үшін IT-аутсорсингтік компанияның әкімшілік және басқару персоналының сауалнамасының нәтижелері сипатталды, есептеледі және талданды. Мұның барлығы компанияның ауқымды бизнеске қызмет көрсету сегментіне көшуге көмек беру мақсатына арналған.

Түйінді сөздер: Клиенттің маңыздылығы, АТ-аутсорсинг, Ақпараттық технологиялар инфрақұрылымы кітапханасы (ITIL), бизнес-процесс, Пирсонның корреляциясы.

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The value of IT outsourcing for the client

Abstract. Customers expect IT outsourcing to transform IT functions into compact and dynamic tools that respond quickly to business needs and opportunities. But these are only abstract desires. They hide a lot of details that the client pays attention to: response to a request time, reasonable price, quality, communication skills of specialists, their politeness, how well specialists understand the client's problem, and so on.

The article describes the calculation and analysys of the results of a survey among the administrative and management personnel of an IT outsourcing company in order to understand its main value for customers, what customers pay most attention to and how to improve the existing system if the main goal of the company is to scale and move to the large business service segment.

Key words: Customer value, IT outsourcing, IT Infrastructure Library (ITIL), business process, Pearson correlation.

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DEVELOPMENT OF A SMART REFRIGERATOR WITHOUT A SELLER

Abstract. *Today's technological progress has allowed the use of intelligent devices and machines almost everywhere. The refrigerator is considered one of the most important appliances, which is used almost everywhere for the purpose of storing food, beverages, and medicines at low temperatures and in a closed*

place to avoid exposure. There is such a problem as the lack of cashless vending machines, the unavailability of information about the location of vending machines, etc. As a solution to the above problems, a smart refrigerator is offered. The proposed smart refrigerator uses a Radio Frequency Identification (RFID) reader, an Arduino Uno microcontroller, RFID tags for all items in the refrigerator, a user-friendly application developed using Microsoft Visual Studio, Python, a core MySQL database developed by vendors to store information related to each purchased item, and a GSM/GPS A7 module, with support for GPRS data transmission.

Keywords. *Smart refrigerator, radio frequency identification, internet of things, cashless payments, electronic item surveillance.*

Introduction

This article focuses on the development of a smart fridge, an intelligent system, a smart, autonomous showcase that works without a cashier and an operator. When embedding RFID systems in the refrigerator, the RFID-tagged products can be automatically identified. In the modern world, the "Internet" as an integrated information system of virtual space generates a special reality, an Internet culture with its concepts, values, way of thinking and language. With the rapid development of technology in the world and in the country, more and more familiar things are changing, transforming with the new requirements of time, and changing beyond recognition. The relevance of the development of a smart commercial refrigerator has been revealed based on the analysis of the market and the the nascent technologies.

The Smart Refrigerator project is a shopping kiosk for selling various products, drinks, dishes, and other types of food. The relevance of the development of such a project is caused by the fact that non-cash payments are developing in the Kazakhstani market every day, for example, in 2019, for the first time in history, non-cash payments exceeded cash payments in our country. And this gives an impetus to the development of online payments and the growth of online services. This adds value to such a project as creation of a smart commercial refrigerator. In addition to the development of non-cash payments, an important factor was the development of mobile applications, increased efficiency and productivity, the emergence of 3G, 4G networks and the overall development of smartphones in general.

The development of a refrigerator is a conventional refrigerator display that is being enhanced by the Internet of Things. The task of a smart refrigerator is to make it as easy as possible for the user to receive the goods and make a payment quickly. Development requires the utmost simplification of all processes to maximize efficiency and reduce development costs. The Internet of Things will be used for the development of the project: GSM, RFID, Raspberry Pi, RFID reader, magnetic door, and others. To certify a project as quickly as possible, you will need to use an agile methodology. To reduce development costs, it will be necessary to develop a mobile application based on the Flutter framework in the dart language.

For projects such as a smart refrigerator, it will be very important to use the agile method and microservices architecture. Microservices are another type of software development. This term specifically describes a style of software development that programmers find more and more attractive. Many projects have used this style over the past few years and the results so far have been very positive. So much so that for most of our colleagues, this style is becoming the main style of software development. The microservices architecture style is an approach in which one application is built as a collection of small services, each of which runs on its own and interacts with others using lightweight mechanisms, usually HTTP. These services are based on business needs and are deployed independently using a fully automated environment. There is an absolute minimum of centralized management of these services. By themselves, these services can be written in different languages and use different storage technologies.

Backgrounds and related works

The presented iFridge smart refrigerator uses the RFID technology. The goal of iFridge is to create a refrigerator with an intelligent system, using the RFID technology that allows the user to

manage the products stored in the refrigerator. The iFridge provides the user with many features. It allows the user to efficiently manage and locate items stored in the refrigerator and provides the user with a food tracking feature using RFID tags that are attached to each item.

Numerous applications of RFID technology in the food industry include supply chain management, food temperature monitoring, and food safety assurance. In Supply Chain Management System RFID tags are used to track food products during distribution and storage. In this application the RFID technology serves as a replacement for barcode scanners.

RFID systems do not require a line of sight to read the tag, their range is greater than that of a barcode, readers can communicate with multiple RFID tags at the same time, and tags can store more data compared to a barcode. With the ability to scan multiple tags in a three-dimensional space known as the survey area, the RFID technology also makes it easier to automatically ship products from a warehouse to a retail store. The RFID system implemented in the store can be used to maintain an accurate database of its inventory, which automatically alerts the warehouse management system when inventory runs out. Wal-Mart has implemented such a system of timely shipment of products. Thus, RFID technology will provide benefits such as faster and more efficient warehouse operations, better inventory tracking throughout the supply chain, and improved forecasting.

Wal-Mart store Inc. was the first major company to push for the introduction of RFID in the supply chain management. In June 2003, WalMart announced that it would require its top 100 suppliers to place RFID tags on shipping crates and pallets by January 1, 2005. Each label will store an electronic product code (EPC), which will be used to track products as they arrive at Wal-Mart distribution centers, and then, in turn, are sent to individual stores. The 300 largest suppliers place RFID tags on all pallets and crates of products. British Telecommunications has launched a new online, real-time food tracking system based on RFID technology [1]. This system tracks products in real time to speed up and reduce the cost of product recalls. The online network provides retailers and their suppliers with access to real-time synchronized data on the current and historical status of all items in the warehouse as they move through the supply chain. This system combines barcodes and RFID read/write tags with a secure Internet data exchange platform. eProvenance (Bordeaux Sedex, France) has developed an RFID-based tracking system to preserve the quality of fine wines and track their origin. This RFID system consists of 3 components. The first component is a semi-active 13.56 MHz RFID tag placed inside each a case of wine. This semi-active tag allows wine producers and distributors to track and record the ambient temperature in each case wine 3 times a day. The second component is a 13.56 MHz passive RFID tag with a unique code attached to the bottom of each bottle for inventory tracking and management. The third component is a patented and tamper-proof neck at the base of the capsule in each bottle. The seal has a unique identification code printed in invisible ink, which contains the identification numbers of both semi-active and passive tags. All 3 components are linked together with their unique identification numbers in an online database [2].

The smart refrigerator with multimedia capabilities for better nutrition and health, proposed in [4], focuses on the refrigerator as one of the devices that have been changed from the traditional, designed only for storing food, to the integration of the refrigerator with a TV, radio, Internet, and computer. The goal was to develop a project to create an application for a smart refrigerator with the aim of having a positive impact on the health and well-being of consumers to achieve their goals and objectives. The proposed refrigerator has the following features: recommendation of suitable recipes for different users according to the stored information, creation of different recipes that can be selected from different cooking methods, notification of the user of food facts, specification of the type of prohibited products and the types that are allowed for users suffering from a certain disease, making purchase lists, displaying calories for all products stored in the refrigerator, scanning products, and storing information in a database to alert the user about products that are about to expire. The main purpose of the RFID refrigerator is to implement a refrigerator to support an updated list of items stored therein. To do this, each product is marked with an RFID tag, and when the user

places it in the refrigerator, the RFID reader will be able to identify the unique RFID tag of the product and register it both in stock and in the database.

The manufacturer of a combined refrigerator with a freezer with a cooling medium from Siemens in has developed a smart refrigerator that meets the needs of the customer. Their main goal is to create a smart refrigerator with all possible features that customers expect will encourage family members to eat and watch TV in the kitchen, rather than in the living room. The Cool Media combination refrigerator and freezer has a built-in 38 cm LCD screen [3]. This LCD TV is different from any other LCD TV because it is movable, and the user can adjust its position anywhere. The LCD also has a power management app which offers the user the choice of connecting a satellite, DVD, video camera, and headphones.

The main goal of the LG TV refrigerator was to create a refrigerator that changes the idea of the need for a traditional refrigerator that stores food to keep it cool, to the need for a smart refrigerator with compatible features. The LG TV refrigerator comes with a 15-inch touch-screen LCD TV with a power management app, DVD connection, and FM radio. In addition, the manufacturer has created an in-refrigerator Weather plus LCD display (another LCD that is smaller than a 4-inch LCD TV) that is specifically designed to display forecasts based on your region, date, and time. This LCD display features a calendar with the ability to set an alarm, eight recipe banks of categories with 100 pre-loaded recipes, and a personalized digital photo album.

The manufacturer of the four-door refrigerator with a freezer Samsung in created this refrigerator to meet the customer's need for a refrigerator that has a built-in 10.4-inch wireless LCD screen. This LCD display has many features designed for the user, including a power management app. Some of the refrigerator's features include a TV connection, a video player, an Internet connection, and the ability to easily find items in an unmarked section of the refrigerator. In addition, it provides communication between smartphones and the refrigerator thanks to the Bluetooth function. The food management app allows the consumer to manage the food inside the refrigerator. It provides the user with different categories of products, and according to this category, the user can easily record the products using the touch LCD display. The recorded item is stored in the application database, so the user can change the list at any time they want. In addition, the application provides the user with the ability to save their favorite recipes and provides the ability to record notes and diaries. In the Samsung refrigerator, the user needs to manage the food manually by inserting information about each item into the app's database, but in the smart refrigerator, the user does not need to do this, because the refrigerator has an RFID reader that will identify the items and store the necessary ones [4].

RFID technology basics

Radio frequency identification (RFID) belongs to the Auto-ID family, which aims to identify objects using appropriate technologies. Among them, we list smart cards, OCR, biometric procedures, magnetic cards, barcodes, and RFID [4]. The use of the technology must be clearly defined and must meet some criteria regarding the business case model. Bare codes are a famous identification system, but it suffers from some disadvantages, such as sensitivity to the environment (dirt, moisture, abrasion, etc), the need for line-of-sight (LOS) lines between the code and the reader, and the inability to update its contents since the barcodes are finally an image.

However, with RFID, everything is different since the line of sight is not required. RFID tags are of different types and are grouped mainly depending on the reading range, read / write capabilities, and energy autonomy (passive semi-passive/active).

An RFID tag is a kind of silicon memory connected to a resonating antenna. The chip contains at least a unique serial identification number that provides identification of the associated object attached to it. Thanks to the miniaturization process, it becomes possible to integrate the RFID tag into "any object", considering the tag selection criteria, to ensure communication with the base station. A large palette of imaginative applications can be presented, such as: logistics, transportation, item asset management, electronic item surveillance (EIS), real-time location system (RTLS),

healthcare, maintenance, and even in the smart home, where any device can be turned into an intellectual object of communication. In our work, we suggest that each purchased product (milk, chocolate...) should be marked with a UHF RFID tag. This link cannot be achieved without considering the ecosystem solution, especially for all shareholders who may be interested in a specific return on investment (ROI) in various vertical activities, such as retail, warehouse management and logistics.

The basic RFID system consists of three parts. The first element is a label, which is a kind of a silicon memory chip connected to an antenna. The following paragraphs give a brief overview of the various tag families according to some criteria. The second element is the base station (reader). The third describes the software stack (middleware, application).

There are many types of RFID tags. The choice depends largely on the limitations of the application. Typically, tags are grouped according to common criteria related to energy, read range and capabilities, memory access.

Figure 1 - The motion sensor recognition using RFID tag technology

An RFID tag (Fig.1) is a kind of silicon memory connected to a resonating antenna. The chip contains at least a unique serial identification number that provides identification of the associated object attached to it. Thanks to the miniaturization process, it becomes possible to integrate an RFID tag into "any object", considering the criteria for selecting the tag, to guarantee communication with the base station. A large palette of imaginative applications can be presented, such as: logistics, transportation, item asset management, electronic item surveillance (EIS), real-time location system (RTLS), healthcare, maintenance, and even in the smart home, where any device can be. it turns into an intellectual object of communication. In our work, we suggest that every product purchased (milk, chocolate, etc.) should be marked with a UHF RFID tag. This connection could not be provided without considering an ecosystem solution, especially for all stockholders who may be interested in a specific return on investment (ROI) in various vertical lines of business, such as retail, warehouse management, and logistics.

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There are many types of RFID tags [8]. The choice depends largely on the limitations of the application. Typically, tags are grouped according to common criteria related to energy, read range, memory access, and read capabilities.

Energy: According to this metric, three categories of systems are defined. The first is a passive tag; the latter do not have a built-in battery, but they collect energy wirelessly from the electromagnetic field generated by the base station. The second type is called a semi-passive tag; the

necessary energy for the communication process between the base station and the tag is provided by the reader, but this type of tag contains an on-board battery reserved only for powering additional units, such as built-in sensors. The latter type is associated with an active RFID tag. This category includes an onboard power source; the tag can be described as a transmitter.

Reading distance: According to this criterion, tags are classified according to communication distance, proximity, proximity, long distance [9].

The ability to read/write: this criterion describes the tag memory access methodology. Basically, we distinguish between read only, write once, read many, read/write.

Structure of the smart fridge architecture

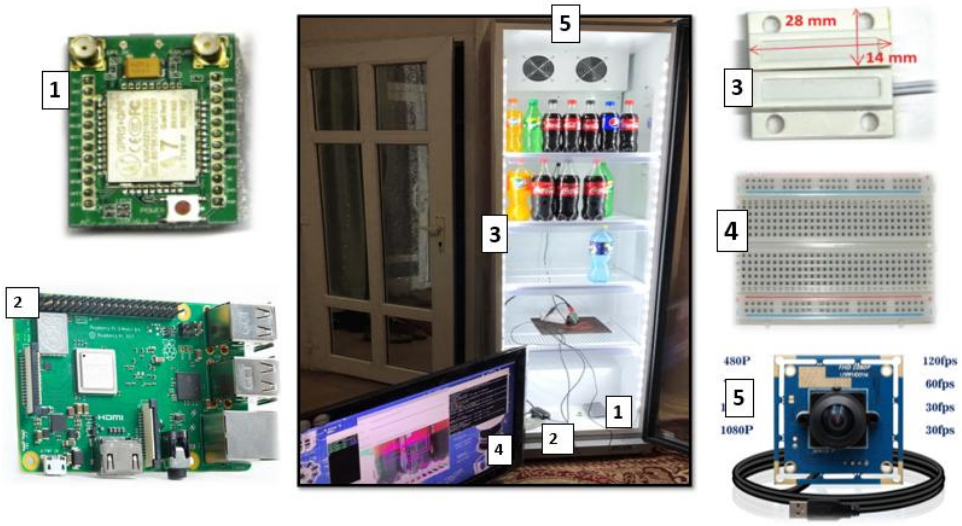

Figure 2 - Structure of the Smart refrigerator

Figure 2 shows the physical structure of the solution.
It is needed to highlight the following elements:

1)GSM/GPS module A7, with support for GPRS data transmission;
2)Raspberry Pi Microprocessor;
3)sensor of door opening;
4)Circuit board (400 pins)
5)Camera

The Project provides the following functionalities:

- Availability of information about the location of Storefronts and products inventory;
- Possibility of non-cash sale of beverages
- The customer service speed is 15 seconds. The queue of buyers and direct contact between people is excluded.
- Purchase in 3 steps. To open/select the product/confirm the purchase.

Figure 3 - Stages of implementation

How does it work (Fig.3)?

1) User authorization-linking a bank card
2) Removing the QR code of the refrigerator
3) Scan QR-code
4) Opening the doors
5) Grab&Go - automatical withdrawal of the fundsn from the client's accounts

Conclusion

Radio Frequency Identification (RFID) is an alternative technology that can replace traditional Universal Product Code (UPC) barcodes. RFID allows you to identify an object at a distance, without requiring a line of sight. RFID tags can also include additional data, such as product and manufacturer information and can transmit measured environmental factors such as temperature and relative humidity [10]. This article presents key concepts and terminology related to RFID technology and its applications in the food industry. The components and operating principles of the RFID system are described. Numerous applications of RFID technology in the food industry (supply chain management, food temperature monitoring, and food safety) are discussed. Challenges in implementing RFID technology are also discussed in terms of read range, read accuracy, heterogeneous standards, cost, disposal issues, privacy, and security.

Based on all the research conducted in the framework of the project to create a smart vending machine using the Internet of Things and microservices architecture, the results were achieved: the project conducted a carefully announced market analysis with specific information. Chart of the workflow was designed from the beginning to the end. The possible risks at the project launch and the risks that the project users will not immediately get used to the new technical solution are analyzed. Teamwork has been analyzed and planned in each project with specific roles prescribed in each project area . And in the end, we can say based on all these data, the project has a great potential for growth and development, thereby solving the problems of the population with a quick purchase of goods available 24 hours a day. Another important advantage of this smart refrigerator project is that it has a large export potential and is not geographically tied to any country.

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Разработка умного холодильника без продавца

Аннотация. На сегодняшний день технический прогресс позволил использовать интеллектуальные устройства и машины практически повсеместно. Холодильник считается одним из важнейших приборов, который используется почти везде для хранения продуктов, напитков и лекарств при низких температурах и в закрытом месте, чтобы избежать воздействия. Сейчас на торговых площадках существует проблема, как отсутствие безналичных торговых автоматов, отсутствие информации о местонахождении торговых автоматов. В качестве решения вышеперечисленных проблем предлагается умный холодильник. Предлагаемый умный холодильник использует считыватель радиочастотной идентификации (RFID), микроконтроллер Arduino Uno, RFID-метки для всех предметов в холодильнике, удобное приложение, разработанное с использованием Microsoft Visual Studio, Python, базовой базы данных MySQL, разработанной поставщиками для хранения информация, связанная с каждым приобретенным товаром и модулем GSM/GPS A7 с поддержкой передачи данных GPRS.

Ключевые слова. Умный холодильник, радиочастотная идентификация, интернет вещей, безналичный расчет, электронное наблюдение за предметами.

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Сатушысыз ақылды тоңазытқышты құру

Аңдатпа. Бүгінгі күні технологиялық жетістіктер интеллектуалды құрылғылар мен машиналарды барлық жерде қолдануға мүмкіндік береді. Тоңазытқыш бүкіл жерде тамақ, сусындар мен дәрі-дәрмектерді төмен температурада және қоршаған ортамен әсер етпеу үшін жабық жерде сақтауға арналған маңызды құрылғылардың бірі болып саналады. Қазіргі кезде сауда алаңдарында қолма-қол ақшасыз сауда автоматтарының жетіспеушілігі, сауда автоматтарының орналасқан жері туралы ақпараттың болмауы байқалады. Жоғарыда айтылған мәселелердің шешімі ретінде ақылды тоңазытқыш ұсынылады. Аталған ақылды тоңазытқышта радиожиілікті сәйкестендіру (RFID) оқырманы, Arduino Uno микроконтроллері, тоңазытқыштағы барлық элементтерге арналған RFID тегтері, Microsoft Visual Studio, Python, сақтау үшін сатушылар әзірлеген MySQL базалық дерекқоры пайдаланылатын ыңғайлы қосымшаны қолданылады, әрбір сатып алынған өнімге және GPRS деректерін беруді қолдайтын GSM/GPS A7 үлгісіне қатысты ақпарат беріледі.

Түйінді сөздер. Ақылды тоңазытқыш, радиожиілікті сәйкестендіру, заттар ғаламторы, қолма-қол ақшасыз төлемдер, объектілерді электронды бақылау.

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