

# USAGE OF RFID TECHNOLOGY FOR THE NEEDS OF LOGISTICS OF SERVICES

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**Abstract:** RFID technology is common available technology, that is capable to bring new and innovative view of customer services of logistics of services. RFID technology in logistics of services is able to improve the information, financial and material flows in order to ensure better customer services. RFID is a modern technology, which currently provides a wide range of logistics of services to the users. Logistics of services deal with the management of material, information and financial flows in order to ensure quality of services at the time, in current location and necessary costs.

## 1 Introduction

RFID is a modern technology, which currently provides a wide range of logistics of services to the users. Logistics of services deal with the management of material, information and financial flows in order to ensure quality of services at the time, in current location and necessary costs.

For the needs of logistic of services has been selected a catering unit as a company, where can be used RFID system for rendered services. A system analysis of the restaurant was made. Based on the analysis it was designed a new information system thath uses RFID technology [1].

## 2 The proposal of information system

The new information system will use the latest technology in the field of RFID, in the management of the flow of materials, information and finances. Introduction of a suitable information system will shorten times of operations (order time, preperation time etc.), that will increase productivity of the restaurant and the information system will increase interests in the restaurant and attract new customers. The proposal of information system will consists of three modules: module orders, module cash desk and module server [2], [3].

### 2.1 Module orders

Module orders is dependent on data received from the control unit. Control unit of module orders is Raspberry Pi. The control unit is equipped with touch screen, USB interface, power supplies for the control unit and connector RJ-45 for connecting to LAN. To the control unit is connected a RFID reader via USB.

Description of the running application: Application is waiting to attach RFID card to RFID reader. From the card it reads the unique identifiacion number, under which the application can recognize individual customers.

After applying RFID card to reader the application will decide, if there is an open bill in central personal computer, if not then it will create new bill. The customer chooses from the menu that is stored in the control unit. Confirms his order and then the data writes to a specific bill and account in central personal computer based on RFID card data. A waitress can entry in this process and edit an order on herself [4], [5].

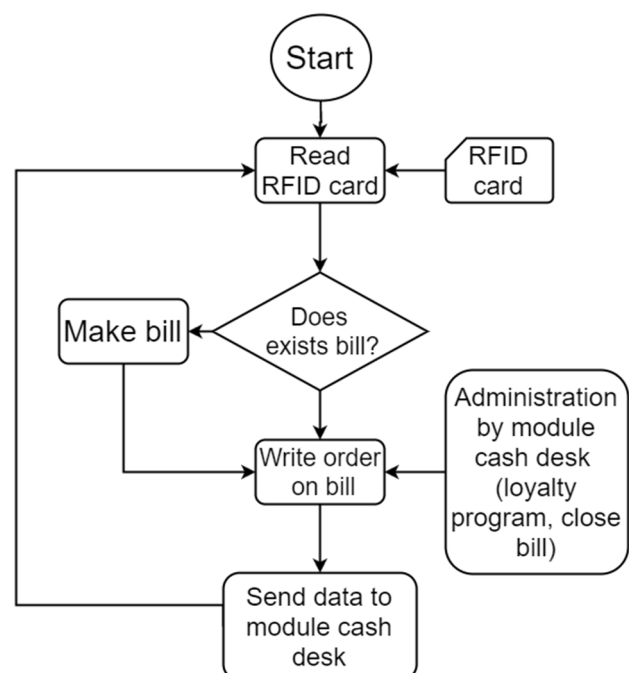


Figure 1 Application diagram – module orders

### 2.2 Module cash desk

Module cash desk is the main part of the whole information system. It consists of a central personal computer. On this computer is deployed the information system. To the central computer is connected RFID reader

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that is used to log in to the information system and for the needs of the loyalty program.

Description of the running application: After receiving order from the customers will on the central computer record a customer order. After writing on the bill data will be send to the central computer with the information about bill on the server, where the data based on RFID card account are stored. At the same time as writing on central customer bill, the application has to decide if the order obtains also a meal. If so, the kitchen has portable printer and the order is printed for the kitchen and the order also shows on the monitor, which is also in the kitchen. Otherwise is the order displayed on the screen of central computer at the bar. Upon delivering the order for customers waitress confirm delivery. Then it is able for the customer to make a new order and the algorithm will repeat. If the customer no longer wishes to order, he pays his order. After entering into the system, the information about the payment sends central computer to the module server. The central bill will be closed, then will be printed a receipt for the customer and the central bill is deleted in the central computer and then is waiting to receive another order.

**2.3 Module server**

Module server provides a backup of all data. On the server is a database of customers. Using the web interface, customers can see the statistics how many they consumed, what is the current status of the loyalty program. In addition, an administrator can log in to the web interface to obtain actual information about the number of customers and how many orders where made. Based on these data, he is able to prepare accurately orders to the supplier, and thus ensure the smooth running of the bussiness and reduce costs. By using this information system can the company reduce supply of food and beverages and that leads to reduce storage costs. Module server communicates via Internet directly with the module cash desk, which is main source of information for the module server. Module server uses cloud services.

Description of the running application: Module cash desk sends the informations to the module server about customers and the order. After receiving information will update data about customer and account. After restoring data that are adjusted to loyalty program, module server sends the updated information to the module cash desk.

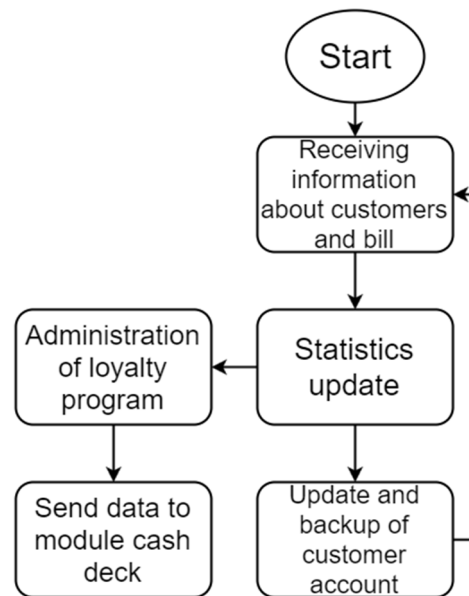


Figure 2 Application diagram – module server

**RFID reader**

For the information system was chosen RFID reader that connects to the control unit via USB port.

**RFID card**

For the needs of information system will be purchased RFID cards. These RFID cards are already pre-programmed and have read-only-memory (ROM), so it is possible only to read data (Unique Identification Number) from them. Every card has their own UID under which the application of the information system can pair RFID card with customer account.

**2.4 Use case diagram**

In term of application of the information system may recognize three levels of users with different access to the information system.

A customer can only place an order. Waitress is receiving the order from the customer, it is able to create a new record of the order and she can change the order made by the customer. Admin can handle the overall system administration.

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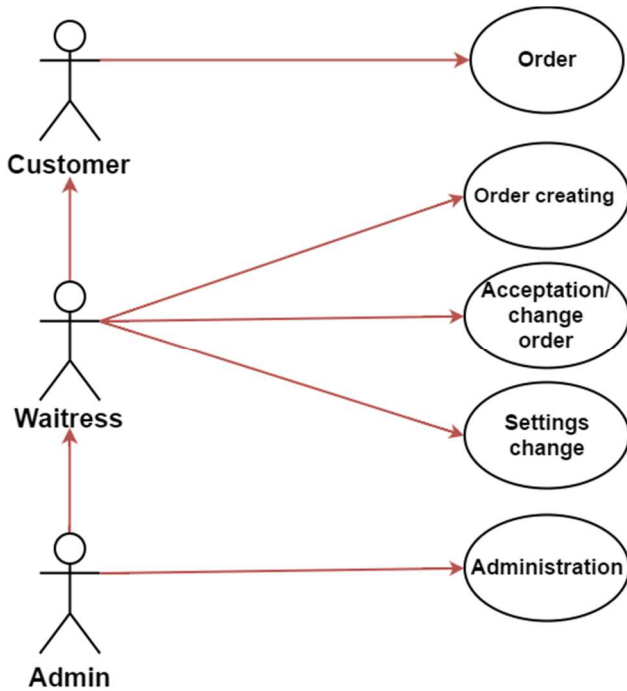


Figure 3 Use case diagram

**2.5 Web interface**

With the launch of the new information system will be created a website. The new service for customers, where the customers can see various statistics associated with the use of RFID cards. The customer can pick up the RFID card at waitress. This card contains UID. On the website the customer will create an account with unique login and password, after signing in to the web interface of the information system. Within the web interface the customer can track his orders statistics as well as the level of the loyalty program.

**2.6 Terminal for the waitress**

Waitress will have a terminal for ordering. It is a portable device for example a tablet, which is attached to the application of the information system. Waitress receives an order from the customer. She select from the list the number of the table and assing an order. Terminal behaviour is based on module orders. Terminal sends data about the order using WiFi to the central personal computer, where the order processes the module cash desk.

**2.7 Implemetnation diagram**

Implementation diagram indicates how the information system will be pull into practice. Deals with all the particullars necessities for the implementation of the information sytem and how each part of the information system works together.

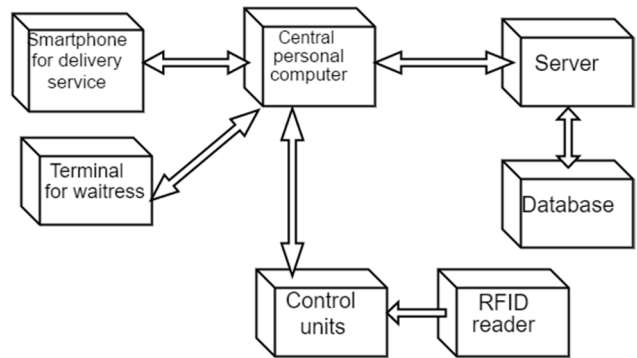


Figure 4 Implementation diagram

**2.8 Simulation model**

To create a simulation model of the restaurant was used program Tecnomatix Plant Simulation. Based on the data obtained in the analysis of the arrival of customers and customer delay in restaurant was made simulation model. The mode reflects incoming customers and time that spend in the restaurant.

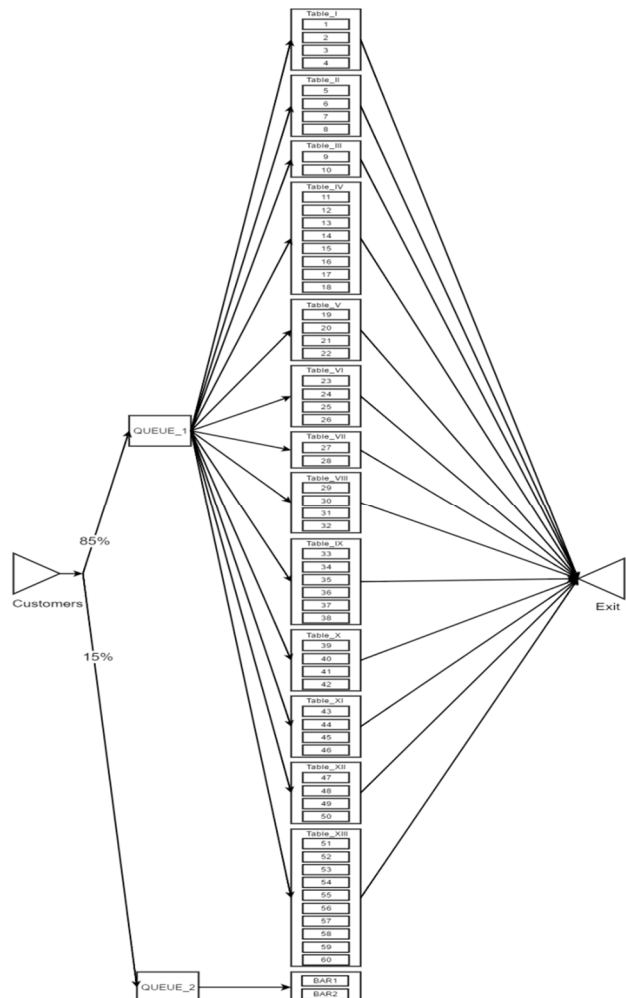


Figure 5 Formalized diagram simulation model

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The result of the simulation is a statistic that reflects the percentage availability of each multi-channel devices during open hours of the restaurant. From that simulation it is possible to determine, if there is a free capacity to increase production.

**Conclusions**

By applying new information system to the restaurant, web interface and the loyalty program for streamlining the management of the restaurant there are two views on system how it works. In the first case the customer owns RFID card for the needs of the loyalty program, in other case the customer doesn't own RFID card.

Customer comes to the restaurant and want to order. If the customer owns the card, he attaches it to the RFID reader of control unit. UID is readed from the RFID card. Based on UID of the card, is the card paired with account made on the web site. The customer makes an order. The control unit is on every table in the restaurant. In the control unit is stored the whole menu. By simply clicking on the screen of the control unit customer chooses what he wants and confirms his order. On the base of the order it will be in central personal computer opened a new bill for a particular table. Waitress confirms the order in the central computer and all ordered items, too. All ordered item will be write on the open bill in central computer. The order will be prepared and waitress brings the order to the customer at the place where he sits. Customer consumes his order and if he want still to order something, he put his RFID card on the RFID reader and the process will repeated all over again. If the customer don't want to order something else, but he wants to pay his order. The customer clicks on the control unit on word "PAY", so he let know the waitress, that he wants to pay his order and want to leave. After paying he puts his RFID card on the RFID reader, where the waitress confirms that the orders has been paid and the customer will have the loyalty points credited to his account. After writing loyalty points to his account, the customer leaves the restaurant.

If the customer does not own the RFID card, he can get it from the restaurant staff. He creates an account with unique login on website of the information system and then is RFID card assigned to the loyalty program. Next the customer can place an order using RFID card.

If the customer doesn't wish RFID card of the loyalty program, he makes order without card via control unit with the difference, that the customer doesn't receive loyalty points.

By applying the information system using RFID technology, the loyalty program will significantly reduce the length and time of operations for the preparation of orders.

The application uses a modern method of communication between the individual modules based on LAN and Internet. The proposed information system eliminates errors that can make waitress, reduces times of

orders. An important aspect of the information system is the introducing of the loyalty program to the customers, that with regular visiting of the restaurant will receive loyalty points, which can be spent for buying some food or to achieve discount on the whole bill.

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**Review process**

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