UNIVERSITATEA DIN PITEȘTI
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EDUCAȚIE FIZICĂ ȘI INFORMATICĂ
Programul de studii: Masterat

LUCRARE DE DISERTAȚIE

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E-commerce Online Magazine Platforms. Specific technical means.

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GENERAL INFORMATIONS

Online shopping is a practice more and more popular in the modern world because of commodity, variety and less time consuming. A process that some time ago took over an hour now can take only a few minutes behind a computer that is connected to the internet.

In this document will be presented all the advantages and disadvantages of this modern shopping way and also the steps to create and use an online shop.

Chapter 1 – Introduction. This chapter will describe in short words what you are going to find in this document, how it works and what should be done.

Chapter 2 – Detailed informatios. Here will be presented the positive and negative aspects of online shopping. Also, in this chapter will be presented many other technical details like payment options, development recommendations, economy tips and tricks, SEO and many others.

Chapter 3 – Used technologies. The example application uses multiple different languages and technologies. Here each technology will be described and explains why it was chosen for this project and how it helped the development.

Chapter 4 – Implementation of the application. Describes how the technologies were used, all the back logic and implementation tips and tricks.

Chapter 5 –Application specifications and features. In this chapter you will find explanations about how the application works, how to manipulate the data and how to use the application at a 100% efficiency.

Chapter 6 – Conclusions. This is my personal opinion about the application and the possibility to be develop new features.

CHAPTER 1 - INTRODUCTION

Is a known fact that we live in the speed century, accessing information was never easier and faster and this is essential. Right now, the fastest communication way is the internet, accessed by computer, phone, tablet and any other device that have a valid connection. Everything is digital now, no matter the domain or the activity. Almost everyone uses a computer and somehow it depends on it.

If we try to see the evolution of the world from the point when the computer was created until now, we can observe that the technology is growing exponential and the end user have more and more access to information. Also the technology helps them to easy reach objectives that in the past were very hard to be accomplished.

The paper was changed with digital storage which is much safer, the mathematical effort was replaced with great computing skills of a computer which are much faster than a normal human mind and the time spent by walking to a physical shop was replaced with a few minutes spent behind a computer and a minimal effort to move and click a mouse.

1.1   Project subject

When personal computers appeared on market it costs a fortune and there were not so many alternatives. Today everybody have at least one computing system and it may be a computer, a phone, a tablet or other gadget. They come in all sizes and shapes. We have phones just as powerful as computers and computers that are over twenty years old and are still doing their job. Every company uses a computing device for different tasks such as security, customer interaction, data storage.

In present, any company uses a computer that have installed different software applications useful for its business. These software applications helps the administrators and users to save time, and when time means money, that's a lot. Also, a computer is a modern way to store and search for needed data. The data acquired in 50 years can be easily stored on a 2.5" hard drive or a tiny memory card.

My application represent an ideal solution of a modern shopping style: an online shop. In this way an user can order anything in less than five minutes using only a few mouse clicks and the administrator can easily track the orders, check the stocks and update the prices and availability status of any product.

It is structured for three kind of users:

- *Administrator* – Has full control over website and can access all the pages, some of them inaccessible to the rest of the users.
- *Anonymous user* – Is an user that doesn't have a registered account on the website. He has the most limited access to the features.
- *Registered user* – Is an user with more access than an anonymous one. All of his history and data are stored in local database and can be read when needed.

Every user have different privileges and each user can change only the data assigned to it. This mean that a person can only update his profile, not any profile. All the information is confident and the data can't be accessed by anybody. The administrator is the only person that can access users data.

The application is very useful for shoppers, they can find a large diversity of products and easily search what they want. Also, the shop administrators can easily manage the orders, receive the payments and check the stocks. In this way both kind of users save lot of time and are not limited by time, online shops being opened all the time and not only for a limited time a day.

CHAPTER 2 – ONLINE BUSINESS

The internet is a great place to open a company but its potential isn't used yet at 100%. Anybody can make money on internet without even knowing too much programming and without having a huge amount of funds to start.

A company that have an online page has a few more advantages than a company that has only physical centers. Those advantages can be for the owner or for the customer.

2.1 Online business types

Electronic commerce (or e-commerce) is the process of selling, buying or exchange of products or services through the internet. An e-commerce business is based on:

- Online presence
- Online orders
- Online payments

The virtual market is the place where sellers and customers meet for selling, buying or exchanging products, services or information.

Electronic business are divided in multiple categories.

Business to business (B2B)

B2B represents a kind of e-commerce where all participants are companies or organizations. This kind of business uses a special channel of communication between seller and customer. The customer uses the sellers extranet by usernames and passwords.

This kind of business include search of potential providers, product catalogs and the possibility of ordering products of services.

Business to customer (B2C)

B2C is a kind of e-commerce where companies sell products or services to regular customers through online shops (virtual shops). Online shops are based on a website of a company created for promoting and selling of products or services. An online store contains a product/service catalog which is managed using a database management system where all the data are stored. Online shops have features for searching, viewing, ordering and paying for products. This kind of business had a very slow evolution because of security.

Consumer to business (C2B)

C2B is a category of business where consumers uses the internet to sell their products or services to the companies.

Consumer to consumer (C2C)

C2C is type where consumers are selling products and services to another consumer (like ebay.com).

M-commerce

M-commerce is based on transactions made using mobile phone. Most common M-commerce business are information delivery, tickets selling, etc.

E-banking

This business is related to online banking transactions: money transfer, electronic payments, banking consultation.

E-directories

Those are websites that contains huge amounts of data. They are organized by categories and the data finding is made based on searching trees.

E-engineering

Is made for distributed electronic development.

E-gambling

Is based on online gambling games, like blackjack, poker, etc.

E-learning

Represent learning platform and is mostly used by schools and universities.

E-Procurement

Known as electronic supply. Is used for product or services supply by big companies and public authorities. An offer specifications are posted on the Web and companies place bids. This system create competition and lower the price.

E-trading/e-brokering

Those are virtual stocks systems used for online selling and buying.

Government to business (G2B)

Represents a business model where a governmental institution buy or sell products or services from/to companies.

Government to consumer (G2C)

Those are online relationship between govern and citizens. It is used for information and public services like duty payments.

2.2 Payment methods

A very important aspect of e-commerce is the payment method. Digital business needs digital payments too. There are a lot of digital payment methods but most used are:

- Credit Cards
- PayPal
- Electronic checks (e-checks)
- CyberCash
- E-charge
- Gift cards

Credit cards

The most used digital payment method is using credit cards. The customer needs to fill an online form with details about his credit card. Due to multiple security layers (like 3D Secure), this kind of payments are more secure than few years ago.

PayPal

PayPal is a software solution for digital payments. Both, seller and customer, needs to have a paypal account. There are multiple types of paypal accounts. It acts like a gateway between customer's card or bank account and sellers account. For example, the customer can link its credit card with his paypal account. When he will make a transaction with his paypal account, the paypal service will make a transaction between the card and its service and then will transfer the funds from customers account to sellers account. This practice is very useful because paypal is a secure layer for your transactions.

E-checks

E-checks represents a very used payment method in electronic business. The online shop will give the customer the possibility to fill a form, his data will be send to the seller who will print them on a regular check.

A group of banks has created a model of electronic check which is very close to classic checks. The payer use a processor to generate and sign a digital check which will be sent through email or web. After the check is filled it will be sent to the customers bank which will make the transaction after the verification of the digital signature.

CyberCash

This is a method where the customer needs to have installed a software that simulates a wallet, encrypt the messages and store the transactions. This software let the customer to use more payment methods: digital money, credit card or checks. When the software is installed, a public key and a private key are generated. The public key is sent to CyberCash which save it in a database next to all public keys generated by sellers and customers. The seller uses a similar software. The customer and the seller must exchange keys in order to know which key will be used to encrypt the messages.

Gift cards

Using different payment methods, a person can buy a gift card that has an exact value. The gift card can be sent to another person (as a gift) and can be used to buy products or services representing the value of that gift card.

2.3   Online frauds

Because a lot of money is made online it's no wonder that there are multiple kind of frauds. A few of them are:

1) Online job offer – Some people pretend that they can make you rich without working had. They lie you with simple tasks like manual activities or writing texts. But for this tasks they want you to buy first some books or materials that can train you for your "future" tasks. Or maybe to pay an admission fee.

2) Multi Level Marketing plans – the customer needs to bring new members to the "business" in order to grow up the business and increase the visitors.

3) Pyramidal schemes – This kind of thing is known online and offline. The earnings are received form another recruited members.

4) Copyright frauds – A scam website will pretend that it will host a contest of content. The victims are lied that the contest will have generous prizes but at the and all the content will be stolen by the hosts and considered their personal work.

5) Imaginary acquisition – The users is announced via email that he will received something he ordered some time ago.

6) Fake pages – Some pages request users details (like credit card information) in order to do something. Some of them are just copying the visual style of some serious websites and users are easily fooled.

2.4 Advantages of e-commerce

Online business have advantages for both sides: sellers and customers.

For sellers:

- Almost any kind of product can be sold on internet.
- It's fast and cheap way to inform and promote your offers.
- An online shop does not require as much money on start like a traditional one.
- It eliminates some physical communication restrictions between partners.
- Costs are reduced by reducing the time needed for supply.
- Administrative costs are reduced by efficiency on economical processes for finding new suppliers and payment.
- A better data storage about clients and market.
- Fast feedback response from clients regarding services and products, statistics of searches, periods and trends.
- Reduced costs of redesigning.
- Much cheaper advertising.

For customers:

- Online shops are opened 24/24 and can be accessed by anyone that have an internet connection.
- The customer save time searching for products, reviews and comparing prices.
- This kind of commerce lets the customer to study the market in order to decide which is the best price, the best product or service for him and can compare its characteristics with multiple other products.

2.5   Disadvantages of e-commerce

1) **Insecurity**

   In this moment many customers are still sceptic when buying something using internet. This insecurity may be related to the first e-commerce websites that had a lot of security issues.

2) **Infrastructure**

   The internet was first created to be an opened environment based on communication but not really safe. That's why security systems are getting stricter and complicated. This is a base element of e-commerce.

3) **Customers mentality**

   This is a big disadvantage of e-commerce and it depends by the professionalism of companies. Seller's attitude can make the customers to be suspicious and avoid their products.

4) **Ignorance**

   A lot of people are ignorant and refuse to accept technologies or technical progress but also the limited telecommunication infrastructure can cause a disadvantage for e-commerce. This can change in the next years since the price for internet access is getting lower and the areas that can support internet connection is growing fast.

5) **Other disadvantages**
   - Users can't test or touch the products.
   - There is no seller that can recommend products. Also, sometimes there's no one that can reply to user's questions.
   - Products can be damaged during shipment.

CHAPTER 3 – USED TECHONOLGIES

The computer is an universal instrument that easily adapts for different projects. It can be used for multimedia, games, information but also it can transport any user to any part of the world.

The internet access can be compared to a dream without an end, a holiday in any corner of the world but taking place in user's room. The internet gives us freedom of communication, a collection on libraries, study groups, information and pictures around the world but also many other useful data. In internet, the distance is measured in speed and the effort is measured in clicks.

The internet is actually a computer network containing machines all over the world. Specialist say that the internet is a sum of communication protocols that allow data transfer between different network placed randomly around the world and giving access to information that is stored in computers that are part of those networks.

Basically, the internet is a huge network, a network of networks.

The internet evolution was incredible, it was growing exponentially. In 1985 about 2000 computers were connected to internet. Today there are hundreds of millions of computers connected around the world and their number is increasing very fast.

In our country the internet connection was considered a lux for a long time. From the point of view if infrastructure, it evolved very fast and now Romania is having one of the fastest internet connections in the world.

Now, the internet represents the easiest way of informing. There are a lot of resources available in many languages and for absolutely any domain of activity.

Specialist are trying to make the internet even easier to access and utilize. Internet is getting better and better on all of its attributes: design, speed, security. To understand that we must enumerate the technologies used.

- **Collaboration**

There are huge progresses for long distance conferences. A lot of changes and improvements were made for video conferences and VoIp calls.

For example, there were developed technologies which allow to share documents all over the network for being modified by multiple persons from different place. Also we can initialize video or audio calls and more than that, we can share projects and documents for being changed by any participant of the conference.

- **Objects**

Unlike few years ago, web pages are not limited to texts and graphic design. Today the designers can use their imagination and develop almost anything they want inside of a web page.

For example, there are a lot of software applications that are able to run online from server or directly in browser without needing a installation of the software first.

- **Online complex messaging**

Just like web pages, neither emails are not limited to texts anymore. Now almost all email clients use HTML markup language that allows the content to be well designed with a variety of font, colors and multimedia content. More than that, we can attach documents, multimedia files or any other type of digital files.

- **Security**

Security was always a problem for internet and all the time new security policies appeared. Sadly, everything that is secured raises curiosity and hackers search any security breaches. They exploits those breaches in order to access the data they want. In present, the connections and transactions are becoming much safer and in the future probably the security won't represent a problem anymore.

Specialists are creating a safer environment for users of the web but also for those who make transactions, ensuring the security needed using different types of authentications and a very well optimized code.

3.1   Web pages and web servers

World Wide Web (known as WWW) is the base of a HTTP protocol (Hyper Text Transfer Protocol). HTTP is a small and fast protocol that fits to any distributed multimedia system and allow to surf between different websites.

The web is actually a sum of pages hosted on systems that run a web server software. Usually the host is confused with the web server and that's wrong because the web server is a kind of software and the host represent the physical device which runs this software.

A web server is a software that when is asked, it returns web pages to the client. When the user asks for a specific file from an IP address, the web server is searching it if the file exists, it is returned to the user.

The file that is returned by the web server can have any type. It can be a web page, an image, a document, a video, etc. The web server doesn't have the power of decision. When a browser asks, the web server responds.

For a connection to web server the user must create a request, then an IP connection will be created between the host and the client. The response will be sent back to the user using this new created IP connection. At the end of transmission, the connection will be closed.

On the same host can run multiple internet applications, each one using a different port. For example, on the same host can run a web server, a ftp server, a dns server, a smtp server (for email), etc.

Each server software uses its own port to be sure that the request are coming for the right clients.

Most server softwares uses some predefined ports: web servers default is 80, ftp 21, smtp 25, etc. In order to hide this, the administrator can change the ports. Also, on same host can be installed multiple server softwares if for each one will be set a different port.

The internet is a global computer network. Just like internet, web pages can be very complex documents. Web pages are saved on hosts hard disks and managed by a special server software. On a request, the file is searched, found and returned to the user through a web browser.

The web browsers are software applications specialized in parsing and displaying web pages. It uses a special markup language, Hyper Text Markup Language, knows as HTML. HTML is used to encrypt web pages with all information needed to display. HTML is based on a lot of tags with different significations.

A web page is based on multiple resources like graphic files, texts or multimedia files. Multiple files can be linked using a mechanism called hypertext. When the user trigger the request of another page using only a mouse click, the browser send the request to the server which will try to find that page and return it to the user. Those links between pages are very easy to identify because most of browsers change the color of text for a hyperlink.

A website is a collection of linked pages with texts, images or multimedia elements. A well designed website uses a home page and each other page will use a link to the home page.

When a website is developed, usually all pages are organized and stored in a folder or a collection of folders known as local website.

By releasing a local website on internet (upload on web server), all filed and folders are mapped by the web server. Once uploaded, the web server transform the website from local website to public website.

The differences between a local website and a public website are that the local website can be accessed without an IP connection since the public website can't be accessed without an IP connection (an internet connection).

The computer that hosts the local website is known as local host.

Although a lot of web pages in World Wide Web are created and written in HTML, there are a lot of other pages written in other ways, using other languages.

3.2 Static web pages and dynamic web pages

HTML

Web pages are actually simple documents written using HTML markup language. HTML represents a sum of intuitive tags that are very easy to use and learn.

Web developers use this markup language to add style and functionality to web pages. The browsers are reading this HTML code and interprets it and display for the user the result, just like the developer created it.

HTML is just a markup language. It can create layouts and forms, nothing more. For an extended functionality is needed a scripting language which will perform logic code that will run in browser. This way the web pages can contain small applications that can run in user's browser.

CSS

CSS (Cascading Style Sheets) represents a standard for element style inside a HTML document. The CSS code can be inserted inside HTML files or using separate files which are referenced inside HTML documents.

Javascript and jQuery

Javascript is also known as JS and is a powerful scripting language that can add custom behaviors to HTML pages.

The browser save in his memory a HTML page, organized like a tree of tags knows as DOM (Document Object Model). Javascript is able to read this DOM, interpret and manipulate it.

jQuery is a library based on javascript scripts that let the user to implement same functionality for a page but with less code that basic javascript. A implementation that in javascript takes 100 lines of code can be done in jQuery using only one line of code.

AJAX

Ajax (Asynchronous Javascript and XML) is a technic that creates an asynchronous HTTP request to the server in the backend without reloading the entire page. The server response can trigger a javascript code to run and manipulate the DOM to display the new data on all page or only on a part of the page.

Ajax is useful because it can reload a part of the page in short time, reloading the entire page would take much more time.

URLs

Every resource from internet is identified by an unique URL (Uniform Resource Locator). An URL uses this schema:

Protocol://hostname/path/resource

Protocol – is a set of rules which allow two or more entities to communicate by data exchange. Here are some used protocols:

1) file - used for an URL that points to local computer
2) http – indicates the address of a web resource
3) ftp – allow users to connect to a web server in order to upload or download files

4) gopher – indicates the URL of a Gopher directory. It represents a system used for locating and transferring information used for indexing file names in internet

5) telnet – allows connecting in real time to another computer using internet and using it like a local computer.

The name of the host is used as identification in internet. The name can be represented by an IP address but also by a name of a local computer or a computer from internet using DNS specifications (Domain Name System).

Port – is represented by an unique number associated to any server type application which run on computer. On a coputer can run multiple servers using different ports.

Resource name – represents the name of the resource. This can be of any type.

A limitation of URLs is that they can't have blank spaces and some special characters. Every forbidden character will be converted to a code associated, preceded by % symbol and then replaced.

3.3 C# Language

C# is an object oriented programming language created by Microsoft in the late 90s. It is derived from C++ language and was a response to Java language created by Sun Microsystems.

Its name is inspired from music, where a sharp symbol indicate that the note should be with a semitone higher in pitch.

C# is one of the main programming languages included in Microsoft's powerful framework .NET Framework.

Microsoft developed this powerful framework in order to help programmers to develop complex applications for different purposes, using multiple languages (like C++, C, Visual Basic, C#).

On web, C# was first used in ASP applications (Active Server Application). ASP is a server side web application framework that give the possibility to programmers to create complex websites. An ASP page has two different sides: front end, which is shown to the user and where the HTML is written and back end where is all the logic of the page.

Later, Microsoft used C# for MVC applications (Model-View-Controller). MVC is a modern architectural pattern that separate the code in three different parts:

- Model – the applications logic and entities
- View – the application GUI which is shown to user
- Controller – the way of communication between view and model
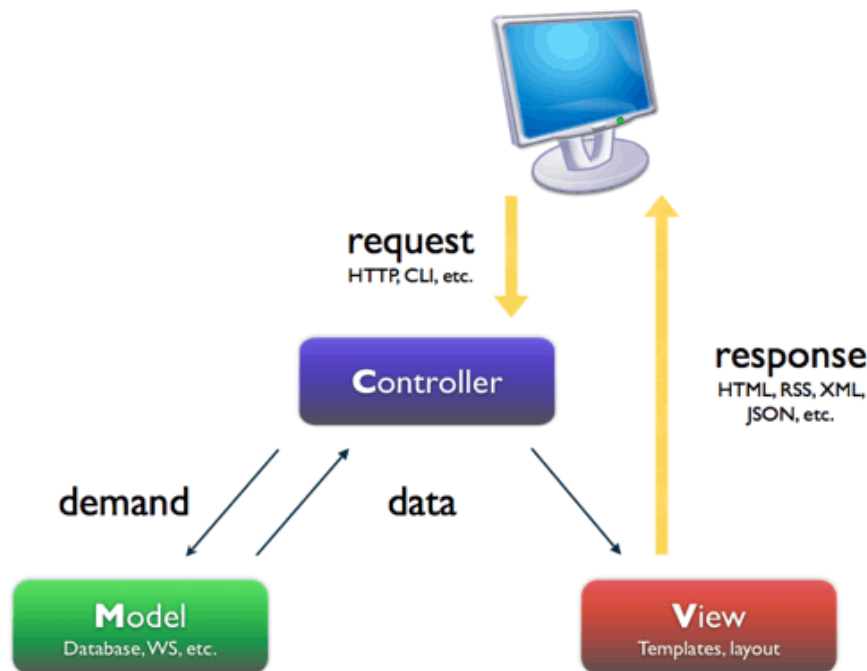
Figure 3.3.1 – MVC schema

Since C# is derived from C++ the syntax will not be so different. Just as C++, C# uses same kind of types of separators.

Data types

Table 3.3.1 – C# Data Types

Short Name	.NET Class	Type	Width	Range (bits)
byte	Byte	Unsigned integer	8	0 to 255
sbyte	SByte	Signed integer	8	-128 to 127
int	Int32	Signed integer	32	-2,147,483,648 to 2,147,483,647
uint	UInt32	Unsigned integer	32	0 to 4294967295
short	Int16	Signed integer	16	-32,768 to 32,767
ushort	UInt16	Unsigned integer	16	0 to 65535
long	Int64	Signed integer	64	-9223372036854775808 to 9223372036854775807
ulong	UInt64	Unsigned integer	64	0 to 18446744073709551615
float	Single	Single-precision floating point type	32	-3.402823e38 to 3.402823e38
double	Double	Double-precision floating point type	64	-1.79769313486232e308 to 1.79769313486232e308

char	Char	A single Unicode character	16	Unicode symbols used in text
bool	Boolean	Logical Boolean type	8	True or false
object	Object	Base type of all other types		
string	String	A sequence of characters		
decimal	Decimal	Precise fractional or integral type that can represent decimal numbers with 29 significant digits	128	$\pm 1.0 \times 10e{-}28$ to $\pm 7.9 \times 10e28$

Comments

For comments C# give us two methods:

1) One line comment – before the comment will be inserted //

   Example: *int x=1; //x will be 1*

2) Multiple line comment – comment will start with /* and will finish with */

   Example: *int x= 1 + 5; /* x will be initialized with 1+5*

                        *x will be 6 */*

Basic instructions

Just like C++, C# uses five basic instructions:

1) If clause – checks if a condition is true or not.

Example:

```
if (x != 0 )
{
        int  y = 5;
        x = x - 5;
}
```

2) Swich clause – search the next step based on variable's value

```
switch(day)
        case 1 : x = "Monday"; break;
        case 2 : x = "Tuesday"; break;
        case 3 : x = "Wednesday"; break;
        case 4 : x = "Thursday"; break;
        case 5 : x = "Friday"; break;
        case 6 : x = "Saturday"; break;
default : x = "Sunday";
```

3) Do … while cycle

```
do
{
        x--;
}
while (x > 0);
```

4) While cycle

While (x > 0)

{

   x--;

}

5) For cycle (cycle with exact number of steps)

for (int I = 0; i < 10; i++)

{

   x += I;

}

3.4   Entity Framework

Entity Framework (EF) was a part of Microsoft's .NET Framework until version 6. On newer versions it was separated from .NET Framework. EF is an object-relational mapping framework.

This technology supports data-oriented applications. Developers needed to work with data engines (databases) where the data is stored and to manipulate the data using some logic. The data can be stored on multiple storage systems, with different configurations and protocols.

Entity Framework helps developers to map the database with programming objects. Each table from database will be mapped to an object. Object will be linked just as database tables they inherit.

3.5   LINQ

LINQ (Language Integrated Query) is part of .NET Framework and represents a language that adds querying capabilities to data on .NET languages.

It was released on November 2007 as a major part of .NET Framework 3.5.

C# in extended by LINQ which adds query expression which are like SQL statements. Those LINQ statements can extract and process data from a database (using Entity Framework), arrays, lists, enumerable classes, XML documents and many other data sources.

LINQ uses some standard query operators:

- Select – performs a projection of results selecting only few aspects of the elements.
- Where – This operator allows the user to search for elements based on a specific set of rules. Each element is checked for those rules.
- Min / Max / Average / Sum – Those operators return a numeric value for each element that is part of the collection. Are used to find the minimum, maximum or average values of the entire collection. Sum is used to calculate the sum of the collection.
- Join – Just as inner join in SQL, join operator link two collections based on matching keys.
- Concat – is used to concatenate two different collections
- OrderBy – This operator is able to sort the collection ascending or descending according to some specified key. Default order is ascending.
- Reverse – This operator is used to reverse a collection.
- First / FirstOrDefault / Last / LastOrDefault – The result of the query will return a enumerable list of elements. These attributes returns only the first or the last element of the list. In case of an empty result, First and Last

will throw an exception since FirstOrDefault and LastOrDefault will return the default value for the element type.

- ElementAt – Is used to return the element at a given index in the collection.
- Contains – This operator check if the collection contain a user given element.
- Count – Is able to return the number of the resulted elements in the collection.

LINQ query example:

> *var result = from s in Strings*
> > *where s.Contains("LINQ TEST")*
> > *select s*
> > *Order by s.id*

3.6   Databases

In our times, databases are indispensable for modern life. Any person interacts daily with at least one database. Making a transaction, buying products, ordering tickets or daily shopping implies data stored in a digital database.

A database is a collection of data records having logical keys. A database can be digital or physical, digital databases can be online or offline. An old physical database is the simple notebook. It was used to store data which was read after some time. In present, the technology evolved and the notebook was replaced with a digital version which is much faster and more convenient to use.

A database must ensure:

- Data abstraction
- Data integration (a database is a collection of related data)
- Data integrity (refers to data rightness and manipulation)
- Data security (limited access to it)
- Data sharing (multiple users can access the data)

3.7 SQL

SQL (Structured Query Language) is a programming language specific to the databases. It appeared in 1970 and later becomes a standard (being ANSI-ISO standardized), now being the most popular language for creating, editing, searching and usage of the data through database management systems.

Characteristics

- SQL is able to describe the data but also it is able to use it.
- Data usage is the extended part of SQL.
- Is based on a sequence of commands (queries). Each query is sent to the database management system and resolved, returning a result.

SQL3 (SQL '98) is a standard that define the object-relational model of a database.

SQL is based on queries. A query is a sequence of components (tokens) which can be: identifiers, keywords, constants and special characters.

Keywords and identifiers

Keywords are, semantically speaking, elements with a specific signification for language:

- Commands names: SELECT, INSERT, UPDATE, ALTER, etc.

Example:

SELECT * FROM tableName WHERE id=13

- Data types: numeric, integer, timestamp, date, varchar, char, etc. SQL is not a case sensitive language, this means that it won't see a difference between a uppercase and a lowercase.

Identifiers are names inside a query and can represent a table name, column name, etc. They are:

- Simple identifiers (basic)
- Delimited identifiers – represent a name surrounded by quotes which can contain any kind of characters. A delimited identifier is used, usually, for a longer table name.

Constants

Constants can be:

- Integers (defined on 4 bits)
- Reals (defined on 8 bits)
- Char arrays
- NULL – special constant representing an empty data.

Special characters

- Operators (+, -, /, *, etc.)
- ; used for delimitation
- Decimal point (used for real type data)

Operators and expressions

The operators can be represented using one or more special characters (+, <, *, etc.) or by words (OR, AND, NOT).

Operators can be classified like:

- Binary – need two operands
- Unary – need only one operand
- Arithmetic - +, -, *, /, <, >, etc.
- Logical – OR, AND, NOT

Logical operators apply only for ternary values (value that represent an operand that can take one of the following values: TRUE (1), FALSE (0) or NULL).

Comparison operators evaluate each expression to a logical value: TRUE or False. Boolean type exist in SQL since SQL3. Comparison operators can be:

- Arithmetic: <, >, =, etc.
- Relational:
  - X BETWEEN minim maxim;
  - X LIKE sampleText, where x is a character array;
  - X IS NULL or X IS NOT NULL;
  - X IN valueList

SQL functions

There are a few SQL functions:

- Grouping functions: calculates certain values for whole table columns: SUM, MIN, MAX, AVG, etc.
- Mathematical functions: trigonometric operations, logarithms, rounds, etc.
- Date functions: used for time and dates.
- Conversion functions

Example

SELECT (SUM(mark)/count(*)) as avg

FROM tblStudent

WHERE id=21

SQL Commands

SQL uses two different command types:

- Creation, deletion and alteration of tables. Those are commands for defining the data.

- Data manipulation: SELECT, INSERT, DELETE, UPDATE.

CHAPTER 4 – APPLICATION SPECIFICATIONS, USAGE AND IMPLEMENTATION

4.1 Presentation

Along with evolution, the human felt the need to measure and save all economical activities on an individual or group level. In time, the storage and measurement methods were changed but they all had the same scope.

Today everything is digital, this way the data can be accessed faster and it is safer to store them. Because of informatics systems, the activities can be simplified and optimized for a great yield.

The computer is an instrument that made the life easier for human kind. Its world wide usage made the humanity to be dependent of its utilization. Either for personal use or for group use, it is a known fact that the computer makes any work to be easier.

Let's think about how a shop works without a computer. Customers should walk to the store. The store is not opened 24/24 so the customer should synchronize with the store's working program. This is hard if the customer has a job with the same schedule as the store. After arriving at the store, the customer should search for the product. A lot of products are exposed so he should try to find what he wants. After a long time his conclusion is that the product doesn't meet his requirements or maybe he doesn't have enough details about what the product can do. This is not good since a lot of time was spent for nothing. For the seller's side is ever worse. He needs to check the stocks daily, to check what he sold, what's the amount of money spent for supply, to make calls to all suppliers in order to find the best price, etc. A lot of mathematic calculations, time spent and stress. Can't this be easier?

An online shop is made to solve a lot of this problems and to be easy and accessible for the customers. All features of the application are intuitive.

4.2 Home Page

The main page of the shop is accessible from any other website's page by clicking on the logo.

As you can see in the image below, the first page is a simple page that lists the newly added products and the latest offers. In the left side (sidebar) there is a dynamic list of main product categories. On click, under each category will be listed another list which represents the subcategories.

Also, there is a carousel that promote certain products.
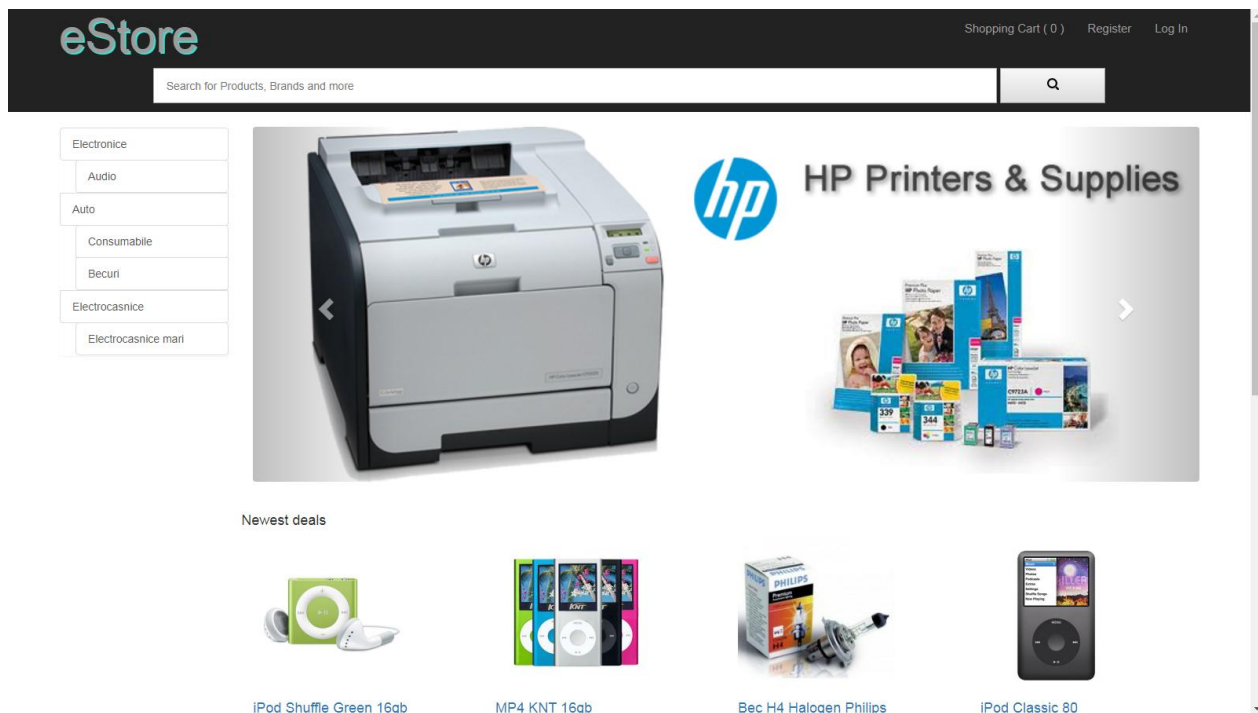
Figure 4.2.1 – Home Page

The header contains useful menus (for Login, Shopping Cart or user account when someone is logged in)
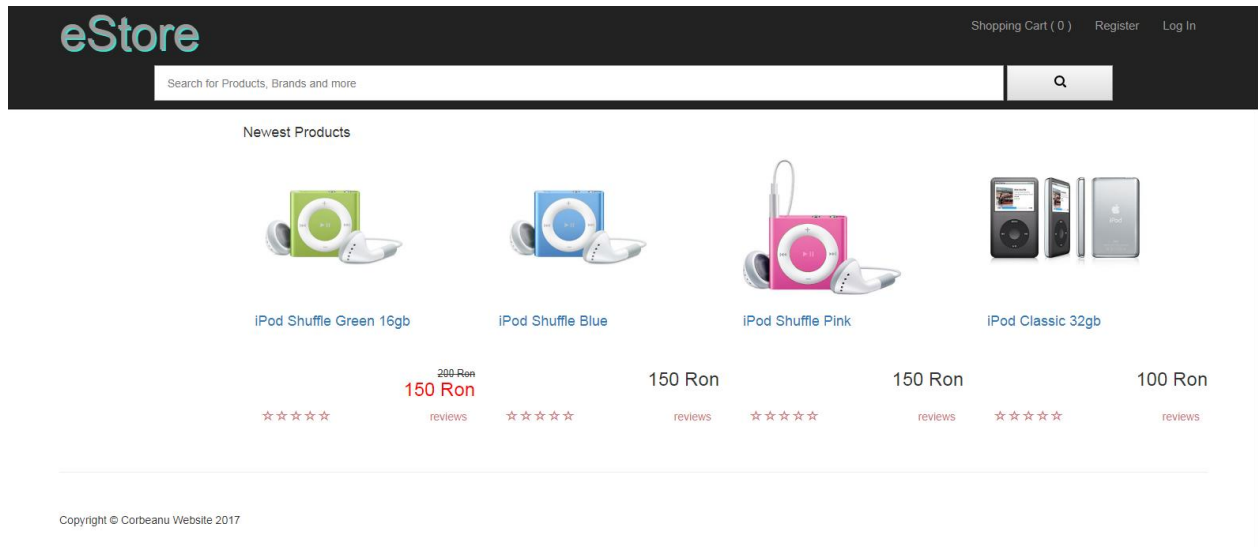
Figure 4.2.2 – Home Page newest products

4.3 Data storage

The application works with different data, filled by user or hardcoded. Some of them are user details, names, prices, passwords, emails, phone numbers, etc. All the data is stored in a database created using SQL language, structured on multiple tables, each of them with a different role.

For checking the raw data I used SQL Server, a software developed to manage SQL databases. I was using it for creating queries for creating tables, altering tables, inserting data, testing data and checking the raw data in order to see if the shop's logic is written well.

Below you can see the application database schema. The schema contains all used tables and relations between them.
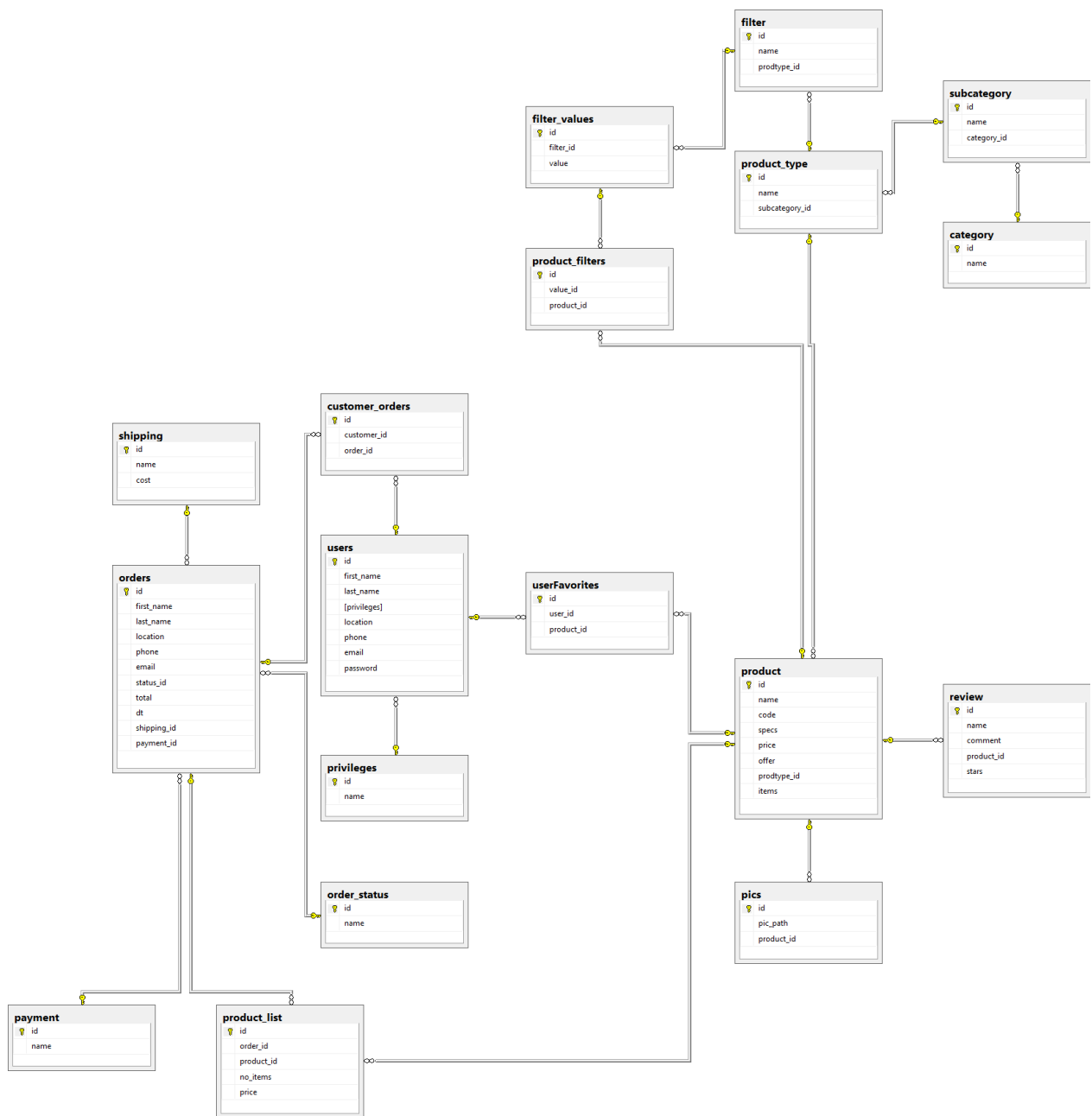
Figure 4.3.1 – Database model

The web server used is the one integrated in Microsoft Windows, IIS (Internet Information Services). In IIS settings in specified a directory that should be discoverable in internet. This directory contain the application. In this way, the website is fully functional on internet. You can check bellow the settings.
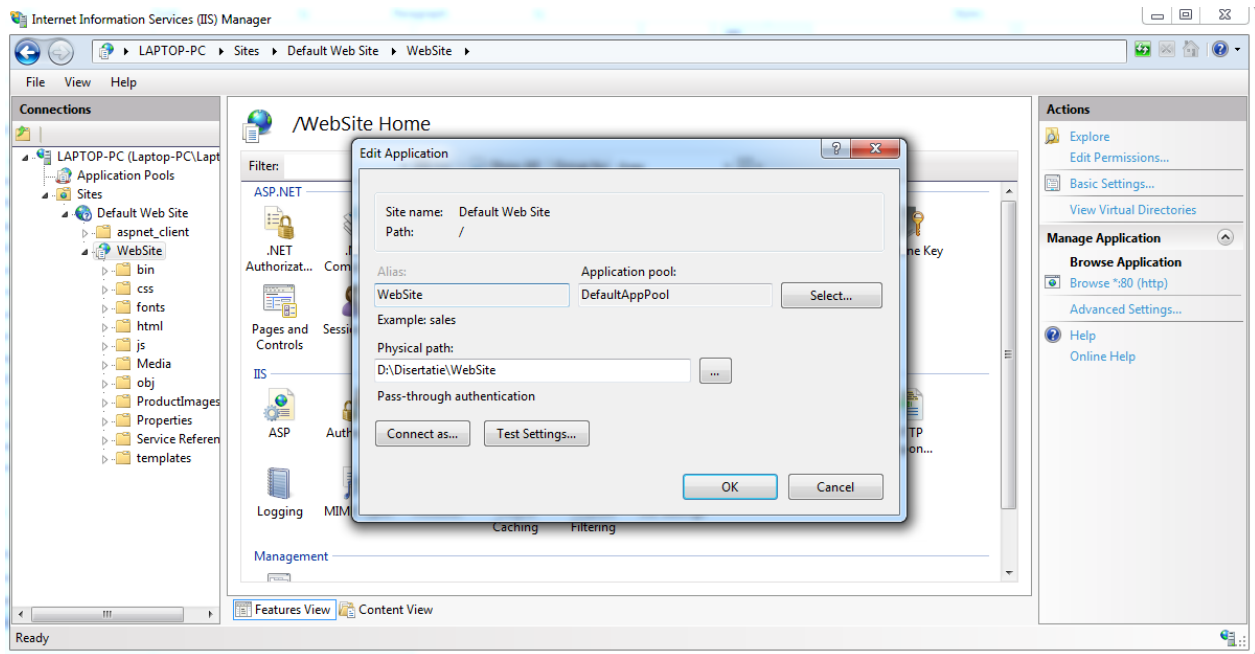
Figure 4.3.2 – IIS Configuration

4.4 Database creation

Because of security no user have direct access to database. In order to create, backup, alter or delete it you need to have access to a management software installed on server. I used SQL Server for management.

The connection to the database is made through Entity Framework, using a connection string set in Web.config file. The connection string looks like this:

```
<connectionStrings>
<add name="DB_entities"
connectionString="metadata=res://*/DB_diagram.csdl|res://*/DB_diagram.ssdl|res://*/DB_diagram.msl;provider=System.Data.SqlClient;provider connection string=&quot;data source=LAPTOP-PC;initial catalog=disertatie;persist security info=True;user id=crb;password=password;MultipleActiveResultSets=True;App=EntityFramework&quot;"
providerName="System.Data.EntityClient" />
</connectionStrings>
```

The base tables were created manually using SQL Server. Inside solution there's a database project where all mappings and entities are stored. Also, there is a folder that contains all operations needs to be ran on database in order to be up to date.
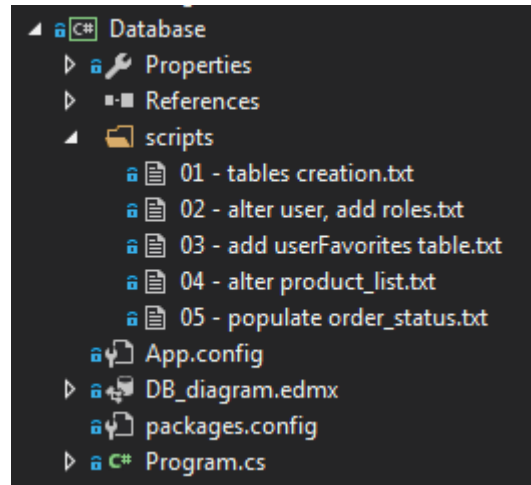
Figure 4.4.1 – Database project scripts

4.5 Logging

The application have one feature implemented to use developers and maintenance team. One of its projects is responsible of logging different error messages to a specific file.

This feature is very useful in order to check where an error occurred and why. A logged message contains the time, the error message, a stack trace, the file where the error was thrown and the index of code line.

Figure 4.5.1 – Log sample

All the logs will be stored in c:\storeLogs\logs.txt. As a future change, the logs file and directory will be set dynamically using a key defined in Web.config file.

4.6 Users

On first launch of the website, the customer will see the home page presented above.

The application divides the visitors in three different types:

1) Admin users – users that have full access
2) Anonymous users – users that have limited access. They can only see the products and place orders.
3) Registered users – users that have a registered account on the website. They aren't having so many rights as an admin but still they have more rights than an anonymous user. Despite an anonymous user, the registered user can save his contact details, can check past orders and can save products in a favorite product list.

A registered user is able to use the User Panel. This panel gives him a plus of features. If an unregistered user which is trying to access a page that require

registered rights or admin rights will be redirected to homepage. Same story with a registered user that is trying to access an admin page.

This is how an admin panel looks like. A page for registered users will look just like it but with less menus.
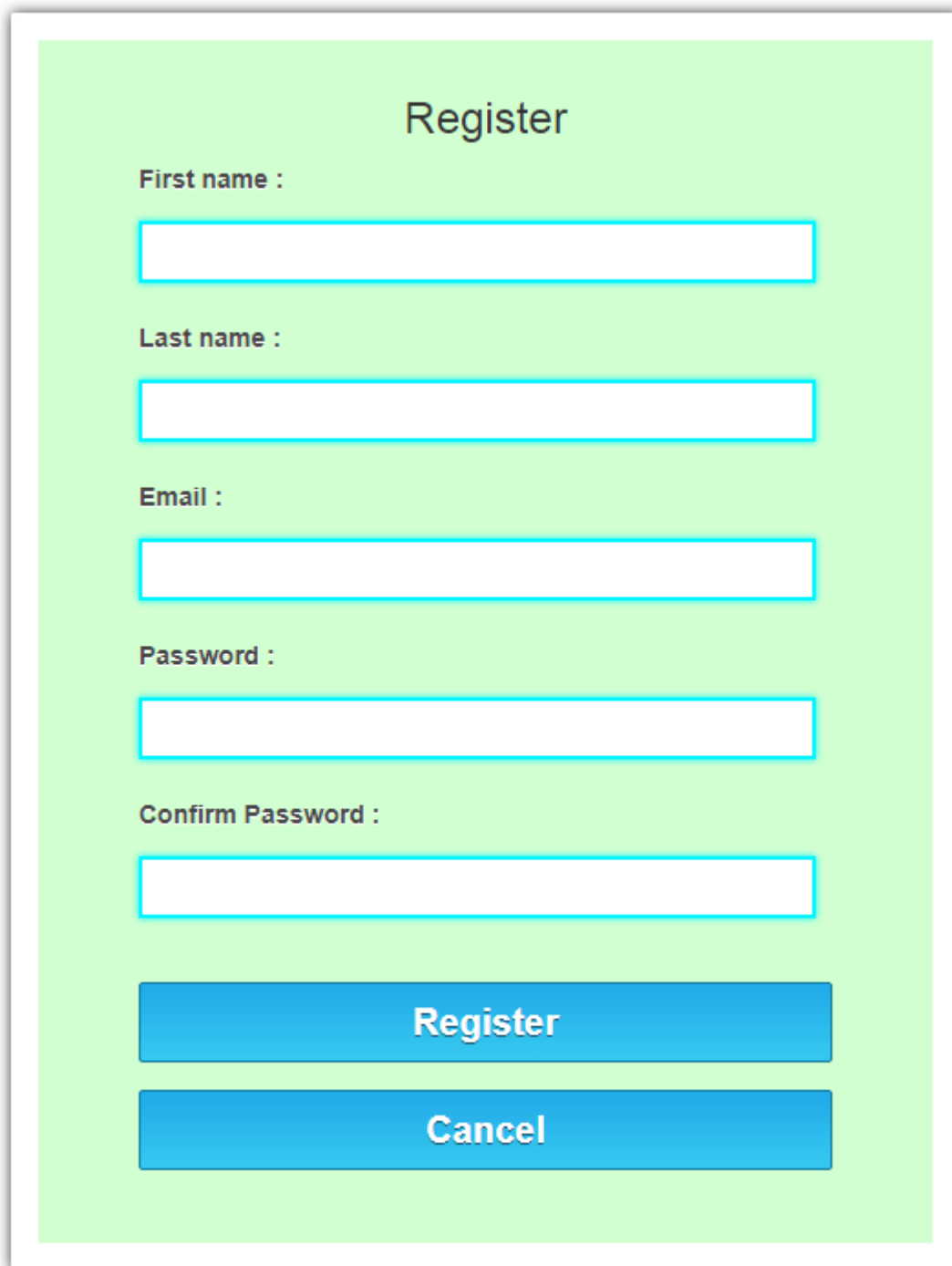
Figure 4.6.1 – User Panel

On registration, any user will have basic permissions. In order to transform it from registered user to admin, an admin should change his role directly into the database.

In order to be a member, the visitor should search for the Register button placed on the upper right corner of the website. For registration, minimal information is required for user account. The registration form looks like this.

Figure 4.6.2 – Registration page

4.7 Orders

Any user can place orders. Registered or anonymous, all users are able to purchase products from the website, 24/24. The difference is that the registered users can track their older orders.

For placing an order, the users need to add their products to the cart list. In the product page they should select the quantity and then click on the Add To Cart button.
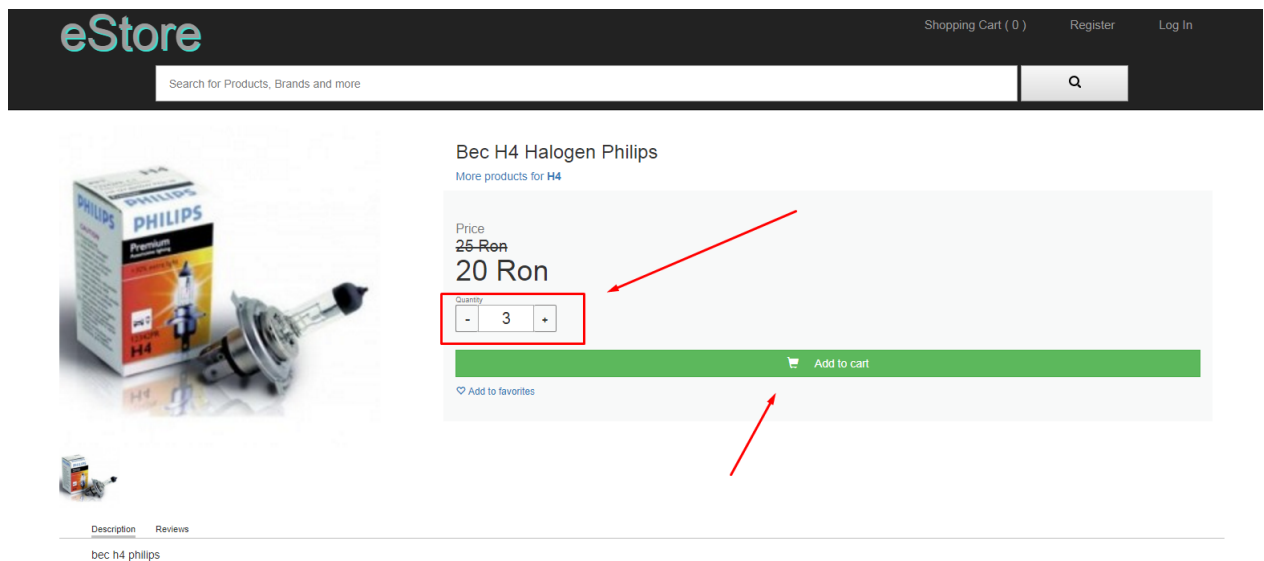
Figure 4.7.1 – Product page

For the products out of stock, the button will be disabled.

After adding the products to the cart, next step is to check the cart. This can be done by clicking on the Shopping Cart menu on the upper right corner.
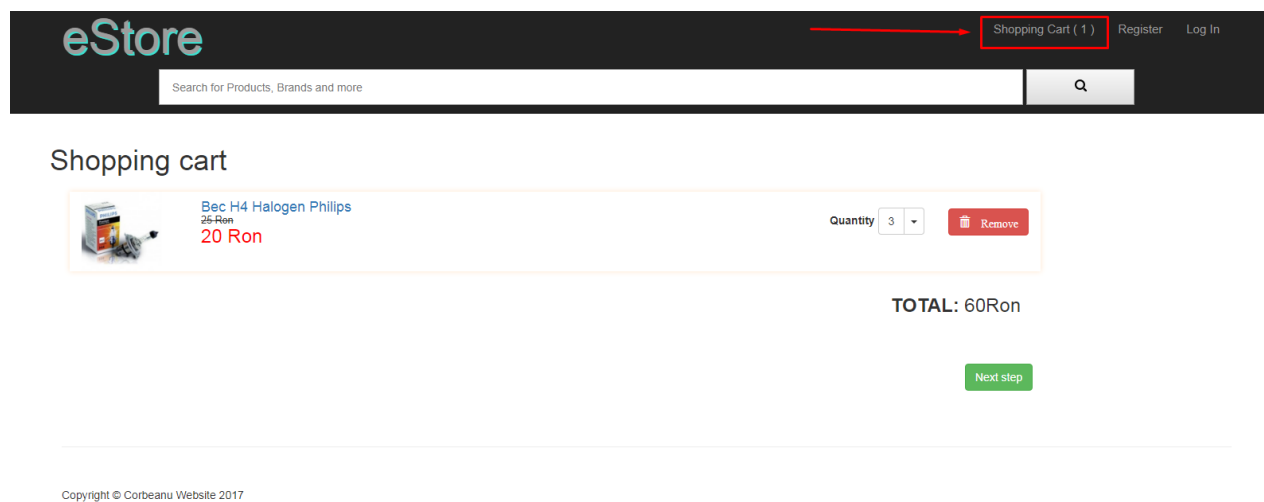
Figure 4.7.2 – Shopping cart

On the shopping cart page the user is able to remove the products from his cart or to change the quantity of a product. Also, a total is calculated for his product list. If everything is right, press the Next Step button in order to move forward.

This is the last step of an order. Here the user should provide all mandatory shipping and billing info. Also he can check the shipping method. By clicking on Place Order he will confirm that the information provided is correct and the order will be sent to the site admins. Also, this page will be filled automatically with the data stored in database for registered users.

Figure 4.7.3 – Order page

4.8 User panel

Registered users have access to an area dedicated only for registered users. This area is based on a few pages with data important for user.

Profile page

The profile page is the place where users can store their shipping and billing details. This details will be automatically filled on order page when the user is logged in and will place an order.

Figure 4.8.1 – Profile page

Favorites

A registered user can create a list of favorite products by clicking the Add to favorite option in the product page. The option is placed just under the Add to cart button.

Figure 4.8.2 – Add To Favorites options

In the favorites menu from user panel, the user will see a list of all products added to favorite. This is a quick access to products wanted by the user. He can always add or remove products from this list.
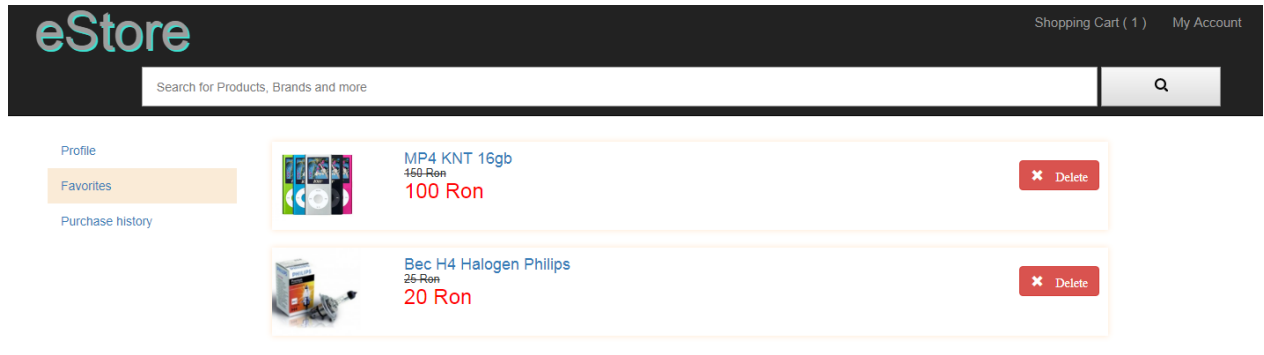

Figure 4.8.3 – Favorite list

Purchase history

This page is used to check the past orders of the client. Each order in this list will contain its unique number, the date when it was placed, the total cost and the status. Also, there's a button that will show the order details.
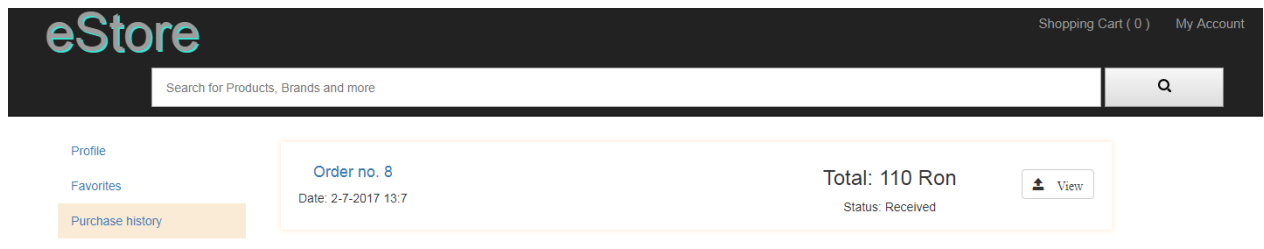

Figure 4.8.4 – Purchase history page

When clicking the View button, the page will switch to detailed mode and more information about the order will be shown. On the top the user will see the address used, phone number, status, shipping method, total, etc. Under that he will also see the list of products and the quantity of each one.
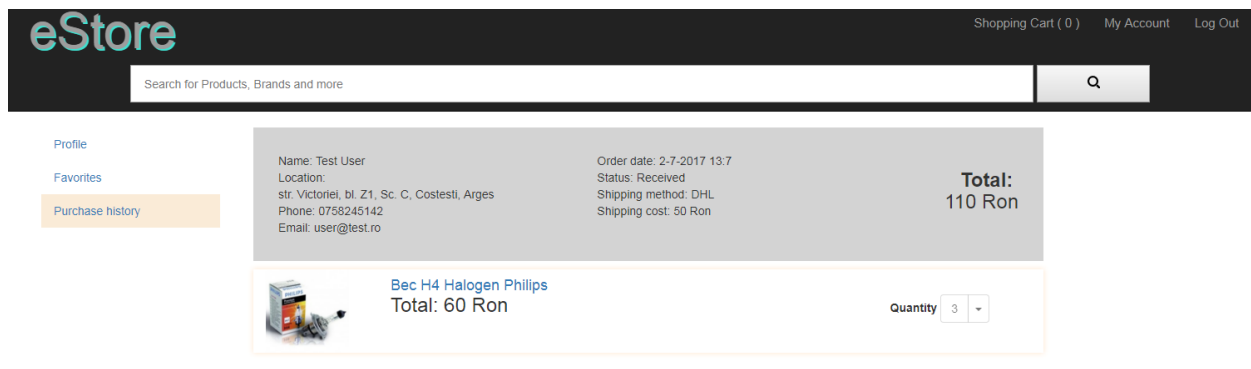
Figure 4.8.5 – Purchase history detailed page

4.9   Admin panel

An admin will have more options on his panel despite a simple registered user. All the menus for a registered users are available for the admin too. Here's what's more:

All orders

This is a page where the admin can see all the orders, placed by all users, registered or not. The logic is just as for the *Purchase history* page and the admin will see the same details.
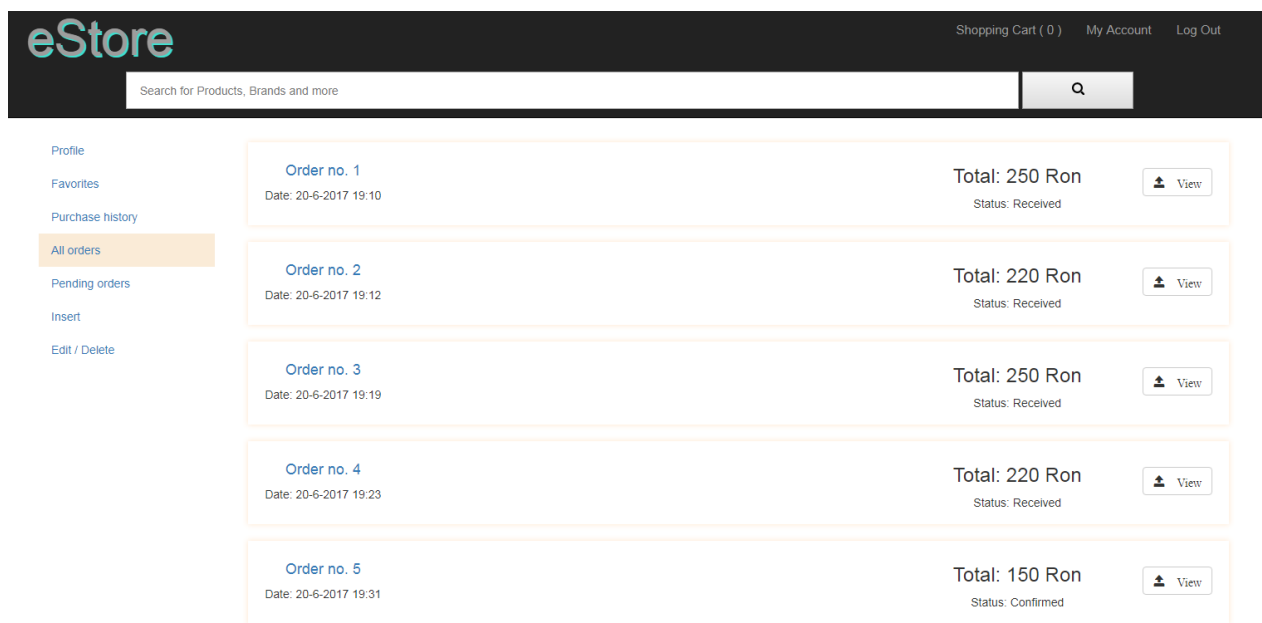
Figure 4.9.1 – All orders page

Pending orders

All orders are organized in three statuses: Received, Confirmed and Sent.

A Received order is an order that has been saved in the system but was not checked and confirmed by an admin.

A Confirmed order is an order that has been checked and confirmed by the admin but it is not sent to the customer yet.

A Sent order is an order that was already shipped.

Using this menu the admin can check all the orders that were not shipped yet and change the status. An order which have the Received status can't be directly marked as Sent. The status change should be done one at a time. For changing the status, the admin should click the green button associated with the order.
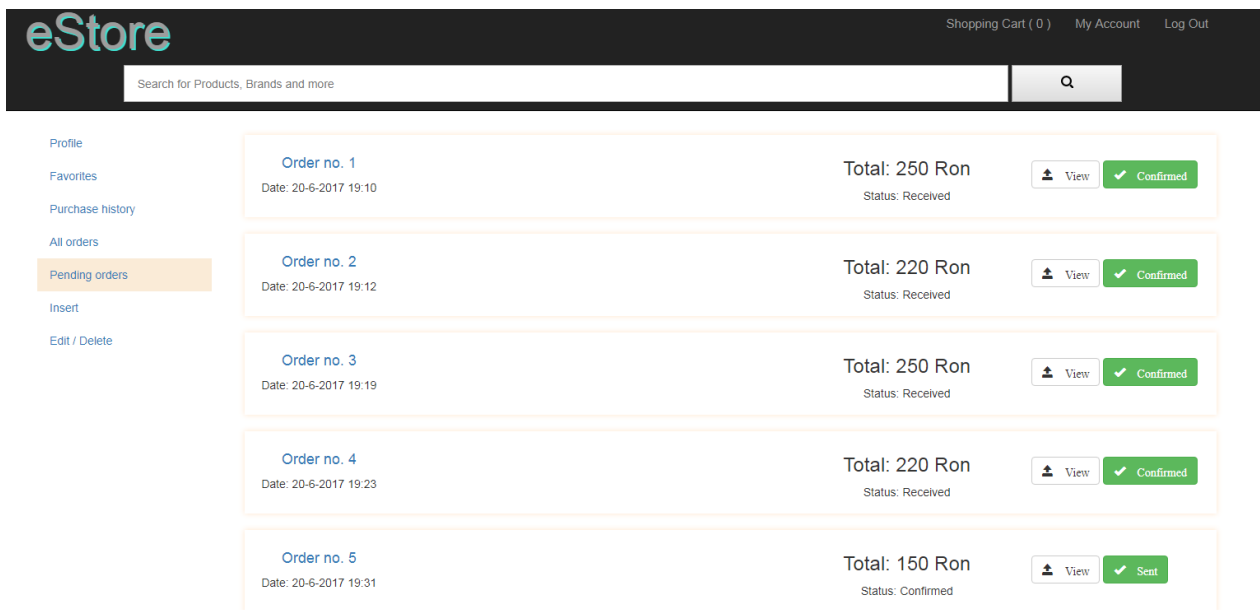
Figure 4.9.2 – Pending orders page

Insert and **Edit / Delete**

Those are a set of pages used to manage the content of the website. This way the admin can add a category, can remove a category, can add or change a product, a type or search criterias for a product. In the example below you can see how a product can be updated.

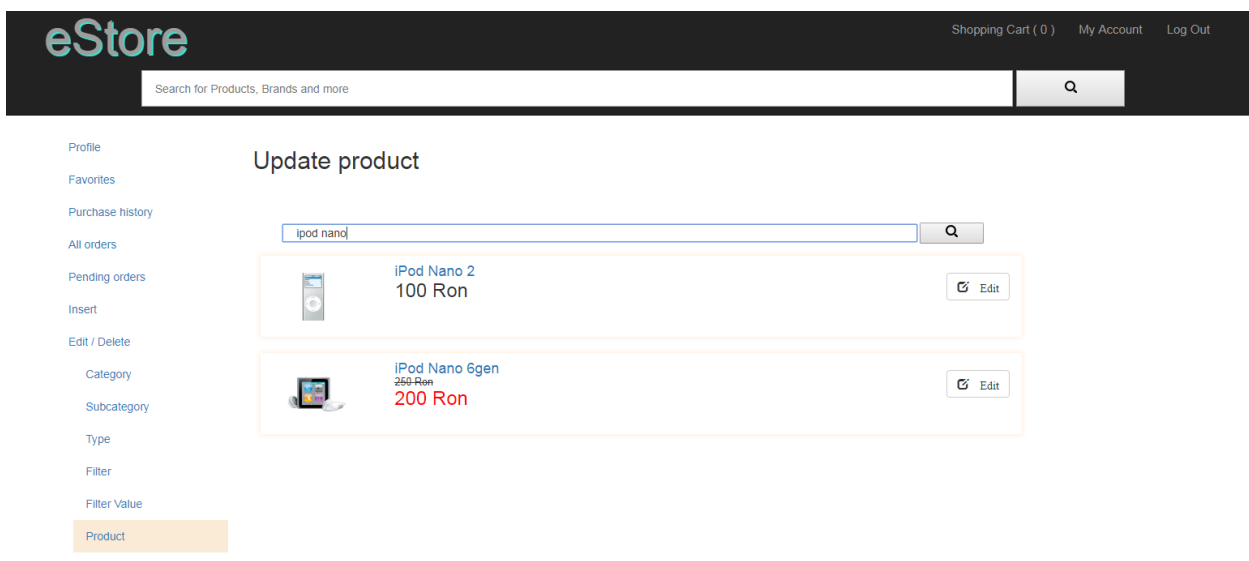In order to update a product, first we should search it.

Figure 4.9.3 – Product search for edit

As you can see, each product have an edit button. When pressed, a page just like the adding page of a product will be opened. Here the admin can change any aspect of a product.

Figure 4.9.4 – Product update page

4.10   User reviews

Users are able to leave reviews for purchased products. A review is based on a description, a mark (1 to 5 stars) and a name of the reviewer. To leave or read a review just scroll to the bottom page of a product and switch the tab from description to reviews. There a list of reviews will be shown and a button will allow the user to add a new review. On click, an empty form will pop out and the user needs to fill all fields in order to be validated.

eStore

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Shopping Cart (0)   My Account   Log Out

Search for Products, Brands and more

Not so awesome

Corbeanu Alex
★★★★★
Un produs exceptional!

Add review

Name: *

Review: *

Stars: *

5 ▾

Save

Figure 4.10.1 – User reviews

CHAPTER 5 – CONCLUSIONS

5.1 Developer conclusion

The importance of internet in human's life is already known. Its advantages should be used by any company that wants to evolve. The absence of a company in online and the presence of the concurrence can explain a big difference in transactions.

A website is developed just one time and will last a lifetime. Also, a website can be accessed anytime on any hour from anybody. All the administrators should do is to update the content.

5.2 Update possibility

This version of the application is not a final version, it's actually the first. The shop can be upgraded with new features. Here are a few new features that can be added:

- Dynamic install of the database on first run
- Blacklist – a list to filter problematic users based on email and phone number
- Dynamic display template changes – a way to change the style of the website without knowing any programming languages.
- Email notifications sent to customers – email alerts for stock availability, order status or newsletters.

Those are just a few development ideas for a future version of the shop. According to technologies improvement, some new feature ideas can be added.

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