

Automated business-process assistance system at small commercial agricultural enterprise

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Abstract—The article describes the main trends in the digitalization of agriculture: software applications, cloud services, remote sensing, precision farming. The main business processes in a small commercial agricultural enterprise are considered. Automation of business processes largely determines the timeliness and effectiveness of management decision-making at enterprises of any size and sphere of management. The object of the research is the company "Elite". This is a small livestock enterprise. It sells goods and services for farmers. To ensure the efficiency of financial and business operations, an automated system (AS) is needed, based on a modern database. Since the enterprise is small and located in the rural outback, the installation of modern large-scale accounting systems becomes impractical. The functional task of the developed information system is the automation of warehouse accounting and sales accounting at the enterprise of company "Elite". The ER is a model of the developed database, as well as an example of the developed application. The environment for the MySQL, VS, C #, MySQL Server DBMS was chosen as the medium for implementing the system of accounting for purchases and sales. The developed application allows you to improve the flow of business processes and improve their efficiency. This application can be used in other agricultural enterprises of this type.

Keywords—*automated system, agricultural enterprise, business-processes, database.*

I. INTRODUCTION

Information and communication technologies are now widely used in all branches of agriculture. The introduction of digital technology in agriculture is growing rapidly. The possibilities of information technology in this industry are truly limitless. They are used to increase agricultural output and control its quality, and sales. According to the estimates of the Department of Development and Management of State Information Resources of the Ministry of Agriculture of Russia, the comprehensive digitalization of agricultural production will allow farmers to reduce costs by 23%.

The economic category “business process in the agro-industrial complex” is an economic activity of economic entities of the agricultural industry, aimed at making a profit in the field of food production, agricultural raw materials, as well as to support the activities of the agricultural entity itself [1]. A number of publications of both foreign and domestic authors are devoted to automated business process support systems [2, 3, 4]. They show such trends as an

increase in the volume of information, the adjacency of the areas of commerce, the acceleration and increase in the range of financial transactions, the need to transfer automated accounting to mobile, the need to automate business processes.

For the correct decision making information aspect becomes important, which implies the availability of information about the external and internal environment of an agrarian organization, to assess the prospects for further development.

It is obvious that the necessity and possibility of digitization of the most part of activities in agriculture is largely due to the scale of production, as well as the volume of turnover.

The digitization of agriculture is developing in such areas as software applications, cloud services, remote sensing, precision farming. Such directions as:

Differentiated watering and sowing, fertilization, yield forecasting

- sensors to measure the temperature and humidity of the soil / air / products, monitoring systems of agricultural equipment and personnel, monitoring of fuel and lubricants and cattle.
- aerospace imaging and mapping from unmanned aerial vehicles.
- machine learning and analytics
- applications and cloud services: agricultural scouting, accounting, management of an agricultural enterprise via mobile devices.
- ERP-systems: integration of disparate data in a single system [5].

Today, there are quite a lot of systems for automating business processes; however, their application is not always advisable in a small commercial agricultural enterprise, since they require constant updating and maintenance. Therefore, the development of an automated system to support business processes in a small commercial agricultural enterprise is quite an urgent problem.

In modern conditions, the use of automated information systems largely determines the timeliness and effectiveness of management decisions in all areas of activity of both the public sector and private companies (financial operations, personnel management, etc.), as it allows processing quickly in a fairly short time. and qualitatively sufficiently large amounts of information [6]. Operational analysis of changes in environmental conditions becomes the key to the prosperity of any organization.

Since the search and compilation of the necessary information, carried out manually, is a rather laborious process, it is advisable to create automated systems that would allow storing and updating interrelated data on the whole complex of tasks being solved. These ideas are embodied in database management systems.

In this study, a small livestock breeding enterprise is considered as a subject area. The company sells a large number of services that are in demand among farmers. To ensure the efficiency of the derivation of information about the products sold, an automated system (AS) is required, based on a modern database. The use of an automated system for working with a database will significantly reduce the time to service an enterprise's customers.

II. RESEARCH METHODOLOGY

The purpose of this study was to develop a database called "Selling bull seed for artificial insemination" and an automated system for working with it in order to improve customer service and optimize it.

The company "Elite" was chosen as an object of research. The main field of activity of the organization of company "Elite" is the purchase and sale of bull seed for breeding, storage of this seed and the provision of services in artificial insemination.

The functional task of the developed information system is the automation of warehouse accounting and sales accounting at the enterprise of company "Elite".

The enterprise in question is a legal entity that performs the functions of a wholesale and retail trade and conducts direct work with clients. The company has been successfully operating since 1977. The main objective of the enterprise is to improve the productive qualities of cattle by introducing artificial insemination methods using the semen of the most high-valued bulls. The company has a selection work aimed at increasing the growth rate and the quality of muscled carcass (muscled hind legs to the hock or to the wrist joint, well-developed dewlap, pronounced hams and a long part of the loin). This company has the following departments: a warehouse where all the goods and the point of sale of the goods are stored at wholesale and retail prices.

Consider the business processes that exist in the activities of this enterprise. For proper management decision-making, marketing activities are needed: research of the supplier market and sales market, as well as establishing business relations, drawing up and analyzing reporting documents on financial transactions, monitoring financial transactions

Then it is necessary to form a purchase, having previously concluded an agreement with suppliers.

After purchasing the goods and their timely delivery to the warehouse it is necessary to ensure its safety and conditions of detention.

After the conclusion of the contract of sale is the sale of goods with possible additional services.

As with any business scheme, the activity of the company "Elite" has input and output information.

The input information is formed, as a rule, on the basis of financial documents both in paper and electronic form.

1. Data about the client are formed on the basis of a general passport, as well as the customer's TIN.

2. Information about suppliers is formed on the basis of the expenditure invoice (name of the organization, contact phone number, legal and actual addresses, payment details). The screen will also display information about the delivered product, its quantity and cost.

3. When goods arrive at the warehouse, the initial information is taken from the expenditure invoices, and the resultant is displayed on the screen.

4. When selling goods to the buyer, information on the list of goods ordered by them will be necessary, the outgoing document will be the outgoing document.

We formulate the requirements for the developed software product. This software is intended to account for the sales of company "Elite". At the stage of pre-design software for accounting orders received a list of requirements:

- 1) convenient user interface;
- 2) authorization of program users;
- 3) the ability to add new modules to the program;
- 4) printout of order forms on the printer.

III. PRACTICAL SIGNIFICANCE

Taking into account the requirements formulated, the software that is being developed should include the following modules:

- Ordering module
- Product Search Module
- Order Editing Module
- Order Statistics Module
- Invoice print module

The program is a standalone application that does not require installation of databases and programming languages on a computer. The program interface is a form with the following fields: order date, order amount, quantity ... Adequate work of the software application requires a workplace that satisfies the following conditions:

- PC with installed windows 2010 operating system,
- Printer,

User documentation.

The user should be assigned a workplace equipped with software and hardware: a computer, a printer, a standard Microsoft Software package, operational documentation

Taking into account the requirements for the developed software, we will define the means and methods of development. As the development tools selected:

programming language- c #,

database management system- mysql.

C # is a modern, general-purpose object-oriented programming language created and developed by Microsoft. Today there is a variety of software developed in C #: office applications, web applications, websites, desktop applications, mobile applications, games, and many others.

The properties of the used DBMS largely determine the effectiveness of the developed automated system. Therefore, we begin its description with an information model and a set of software tools.

Essence of the designed database:

Shop customers. Attributes - id, full name, passport data, TIN, phone.

Goods (catalog). Attributes - id, product code, product name, price (pcs).

Deliveries. Attributes of suppliers - id, full name, TIN number, telephone. Orders. Attributes - id, name, customer, cost, date of order.

Catalog - supplies. Attributes - id - catalog, id - delivery.

Manufacturer. Attributes - id - izgotovitel, name, phone.

Manufacturer Directory. Attributes - id-catalog and id - manufacturer.

ER-model - a data model that allows you to describe the schema domain.

The ER model is used in high-level (conceptual) database design. With its help, you can select key entities and identify relationships that is to be established between these entities.

During database design, the ER model is converted to a specific database scheme based on the selected data model (relational, object, network, or other).

ER-model is a formal design, which in itself does not prescribe any graphic means of its visualization. As a standard graphic notation, with which you can visualize the ER-model, an entity-relationship diagram was proposed.

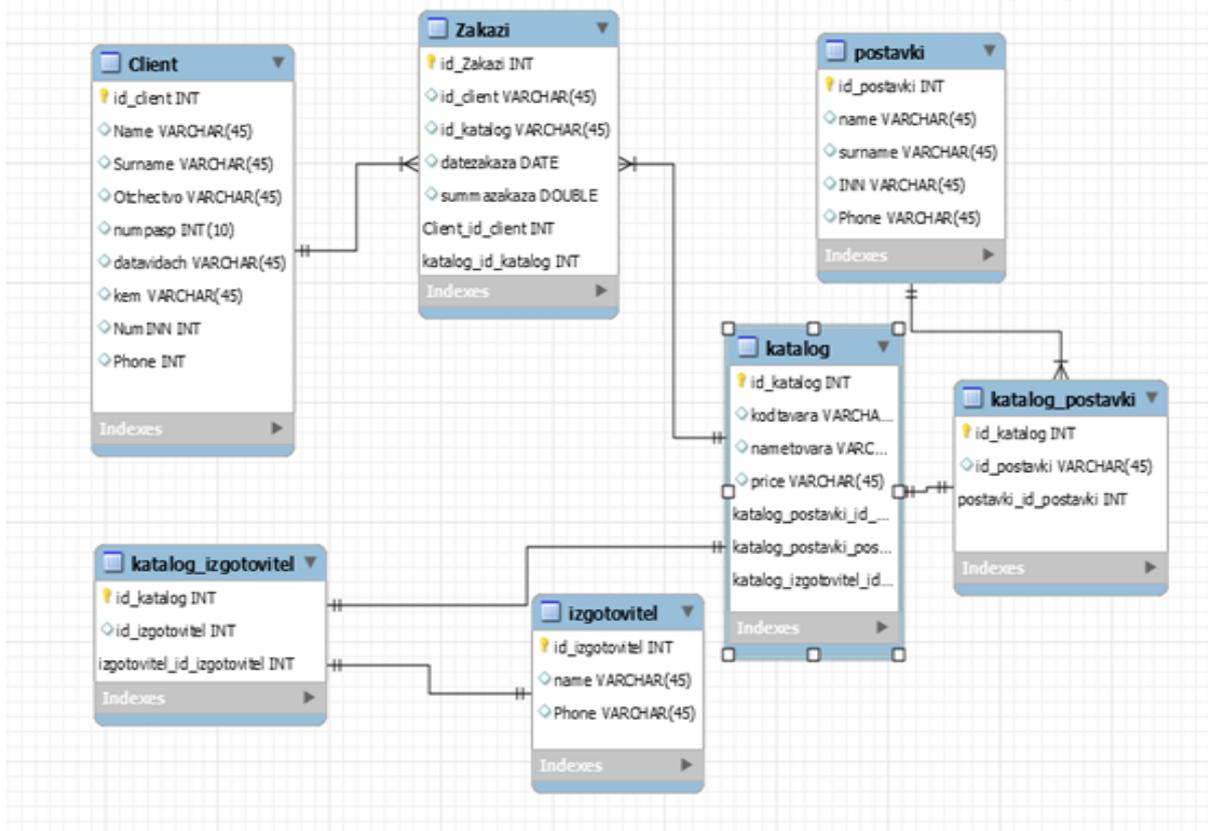


Fig. 1. ER - model

The environment for the MySQL, VS, C #, MySQL Server DBMS was chosen as the medium for the implementation of the procurement and sales accounting system.

MySQL is an open source relational database.

MySQL is cross-platform, which means that it runs on several different platforms, such as Windows, Linux and Mac OS, etc.

Task list defining custom scripts

On the basis of the model provided, a list of tasks (user scenarios) is created, which the user decides within the interface. In this case, the preparation of the invoice: the addition, modification and printing of the invoice. Or its removal.

Fig. 2 shows an example of a user interface for working with a database, in particular with an order accounting table.

Software designed to record orders tested by users of the company "Elite". Electronic accounting of orders allows you to analyze the demand for products and services of the enterprise and plan the future activities of the organization.

IV. FINDINGS

The article shows the rationale for the development of specialized software applications for accounting orders in the company "Elite". In the course of this study, a window application with a graphical interface was developed and a database was designed on the topic: "Developing software for recording sales of company "Elite" in the C # (C Sharp) programming language with connection to the My SQL Server database, which allows to optimize the work of the company "Elite", where this application was implemented.

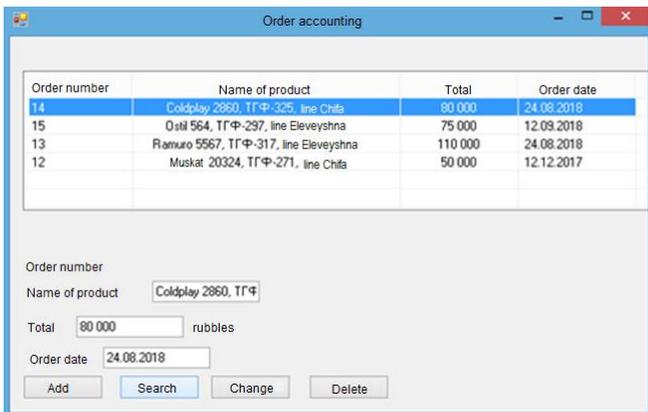


Fig. 2. Automated system interface

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