Ministry of Education and Science of Ukraine

Sumy State University

Educational and Scientific Institute of Business, Economics and Management

Department of Economic Cybernetics

BACHELOR'S QUALIFICATION WORK

On the topic: «Development of UMH Radiogroup advertising automation collection and analysis automation service»

Completed by student <u>4th course</u>, group <u>AB-71a.an</u>
                                        (course number)   (group code)

Specialties 051 "Economics»

(«Business Analytics»)

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Sumy – 2021 year

ABSTRACT

bachelor's thesis on the topic

" Development of UMH Radiogroup advertising automation collection and analysis automation service "

student _____Hrek Kateryna Andriivna_____

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The relevance of the topic chosen for research is determined by the fact that more and more companies are beginning to automate their production. To improve the overall condition of the company, it is necessary to restructure it, so some basic and secondary processes need to be reorganized, namely - automation.

The purpose of the qualification work is to develop an automated service for analytics of advertising manifestations.

The object of study is a process of automation of business processes in production.

The subject of research is business process automation tools.

The objectives of the study are to study the essence of business process automation, analysis of existing applications used by production, development of requirements, functionality and structure for the created system, evaluation of economic efficiency of the implemented innovation.

The information base of qualification work is data and materials of UMH Radiogroup, various studies in the field of automation.

The main scientific result of the qualification work is as follows: the state of automation in everyday life and in production was analyzed, an analytical service was developed with the help of which the process of data analysis will be much easier for the company.

The obtained results can be used by UMH Radiogroup for use at the enterprise and for other firms as an example of successful automation.

The results of approbation of the main provisions of the qualification work were presented by the media holding UMH Radiogroup in the form of a certificate of implementation.

Keywords: automation, analytical service, technologies, technological optimization.

The content of the qualification work is presented on 25 pages. List of used sources from 40 names, placed on 3 pages. The work contains 4 tables, 6 pictures, and 4 appendices posted on 9 pages.

Year of qualification work - 2021 years.
Year of work protection - 2021 years.

Ministry of Education and Science of Ukraine
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APPROVE
Head of Department
Dr. Econ. Sciences, Professor
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"__" _____ 2021.

TASKS FOR THE QUALIFICATION WORK OF THE BACHELOR

specialty 051 "Economics" (Business Analytics)

4th year student, group AB-71a.an

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1. Topic of the work: _____ Development of UMH Radiogroup advertising automation collection and analysis automation service
   approved be order of the university «__» _____ 2021 №_____
2. The deadline for submission of completed work by the student «__» _____ 2021
3. The purpose of the qualification work: _____ is to develop an automated service for analytics of advertising manifestations.
4. The object of study: _____ is a process of automation of business processes in production.
5. The subject of study: _____ is business process automation tools.
6. The qualification work is performed on materials: data and materials of UMH Radiogroup, various studies in the field of automation.
7. Indicative plan of qualification work, terms of submission of sections to the head and the maintenance of tasks for performance of the set purpose
   Chapter 1. RESEARCH OF THE STATE OF AUTOMATION OF BUSINESS PROCESSES AND FORMATION OF REQUIREMENTS FOR THE SERVICE OF AUTOMATION OF COLLECTION AND ANALYSIS OF ADVERTISING
   _____

   (name – submission deadline)

   In chapter 1. Research of the state of automation of business processes, general characteristics of UMH Radiogroup, terms of reference for creating the service
   (the content of specific tasks to the section that the student must perform)

   Chapter 2. IMPLEMENTATION OF SERVICE OF AUTOMATION OF COLLECTION AND ANALYSIS OF ADVERTISING MANIFESTATIONS
   _____

   (name – submission deadline)

In chapter 2. Stack of technologies used in the development of the service, description of the structure and functionality of the service, estimation of economic efficiency of analytical service

8. Consultations on work:

Chapter	Surname, initials and position of consultant	Signature, date	
		Task issued by	Task accepted by
1			
2			

9. Date of issue of the task: «__» _____ 2021

Supervisor _____   ___Kuzmenko O.V.___
                    (signature)   (initials, surname)

Received the task to perform   _____   ___Hrek K.A.___
                    (signature)   (initials, surname)

CONTENT

INTRODUCTION

From the beginning of its existence, humanity has not stopped its development. More than 100 years have passed since the beginning of the functioning of organized society and the creation of the first primitive technologies. However, humanity did not stop for a moment. People continue to evolve, improve society and create new technologies.

From the beginning people had different needs, but later due to different circumstances those needs began to change. As the saying goes, "demand creates supply," so the more needs people had, the sooner it was necessary to develop. When people began to unite in large groups, cities and countries, the question arose of mass production of necessary goods and expansion of services. Thus began the restructuring and almost every city began to appear factories, small and large enterprises. Large groups of people were hired, and specialized educational institutions began to be rebuilt to train specialties. Society continued its rapid development. And so in the 21st century, or as the century of information technology is considered, people are making a new leap in evolution.

Now it is impossible to imagine your life without the latest technology. Every day from the screens of smartphones, laptops, TVs there is information about the annual update and optimization of existing technologies. People are used to using technological devices in everyday life, without even thinking about how much easier their lives are now. However, for large and small enterprises, the availability of technology means improved production. Thanks to the optimized work of the enterprise any order of the client can be made in the minimum terms. And as a result, the company receives not only a profit and a regular customer and partner, but also the opportunity to enter a more competitive market and expand its influence.

The activity of the enterprise is a connected set of business processes, the ultimate goal of which is the production and sale of products [1]. In the period of rapid

development of technologies and communications there is a big question of modernization and automation of activity of both small and large companies.

Information technologies radically change business processes and significantly improve the main performance of the company, which allows it to stay ahead of competitors.

The relevance of the research topic is due to the need to automate processes in companies, as well as the constant renewal of production activities in terms of innovative development of society. Business process automation is a wide range of tasks which includes various operations performed by employees. With its help, companies will not only improve the overall work of production, but also become competitive. This is a chance not only for large but also for small corporations, which often suffer from strong competition.

The purpose of this diploma project is to create a service for analytics of advertising companies UMH Radiogroup, which will be a de facto analogue of Google sheet Excel but with more powerful and flexible functionality.

Achieving this goal determines the solution of the following tasks:

- identify the role of automation to improve business performance;
- provide a description of the media holding UMH Radiogroup;
- provide a description of the service architecture;
- describe technologies and tools for service development;
- describe the structure and functionality of the analytical service;
- give an economic evaluation of efficiency.

The object of research is the process of automation of one of the business processes of the company to facilitate analytical analysis. UMH Radiogroup was chosen as the basis of the study.

1 RESEARCH OF THE STATE OF AUTOMATION OF BUSINESS PROCESSES AND FORMATION OF REQUIREMENTS FOR THE SERVICE OF AUTOMATION OF COLLECTION AND ANALYSIS OF ADVERTISING

1.1 Research of the state of automation of business processes

Due to the rapid development of technology, automation is the regulation and management of production processes that are carried out without human intervention or only under its control [1]. Many people understand this concept in different ways, and it is also implemented in different ways. First of all, it depends on the type of enterprise. Automation of large production associations is different from small companies. If the main product of the enterprise, such as the production of spare parts, then in this case, automation looks like a request for the production of these parts. Now the person should not spend time for independent designing and creation, all that is necessary is to program the machine and to provide material, all other work will be carried out by the mechanism now. Another example of the introduction of automation in small companies. Production in such companies is mainly focused on a certain category of consumers, so it is better to apply automation to such a process as document management or accounting. Many entrepreneurs also practice hiring third-party consulting companies where specialists from various fields are represented, which can also be considered as workflow optimization.

It should also be noted that automation can be not only in enterprises. People no longer pay attention to how much easier their daily lives are. How many opportunities are open due to the optimization of various processes. In recent years, the pandemic has spread across the planet, but this problem has not stood in the way of society. All educational institutions, the vast majority of government agencies, even restaurants and supermarkets have become automated. People did not stand in queues, but made online orders. This not only helped them to avoid the disease, but also significantly saved time and sometimes

money, because the goods on the Internet can be much cheaper. Pupils and students had the opportunity to study at home, and teachers used various platforms to test their knowledge [2].

With the rapid development of technology and society, the demand for business automation is growing. The traditional functionality of running business is no longer relevant, and therefore the number of requests for automation of various business processes in companies is growing [3].

A variety of resources are required to successfully complete a task that targets a specific business process. However, not every company is able to spend it on tasks of varying difficulty. There are a number of tasks that can be performed by modern programs, thereby facilitating the work of certain employees of the enterprise. As a result, there is an optimization of processes and increase the efficiency of the team as a whole. And thus increases the company's productivity, which will allow it to enter the field of new opportunities. New customers, orders and business partners are no longer so unattainable for small businesses due to automation [4].

Any innovation can not only improve the work of the enterprise, but also cause significant losses. Therefore, to prevent risks, workers need to be aware of the pros and cons of automation [9]:

- Structure (the company's work will be structured and systematic. The departments will be in order, and they will be able to give results on their own.)
- Strategic business development (instead of an endless operating routine, companies will focus on the strategic development of their business. It will also be possible at any time to assess the current situation and identify problems that hinder development.)
- Attracting employees (employees will become a real team that clearly sees the end result and is motivated to achieve it at all costs.)
- Systemic growth (due to the systematization of business processes and the coordinated work of all business departments will show stable profit growth.)

The most common disadvantages faced by companies include: high cost of automation (not all modern businesses can afford automation specialists), lack of organizational readiness of the team and poor previous experience.

It is possible to allocate a considerable quantity of tools and technologies which allow to change radically activity of the enterprise [8]:

1. Transition from local to global networks. (Ensuring interaction between users and computing resources.)
2. Database and client / server architecture.
3. Access to information.
4. Accelerated software development tools.
5. Email.
6. Office automation. (automation of office work, document management and document visualization to simplify the storage and dissemination of information)
7. Group work software.
8. Systems of automated design, modeling, production and planning of production resources.
9. Mobile computing.

In Ukraine, production automation has been particularly active since the second half of the 1950s. Since then, companies have begun to invest in new equipment, machinery and materials. In 1965, there were about 14 automated enterprises in Ukrainian industry. Every year this figure increased, and the types of automation improved and thus we can say that almost all production is automated [6-7].

Automation is undoubtedly an innovation for companies and entrepreneurs. Thanks to the requested business processes, it is possible not only to optimize the production or provision of services, but also to simplify internal processes. The most important resource today is time and the introduction of optimizations will help save it. Automation can be considered a valuable investment because of its efficiency. Process automation can fix errors and get work done faster than humans. Global research shows that companies can

save up to 75% on various tasks. Because of this, companies must determine which processes are best suited for automation and which are best handled by humans [5].

1.2 General characteristics of UMH Radiogroup

Ukrainian media holding is one of the key representatives on the Ukrainian media market. As a rule, the holding includes several companies and owns a controlling stake in their shares. Such huge ones not only get at their disposal small and large subsidiaries, but also make important decisions in business. One of the main tasks of such a holding is to manage investments in their companies for their further development [10].

The Ukrainian media holding, in turn, is part of United Media Holding. Thanks to various financial operations (placement of 15% of shares), the company thus attracted $ 45 million in investments, and capitalization amounted to $ 300 million. The company's management positively assessed the results of the transactions as it led to various foreign investments. This strategy made it possible not only to attract new partners, but also to enter the open market [13].

Ukrainian international multimedia group, producer of media content, UMH Radiogroup has been on the market for 27 years. Founded in the late 1990s, the Ukrainian media company produces content for all types of media: Internet, radio and periodicals, as well as retail and printing. The head office of the head company is located in Kyiv. Other offices and representative offices are located in 43 cities of Ukraine and Russia.

The history of the media holding begins in 1994, namely with the publication of the newspaper "Telenedelya". Since 1998, the publishing house has been expanding and new newspapers have been launched. In 2001, the first radio station was launched; UMH group becomes one of the largest holdings of the Ukrainian radio market with a daily audience of 4.5 million people, and in 2003 the development of a new Russian market begins [11].

In just 5 years, the media holding has achieved a leading position in the Ukrainian market. Today, resources cover about half of Internet users, and the group's share in the

online advertising market. UMH is one of the top 5 companies operating in the Ukrainian market. UMH's web project portfolio includes about 20 popular resources, including leading projects: tochka.net, korrespondent.net, Bigmir) net, i.ua, Football.ua.

The company's stock was placed on Frankfurt Stock Exchange. UMH group is WAN-IFRA member. Target markets of the company are adult Russian-speaking population of the former Soviet republics that constitutes about 155 million persons where the company currently covers 12% of the audience which is 18.6 million persons.

The UMH Radiogroup brand portfolio includes the following radio stations [12]:

- Jam FM (Ukrainian and Russian rock music for men 25-45);
- Voice of the Capital (information-analytical radio, "news" format);
- NRJ Ukraine (Ukrainian and foreign pop music for young people aged 16-30);
- Autoradio Ukraine (radio for motorists, men 25-55);
- Radio Pyatnitsa (radio with popular entertainment music);
- Nashe Radio (Ukrainian and foreign songs for the audience of 35-55, was sold to TAVR Media in 2020);
- Retro FM (world and Soviet hits of the twentieth century);
- Lounge FM (radio for business use).

The company's revenue-generating activities include:

- Sale of airtime for advertising;
- Introduction of sponsorship projects on the air;
- Sale of additional advertising blocks for VIP-clients;
- Sale of frequencies;
- Leasing of equipment for other radio stations;
- Information partnership and brand support.

With the active development of digital technologies, the Internet has become an important priority in the development of UMH GROUP's business. Since 2008, through acquisitions and development of its own projects, the company has formed a portfolio of

20 projects. UMH GROUP is the largest media group in Ukraine with more than 20 years of successful history, with a huge mission not only for clients but also for society [11]:

- Society mission (the main goal is to inform the public about all important news. Build a connection between society and government, the formation of state and nationally oriented public opinion.)

- Client mission (convenient forms of creating and spreading information for clients)

- Partners mission (mutual respect and mutual cooperation as the key to trust. The partnership should contribute to increased efficiency and mutual growth of business quality.)

- Employee mission (strong relationships with employees based on professional ethics, respect and responsibility.)

Thanks to the detailed relations between the holding and the main clients, as well as the clear mission of the company, they were able to bring not only popularity to the media holding, but also high income. Numerous projects, continuous cooperation and many years of experience prove that UMH Radiogroup is a fairly competitive company.

1.3 Terms of reference for creating the service

Data analytics in any enterprise plays an important role for development. Thanks to the collected data, employees can analyze the financial condition of the company, identify weaknesses and strengths, and where improvements are needed. Of course, a detailed and accurate analysis requires a large sample of data. However, the question arises where it will be more convenient to process this large amount of information. Thanks to the latest developments of large corporations, such as Google, users have the opportunity to use the proposed package with various services for smooth work with documents.

One of the most commonly used is Google Spreadsheets. In this application, users can work with spreadsheets and save to Google Drive for further modification and use

by others [14]. For a detailed understanding of what is the service Google Spreadsheets below are the pros and cons of this application [16]. (tab 1.1)

Table 1.1 – Advantage and Disadvantage of Google Spreadsheets

Advantage	Disadvantage
• Free unlimited resources Google Sheets is a free, open source application. It is also possible to use other free services from the presented package.	• The need for knowledge of formulas For some operations, such as balance sheet, knowledge of formulas is required.
• Easy adaptation For analytics, as well as for organizing accounting tables, this is one of the simplest and most understandable tools.	• Complexity in the amount of data Possible delays in information processing due to the large amount of tribute
• Data security Working in the application, the user has the opportunity to save data on Google Drive. User can also both restrict and expand access to the edited document.	• Minimum number of functions Some users compare Google Sheets to Excel, that is, it means a narrow set of functions for processing data.
• Analytics and management reporting The tabular form allows to analyze and read data. It is possible to use various formulas.	• Weak data security Although there is the possibility of narrow access to the files, this does not mean that the risk of hacking is gone.
• Integration with external services The application allows to interact with other services and exchange data automatically.	• Inconveniences in the application used When adding a new ad campaign, all the data below had to be shifted and monitor the correctness of changes

After analyzing the pros and cons, it can be concluded that Google Spreadsheets is definitely a convenient and affordable alternative. The user is free to create, edit documents, analyze data. However, the above disadvantages can turn into a problem. For large companies it will be more convenient to use a reliable service that is able to analyze a large array of data. Security is also a prerequisite. One of the most serious problems is internet fraud and cybercrime. Google Spreadsheets service, unfortunately, is equipped with a weak security system [15]. This could damage and

rob the data. Employees spent time setting up local access and the necessary links. However, previous experience shows that these links can be viewed by a person who should not have access to this information.

Therefore, the management of UMH Radiogroup decided to create a service to which only those people who have a login and password to log in would have access. This system of protection would be an excellent implementation against various cyber threats. It is an automated service for analytics of advertising manifestations. This service will not only help to store, edit and analyze a large array of data. Also, thanks to specially designed protection, important company information will not be able to be attacked by cybercriminals.

The purpose of the project is to collect information on all advertising projects of the Company (hereinafter referred to as AC (advertising company)), analytics and use of real-time service to refer to the current AC at each radio station, their placement on resources, etc. The actual analogue of Google Sheet Excel but with a more powerful and flexible functionality.

This service consists of the following elements:

From the left side in the column goes blocks with the name: portal, sites and mobile applications (it is possible to add others). Each of these columns are divided into blocks where blocks should be dynamic to edit. In each block, the resources of the UMH radiogroup according to their location, such as the site site consists of three resource stations (Lounge FM, NRJ Ukraine, Radio Friday). Each unit of the current resource consists of lines where the advertising manifestation of the AC is placed, this block should also be dynamically edited (the number of manifestations for the station, its name, etc., for example - "branding" or "Banner 1024x900"). Also on the left side is the logo of the company "UMH RADIOGROUP".

The upper part of the workspace is divided into the dates and months. The date of the current month goes to a row. The moon container according to design should be able to change the color, this is required for certain separation from all other months (color change occurs from the administration)

The actual workspace of the service consists of a grid where the user has the ability to isolate the desired number by settings in the admin panels of cells according to:

1. Current date of AC
2. Current AC station (NRJ Ukraine station as an example)
3. Current advertising manifestation (eg POPUP)
4. Current resource (site, mobile application, etc.)

When you hover on a AC, it is necessary to display a company logo that is now placed, the placement is highlighted, if you click on the AC (on the line), the comment box is opened where the information is located to the number of views, clicks, accommodation date, and expiration date, maybe others required. In the comment box, there is a button for editing a comment, it is in the right upper corner (three points).

2 IMPLEMENTATION OF SERVICE OF AUTOMATION OF COLLECTION AND ANALYSIS OF ADVERTISING MANIFESTATIONS

2.1 Stack of technologies used in the development of the service

One of the first stages in the development of the presented service is the choice of database. Even the simplest service or mobile application cannot exist without a database. Therefore, the MariaDB database was used in the creation of this analytical service. This is one of the few most widely used databases. For a better understanding of the functionality, the following is a comparative description of the two databases MariaDB and MySQL. MariaDB has added optimizations that improve database performance over the original MySQL [18-19]. (tab. 2.1)

Table 2.1 – Characteristics of optimization of MariaDB

Optimization	Characteristic
Representation	In MariaDB, only the tables that are needed for the query are requested. While MySQL, when querying, presents all tables, and even those that may not be required
Column storage	MariaDB provides tables in the form of columnar storage that are used for big data analytics.
Virtual table columns	Virtual columns in MariaDB are capable of performing calculations at the database level. This allows you to transfer typical calculations from applications to the database server. This feature is not available in MySQL.
Storage backend	MariaDB provides several powerful storage engines (XtraDB, Aria, etc.). To configure these storage engines for MySQL, you need to install them manually.

Continuation of table 2.1 – Characteristics of optimization of MariaDB

Compatibility	MariaDB intends to maintain high compatibility with MySQL, ensuring accurate compliance with versions of MySQL. This opens the possibility of uninterrupted migration to MariaDB without any changes in the code base of the program.

Based on the above, we can conclude that MariaDB is undoubtedly quite a powerful tool that provides many unique features that are not available in MySQL [17]. Although the developers of MariaDB are the same ones who created MySQL, availability of these optimization will increase database performance and it may become worthy replacements in the future. The picture below shows the structure of the database. (pic. 2.1)
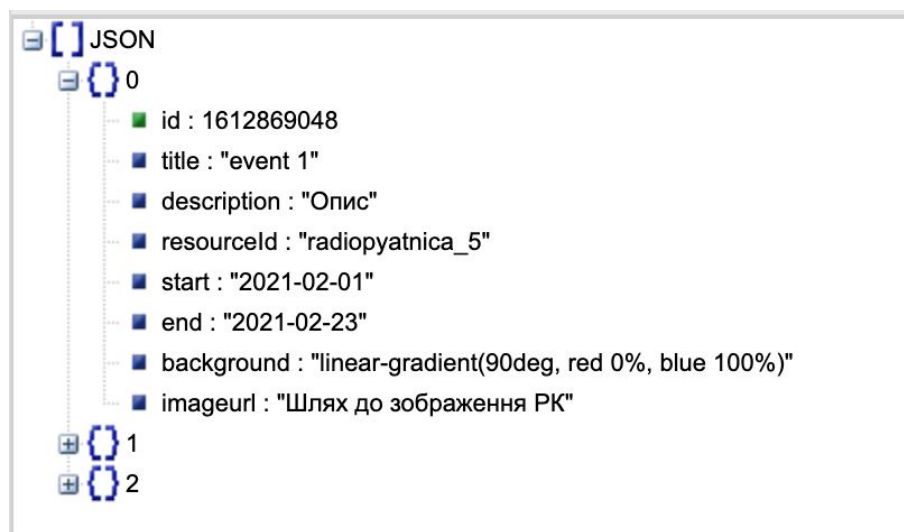
Picture 2.1 - The structure of the database

The database is in json format. Description of the keys is represented below:

- id - unique identifier of the entry;
- title - the name of the advertising campaign;
- description - description with analytical data;
- resourceId - station and format identifier (branding, PopUp, 240x350, etc.);
- start - start date of the advertising campaign;

- end - the end date of the advertising campaign;

- background - brand colors of the advertising campaign;

- imageurl - advertising campaign image.

In this project, a task manager was also used to automatically execute frequently used Gulp tasks, and npm was used to install the libraries, which is included in Node.js (an asynchronous JavaScript environment designed to program web applications to handle multiple concurrent connections.) Logos were created with Font Awesome, the most popular web icon set and toolkit [20-22].

The next step is development of frontend and backend. Any site, mobile application or service consists of server and client parts. The Backend part of the site is instructed to receive information, data and HTTP requests from the client part, processes them and performs the appropriate actions. The backend is located on a remote server and ensures the smooth operation of the site [23]. The frontend is responsible for what the user sees (buttons, panels, data visualization). Also displays the response to the user's request as an HTML page [24]. To create the service presented in the thesis, the following tools were used:

- Frontend - HTML, CSS, JavaScript, Bootstrap 4 grid, libraries jQuery, FullCalendar;

- Backend - Laravel 8.x, Maria DB

Since the creation of the backend part is quite problematic due to the need for deep knowledge of programming languages and architecture, many developers use frameworks that are a ready-made structure of the server side of the site with a large set of tools, functions and data. In this project, as already described earlier, Laravel was used. Laravel is a free open source web framework designed for development using the MVC (Model View Controller) architectural model [36-37]. The framework makes the work of programmers much easier due to its wide range of functions. The disadvantages include the time spent on development, as after the installation of the framework there are only basic controllers, migration, you need to create and write code yourself. But this can be considered an advantage, because the developer knows what and how it works.

When creating the client part (frontend) of the service, the following tools were used [25-32] (tab. 2.2)

Table 2.2 - Used tools in the development of service

Used tools	Characteristic
HTML - site content	HyperText Markup Language (HTML) is responsible for the content of the site. This tool determines what kind of information and in what part of the web page it will be located.
CSS - site design	Neither HTML nor CSS is actually a programming language. It is not a markup language - it is a stylesheet language. With this tool, you can selectively apply styles to elements in HTML documents.
JavaScript - site interactivity	JavaScript is a language that allows complex things to be done on a web page. For example, not only displaying static content, but also moving tables / 2D and 3D animation, etc.
jQuery is a JavaScript language framework	A library with a set of ready-made functions that simplify writing JavaScript code (selection of an existing part of the code to make it easier to work).
Bootstrap	Bootstrap is an open source HTML, CSS, and JS framework that developers use to quickly build responsive website designs and web applications.
FullCalendar	FullCalendar is an open source jQuery plugin. Wide functionality and easy configuration of the framework allows you to work with most date and time formats.

The software intermediary API was also used in the development of the service. It allows you to collect statistical information (clicks of views, etc.) advertising company from mobile applications of radio stations. In the further development of this service it is planned to integrate the API with the developed project. An example of such integration could be the creation of an advertising campaign using the service, when creating the

appropriate links to the API are generated and then used to collect statistical information from mobile applications or sites.

One of the advantages of the API is the level of security. User data will not be fully available to the server. Due to the existence of the API, user data is sent to the server, and after their detailed processing is again sent to the user in a convenient form. Many large companies such as Google, eBay, Salesforce.com, Amazon and Expedia use this technology to increase profits [35].

2.2 Description of the structure and functionality of the service

For each company, the collection and analysis of existing information is one of the important requirements for successful operation and further development. UMH Radiogroup's analytical service was created to collect information on all the company's advertising projects, as well as analytics and use the service in real time to mark the current advertising campaigns at each station of the radio group.

The analytical service was developed in accordance with the terms of reference provided by UMH Radiogroup. The project was implemented on the basis of the FullCalendar plugin interface [33-34].

According to the information provided in the terms of reference, when creating an analytics tool in accordance with the rules of commercial secrecy, the company must be protected from third parties. Security must consist of a password and login and all users are registered by administrator manually. Also, only the administrator has the ability to edit comments and add new advertising campaigns to the service.

This is a service for use on a permanent basis, so its need to create a data archive for the entire year of advertising campaigns with the ability to view and change them at any time.
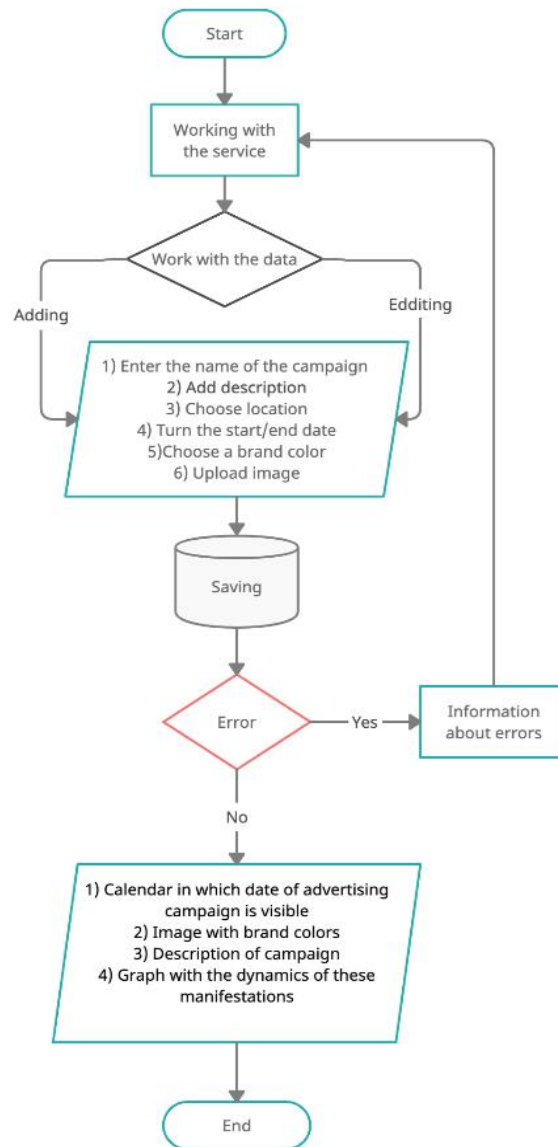
The main page (pic 2.2) of the service presents a table in the form of a calendar. In the upper right corner there are navigation buttons with which the user can select any year or return to the current year. In this way, employees will be able to track future and current

advertising manifestations and change it. There is also an "Add entry" button that allows users to add new advertising projects.

The picture below (pic. 2.3) shows the algorithm for adding a new advertising campaign entry.


Picture 2.2 - Screenshot from the main page of the analytical service of UMH Radiogroup

Picture 2.3 - The algorithm for adding a new ad campaign entry

Execution of this algorithm of actions will provide further work with advertising campaigns. This table is divided into columns that represent radio stations and advertisements. The "Ads" column is divided into blocks where the advertising is placed. As an example (pic 2.4), the table shows what the planned advertising events might look like. When pressed, detailed information about it will be specified.
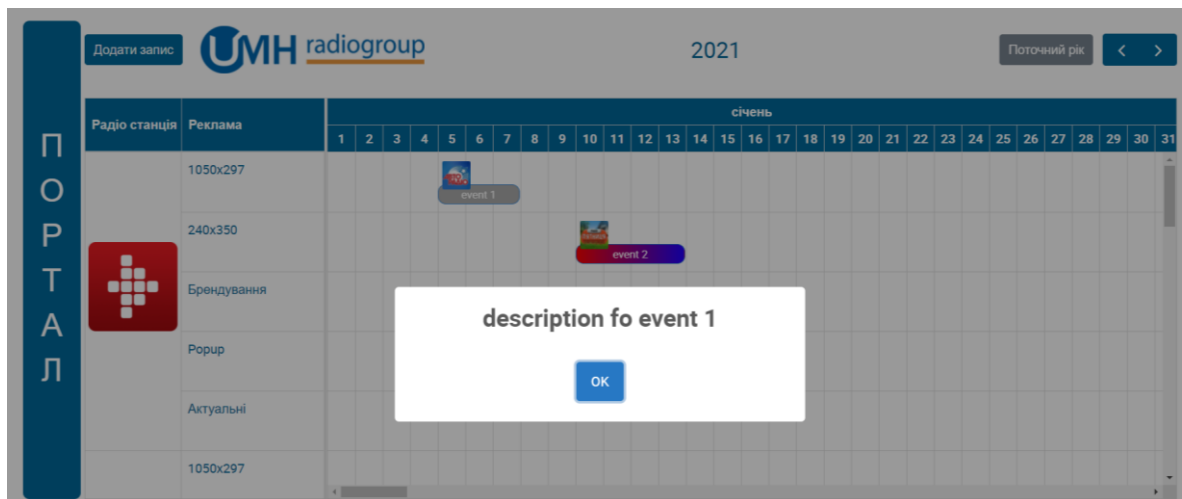
Picture 2.4 – Screenshot of detailed information of the planned advertising events

As already mentioned, the "Add Entry" button allows you to add new advertising manifestations (pic. 2.5). When pressed, a window appears where there are free spaces to fill. You can change the name and color of the advertising campaign, select the start and end dates of advertising, download the desired file and add the necessary description.
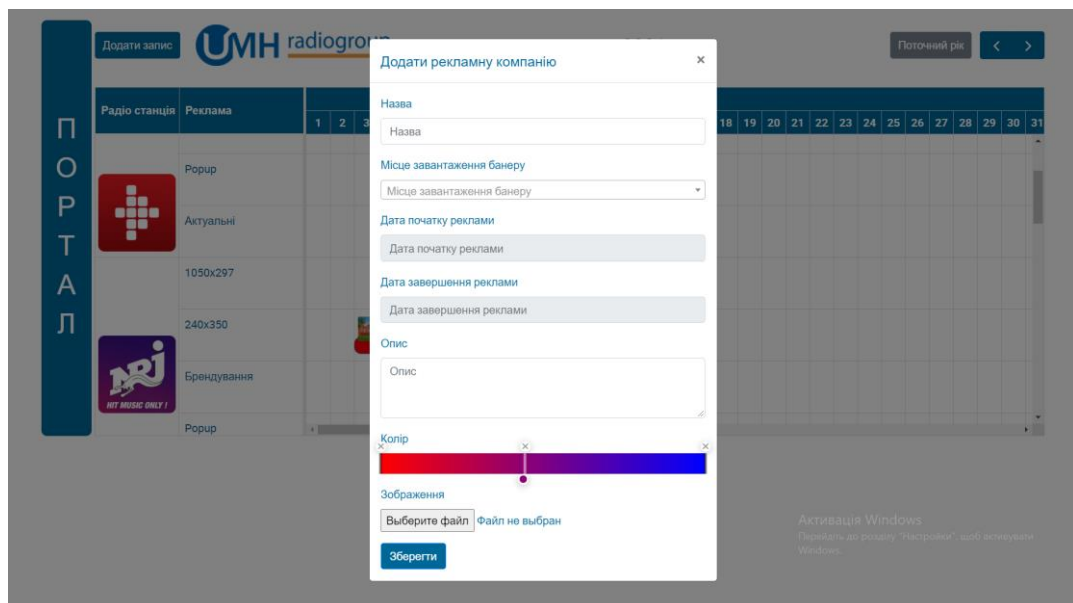
Picture 2.5 – Screenshot of the window for adding a new advertising campaign

How other specified characteristic look like are represented at appendix B. Also, when you click on the brand name, the system returns the user to the current date. (pic 2.6)

Picture 2.6 – Screenshot of the result of clicking on the brand name

Thus, this seemingly simple but convenient analytical service will not only provide reliable data protection, but also help in their analysis and structuring.

2.3 Estimation of economic efficiency of analytical service

To understand the need and feasibility of creating and implementing an analytical service, it is necessary to assess the economic efficiency. The ratio of the final results of the economic system to the resources expended is economic efficiency. Many entrepreneurs underestimate this figure when starting automation and optimization of companies. However, thanks to this indicator, the manager can understand how much he can save not only invested funds but also resources.

Cost-effective calculation methods vary depending on the industry, enterprise and type of product. The economic effect of automation can only minimize costs because automated implementations are not a source of profit. The main effect of the introduction of automation tools is to reduce the use of various resources of the enterprise, primarily by increasing the efficiency of management and reducing labor costs for the implementation of the management process. For most enterprises, the economic effect appears in the form of savings in labor and financial resources obtained from [38-40]:

- reducing the complexity of calculations;
- reduction of various labor costs;
- saving on consumables;
- reduction of employees of the enterprise.

To calculate the efficiency indicator, the following formula is used (formula 2.1):

$$E = S - K_e * K \tag{2.1}$$

Where S - annual savings, UAH; K_e- normative coefficient of efficiency of capital investments, which is equal to 0.35 for IT-sphere; K - specific capital investments in fixed and current assets.

First of all, for calculating capital investments, the following formula is used (formula 2.2):

$$K = K_p + K_{pi} \tag{2.2}$$

Where K_p- cost of the project, K_{pi} - cost of project implementation.

To determine the cost of the project, the tariff of the minimum hourly wage is used - 36.11 UAH. Also, the number of working days for the project - 20 days, and the number of working hours - 8 hours.

$$K_p = 36.11 * 20 * 8 = 5777.6$$

The following steps were taken in creating the project. (tab. 2.3)

Table 2.3 – Name of steps and it duration which were taken in creating the project.

Name of works	Duration of days
Development, analysis and execution of technical specifications	3 days
Study of literature, ways of implementation	3 days
Algorithm development and creation	5 days
Program improvements	5 days
Economic justification	1 day

With that information it possible to calculate cost of project implementation:

$$K_{pi} = (3 + 3 + 5 + 5 + 1) * 36.11 = 613.87$$

And now specific capital investments equals:

$$K = 5777.6 + 613.87 = 6391.47$$

Next step is to calculate annual savings (formula 2.3):

$$S = E_b - E_c \qquad (2.3)$$

Where E_b - expenses for the base year, E_c - estimated costs for the year.

To calculate the expenses for the base year, it must be used the number of working days per year - 251 days, the time to process the order by the employee on average - 6 hours.

$$E_b = 251 * 6 * 36.11 = 54381.66$$

In case of implementing optimization of production, the time to process the order will decrease to 2.5 hours, so the expenses for the base year will change.

$$E_c = 251 * 2.5 * 36.11 = 22659.03$$

So, according to the formula (2.3) annual savings equal:

$$S = 54381.66 - 22659.03 = 31722.63$$

Now, it possible to calculate the efficiency indicator according to the formula 2.1.

$$E = 31722.63 - 0.35 * 6391.47 = 29485.62$$

Another indicator for assessing efficiency is the coefficient of economic efficiency of capital expenditures (formula 2.4):

$$R_{ce} = \frac{S}{K} \qquad (2.4)$$

$$R_{ce} = \frac{31722.63}{6391.47} = 4.96$$

Also it possible to calculate another indicator of efficiency of information systems implementation such as payback period (formula 2.5):

$$P_p = \frac{K}{S} \qquad (2.5)$$

$$P_p = \frac{6391.47}{31722.63} \approx 0.2$$

According to the developed calculations, the economic effect of the introduction of the automated service of analytics of advertising manifestations will be 29485.62 UAH, and it will pay off in about 2 months.

CONCLUSION

Any enterprise, company, small or large business is a number of different processes. From customer service or the production of certain products to document management, each of these processes requires a number of important resources. The most valuable resources for companies are first of all time and money. By saving time in production, as a result, profit can be increased. Thus came the era of automation and optimization of various business processes.

Thanks to the latest technologies and developments of people, even such a process as hiring new employees does not become so troublesome and stressful. Large enterprises are not only introducing new technologies to replace human labor in order to optimize work. A variety of automated services are also created for data analysis or for easy communication.

As a result of the qualification work, the selected subject area was studied in detail. On the example of the given task submitted by the media holding UMH Radiogroup it was clearly analyzed what is the automation of business processes, what are the pros and cons of this improvement. The study found that although the media company has been on the market for over 27 years, the introduction of automation does not bring significant losses. The company remains one of the leaders in its field. The work raises a number of questions, namely the study of the subject area, analysis of the media holding, development of analytical services and evaluation of its economic efficiency.

The first section presents a study of the state of business process automation. The pros and cons of the introduction of automation in production were considered. Also the characteristic of UMH Radiogroup and formation of requirements to analytical service of advertising displays in the form of the technical task is resulted.

The second section delves into the development of the service. The technologies used for creation and implementation are described in more detail. Based on the existing FullCalendar framework, the appearance of the analytical service was created. Also based

on the MariaDB database, which differs in its optimization and speed. Also in the second section the structure and functionality of the service are described in detail.

One of the important components of various automated innovations is the evaluation of economic efficiency. After calculating these indicators, it is possible to understand whether it is worth spending resources on business process automation, whether this action will lead to losses. The second section describes in detail that at low cost, the media company will be able to save up to 30,000 UAH per year, and will pay off in about 2 months.

Thus, the purpose of the qualification work can be considered achieved, and the tasks - fully fulfilled.

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APPENDIXES

Appendix A

(mandatory)

ABSTRACT OF QUALIFICATION WORK

SUMMARY

Hrek K. A. Development of UMH Radiogroup advertising automation collection and analysis automation service - Bachelor's qualification work. Sumy State University, Sumy, 2021.

The main purpose of the study is to develop an automated service for analytics of advertising manifestations. The essence of the process of business process automation is investigated in the work, the analysis of activity of the enterprise was carried out. The requirements for the system were given and the choice of technologies for service development was made. A detailed description of the structure and functionality of the service was given. An assessment of the economic efficiency of the developed analytical service.

Keywords: automation, analytical service, technologies, technological optimization.

АНОТАЦІЯ

Грек К. А. Розробка сервісу автоматизації збору та аналізу аналітики рекламних проявлень UMH Radiogroup. – Кваліфікаційна робота бакалавра. Сумський державний університет, Суми, 2021 р.

Основною метою дослідження є розробка автоматизованого сервісу аналітики рекламних проявлень. У роботі досліджено сутність процесу автоматизації бізнес процесів, проведений аналіз діяльності підприємства. Були наведені вимоги до системи та був здійснений вибір технологій для розробки сервісу. Був наведений детальний опис структури та функціоналу сервісу.

Проведена оцінка економічної ефективності розробленого аналітичного сервісу.

Ключові слова: автоматизація, аналітичний сервіс, технології, технологічна оптимізація.

Appendix B

(informational)

Analytical service pages
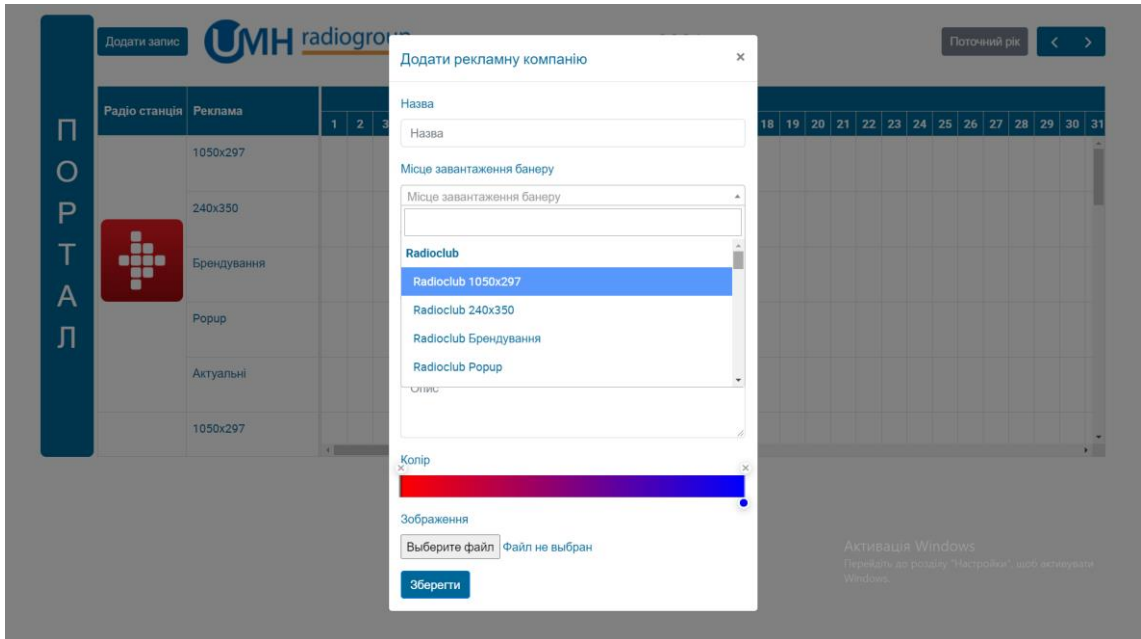
Picture B.1 - Screenshot of the window for editing a new advertising campaign
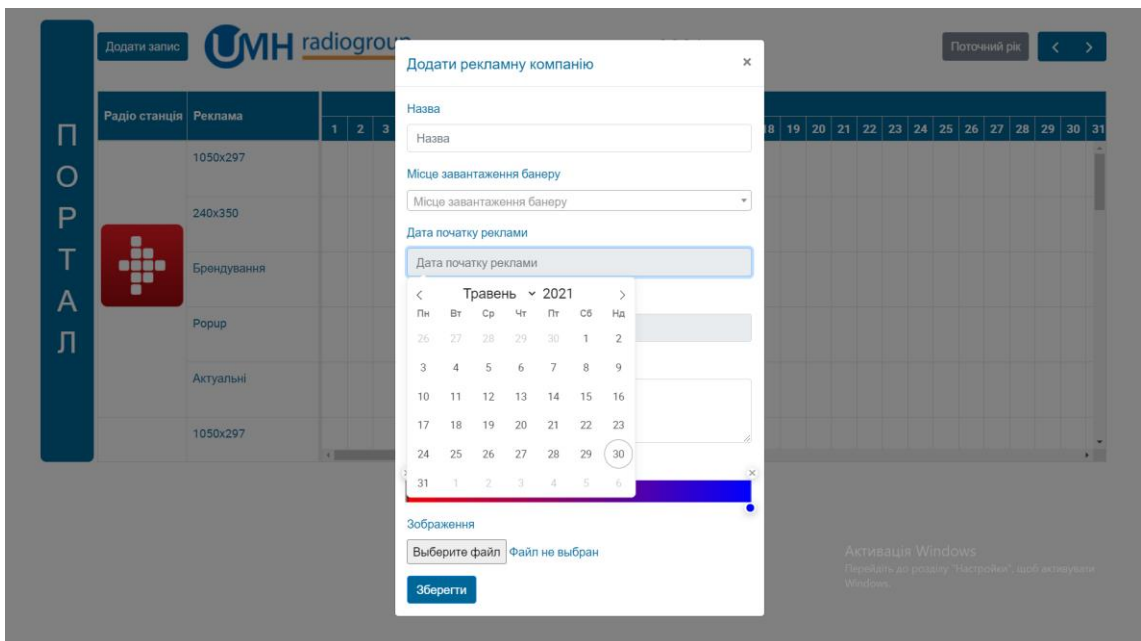
Picture B.2 - Screenshot of the window for editing the date of starting a campaign

Picture B.3 - Screenshot of the window for editing the date of ending a campaign

Picture B.4 - Screenshot of the window for editing the color of a campaign

Appendix C

(informational)

```php
1   <?php
2   header("Content-Type: application/json");
3   header('Access-Control-Allow-Origin: *');
4
5   $jsonFile = __DIR__ . "/db.json";
6
7
8   if (
9       isset($_POST['id']) &&
10      isset($_POST['resourceId']) &&
11      isset($_POST['start']) &&
12      isset($_POST['end'])
13  ) {
14
15      $id = $_POST['id'];
16      $resourceId = $_POST['resourceId'];
17      $adv_date_start = $_POST['start'];
18      $adv_date_end = $_POST['end'];
19
20      $AdditionalArray = array(
21          'id' => $id,
22          'resourceId' => $resourceId,
23          'start' => $adv_date_start,
24          'end' => $adv_date_end
25      );
26
27      $data_results = file_get_contents($jsonFile);
28      $tempArray = json_decode($data_results, true);
29      $index = array_search($id, array_column($tempArray, 'id'));
30
31      $tempArray[$index]['resourceId'] = $resourceId;
32      $tempArray[$index]['start'] = $adv_date_start;
33      $tempArray[$index]['end'] = $adv_date_end;
34
35
36      $jsonData = json_encode($tempArray);
37      file_put_contents($jsonFile, $jsonData);
38  }
39
```
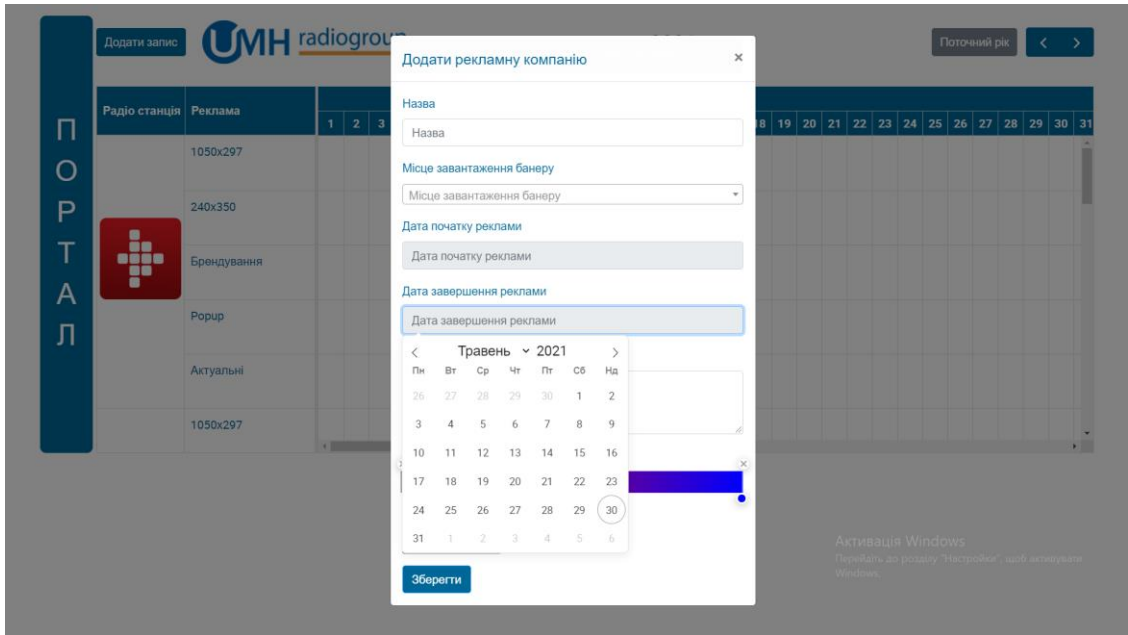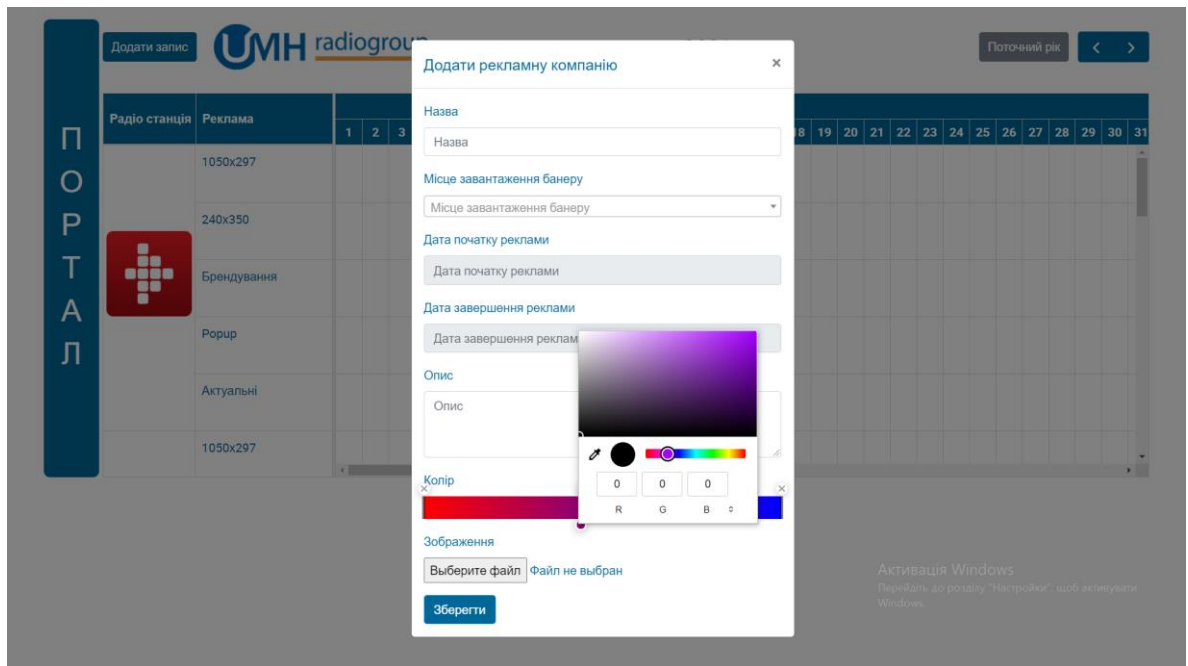
Picture C.1 - Form code "editdata"

```php
1   <?php
2   header("Content-Type: application/json");
3   header('Access-Control-Allow-Origin: *');
4
5   $jsonFile = __DIR__ . "/db.json";
6   $data_results = file_get_contents($jsonFile);
7
8   echo $data_results;
9
```
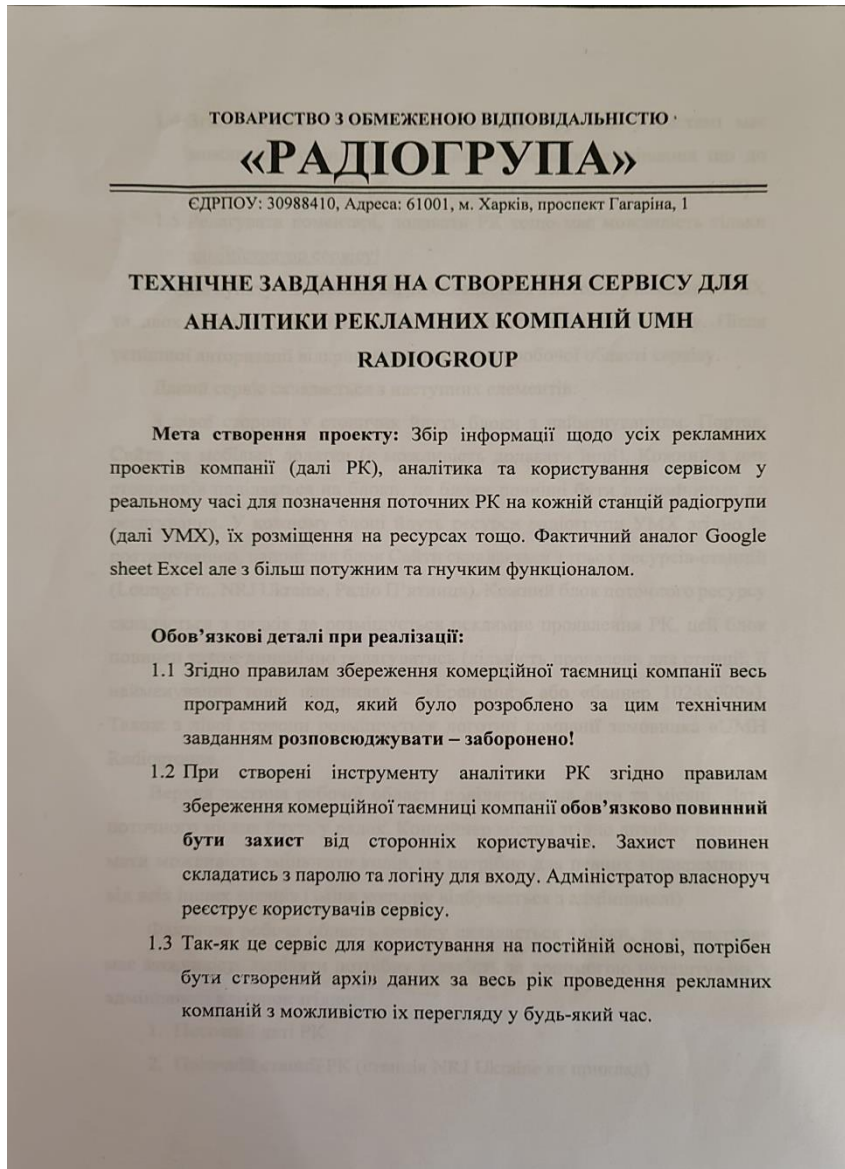
PictureC.2 – "events"

```php
1   <?php
2   header("Content-Type: application/json");
3   header('Access-Control-Allow-Origin: *');
4
5   $actual_link = (isset($_SERVER['HTTPS']) ? "https" : "http") . "://$_SERVER[HTTP_HOST]";
6   $dir = __DIR__ . '/uploads/';
7   $jsonFile = __DIR__ . "/db.json";
8
9   if (!is_dir($dir)) {
10      mkdir($dir, 0777, true);
11  }
12  $allowed = array('jpg', 'jpeg', 'png', 'gif');
13
14  if (
15      //     // isset($_POST["antiSpam"])
16      //     // && empty($_POST["antiSpam"])
17      isset($_POST['title']) &&
18      isset($_POST['desctiption']) &&
19      isset($_POST['station']) &&
20      isset($_POST['adv_date_start']) &&
21      isset($_POST['adv_date_end']) &&
22      isset($_POST['background']) &&
23      isset($_FILES['img']) &&
24      $_FILES['img']['error'] == 0
25  ) {
26
27
28
29      $title = $_POST['title'];
30      $desctiption = $_POST['desctiption'];
31      $station = $_POST['station'];
32      $adv_date_start = $_POST['adv_date_start'];
33      $adv_date_end = $_POST['adv_date_end'];
34      $background = $_POST['background'];
35      $id = time();
36
37
38      $tmp_name = $_FILES['img']['tmp_name'];
39      $name = basename($_FILES['img']['name']);
40      $targetPathFile = $dirUpload . $_FILES['img']['name'];
41
42      $extension = pathinfo($_FILES['img']['name'], PATHINFO_EXTENSION);
43
44      if (!in_array(strtolower($extension), $allowed)) {
45          echo '{"status":"error allowed"}';
46          exit;
47      }
48
49      if (move_uploaded_file($tmp_name, $dir . $id . '_' . $name)) {
50          $AdditionalArray = array(
51              'id' => $id,
52              'title' => $title,
53              'description' => $desctiption,
54              'resourceId' => $station,
55              'start' => $adv_date_start,
56              'end' => $adv_date_end,
57              'background' => $background,
58              'imageurl' => $actual_link . '/umh_diplom/uploads/' . $id . '_' . $_FILES['img']['name'],
59              'path' => $dir . $targetPathFile,
60          );
61
62          if (!(file_exists($jsonFile))) {
63              $tempArray[] = $AdditionalArray;
64              $jsonData = json_encode($tempArray);
65              file_put_contents($jsonFile, $jsonData);
66          } else {
67              $data_results = file_get_contents($jsonFile);
68              $tempArray = json_decode($data_results, true);
69              $tempArray[] = $AdditionalArray;
70              $jsonData = json_encode($tempArray);
71              file_put_contents($jsonFile, $jsonData);
72          }
73          echo '{"message":"successful"}';
74          exit;
75      }
76  }
77
78  echo '{"message":"error"}';
79  exit;
80
```
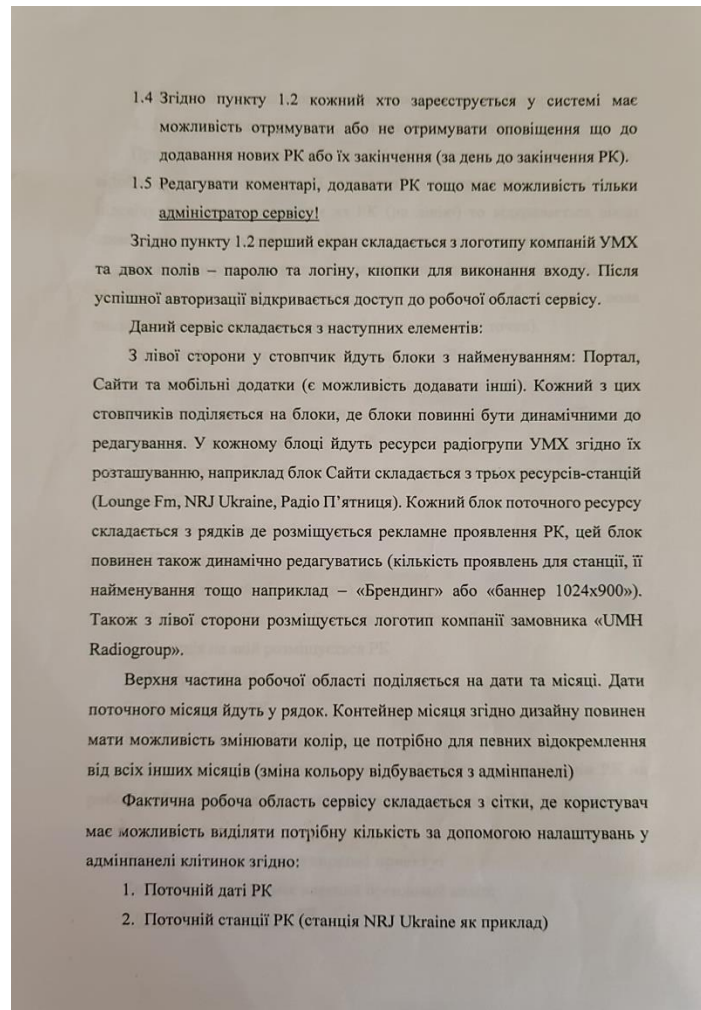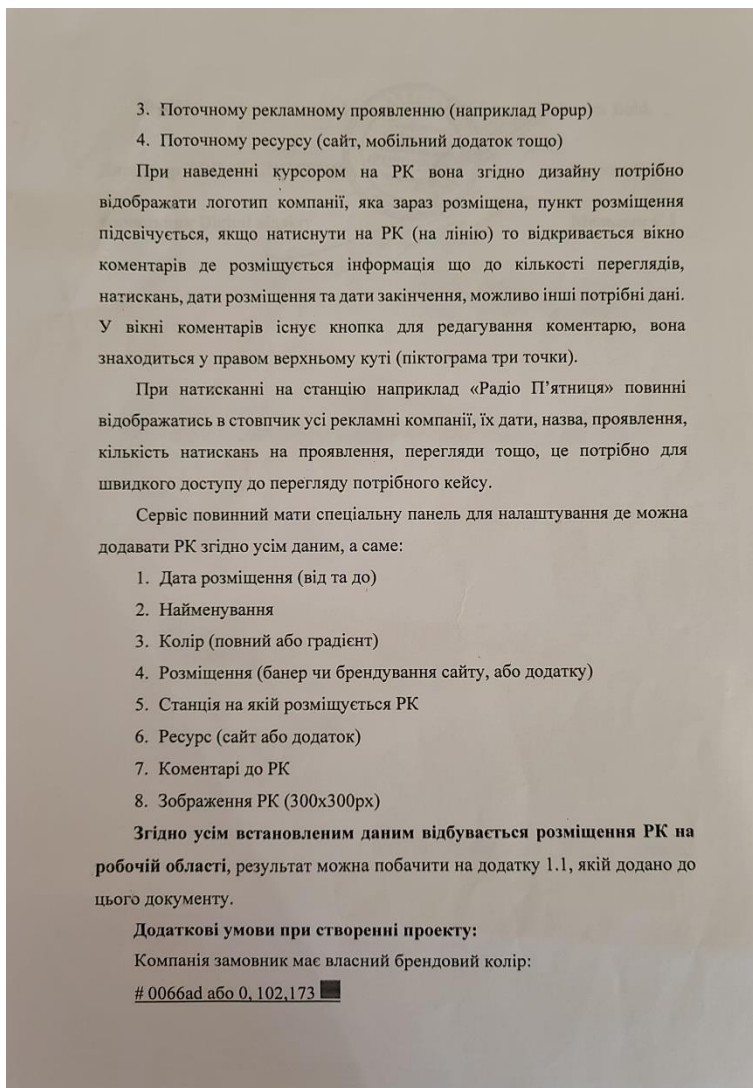
Picture C.3 - Form code "senddata"

Appendix D

(informational)

Picture D.1 - Terms of reference for creating the service

1.4 Згідно пункту 1.2 кожний хто зареєструється у системі має можливість отримувати або не отримувати оповіщення що до додавання нових РК або їх закінчення (за день до закінчення РК).

1.5 Редагувати коментарі, додавати РК тощо має можливість тільки адміністратор сервісу!

Згідно пункту 1.2 перший екран складається з логотипу компаній УМХ та двох полів – паролю та логіну, кнопки для виконання входу. Після успішної авторизації відкривається доступ до робочої області сервісу.

Даний сервіс складається з наступних елементів:

З лівої сторони у стовпчик йдуть блоки з найменуванням: Портал, Сайти та мобільні додатки (є можливість додавати інші). Кожний з цих стовпчиків поділяється на блоки, де блоки повинні бути динамічними до редагування. У кожному блоці йдуть ресурси радіогрупи УМХ згідно їх розташуванню, наприклад блок Сайти складається з трьох ресурсів-станцій (Lounge Fm, NRJ Ukraine, Радіо П'ятниця). Кожний блок поточного ресурсу складається з рядків де розміщується рекламне проявлення РК, цей блок повинен також динамічно редагуватись (кількість проявлень для станції, її найменування тощо наприклад – «Брендинг» або «баннер 1024x900»). Також з лівої сторони розміщується логотип компанії замовника «UMH Radiogroup».

Верхня частина робочої області поділяється на дати та місяці. Дати поточного місяця йдуть у рядок. Контейнер місяця згідно дизайну повинен мати можливість змінювати колір, це потрібно для певних відокремлення від всіх інших місяців (зміна кольору відбувається з адмінпанелі)

Фактична робоча область сервісу складається з сітки, де користувач має можливість виділяти потрібну кількість за допомогою налаштувань у адмінпанелі клітинок згідно:

1. Поточній даті РК
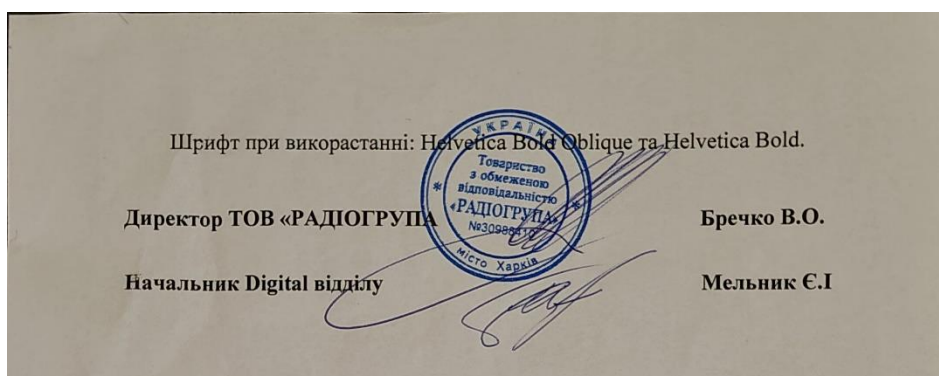2. Поточній станції РК (станція NRJ Ukraine як приклад)

Picture D.2 - Terms of reference for creating the service

Picture D.3 - Terms of reference for creating the service

Picture D.4 - Terms of reference for creating the service