Project of an information system for restaurant business management⋆

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Abstract

Information technologies provide automated systems for enterprises that can help companies track customer interactions and allow employees to quickly process customer data. This concept is known as Customer Relationship Management (CRM), and when properly implemented, it enhances companies' ability to achieve the ultimate goal of customer retention, thereby achieving strategic improvement in comparison to competitors. The article discusses the main trends in the development of CRM systems for the restaurant business. Implementing specialized software can address the following tasks for restaurants: organizing staff work and monitoring the quality of task execution, optimizing the operation of all establishment workstations, maintaining a customer database, tracking orders, controlling inventory turnover, and generating reports, among others. Integrating artificial intelligence and machine learning in the restaurant business sector enables data processing optimization, assisting in predicting customer demand and preferences based on their orders and behavior. Modern CRM systems in business are actively used to analyze data aimed at understanding customer preferences, enabling the creation of personalized offers and effectively implementing targeting campaigns. During the project implementation, the functionality, advantages and disadvantages of management systems for the restaurant business were analyzed. The information system for the restaurant was modeled using UML diagrams, including the requirements for the IT project and the design procedure.

Keywords

restaurant business, information technologies, CRM systems, artificial intelligence, UML diagrams

1. Introduction

A CRM system is an information system designed to automate a company's business processes, ensuring that all its departments interact with customers at the level determined

by the CRM ideology. By automating processes, the system helps companies build a more effective dialog with customers, avoid mistakes in their work, and ultimately provide better services throughout the entire life cycle.

A luxurious restaurant, a cozy pub, a small cafe – all of these are integral systems that require clarity and focus. An attractive menu and a pleasant atmosphere are only half the battle. The ability to organize the work of the establishment plays an important role. Accuracy of calculations, coordination of goods turnover, card servicing and organization of a discount system, as well as control of warehouses and personnel – all this facilitates the implementation of a restaurant business automation system presented in the form of software.

At the current stage of development of customer relationship management systems, advanced technologies such as artificial intelligence (AI) and machine learning (ML) play a key role. These technologies are being integrated to optimize the processing of large amounts of data and develop predictive models of customer interaction based on past experience and behavior.

Modern restaurant business management systems tend to focus on understanding the collected customer data and transforming it into knowledge. They effectively use the concept of big data to target companies and develop individually tailored offers.

2. Formulation of the problem

Optimization of customer relationship management (CRM) in the restaurant business is gaining new dimensions through the introduction of innovative technologies. Trends in the development of CRM systems in the restaurant industry are determined by the need for effective customer interaction and optimization of internal business processes. The use of modern CRM solutions allows restaurants not only to store customer data, but also provides automated management of orders, inventory, and other business components. The use of analytical tools and artificial intelligence in CRM helps to make personalized offers to customers and predict their preferences.

However, despite the obvious advantages, there are a number of problems that complicate the full implementation of CRM systems in the restaurant business. Poor integration with existing technology platforms, high implementation costs, and insufficient staff qualifications can be an obstacle to the successful implementation of CRM in restaurants. This issue requires attention and further research to determine the optimal strategies for developing and implementing an IT project of an information management system in the restaurant business in order to increase the efficiency of customer interaction and business process management.

3. Analysis of recent studies and publications

According to the results of a study aimed at assessing the popularity of CRM systems and their fundamental functionalities, several key aspects can be identified. First and foremost, users highly value contact management capabilities, which accounts for 94% of responses. In addition, interaction tracking (88%) and scheduling/reminders (85%) are important [1].

These results show that CRM system users value the ability to effectively manage contacts and interact with customers. About a quarter of the respondents show interest in using sales pipeline and funnel tracking functions. These data emphasize the importance of developing and improving CRM systems that meet the specific needs of users in managing customer relationships.

It's worth noting that some CRM users are showing interest in more sophisticated and advanced features, such as sales automation, a central database, email marketing, customization, and reporting/analytics. Maximizer Software managing director Mike Richardson discusses the importance of a balanced approach between complexity and a centralized view of the customer, arguing that the best systems are rapidly becoming more complex, but all customer touchpoints should be centralized for a single customer experience [2].

Moreover, Salesforce research indicates that for 85% of customers, it is the experience that a company provides that is important, compared to products and services. Using CRM technology to improve the customer experience includes the use of live chat for fast support, a data bank to display the complete customer journey, and automated knowledge bases. It is also important to synchronize customer data between different applications to create a complete customer image [3].

Recent studies show that the integration of artificial intelligence and machine learning allows for improved data processing, making predictions of customer interaction based on their past experience and behavior. Modern CRM systems are becoming more focused on understanding and analyzing collected data to target campaigns and create personalized offers. In addition, the use of the Internet of Things (IoT) allows you to collect data on customer behavior and automate interaction processes.

Artificial intelligence in CRM involves the use of machine learning techniques to extract information from data, recognize patterns, and make decisions with limited human intervention. Successful companies effectively use artificial intelligence in CRM to analyze customer data, chatbots, and virtual assistants, personalized recommendations, voice and speech recognition, and predictive analytics [4].

Antonio V. believes that AI technologies can have a significant impact on key areas of business, such as forecasting, performance management, upselling, and cross-selling. Beyond the immediate benefits, integrating AI into CRM systems also has long-term strategic implications, allowing companies to adapt and thrive in an ever-changing market landscape [5].

4. Formulation of the purpose of the article

The purpose of this article is to analyze the trends in the development of CRM systems in the restaurant business using advanced innovative technologies, in particular, artificial intelligence, machine learning and the Internet of Things, and also to model the main processes of the project of an information system for managing the restaurant business.

5. Presenting main material

Today, restaurateurs are looking for ways to improve customer service and increase sales, and it is the use of CRM systems in the restaurant business that solves these problems.

CRM systems in the restaurant business are software that restaurants use to manage and track customer interactions and data [6]. As a restaurant customer relationship management tool, they help to retain customers by effectively managing critical guest data, which enables personalized service and marketing. For example, they can track guests' contact information, booking history, dietary preferences, or birthdays. Restaurant CRM systems integrate with other important tools to share customer data between cash registers, loyalty programs, and reservation systems.

CRM for restaurants is beneficial for both customers and the restaurant business itself. The systems provide customers with a personalized experience by remembering their preferences and making suggestions based on past orders. On the other hand, they help businesses increase sales and improve loyalty by "understanding" customer behavior and identifying upsell or cross-sell opportunities.

The CRM space is constantly evolving, which indicates the emergence of new trends and innovations. It is important to focus on the key trends and innovations in CRM systems, in particular, in the field of customer relationship management, significant progress has been made through the use of AI, machine learning, and the Internet of Things (Figure 1). The development of predictive analytics is making the data collected even more powerful, enabling businesses to better understand their customers and predict future buying trends.
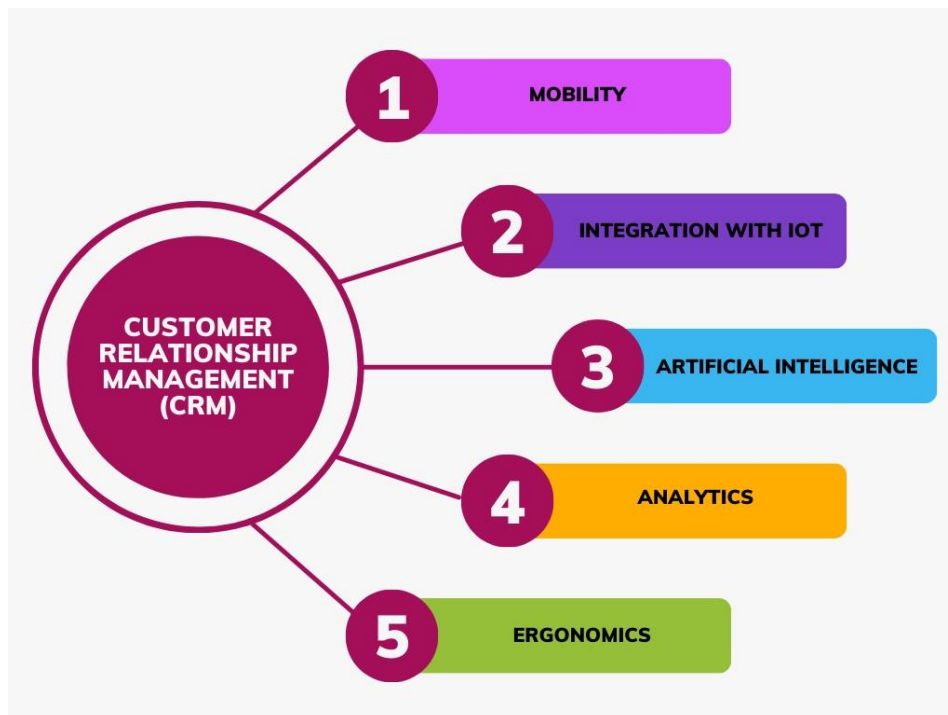

Figure 1: Trends in CRM systems development.

Artificial intelligence and machine learning are used in business intelligence, automation, and user interfaces, as well as in customer service systems through chatbots and automated systems. This reduces the time spent on routine work, such as automatically transferring leads and data directly to sales and marketing departments.

AI-powered CRM systems offer businesses automated task completion, customer interaction, and data analysis capabilities. They can automate processes such as lead qualification, customer development, and support. They also analyze customer data to identify trends, segment audiences, and personalize marketing messages. Artificial intelligence is used to predict the behavior of customers who may be at risk [7].

Machine learning, which is part of AI, allows computers to automatically acquire and improve skills based on their own experience without direct programming. In CRM systems, machine learning is applied to a number of tasks, namely:

- lead scoring: machine learning algorithms evaluate and rank leads based on their behavior, helping to increase the efficiency of sales teams by prioritizing and focusing on key customers;
- customer segmentation: machine learning improves the process of customer segmentation, allowing companies to tailor their marketing strategies to specific customer groups;
- product recommendations: machine learning algorithms analyze customer preferences to provide personalized product recommendations that improve the customer experience;
- predicting customer churn: predictive models help to predict customer churn, allowing you to take preventive measures to retain them [8].

In addition, CRM systems are gradually integrating with IoT channels. This includes interaction with various smart devices, from home electronics to health tracking devices. Integration with IoT allows CRM systems to receive data on customer behavior, identify possible product issues, and automatically initiate a support process to resolve them [9].

The introduction of mobile applications to interact with smart devices is becoming a key strategy in many industries, including the restaurant business. This will help to avoid the lack of interaction with customers through various means of communication. Thanks to this, the smart device receives constant data about consumers, analyzes their habits and influences them at different stages, from purchase to operation. This systematic monitoring allows businesses to provide a variety of services, such as remote maintenance and product customization, while facilitating the effective implementation of customer relationship management strategies.

The introduction of IoT technology in production allows businesses to reduce the risk of losing customers, as their data stored on IoT devices becomes inaccessible when a consumer switches to another manufacturer. In turn, customer analytics allows you to create a personalized experience for customers by understanding their behavior. Using specialized software, companies can create detailed customer profiles. Marketing analytics helps to optimize the effectiveness of campaigns by using data analysis tools to understand customer preferences.

Revenues from specialized customer relationship management (CRM) software have surpassed those database management systems to become the largest in the IT market. According to the forecast, revenues from the use of software are expected to reach more than $80 billion by 2025, making CRM systems the fastest growing market in the service sector [10, 11, 12] (Figure 2).
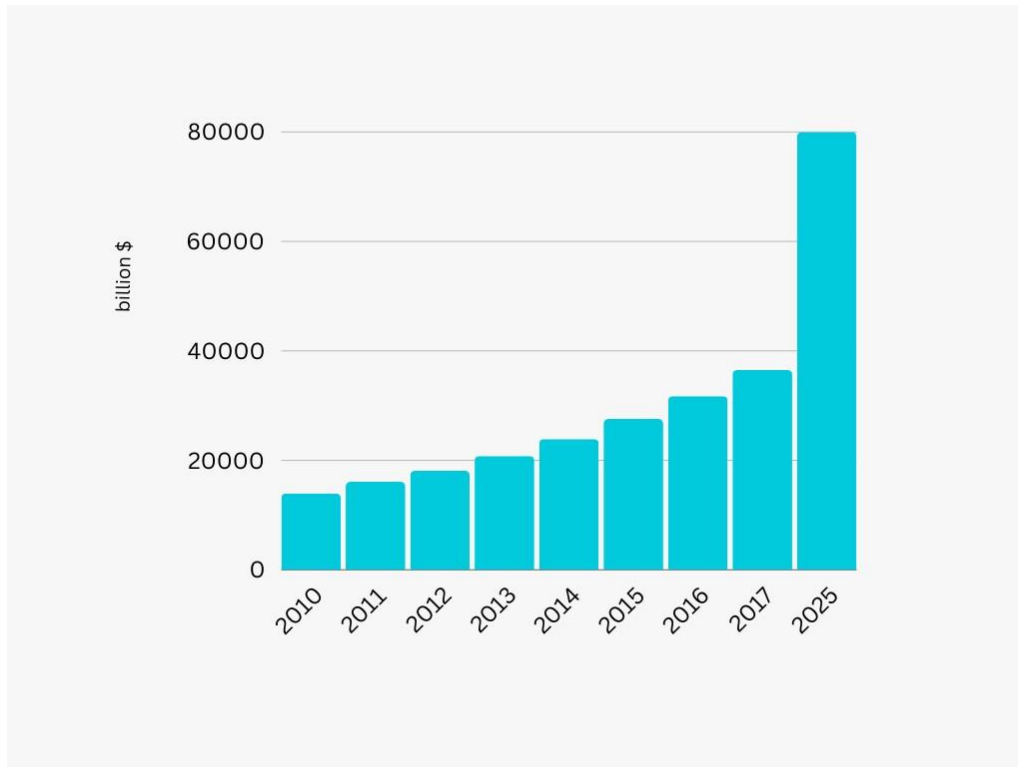

Figure 2: Forecasting revenue from CRM software.

Trends in the development of CRM systems in the restaurant business indicate a growing interest of companies in using innovative technologies to improve customer interaction and optimize business processes. Domestic startups are actively developing CRM products aimed at the restaurant industry with a focus on the international market. Adapting to global standards is a key element of competitiveness, so creating a product requires a clear understanding of the necessary stages of software development.

Management software is constantly evolving, and new interesting offers appear on the market. Software products for the service sector should effectively build work with clients, control employees, assess the level of service, and record information about visitors [13]. Table 1 analyzes the functionality of CRM systems for the restaurant business.

Table 1
Functionality of cloud CRM systems for the restaurant business

Name of the CRM	Characteristics of the system	Advantages	Disadvantages

Toast	The POS system offers a variety of restaurant CRM services. The software is a great basic CRM option for restaurants that already use Toast in other areas of business.	Integration of email and sales. Automated email marketing campaigns. Campaign metrics. Loyalty program options. Gift card program.	No SMS marketing.
OpenTable	CRM software helps to create personalized communication with customers and VIP profiles. The program provides weekly reports on guests, server reviews, and insights to help you better understand your customers.	Client profiles with notes and server settings. Customizable and automated communication options. Tracking of marketing ROI. Detailed reports on customer spending and order history. Competition analysis. Integration with POS.	Lack of marketing automation and guest surveys.
Poster POS	Poster POS is a cloud-based restaurant program with built-in CRM. The system allows you to keep records in restaurants in combination with maintaining a customer base.	A full-fledged guest database. It works from mobile devices. Remote access. Intuitive interface. Automation of restaurant workplaces. Receiving a variety of reports. Customer analytics. Loyalty programs.	Instability and malfunctions in keeping records of goods. Limited functionality and flexibility of the system.

POSist	POSist can be used as a universal restaurant management system with built-in CRM or as specialized CRM software.	Management of several locations. Formation of a customer base. Opportunities for guest segmentation. Automation and management of email, SMS, and advertising marketing. Targeted marketing campaigns. Loyalty programs.	High cost. Reporting can be difficult to understand. Customer service is not systematic.
EatApp	Cloud-based restaurant management system that includes CRM software.	The software is easy to use. Possibility of booking tables and orders. Comprehensive customer profiles. Targeted marketing campaigns. Opportunities to segment the guest database. POS integration.	High cost.

Let's analyze the life cycle stage of a project aimed at developing a restaurant information system. At the first stages of creating CRM systems for the restaurant business, it is important to define the architecture of the information system and conceptualize the main functionality. The use of UML diagrams allows you to effectively visualize and model aspects of application requirements analysis and design.

The requirements for a restaurant information system include the ability to view basic information about the establishment and contacts, view menus with details about the dishes and images, and the ability to create table reservations for a specific date and time. Important requirements are an intuitive and friendly user interface, as well as an attractive system design [14].

The use case diagram visualizes the requirements for the system, helps to imagine the roles of the system and their interaction with it (Figure 3). It visualizes the functional requirements from the perspective of the customer and the restaurant administration. The

purpose of creating a use case diagram is to determine the context of the subject area for system design, as well as the need to develop an initial conceptual model of the system and its further improvement.
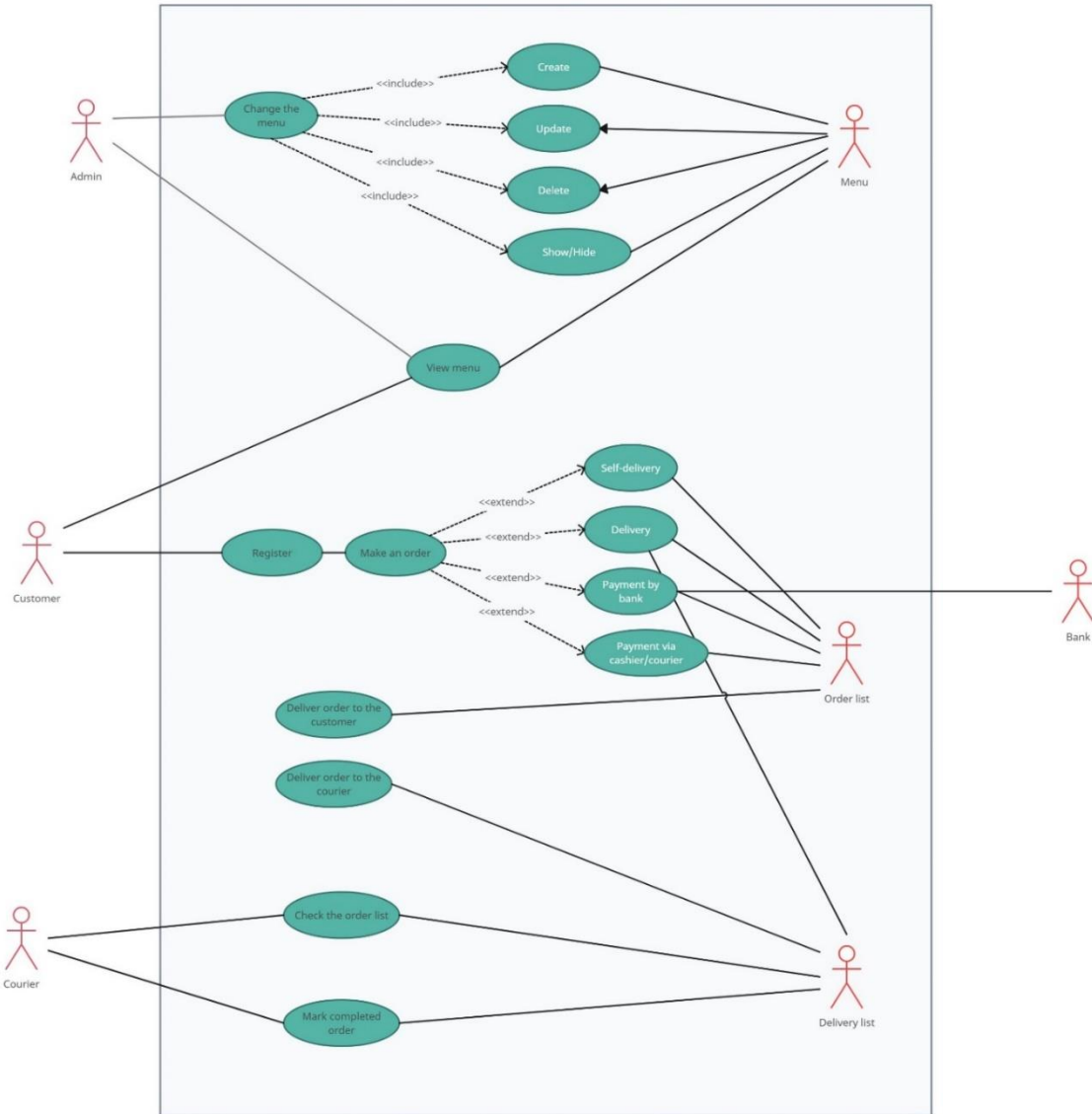

Figure 3: Diagram of the system usage.

The activity diagram for the IT project of the restaurant information system is shown in Figure 4. The activity diagram shows several scenarios of interaction with the system. The customer has the opportunity to view general information about the establishment using the website, as well as a menu with prices and details about the dishes.
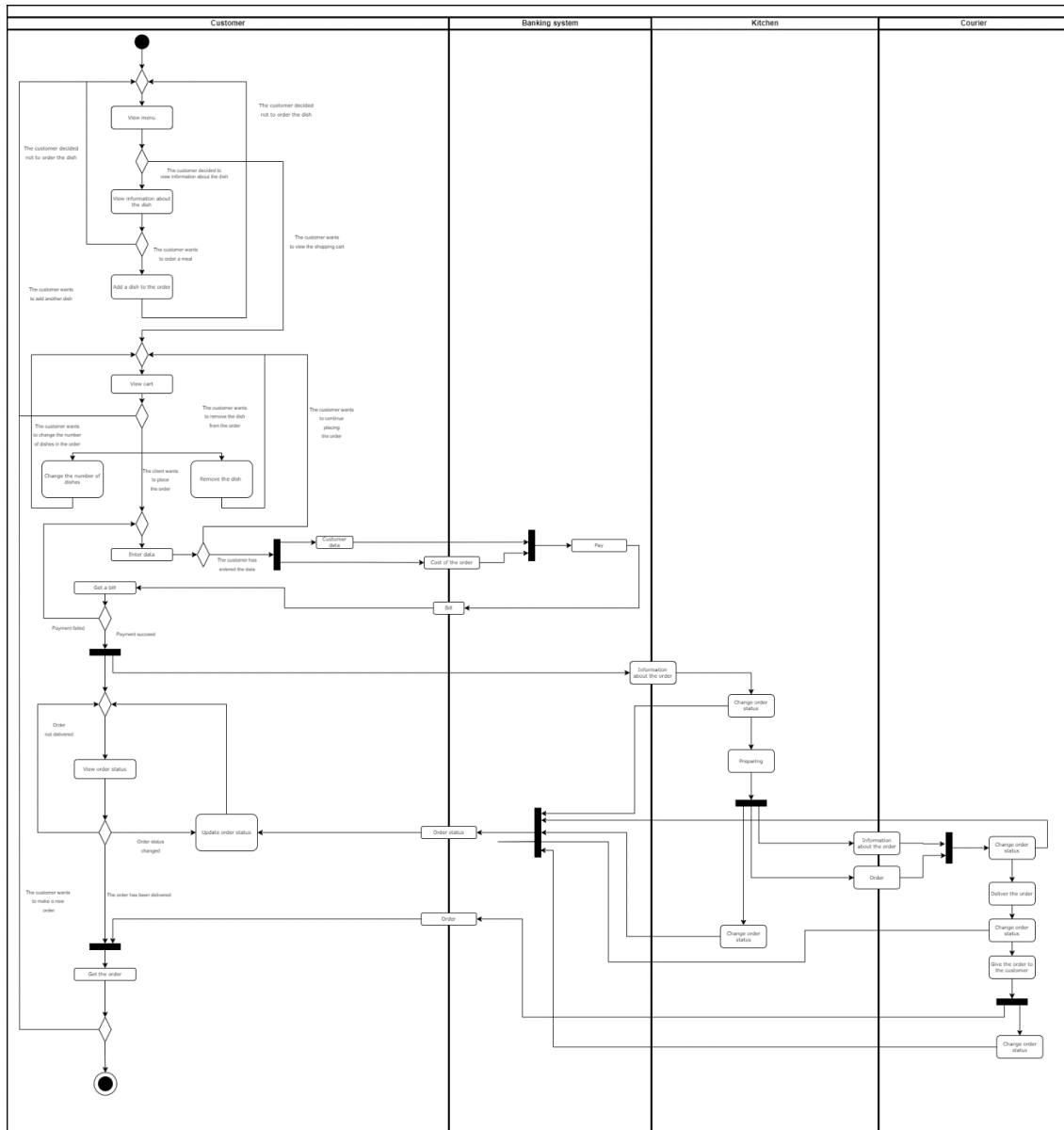
Figure 4: System activity diagram.

The proposed project of an information system for managing the restaurant business will provide the following opportunities using artificial intelligence:

- analyzes competitors and identifies their weaknesses;
- writes interesting posts for social networks and the website on a daily basis;
- conducts market analysis and develops promotion strategies;
- helps the sales team overcome objections and close deals;
- creates accurate demand forecasts and improves the quality of management decision-making;
- train employees and improve their professional skills.

Thus, restaurants need an information system that would be convenient and easy to use by the client, meet his requirements and requests, namely: to book a table for the right date and time, order the desired dishes and drinks, and have a guarantee of timely order fulfillment. The requirement from the staff is to ensure that the order is received from the client and transferred to other departments – kitchen, bar, hall, automatic collection of data on online orders and products available in the warehouse, and the current occupancy of the halls. The requirement for the program from the administration and management is the automation of personnel management.

6. Conclusions

The concept of CRM systems is based on the principle that the customer is a key factor in doing business, and their requests, needs and requirements for services are crucial. CRM systems are aimed at ensuring optimal interaction with customers, taking into account their wishes, ways of interaction, reaction to the service, as well as assessing the quality of the service provided. In this regard, the restaurant business is based on service and marketing processes aimed at meeting customer needs. The practical implementation of CRM systems in the restaurant business has its own peculiarities, which relate to both the functioning of the institution and service processes, as well as the model of the CRM system itself. The processes of working with information reflect the principles of a restaurant establishment, such as organizing service, searching for potential customers, conducting market research, and interacting with customers.

Modern trends in the development of CRM systems in the restaurant business include the integration of artificial intelligence and machine learning to optimize data processing and demand forecasting. This allows you to create personalized offers for customers and effectively implement targeted campaigns.

When choosing information systems for restaurant business management, it is important to carefully analyze the functionality, advantages, and disadvantages of CRM systems. It is also important to take into account the specifics of your business and its needs. In this article, the requirements for an IT project are formulated, and the modeling and design of a restaurant information system using UML diagrams are carried out.

The results of the study theoretically substantiate the need for practical implementation of CRM systems in the management of restaurant business, in particular, taking into account the peculiarities of service processes and characteristics of such systems. This approach contributes to the automation of customer interaction functions and helps to improve the quality of service in the restaurant industry.

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