DESIGN AND CREATION OF A COMMERCIAL WEBSITE – PRACTICAL SOLUTION FOR ELECTRONIC COMMERCE

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Abstract

Developing a solid online presence for a business in the commercial sector is vital to both its survival and growth. The culmination of all elements, strategies, tactics, and effort exerted by a company in selling products reaches its completion only at the moment of finalizing the sale of the product. An e-commerce business relies on a web-centered information system, built around the website that includes the online store. The purpose of this article is to present an IT solution for creating an e-commerce website as a working tool that incorporates the desire of businesses, consumers, and management to limit costs while simultaneously improving the quality of products and increasing the speed of service delivery. The e-commerce platform presented in this work constitutes a modern solution for implementing an online store, intending to sell agricultural products and equipment. For database management, a relational open-source software, MySQL, has been chosen, preferred for its numerous advantages and its ability to run on almost all software platforms. For fast processing and easy page loading, PHP has been used, which is one of the most popular open-source programs and has the advantage of running on almost all operating systems. The website features a modularized structure, consisting of administration, authentication, payment, and order launch/cancellation modules. All these components contribute to the optimal functioning of the e-commerce application.

Key words: *e-commerce, website, database*

INTRODUCTION

In today's world, a business that is not present on the web practically does not exist. It is much more convenient for the user to order with a click than to travel to the manufacturer's/provider's headquarters or a retail outlet. E-commerce is concerned with the presentation, sale, and marketing of goods and services through the technologies offered by the Internet.

The main advantages that e-commerce and, in general, automated information solutions bring to the activities of businesses are as follows [1]:

✓ facilitates the expansion of business by providing quick access to local and national markets, but more importantly, to international markets;

✓ reduces costs associated with the conduct of the company's activities, particularly those related to information creation, processing, distribution, storage, and retrieval;

✓ creates the possibility for easy customization of products and services according to the buyers' needs;

✓ adaptation to changes can be faster through the use of e-commerce technologies;

✓ generates new business models – customer databases and preferences can provide crucial information for subsequent decisions;

✓ communication and transportation costs are significantly reduced;

✓ product promotion is carried out more extensively and rapidly.

Among the multiple advantages for consumers, we can specify the following [3]:

✓ provides consumers the opportunity to buy or engage in transactions 24 hours a day, throughout the year, from almost any location;

✓ buyers can more easily choose the lowest price for a product or service;

✓ allows for the rapid delivery of products and/or services (in some cases);

✓ consumers can receive relevant information in a short time: within seconds,

not days or even weeks, as is the case in many traditional businesses;

✓ facilitates competition, leading to a decrease in the prices of products and services;

✓ enables consumers to interact with other buyers through electronic communities,

Additionally, e-commerce brings several advantages to society, including:

✓ providing the opportunity for more people to work and shop from home, which can lead, over time, to a reduction in traffic and pollution;

✓ marketing products at lower prices benefits those with lower incomes, contributing to social protection;

✓ e-commerce contributes to increased efficiency and/or improved quality of products and services.

The purpose of this work is to present an IT solution for creating an e-commerce website - an online store - dedicated to the sale of agricultural products and equipment.

MATERIALS AND METHODS

From a structural perspective, the implementation of an e-commerce platform requires the collaboration of four components (information subsystems) [11]:

→ **Client -** an equipment, typically a PC, directly connected (via an ISP) or indirectly (through a corporate network) to the Internet; the buyer uses this equipment to navigate and make purchases.

→ **Merchant -** an information system (hardware and software), usually located at the merchant's premises, which hosts and updates the electronic catalogue of products available for online ordering.

→ **Transactional System -** the information system that is responsible for processing orders, initiating payments, maintaining records, and other business aspects involved in the trading process.

→ **Payment Gateway -** an information system responsible for routing payment instructions within financial banking networks, verifying credit cards, and authorizing payments; this system serves as a gateway connecting the global Internet network with the financial banking subnetwork (subject to enhanced security requirements).

In the initial stage, designing electronic commerce systems involves determining the requirements necessary for website development [2],[10]:

✓ Hardware requirements: characteristics of the machines used as servers (memory, hard disk space, processor speed, etc.)

✓ Software requirements: operating system, web server,

✓ Firewall requirements,

✓ Optional program packages (tax calculation programs, etc.),

✓ Software packages for ensuring the security of the website and transactions;

✓ Communications (referring to bandwidth, network topologies, etc.).

The actual design can be divided into two parts:

→ **Logical Design**, which includes:

- data flow diagram, describing the flow of information on the website, the processing functions to be performed, and the databases to be used;

- description of security elements and backup systems in case of emergencies, as well as the measures that will be taken.

→ **Physical Design**, which translates the logical design into physical components.

The basic specifications of the website presented in this article were PHP and MySQL.

PHP is a programming language widely used in the development of web pages and applications. By using PHP, so-called dynamic pages can be created, incorporating elements of interactivity and allowing interaction with a database created on a server. To work with PHP, one must first have access to a server running PHP (this can be a separate server or a virtual server created on a personal computer, which can be installed using the free WAMP package) [9].

MySQL is a relational database management system, currently the most popular open-source RDBMS, and a key component of the LAMP stack (Linux, Apache, MySQL, PHP). The administration of the MySQL system is carried out using the **PHPMyAdmin**

application, designed for managing databases through a web browser [5].

Through PHPMyAdmin, various operations can be carried out, such as creating, modifying, or deleting databases, tables, fields, or rows, as well as executing SQL commands (queries) [8].

Storage engines manage the way data is organized, stored, and accessed. For the e-commerce platform, the *MyISAM* storage engine was chosen, which is also the default in MySQL. It is responsible for executing SQL instructions and handling data from data files, ultimately determining the database's performance. The main features of MyISAM influenced the choice of database design and implementation: support for transactions, locking, indexing, and storage [6], [4].

For tables using the MyISAM storage engine, three types of files were defined: *.sdi* for table structure, *.myi* for index table, and *.myd* for data table. An important characteristic is its ability to scale memory (key_buffer_size) for storing both indexes and the processes of retrieval and sorting [7].

The MySQL server's database used for the website consists of interconnected tables, providing optimal transfer of information among clients, merchants, the transactional system, and the payment system.

RESULTS AND DISCUSSIONS

This article presents the stages of designing and implementing a platform for electronic commerce, serving as the foundation for an online store that will sell agricultural products and equipment. For this endeavour, it is necessary to build the database, construct the relevant tables, and populate them with values specific to the domain for which the application was created.
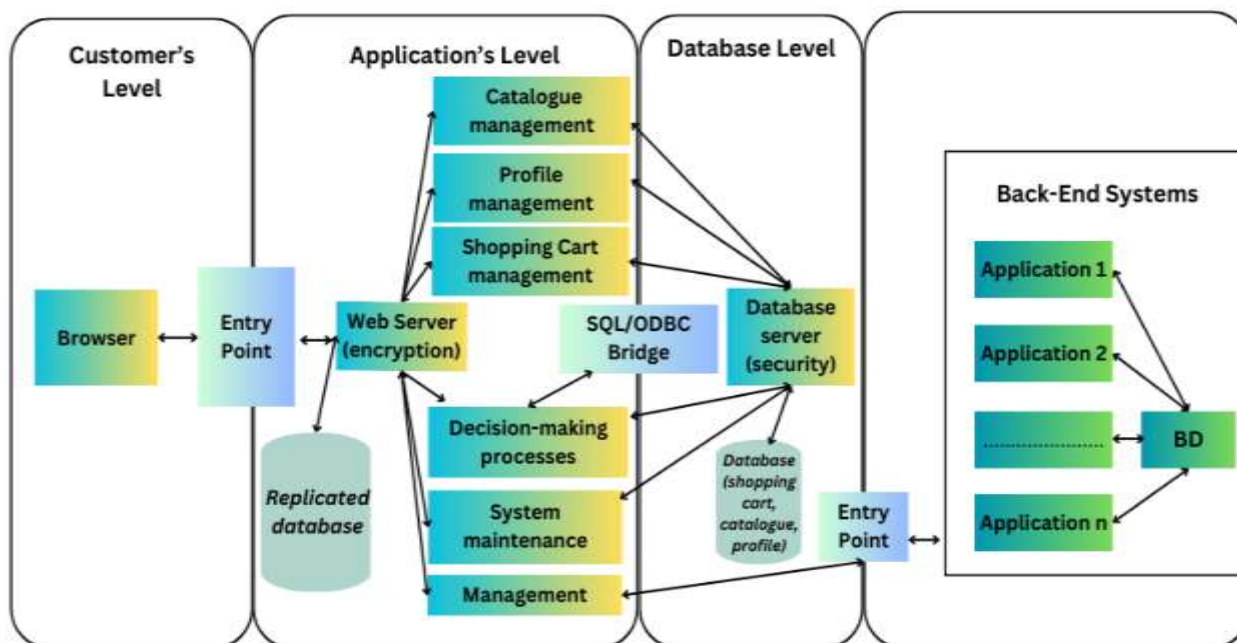
Fig. 1. The e-commerce application
Source: own contribution.

The e-commerce application consists of the following basic elements [2]:
✓ *Web Server* - ensures the functionality of the entire software package of the application.
✓ *Product Catalogue Management* - utilizes data from the product database to generate the catalogue with offerings. Users can browse the catalogue through the browser to search and compare products in the offering.

✓ *Virtual Shopping Cart* - represents the standard way of managing products selected by the customer and placing the order.
✓ *Product Database* - located on the respective server, with the note that the same data may be replicated in databases for users, making it more accessible to the application managing the online store.

The order processing application (purchase order) incorporates the business rules for conducting commercial transactions, with the following actions as premises:
✓   consulting and updating the product database,
✓   price calculation,
✓   selection of the delivery method,
✓   selection of the payment method.
Additionally, the application interfaces with the traditional business activity tracking system through the following actions:
✓   inventory management
✓   order tracking

✓   price calculation
✓   revenue tracking
✓   interactions with third parties, etc.
The Customer Relationship Management (CRM) component manages user profiles based on data transmitted by website visitors and/or data regarding site visitation behaviour, extracted from activity logs managed by the web server.
The Maintenance System component must provide authorized individuals with the capability to develop or reconfigure the system in a manner that is both accessible and secure, preferably through a browser.
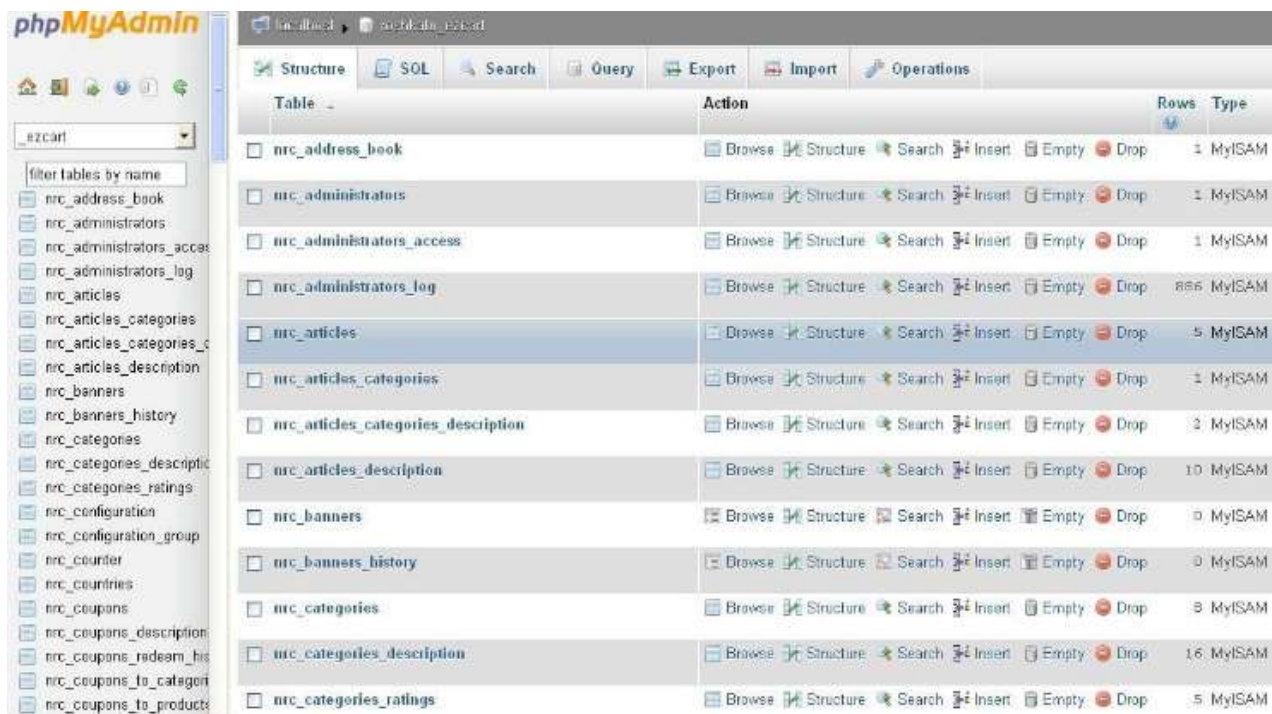
Fig. 2. Capture of the commercial website's database
Source: own contribution

Fig. 3. Fields and characteristics of the Admin table
Source: own contribution.

The database (Fig. 2) belongs to a MySQL server and structurally contains MyISAM tables with complex relationships, optimizing the organization of information.

The following presents the main tables of the database, whose functioning principle involves connecting through a network of the two main parts – the client and the server. In Fig. 3, the structure of the Admin table is

presented, which includes the following fields: the ID (the primary key of the table, representing a unique identification number for each administrator account), the username, password, email address of the administrator, and the admin account settings.

Fig. 4. Fields and characteristics of the Categories table
Source: own contribution.

In Fig. 4, the structure of the Categories table is presented, which includes the following fields: category name, category image, category number, sort order, category status, date of addition, and last modification date.

Fig. 5. Fields and characteristics of the Products table.
Source: own contribution.

In Fig. 5, the structure of the Products table is presented, containing fields related to product characteristics: product ID, type, weight, and quantity of the product, minimum order quantity, maximum order quantity, price, and model of the product, date of product addition, and date from which the product is available.

The Customers table (Fig. 6) contains fields associated with both customer identification elements and actions related to their activity on the site: customer ID, customer group number, gender, customer's first and last name, customer's email address, default address number, phone number, customer's fax, customer's password, newsletter subscription, customer status, customer's IP address, customer's credits, date of last activation, total visit count, account creation date, date of the last account modification, global notifications, date of the last shopping cart abandonment.

Fig. 6. Fields and characteristics of the Customers table
Source: own contribution.

The Orders table (Fig. 7) contains fields related to the customer's order, as follows: order number (ID), invoice number, customer number, customer name, company name of the customer (for legal entities), street name, sector, postal code of the customer/company address, city, country, phone number, email address, customer's address format, customer's IP address, delivery name, delivery company name, delivery address.

The Wishlists table contains three fields that are keys for relationships within the database:

✓ wishlists_id (it is the primary key of the table, representing a unique identification number for each record);

✓ customers_id (it is a foreign key to the Customers table, representing a unique identification number of the user);

✓ wishlists_token (it is a foreign key to the Products table, representing a unique identification number of the product).

Fig. 7. The fields and characteristics of the Orders table
Source: own contribution.

Fig. 8. *Wishlist* table
Source: own contribution.

The store is structured into 3 sections and is available to any user:

a. Presentation area;
b. Client area;
c. Administration area.

a. *The presentation area* is represented by the website's homepage and is designed for the ordinary, unregistered user. This user can gather information about the store and the displayed products, access the store's catalogue at any time, and navigate to pages such as New Products, Contact, My Account, etc., from the main page. To have full access and be able to order products from the site, visitors need to create a customer account by going through the classic process, providing a username, email, password, etc.

The e-commerce website features several functions that allow the following:
- products can be viewed by component category;
- listing of products can be done by

manufacturer;
- advanced search for products can be performed;
- the shopping cart can be viewed;
- modifying the quantity of products is possible;
- adding comments for a specific product is possible;
- any product can be added to the favourites list;
- registration details can be modified;
- the 'wishlist' of products can be viewed.

In Figure 9, the homepage of the website is presented, containing a list of main menus (equipment, pesticides, tools, and accessories), a list that can be updated by the administrator at any time.

Fig. 9. Online Store Interface
Source: own contribution.

In Figure 10, a screenshot of the page displaying the products on promotion with the new reduced prices can be found.

Fig. 10. Promotional Products Page
Source: own contribution.

b. *The customer section* is available to registered users. In addition to the usual features offered to a store visitor, registered users can order desired products. Figure 11 presents a screenshot of the shopping cart,

displaying the content of the cart, and the cost of selected products, and from here, the order can be placed for processing.

Fig. 11. Shopping Cart Page
Source: own contribution.

Fig. 12. Order Form Page
Source: own contribution.

Fig. 13. Order Placement and Confirmation Page
Source: own contribution.

On this same page, the customer has two options through two buttons: to continue shopping or to go to checkout. Throughout the navigation, products can be added or removed from the shopping cart. At the end of the shopping session, the customer can submit the order with a single click on the "Go to

Checkout" button and will be directed to the page containing the order form (Fig. 12), where the customer needs to fill in the details, and then to the order placement and confirmation page (Fig. 13).

Figure 14 presents the page where users can quickly get in touch with the administrator of the online store through a form.

Fig. 14. Contact Page
Source: own contribution.

c. The administration section is accessible to the administrator of the online store, who may be an employee with access to the store's products, not necessarily the store's programmer. An administrator has access to all pages of the store. Additionally, they can add or modify products, view user orders and contact forms, modify user data and access levels, respond to or delete messages, and process or delete orders when they are not finalized or confirmed.
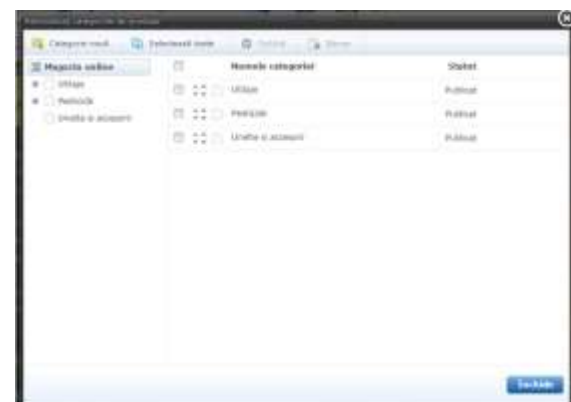

Fig. 15. Edit Category Page
Source: own contribution.

Security standards for the customer are also met, ensuring that an administrator does not have access to a user's password and cannot log in as a client using their username and password. It is a standard procedure in e-commerce to store all passwords encrypted in

the database securely. However, an administrator has access to the entire database and is practically responsible for its management.

The administrator manages the product categories table, and operations such as deleting/editing/adding a newly created category can be performed from the Edit Category page (Fig. 15).

The administrator has the right to edit/add/modify products, and this can be done from the Edit Product page (Fig. 16).
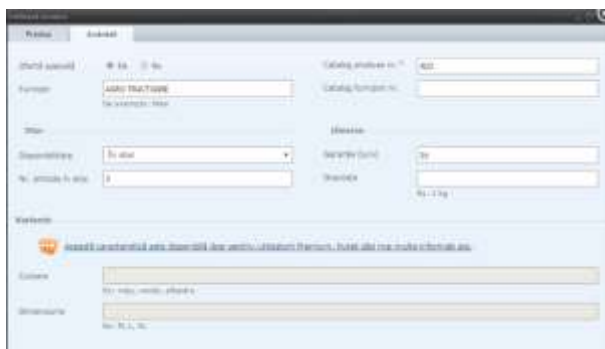

Fig. 16. Edit Product Page
Source: own contribution.

The administrator can add a new product (Fig. 17),

by filling in all the fields on this page: name, price, price without VAT, VAT, initial price (if a discount is applied), product category, description, information, and can subsequently edit and modify them.
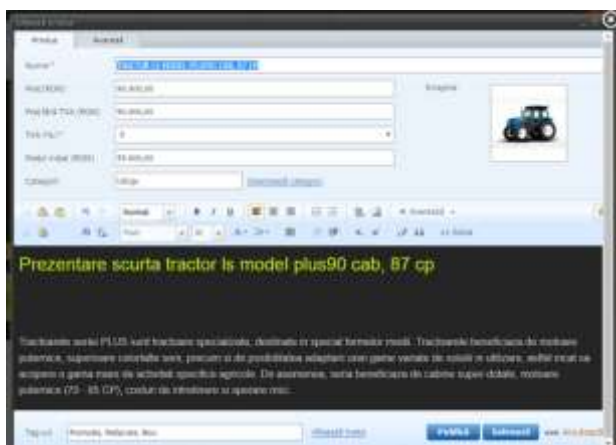

Fig. 17. Add Product Page
Source: own contribution.

Next are the pages where the administrator finds information about customers and can retrieve both the list of customers (Fig. 18) and the list of orders (Fig. 19).

Fig. 18. Customers Page
Source: own contribution.

Fig. 19. Orders Page
Source: own contribution.

The main page in the administration section contains the list of customers along with the following information: name, surname, order placement date, email address, customer group, IP address, visit count, date of the last visit, as well as the order status and payments made.

In the end, the administrator retrieves the order and sends it for processing, and all information about the order is displayed on the final page, as shown in Figure 20.

Fig. 20. Order Information Page
Source: own contribution.

CONCLUSIONS

The e-commerce platform developed in this work represents a modern solution for implementing a virtual store aimed at selling agricultural products such as machinery, tools, pesticides, etc. The product list can be easily updated or edited by the website administrator. The MySQL database contains

a complex structure and relationships, ensuring that the organization of information is done correctly both logically and physically, while PHP scripts collaborate to ensure the optimal functioning of the web application.

Having a website can be compared to having a business card, and through it, any company can create a positive image, gaining a real advantage over businesses that are not present in the virtual environment. The website is a convenient tool for the online store, and the advantages for a company that owns its website are evident for both the customer and the seller.

Since the 21st century is the era of technology, most companies strive to develop their businesses as much as possible and turn to the most efficient and modern methods of promotion and sales, specifically online methods, which favour communication on the Internet and, consequently, sales, contacts, and the reputation of a company.

The increasing number of e-commerce applications has led to the growth of businesses developing their operations online, attracting a larger number of customers. New technologies have resulted in a decrease in the implementation and development duration of web platforms, making market entry much faster. With all these characteristics, e-commerce applications have a very high reliability and are increasingly used by users worldwide.

REFERENCES

[1]Cofas, E., 2009, Electronic commerce and electronic marketing in agricultural markets, International Symposium "Perspectives of Agriculture of the Third Millennium", Cluj Napoca, Bulletin UASVM Horticulture, 66(2), Academic Press Publishing House, pp. 130-135.
[2]Cofas, E., 2011, Databases and computer programming (Baze de date și programarea calculatoarelor), All Publishing House, pp.19.
[3]Cofas, E., Soare E., 2011, E-commerce – a viable solution for the Romanian market of food products, International scientific symposium "Sustainable rural development", 2011, Faculty of Agricultural Management, Timisoara, Scientific works, series I, Vol. XIII (2), pp.165.
[4]Duckett, J., 2022, PHP & MYSQL: Server-side web development, Wiley Publishing House, pp.210-215.
[5]McGrath, M., 2018, PHP & MYSQL in easy steps, In easy steps Publishing House, pp.122-138.&
[6]Myisam, 2024, Default storage engine for the MySQL relational database management system, https://dev.mysql.com/doc/refman/8.0/en/myisam-storage-engine.html, Accessed on January 22, 2024 .
[7]Mysql.com, 2022, My SQL Tutorial Programming Course, https://www.mysql.com/, Accessed on January 19, 2024.
[8]PHPMyadmin, 2024, Open source administration tool for MySQL,
https://www.phpmyadmin.net/contribute/,
Accessed on January 29, 2024 .
[9]PHP, Hypertext PreProcessor, 2024, Scripting language suited to web development, https://www.php.net/, Accessed on January 10, 2024.
[10]Surcel, T., Marșanu R., 2005, Web and database technologies (Tehnologii web și baze de date), Tribuna Economica Publishing House, pp. 68-71.
[11]Technoical University Cluj-Napoca, Electronic commerce, Course, http://ares.utcluj.ro/comertelectronic/index.htm, Accessed on January 18, 2024.