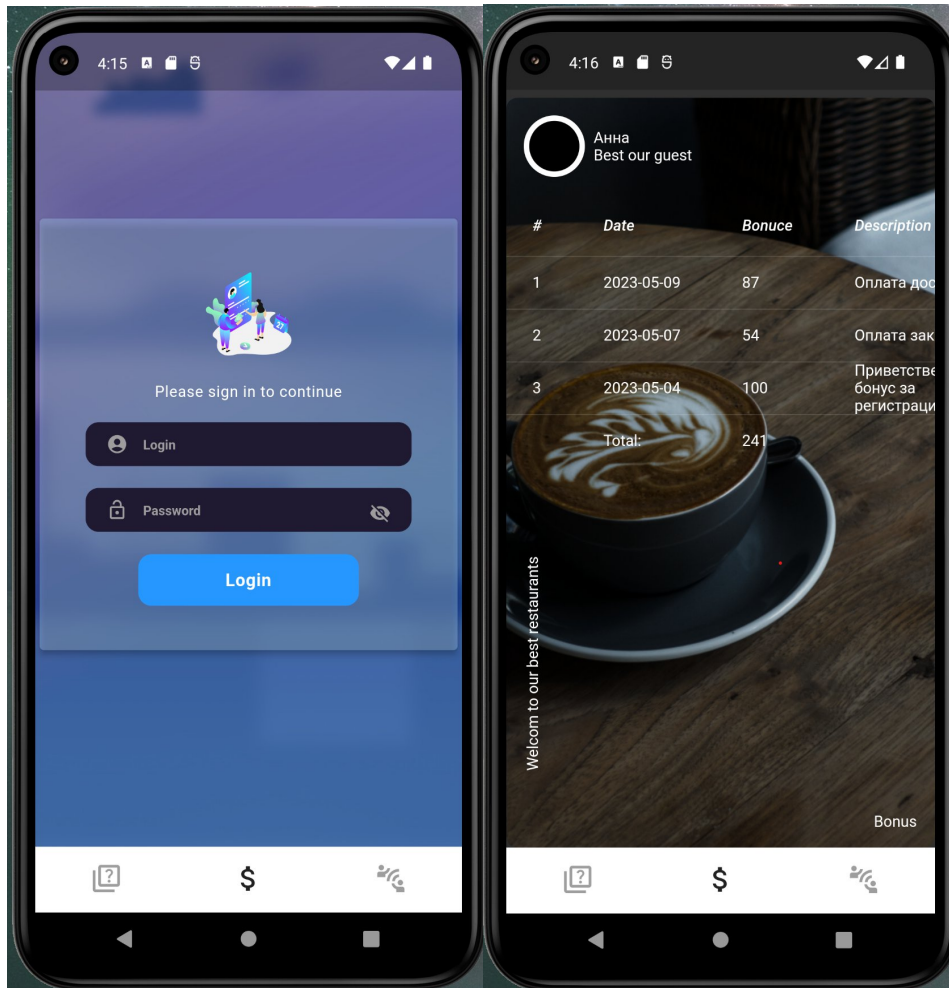


Figure 5. Login Page

On the figure 5 we see access to the personal account. After entering the login and password, the user opens a list of accrual and withdrawal of bonuses.

2.7 Description of launching and links

GitHub: <https://github.com/akke00/Elsury>

To launch the mobile application, you need to go to Visual Studio in the environment section and select the server, which is called CustomerPulse.ru.

However, if you need to fix something and debug locally, then you need to run the web version and select the Localhost server.

3. Website development

3.1 Business card web-site (Pak Aleksandr)

3.1.1 Description and goal

A website is a compilation of web pages and related content that can be accessed through a common domain name and is hosted on at least one web server. Websites are typically created with a specific topic or purpose in mind, such as disseminating news, providing educational resources, facilitating online transactions, offering entertainment options, or enabling social networking. The navigation within a website is facilitated through hyperlinks, often starting from a home page.

A website serves as a convenient and contemporary means to disseminate information and promote services. In our project, the purpose of the website is to acquaint potential clients with the services and establishments offered. Visitors to the site will have access to a gallery featuring various restaurants, where they can explore menus. Thus, there is no longer a need for clients to contact or physically visit the restaurant for introductory purposes. The markup of the site consists of an HTML representation and CSS. While the functional part consists of JavaScript code.

3.1.2 Customer development

Considering that the website serves as the virtual representation and public image of our restaurants, it should possess several crucial qualities. First and foremost, the site should be user-friendly and intuitive, ensuring a seamless experience for visitors. A complex and confusing interface could deter potential clients. Secondly, the website should feature a modern and visually appealing design. This aspect is important because an outdated or cluttered design may lead potential clients to perceive our establishments as lacking in modernity. The third aspect relates to the technical aspects of the website. It should be optimized to function effectively across various devices, ranging from personal computers to smartphones and tablets. Given the integral role of mobile phones in modern life, optimizing the website for mobile devices is essential.

Considering the multitude of significant factors and variables involved, we engaged in discussions with our clients prior to commencing website development, aiming to identify the key aspects that warranted sufficient attention. After careful deliberation, we determined that the website should primarily possess a user-friendly and contemporary design. Furthermore, a substantial amount of time must be dedicated to optimizing the site for mobile devices, as this is a crucial priority.

3.1.3. Description of the system from the user's perspective.

The website consists of 6 main pages, including the home page, and 5 restaurant pages:

- Main page
- Restaurant “April” page
- Restaurant “Vostochniy Kvartal” page
- Restaurant “Neskuchniy Sad” page
- Restaurant “Park Avenue” page
- Restaurant “Beliy Juravl” page

From the home page, the user can get to the page of any of the restaurants, as well as return from the restaurant page to the home page. Also, the user can not only see the interior of the restaurant with photos on the restaurant pages and view the menu, but also find out important information about the establishments, such as address, mail, opening hours and phone number. The website also has a chatbot that can help users with all their questions about the restaurants. More about the chatbot itself will come later.

3.1.4 SEO-optimization

SEO (Search Engine Optimization) optimization is the process of increasing a website's visibility and ranking in search engine results such as Google, Bing and Yandex. The purpose of SEO optimization is to attract more organic (unpaid) traffic to a website and increase its traffic. Optimization involves various aspects, including choosing the right keywords and phrases, optimizing the content on the site, improving the structure, creating quality backlinks, and improving the user experience on the site. SEO optimization is essential because most internet surfers use search engines to find relevant information, products or services. The more a website ranks higher in search engine results, the more likely users are to go to the site and take actions, such as making a purchase, registering, or browsing content.

A well-optimized website can significantly improve a business's online presence and attract more potential customers.

In SEO optimization there are 3 main header tags called H1, H2 and H3. Each of them has its own aim and purpose, but generally all three are used in order to structure and format the content of a web page. Tags help search engines such as Google or Yandex understand the hierarchy and organization of content. Here's a summary of each header tag:

1. H1 tag: This is the main header of the page and is used only once per page. It has the highest level of importance and reflects the main theme or idea of the content of the web page. Including keywords in the H1 tag can help search engines understand the topic of the page and potentially increase the page's ranking.
2. H2 tag: They are subheadings and are used to divide content logically. H2 tags are used to break down the main sections of a page into smaller, more specific topics. There can be multiple h2 tags on a page and they should be hierarchically organized below the h1 tag. Including relevant keywords in h2 tags can also have a positive effect on SEO.
3. H3 tag: These are an additional level of content subdivision within the h2 tag. An h3 tag denotes a subtopic or a more specific aspect related to the h2 tag under which it is located. There can be multiple h3 tags within an h2 section, and they must also be hierarchically organized. Although h3 tags have less SEO impact than h1 and h2 tags, they still contribute to the organization and readability of the content.

Accurate use of header tags in a hierarchy makes it easier to understand the structure and relevance of a web page to search engines. This can potentially improve a website's SEO by providing a clear and organized content structure for search engines to process more effectively.

In order to fill the site with the most relevant, popular appropriate information for the tags and make more effective SEO optimization, it is first necessary to know the statistical information regarding user requests to search engines such as Google and Yandex. Also, based on the fact that the restaurants are located in Kazakhstan, it is worth limiting statistical searches only for the territory of Kazakhstan. For this purpose, I decided to use a service developed by Yandex, which is called WordStat.

WordStat is a tool designed by Yandex for keyword research and analysis. As the leading search engine in Russia, Yandex WordStat assists website owners, marketers, and SEO specialists in comprehending search patterns and identifying frequently used keywords by Yandex users. Yandex WordStat offers the following capabilities:

1. **Keyword Research:** Users can input specific keywords or topics to obtain insights into search volume, related keywords, and commonly used variations among users.
2. **Exploration of Search Trends:** The tool presents data on the popularity of particular keywords over time, enabling users to recognize seasonal trends or shifts in user search behavior.
3. **Analysis of Keyword Competition:** WordStat supplies information on the level of competition associated with specific keywords, helping users evaluate the difficulty of ranking for particular terms.
4. **Search Term Suggestions:** The tool suggests search queries frequently linked to a given keyword, supporting users in expanding their keyword repertoire and understanding user intent.
5. **Geographic Analysis:** WordStat allows users to analyze the popularity of keywords and search trends based on specific geographic regions or targeted locations.

Yandex WordStat proves valuable for optimizing website content, conducting market research, and devising effective SEO strategies tailored to the Russian-speaking audience. By leveraging this tool, users can make well-informed decisions to enhance their online presence.

By analyzing keywords, search trends, as well as geographic analysis with the service, I did SEO optimization for a business card site. I assigned a unique H1 tag to each page, and defined several H2 and H3 tags for each page. So, after publishing the website on the Internet, it will be much easier for users to find information about restaurants .

3.1.5 Hosting a website

Hosting is a service for providing storage space for a website and its files on a server that is permanently connected to the Internet. Hosting providers provide server hardware and technical infrastructure so that websites can be accessible and functional for users on the Internet.

When a website is hosted, all website files such as HTML pages, images, videos, databases and other resources are stored on the hosting provider's server. When a user enters your website address into a web browser, the hosting server responds by providing the necessary files and data to display your website on the user's screen.

I chose a Kazakhstan hosting provider PS.kz to host the website I created. The main reason for choosing a local provider is the loading speed of the site. The website will load faster in Kazakhstan if it is hosted locally.

3.1.6 Result

Extensive efforts were invested, resulting in the successful achievement of all objectives. A fully developed website was created, comprising six primary pages, including the home page. Each page was meticulously crafted with an original and user-friendly design, catering to the intuitive needs of potential customers. Additionally, the designed website was customized to be compatible not only with desktop computers but also with mobile devices and tablets. It was ensured that the website is responsive and capable of adapting to various screen sizes, accommodating all screen extensions starting from 320 pixels. On the figure 6 one may see a personal computer version of the main page of the developed website. One may fully observe the website by typing **visits.kz** in any search engine.

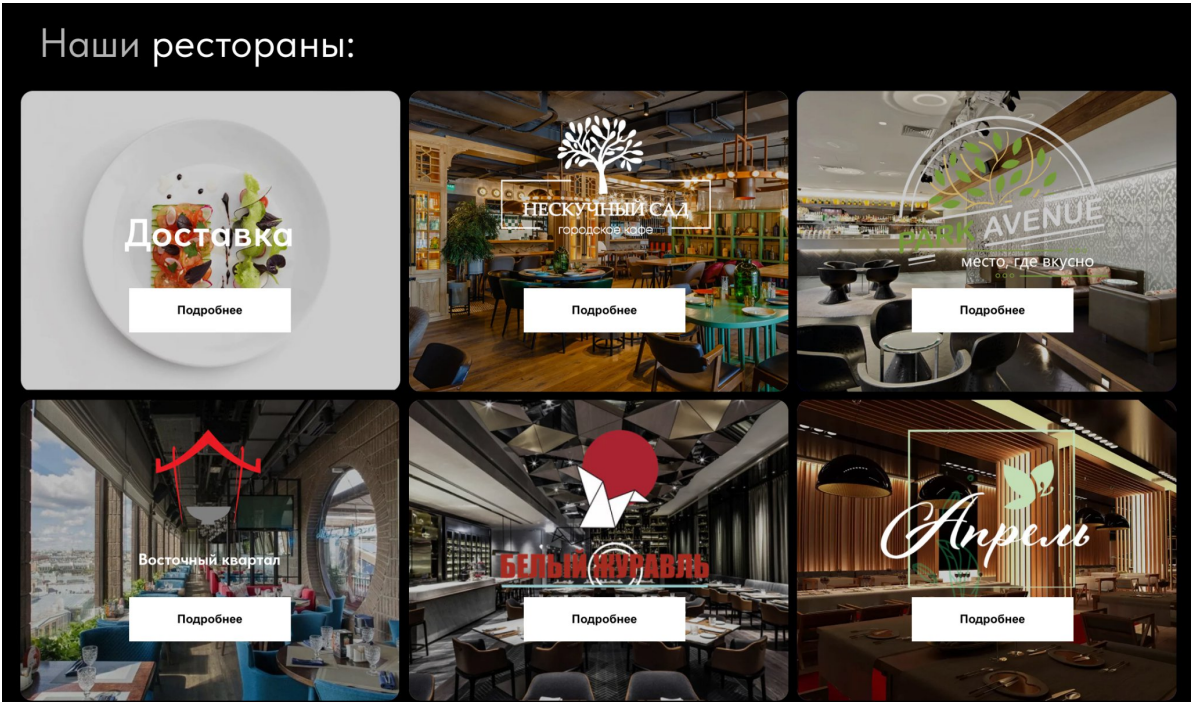


Figure 6. Main page of the website

3.2 Elsurve website(done by Voronina Vlada)

3.2.1 Description

This part is related to developing a web server with two users: workers of the restaurants and guests of the restaurants. The main idea behind this web service is conducting reviews, so all the work is constructed around this goal. It was essential to make possible for the workers: login/logout, check the list of all reviews, change them and delete, check the list of all restaurants and workers of each restaurant separately, add new worker and new restaurant, edit and delete all the available information, and finally the main feature is to check all the guest's answers on the reviews, analyze it and work with it. And it was essential to create opportunities for the guests to participate in the polls, and to save their answers.

3.2.2 Theoretical part

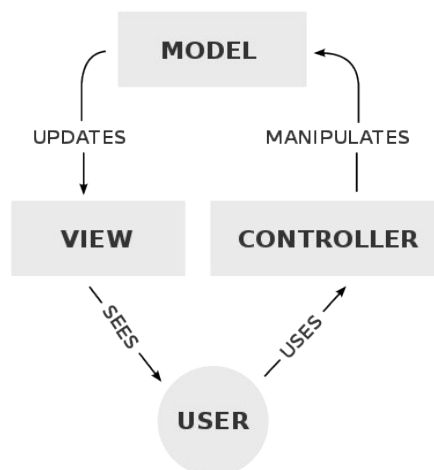


Figure 7. MVC structure

Model-View-Controller(MVC)[5] is a software design pattern which separates app's data and logic on three components: Model, View, Controller, which communicate between each other, and to have better understanding of the communication between blocks provided on the Figure 7.

Model

It is a C# file, which used to manage data and define the structure of the application. It is typically stored in the field named "Models".

View

A view contains the HTML markup, C# code and content that is sent to the browser. It provides the page and design, which the user can see. It typically stores in the field with the name “Views”, where there are folders related to existing controllers, and each folder has the same name as a Controller. In each folder, there are a number of .cshtml files for each method in the controller class, which need visual representation. Views can contain not only html code, but also c# code, so to process it Razor is used. The Razor syntax consists of Razor markup, C#, and HTML. Files containing Razor generally have a .cshtml file extension. The purpose of the Razor view engine is to define the transition from html markup to C# code. The Razor syntax is quite simple, the @ symbol represent that we jumps to the C# code.

Controller

It is responsible for controlling the way that a user interacts with an MVC application. It is C# class, which is typically located in the folder with the name Controllers, and each file name should end with this word, for example, “NameController.cs”. There are two methods, which are used in Controllers to get and post information from the server: HttpGet and HttpPost.

HttpGet allows you to process the user request and to access the chosen page. HttpPost is used to send information to the site, it receives information, which the user wants to change. It is usually used in the forms to fulfill.

3.2.3 Environment

Visual Studio for MAC Version 17.4

3.2.3 Technology

To begin with, we chose .Net to build the web-service, the main advantages of this framework is that it is free, cross-platform and open-source, which is faster than other frameworks, and one of the most popular ones among developers. Then we download Visual Studio, which is one of the best IDE for .Net developers, and collaborate through Azure DevOps, where we have private Git and opportunity to organize tasks. To communicate a .Net server application with MariaDB database, we decided to use Entity Framework Core technology, which allows us to use Code First Approach when designing and refactoring the structure of the database. It is very important, because it provides the opportunity of transition to another type of the database and scaling.

In the Views we have .cshtml files with Razor syntax, which combine both C# code and html to create the webpage view. Also for some views we used JavaScript to add dynamics in the pages, which follows after tag <stript>.

3.2.5 Structure

The project consists of Controllers, this is the folder, where all Controllers are saved, and all the files written on C#. Db folder includes all the tables, which are used in database, described below, and all the files written on C#. The Models folder stores all the models, which was used for the more convenient communication between Controllers and Views. And finally, the views folder consist of all the representation, which can be seen by the user, all the files are written using html, C#.

3.2.6 Customer Development for the web-server

Before starting developing the server and the database, the key part of the project was conducting the customer development interview. After communication with restaurant representatives, the needs and structure of the server and database became clear. There were a few Zoom-sessions with the people who are going to work with the system, it was important to understand what they are waiting for. After this part was done, the database development and web-site development was started.

3.2.7 DataBase

All the tables and relationships between tables were defined using normalization principles. This entails building tables and linking those tables together in accordance with principles intended to safeguard the data and increase the database's adaptability by removing duplication and inconsistent reliance. We decided to have 6 tables for our database.

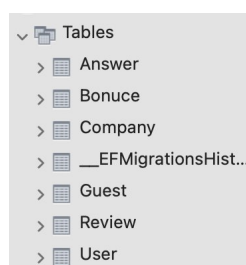


Figure 8. The representation of tables from the DataBase

- “Answer” in this table all the guest answers from the review will be saved, and then can be used for analytics.

- “Bonuce” stores available amount of bonuses for the guest in the loyalty program.
- “Company” stores the data related to the restaurants, for example, full name, contact phone, email, etc.
- “User”, “Guest” tables store the personal data about employees and guests, respectively.
- “Review” stores all reviews, which are active and inactive with description and questions related to the review.

3.2.8 Implementation: Administrative side

This part on the side of administration, it was created for the restaurant's workers and the main controllers of the administrative part are:

- HomeController.cs, Sasha
- AdminReviewPageContoller.cs
- AdminResultPageV2Controller.cs
- UserPageController.cs
- CompanyPageController.cs

HomeController.cs (done by Pak Aleksandr)

This controller is responsible for the functionality of the main and the first page that the user sees - the login page. In this controller there are such functions as:

1. Login()
2. Logout()
3. Error()
4. Database initialization()

Database initialization allows us to connect to our database in order to compare the username and password entered by the user with those stored in the database. If the username or password is invalid, it will trigger a method that displays information about the error.

Since for security reasons no passwords are stored in the database, I decided to use a method such as Salt(), which automatically hashes and encrypts the password before adding it to the database. When the user logs in, the password is also automatically cached and compared with the hash value in the database. This method allows us to secure the user.

AdminReviewPageContoller.cs

Methods in the class: List, Delete, Edit, NewReview. This controller provides all the available list of reviews. And it is possible to add new reviews, edit available reviews, and delete if necessary.

To connect the controller from a web browser, we need to write siteAddress/ControllerName/ControllerAction in the address line. By ControllerAction means the name of the method in this controller.



Figure 9. Controller's method names used in the web-address

/AdminReviewPage/List provides the table with the review name, company name and some details about the review. On this page we have three actions:

- 1) We can edit, if we press the button "Edit" we link to the /AdminReviewPage/Edit/reviewId page, which is related to the method "Edit".
- 2) We can add a new review via method NewReview and delete via method Delete.

All other controllers work in the same way, but have different features.

AdminResultPageV2Controller.cs

Methods in the class: ListOfAllQuestions, Answers. AdminResultPageV2Controller provides answers list, ListOfAllQuestions methods represents all available reviews and by the action "Answers" it is possible to redirect to a separate page for each review, where all the answers, which are separated by the question, shown.

CompanyPageController.cs

Company page controller is one of the most important controllers, it provides the information about all the restaurants in the chain with opportunities to add new company, block the company, edit, delete and check all users(workers) of concrete restaurant, which is done in controller written below with the name UserPageController.cs.

UserPageController.cs

UserPageController provides the information about users of the company, the available actions: Block, Unblock, Delete, Edit, and AddUser. Methods block and unblock change the status, which is stored in the database: if we block users, the field active becomes 0(inactive), if we unblock users, the field active becomes 1(active). Delete simply deletes the user, and editing helps to change the data about workers. The AddUser method provides opportunities to add new users for each company from the browser.

Description from the user perspective: Administrative side

Each Controller has related to its name Views, which is responded to the frontend. Views provides representations and pages for the users.

AdminReviewPage View

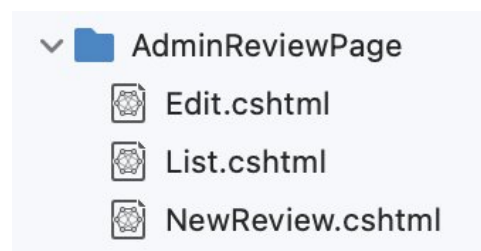


Figure 10. Structure of Admin Review View

Figure 10 represents the way views are arranged for the Admin review page, but the same structure is used for other views. Files with extension .cshtml uses C# and html to provide representation.

Список опросов							
№	State	Описание	Ключ	Company	Вопрос 1/Вопрос 2/Вопрос 3	Действие	
1	active	Опрос NPS в ресторане "Восточный квартал"	review01	БК	1: Как вас зовут? 2: Часто ли вы посещаете наш ресторан? 3: Что нам необходимо улучшить?	Редактировать	Delete
2	active	Опрос о качестве обслуживания	review02	БК	1: Понравилось ли вам обслуживание в нашем ресторане? 2: Оцените качество блюд? 3: Оцените доброжелательность официантов	Редактировать	Delete
3	active	Опрос о доставке	review03	БК	1: Пользуетесь ли вы доставкой из нашего ресторана? 2: Знаете ли вы, что доставка нашего ресторана, в отличие от агрегаторов, работает круглосуточно? 3: Оцените работу нашей службы доставки?	Редактировать	Delete
4	active	Опрос о качестве обслуживания в ресторане "Белый журавль"	review04	БЖ	1: Что вам понравилось в обслуживании нашего ресторана? 2: Что вам не понравилось в обслуживании нашего ресторана? 3: Оцените обслуживание в нашем ресторане	Редактировать	Delete
5	active	Опрос о доставке в ресторане "Апрель"	review05	Апрель	1: Оцените работу службы доставки 2: Заказ доставили вовремя? 3: Оцените качество упаковки	Редактировать	Delete
6	active	Опрос о доставке в ресторане "Нескучный сад"	review06	НС	1: Оцените работу службы доставки 2: Заказ доставили вовремя? 3: Оцените качество упаковки	Редактировать	Delete
7	active	Опрос NPS в ресторане "Парк авеню"	review07	ПА	1: Как вас зовут? 2: Часто ли вы посещаете наш ресторан? 3: Что вы бы предложили улучшить?	Редактировать	Delete

[Add review](#)

Figure 11. List of reviews representation on the web

Edit Review

State

Active

Blocked

key

review03

question1

Пользуетесь ли вы доставкой из нашего ресторана?

question2

Знаете ли вы, что доставка нашего ресторана, в отличие от агрегаторов, работает круглосуточно?

question3

Оцените работу нашей службы доставки?

[Save](#)

Figure 12. Edit Form representation

Figure 11 represents a list of all available polls, if the user clicks “Редактировать” it will be redirected to the page `AdminReviewPage/Edit/review_id` and can change the chosen poll, the form represented on Figure 12. Button “Add review” gives an opportunity to add a new

review for the company. And button delete will erase the poll from the table and from the database.

CompanyPage View

Companies									
#	State	Short name	Full name	Phone	Email	Action			
1	active	БЖ	Белый журавль	+7 (790) 990-9200	info@belyijuravl.ru	Block	Edit	Users	Delete
2	active	Апрель	Апрель	+7 (749) 573-9576	info@april.ru	Block	Edit	Users	Delete
3	active	НС	Нескучный сад	+7 (749) 573-9576	info@neskuchyisad.ru	Block	Edit	Users	Delete
4	active	ПА	Парк авеню	+7 (749) 573-9576	info@parkavenu.ru	Block	Edit	Users	Delete
5	active	ВК	Восточный квартал	+7 (749) 911-2330	info@vostoc.ru	Block	Edit	Users	Delete

[Add new company](#)

Figure 13. List of all companies representation

Company Page View represents all the available restaurants and has 5 buttons. If the user clicks Block, the column State will change status from active -> inactive. The functionality of edit, delete and add new company coincides with the name of these buttons. And pressing the button Users, workers can see who is working in the chosen restaurant.

AdminResultPageV2 View

It has the same structure, each file in the Views represents the method in the Controller. There is only one button in this View called “Ответы”, pressing this button the user can check all the answers related to the specific poll.

3.2.9 Implementation: User side

The main goal of this project was to create a reviews system, so for the user we decided to create two options regarding polls. First option is the user have an option to choose what review he or she wants to answer, and it was done in TakeReviewPageController.cs and TakeReviewPage View, or the corresponding poll can be send to user via email, and this part and concrete poll was implemented in ReviewAskController and ReviewAsk View.

TakeReviewPageController.cs

Simply provide the list of all available polls, and have only one method “List”. There is a button “Take review”, which redirects to the polls, and the next logic written in the Controller below.

ReviewAskController.cs

ReviewAskController has methods `HttpGet Questions` and `HttpPost Questions`, the first method ensures that users can see the page with questions and method posts, take the user answers from the form, and add them to the database.

Description from the user perspective: User side

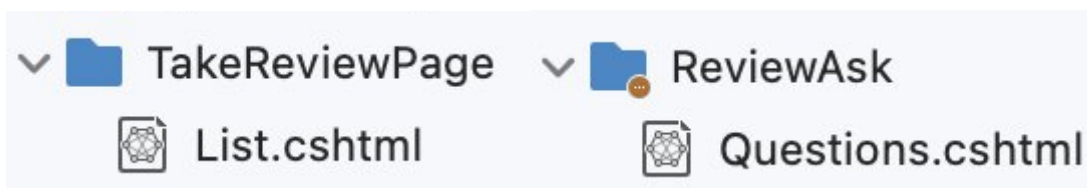


Figure 14. File system description for the Views

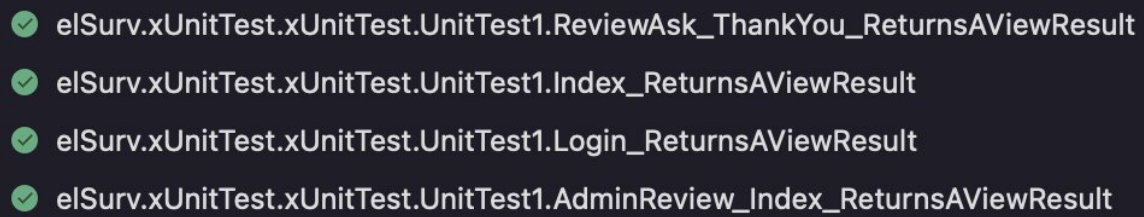
List.cshtml creates the view for the user, where it is possible to see all reviews and if the user wants to participate in review, he or she can press the button “Take Review”, and then answer the questions, which representation is done by Questions.cshtml. In the answer section, users will be asked three questions, which is possible to skip and write nothing. To go to the next question user has to press the 'Next' button, and then when the review will be finished he or she will see the sentence “Thank you for your participation”, it means that the poll is finished and saved.

3.2.10 Testing(done by Sasha Pak)

In order to ensure that each component and unit of code performs as expected and produces the desired output, I decided to apply C# xUnit testing.

The purpose of unit testing is to isolate and test individual pieces of code in isolation from the rest of the application. This allows us to identify and fix bugs in the development process, ensuring that each piece of code functions properly before integrating it into the larger system. In general, C# xUnit testing is an important practice for ensuring code correctness, maintainability, and quality by testing the behavior of individual pieces of code in isolation.

On the figure 1 the results of tests are represented.



```
✔ elSurv.xUnitTest.xUnitTest.UnitTest1.ReviewAsk_ThankYou_ReturnsAPIViewResult
✔ elSurv.xUnitTest.xUnitTest.UnitTest1.Index_ReturnsAPIViewResult
✔ elSurv.xUnitTest.xUnitTest.UnitTest1.Login_ReturnsAPIViewResult
✔ elSurv.xUnitTest.xUnitTest.UnitTest1.AdminReview_Index_ReturnsAPIViewResult
```

Figure 15. Results of C# xUnit tests

While developing tests, the “[Fact]” attribute was used in order to create appropriate tests. Attribute “[Fact]” is applied to a test method, it indicates that it is a fact-based test case that should always pass if there are no logical errors in the code under test.

3.3 Description of launching and links

GitHub: <https://github.com/akke00/Elsurv>

Zip archive with the name webAndMob.zip can be downloaded from Github directly or using Terminal. If you prefer to use Terminal, you need to choose place where to copy and write **git clone <https://github.com/akke00/Elsurv>.git directoryName**

Or just use this link in Visual Studio, then you need to open Visual Studio, press “Open” and choose the directory, where this project is stored and then to open choose the file elSurv.sln. And to be redirected to the server part, you should press “Run”.

3.4 Chat-bots

A chatbot is a program or application controlled by artificial intelligence designed to mimic human communication through text or speech. It uses natural language processing and machine learning algorithms to understand and respond to user requests in a conversational manner.

Chatbots can be found on a variety of platforms and are used to provide automated assistance, answer questions, complete tasks and hold conversations with users. They can be programmed with specific rules or use artificial intelligence techniques to understand context and improve responses over time.

There are two main types of chatbots:

1. Rule-based. Rule-based chatbots follow predefined scenarios and provide responses based on specific patterns or keywords.
2. AI-powered. AI-powered chatbots use advanced technologies such as NLP and machine learning to understand user input, adapt to different contexts, and continuously improve their performance.

Chatbots have a wide range of applications, including customer support, information retrieval, task automation, and more. Their goal is to provide effective answers, improve the user experience, and streamline processes.

Key components of a chatbot system include a user interface, a natural language processing engine, a dialogue management system, and integration capabilities with external systems or APIs. Chatbots serve as a valuable tool for companies to interact with users, improve customer service and automate tasks.

In order to make the use of chatbots as user-friendly as possible, as well as to answer all possible questions from a potential client, we have created three different bots, two AI-powered bots and one rule-based bot. Rule-based chatbot was integrated on the business card website, while one AI-powered bot was integrated on Elsurve website, and the last AI-powered bot was integrated on telegram social network. One may find our telegram bot by searching @VisitsKz_bot in the telegram. Figure 1 shows a block diagram of the rule-based chatbot algorithm.

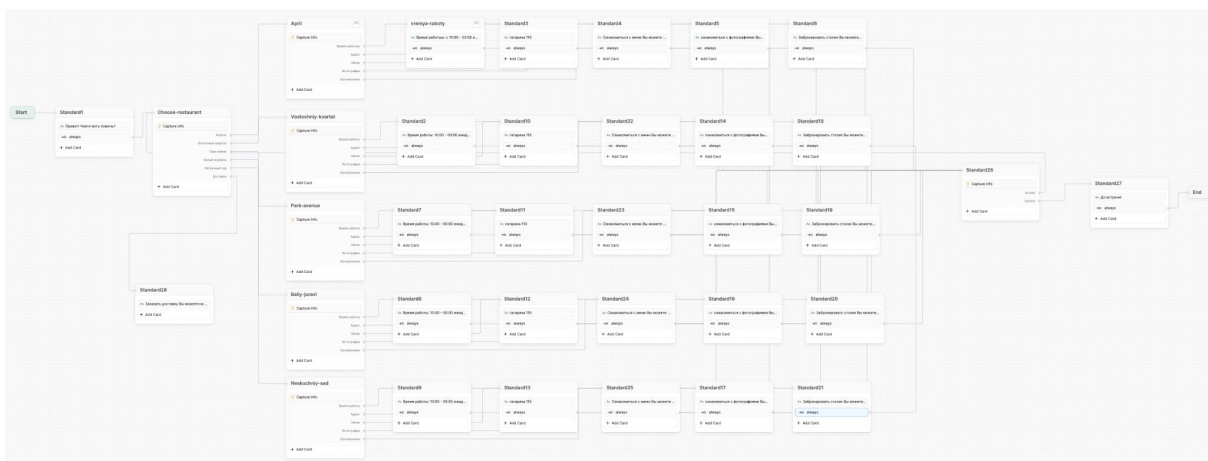


Figure 16. Block-scheme of rule-based chatbot

4. Conclusion

This project meets all the requirements for the terms of reference of the owner of restaurants. First of all, this project helps to keep regular customers and informs the administration about the mood of customers, as it provides an opportunity to send reviews. We got exactly the result that the business owner asked us for. We have also added the function of using a chatbot based on machine learning, which helps to save additional funds and time for both employees and customers.

Thanks to our fruitful efforts, we successfully achieved all of our objectives. We diligently carried out customer development and made significant progress from the initial idea to the final product. As a result, we created a visually appealing website as our business card, ElSurv website, along with a mobile application. We firmly believe that these offerings will assist our customers in expanding their customer base.

Throughout the journey, we gained extensive knowledge about various development tools, including .NetCore, JQuery, Bootstrap, and numerous others. This learning experience has equipped us with a diverse skill set and enhanced our proficiency in developing cutting-edge solutions.

This project meets all the requirements for the terms of reference of the owner of restaurants. First of all, this project helps to keep regular customers and informs the administration about the mood of customers, as it provides an opportunity to send reviews. We got exactly the result that the business owner asked us for. We have also added the function of using a chatbot based on machine learning, which helps to save additional funds and time for both employees and customers.

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