UNIVERSITETI I EVROPËS JUGLINDORE
УНИВЕРЗИТЕТ НА ЈУГОИСТОЧНА ЕВРОПА
SOUTH EAST EUROPEAN UNIVERSITY

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FACULTY OF CONTEMPORARY SCIENCES AND TECHNOLOGIES

MASTER PROGRAM

SOFTWARE AND APPLICATION DEVELOPMENT

MASTER THESIS

"Model for developing specialized B2B portal for mobile interactive devices"

Translation in Albanian:

Model për zhvillim të B2B portalit për paisjet mobile interaktive

Translation in Macedonian:
Model za razvoj na B2B portal za mobilni interaktivni uredi

Mentor:
Assoc.Prof.Dr.Majlinda Fetaji

Candidate:
Labinot Morina, Bsc

ABSTRACT

The focus of this research study is set in devising, evaluating and developing the efficiency of B2B conceptual model for mobile interactive devices, analyzing data using Man Whitney U test which is a non-parametric test. As the case of this study is chosen creating a B2B model as an idea of linking businesses in region of Balkan. The system works on four languages: Albanian, Macedonian, Serbian and English. There are many businesses in the Balkans which have many problem in communication, and finding a market to sell their products which makes it hard to function and survive in business world. The research focus was set to investigate and aces' main factors which help developers to develop a system which is compatible and easy to use. This research study tries to contribute with the devised B2B conceptual model that is intended to help developers in designing and developing a B2B web portal for mobile devices. Through the Case Study is foreseen to investigate few main factors that shows the recommendations in whole inside.

ABSTRAKTI

Fokusi I këtij studimi është krijimi, evalumi dhe zhvillimi i një B2B koncept modeli për paisjet mobile dhe analizimi i të dhanave duke përdorur metodën statistikore Mann-Whitney U-Test I cili është një 'non-parametric test'. Si rast i studimit është zgjedhur si ide kryesore krijimi i një B2B modeli i cili do të shërbej si zgjidhje për ndërlidhjen e bizneseve në regjionin e ballkanit. Sistemi I zhvilluar do të punojn në katër gjuhë: Shqipe, Maqedone, Serbe dhe Angleze. Duke u bazuar se në tregun egzistues shumë biznese në regjionin Ballkan kan shumë probleme në ralizimin të komunikimi dhe një nga problemet kryesore është gjithashtu që të gjindet tregu për shitjen e produkteve të cilat ata i prodhojnë, gjë që kjo e bënë të vështir mbijetesen e tyre ne botën e biznesit. Ky studim është I fokusuar në investigimin dhe gjetjen e faktorëve kryesore që I ndihmojn zhvilluesve në zhvillimin e web aplikacioneve që jan kompatibilë dhe letë të përdorura nga përdoruesit. Ky kërkim studimi do të kontriboj me zhvillimin e një modeli konceptual me qëllim qe ti ndihmoj zhvilluesve në dizajnimin dhe zhvillimin e B2B portaleve për paisje mobile. Përmes këtij rasti të studimit parashikohet të gjindën disa nga faktorët kryesorë që ndikojnë përgjat zhvillimit të këtij koncepti.

Declaration

I certify that I am the original author of this work.

I hereby declare that I have developed and written the master thesis completely by myself, and all the information in this document has been obtained and presented in accordance with the academic rules and ethical conduct. I also declare that as required by those rules and conducts, I have fully cited and referenced all material and results that are taken from work of others.

Tetovo, February 2018 **Labinot Morina**

February 15, 2018

To Whom it may concern:

My name is Maureen Wetzel and I am a former colleague of Labinot Morina. I proofread a hard copy of Labinot's thesis and provided him with suggested edits on that copy for proper English grammar.

Sincerely,

Maureen Wetzel

Maureen Wetzel

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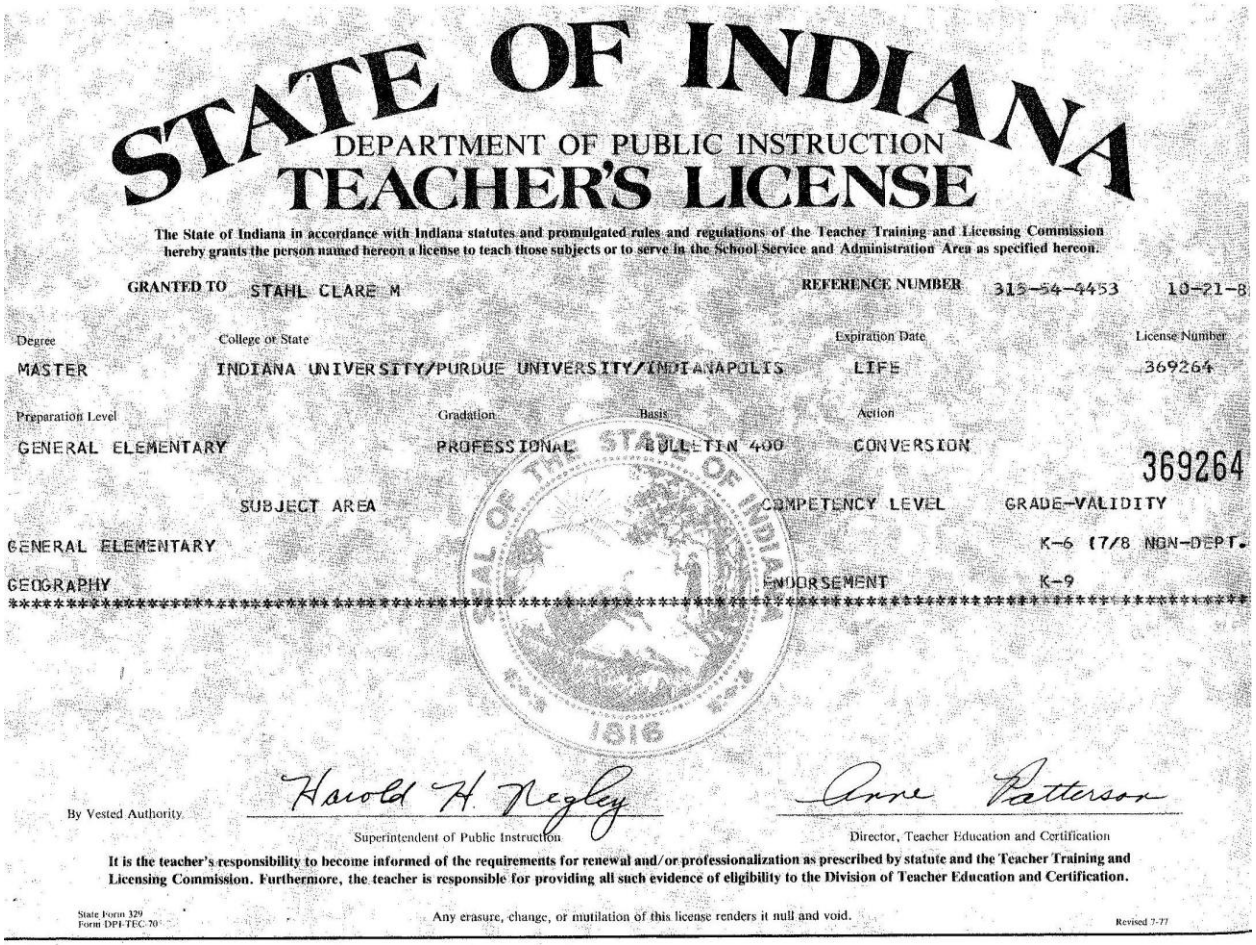

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Contents

Contents

List of figures:

1. Introduction

According to (NEILL, S., MCKEE, D. and ROSE, G.M., 2007) during the last decade, Information Technology (IT) has been the primary force driving the transformation of business.

In recent years the development of information technology has significantly influenced the development and dynamics, both of all businesses and individual people, buying or selling various products. With technology evaluation other businesses in different areas have evolved too.

Most businesses began to follow online marketing and technology evaluation. Many businesses, according to (LAPLACA, P. J. & KATRICHIS, J. M., 2009) do sales based on online sales; all of this is done by enabling B2B portals. Business-to-Business portals have dynamically increased effecting the functionality of many companies around the world. Many company works with online requests made through B2B web portal. These companies operate only as an online store using amazon.com and Alibaba.com online B2B platforms. However, If their businesses operate only online they simply cannot exist if they don't improve their online portals to sell products.

Many companies today do not have physical stores, instead the whole sales process is completed online using their portal, such as Amazon.com, Alibaba.com, and many others. If their portal is not usable, and not preferred by the user, they are likely to go bankrupt. However if the user is satisfied with their portal usability they can be successful.

Another challenge today according to (BOEHM, D. N. and HOGAN, T., 2013) and (BROWN, P. B., Z ABLAH , A. R., B ELLENGER , D. N. and DONTHU, N., 2012)is to develop B2B portals which support mobile devices, like smart phones, tablets, etc. We have a range of mobile devices in proposal such as smart phone with different screens sizes. B2B design and development methods have been developed to be fully functional for mobile devices.

It is necessary, during the development of B2B portals, to implement rules on systems in order to make a portal to support both desktop and mobile devices, (Carstensen, H. P., Vogelsang, L., 2001), According to (Dennis,A.,Wixom,H.B.,M.R.,2008) research it is stated that the testing phase is critical when referring to usage the of mobile devices. Therefore, the research study focused on testing the user interface (UI) interaction on mobile devices especially for smart phones and tablets and user experience (UX).

While comparing and evaluating already exiting B2B portals of all types, a created B2B web portal may be used as conceptual model for the others. This B2B web portal will be in use for desktop computers and mobile devices. This web application is created by the request of “Regional Development Agency South” which is going to be used mainly for Balkan countries such as: Albania, Kosovo Serbia, Montenegro and Macedonia, as at the moment user interface is multilingual and supports only these countries languages.

Another focus of this research is to test the usability of the interface and analyzing gathered data using the statistical method named MAN WHITNEY U-TEST. Using this method we try to conclude how user friendly it is and how usable it is on mobile devices.

1.1. B2B Portal for Mobile Interactive Devices - System Overview

This B2B web application was purposely developed for RDAS agency and is also used for the master thesis. This web application is designed to link businesses in the Balkan region. This system can be used by any business or organization that is interested in cooperating with businesses companies in the Balkans. It is dedicated more for Albania, Kosovo, Macedonia, Montenegro and Serbia thus it supports these country's languages, however other countries can be included as the system supports the English language.

The main functions of this B2B web application are:

Balkan regional businesses are able to register on this B2B portal. After completing the registration form by entering pertinent information such as the type of business and other required information the application administrator provides access to a login. After they login they are able to register their services and products that they would like to sell. By using this B2B web portal, administrators and users are able to see all activities of registered businesses on B2B, including products and the quantities of products in stock. Also, they are able to find business information, starting with mobile phone number, email address, addresses, etc.

This B2B web portal enables users to use this application with mobile phone devices, like smart phones, tablets, and computers. B2B web portal Administrators are able to administrate all information through smart phones the same as B2B simple business user. As previously mentioned, the system is available in four different languages: Albanian, Macedonian, Serbian and English. This product is fully functional after all businesses data is entered in the system. Future steps are adding additional functions to this system such as shopping card system to pay online and creating tools to verify the businesses capacity and their qualities.

One of the main components of this online B2B portal is that all businesses are able to register their products in one of the four available languages. It is very helpful for an Albanian, who does not understand Serbian and English, to give them the option to see products from Serbia or Macedonia in his mother tongue. How does this work? Only the administrator can add categories and products to the system. So, when the administrator adds the products in system he or she adds the 4 languages; This means that when the simple business user logs in he cannot type the product name in order to avoid the writing mistakes that would case troubles to generates reports in future, in this case all entry data are predefine by administrator. The user simply chooses the product from the dropdown menu to enter quantities in system.

The idea is to have B2B multilingual web portal in the Balkan region usable for all countries which support both desktop and mobile devices. By using this B2B web portal, businesses in this region can see where they can find apple's , for example an Albanian businessman doesn't need to know Serbian language to check if any on the producer in Serbia have apples in stock, he just needs to login to the B2B web portal and types in search "apple" in Albanian language and the system find producers in region who have apples in stock. Even the Serbian businessman can enter data in his own language, the system enables the information in four languages. Users will be provided with all necessary producers information like mail address, phone number etc. in his own language. More B2B details are described in the chapter on Development.

1.2. Contribution of the Study

This research study tries to correlate with the development, testing, and usability analyses usability of B2B portal on mobile devices and create a conceptual model by developing B2B portal; to help future companies have an effective B2B web conceptual model. Also part of this thesis is to test and analyze usability of the B2B portal on mobile devices by using an unrelated t-test or related t-test. After the B2B web portal is developed the most important part is testing the mobile user interface. In this testing we have two groups of participants. One group is testing a web application on a computer by using any of the web browsers while the other group will test a B2B portal by using any type of the mobile device for testing the web application that was created for the agency mentioned above. During user interface (UI) testing, I will use questionnaires, measure time task, mistakes, etc. By gathering all of the data we will analyze it by using Mann-Whitney U test in the SPSS program. Another goal of this study is to test how responsive is the B2B web portal in all devices. The idea is to bring about conclusion regarding how important it is to develop B2B web portal with usable user interface (UI) and how satisfying user experience (UX) is today. The screen size on the mobile devices is limited therefore it is important the implementation is set up in the correct way specifically for mobile devices.

1.3. Significance of the Study

This study is important for all those who deal with the development of web applications, most importantly, the ones dealing with the development of B2B web portals. This study itself contains analysis of similar B2B web portal projects that can currently be found on the market. These are already in use and have a good reputation. These similar projects, like Alibaba and Amazon, have been on the market for a long time and are still developing. They continue to make huge steps towards their goal achievements. The importance of this study is analyzing the problems which they had in the past and their goals future.

The importance of the study is to create a conceptual model that helps others to follow steps to develop the B2B web portal in the correct way assuring a fully functional system in all devices.
Choosing the right developmental model and design pattern is one of the main points in every software development process. Completing the research properly we will achieve a successful study.

Another important point of this project is to implement a responsive framework in the B2B web portal to be well optimized for web browsers in mobile devices. Testing the B2B web portal UI in mobile devices like Iphone5 or Samsung S5 and analyzing data by using Man Whitney U test statistical method is also very crucial.

1.4. Statement of the Problem

People use mobile devices, such as smart phones, tablets, to perform their daily tasks more expediently. These devices are mainly used for internet surfing and to perform business transactions for buying or ordering products online. According to (Gorton, 2011) one of the main problems of equipment's is the differentiation in screen sizes, such as differentiation in smart phones, tablets and computer desktop screen sizes.

The problem lies in the way the data is be presented and which way the B2B web portal should be designed in order for users not to have any difficulties while using desktop or mobile devices.

It is difficult to present the same information on mobile device as the one on the monitor because of it's screen size differentiation. In order for the content or description of product to be sufficiently filled with information's possessing all the tools for navigation as button etc.
While having the rapid development in mobile device industry there will still be existing problems in using the mobile devices without the difficulties.

As mention above, one of the main concerns is the testing phase. During the testing phase we must be aware of how careful we should be with the way we choose the testing and the selection of testing groups. Therefore the testing of the application itself will be special as its testing methods for mobile devices according to (Marczyk, G., DeMatteo, D., Festinger, D., 2005). In other words, the testing must contain groups or various mobile device's users from basic level users to those advanced users that have experience in the use of mobile devices purchasing and navigating with B2B web portals.

1.5. Research Questions

The following research question will be studied to achieve the purpose of this work:

4. What are the potential benefits of using B2B portal on mobile devices?
5. What are the main steps or what steps do you need to follow in order to develop B2B portal for mobile devices?
6. How important is user interface and user experience on B2B web portals in mobile devices, especially in finding and ordering products online, and making client comfortable using your B2B as main service ?

1.6. Hypothesis

The following hypotheses have been raised and analyzed:

H1. Developed B2B web portal model will improve substantially the management issues with external stakeholders.

H2. B2B web portal improves business efficiency and satisfaction

2. Literature review

2.1. Introduction

This chapter will be based on research such as books, electronic books, internet including online libraries, journals articles, consulting with national and international developers of web portal experts and who are experienced in developing B2B and B2C portals. The B2B ecommerce web portal has shown to be at the top of the list now for a while, and according to (Leung, 2015), 2016 and 2017 are the years that we would see its real impact. The B2B ecommerce traffic has been increasing rapidly in 2016 & 2017.

Because of the B2B ecommerce web portal satisfactory results, many people are using their mobile devices and tablet to realis online purchase. By B2B ecommerce is being optimized for all mobile devices, its ecommerce sites will have significant impact on search engine rankings even more in coming years if they are usable for mobile devices.

Research and analysis will be based on evaluating basic requirements of developing and creating conceptual model for developing a B2B portal for all devices.

This literature review will be focused on these main points:

- Researching software development models used by most of ecommerce to build their B2B portals.
- Analyzing two of the best B2B web portals in the world for online commerce, how important it is for them user interface and what the users experience is from previous years.

- Analyze how these B2B portals are optimized for mobile devices and how the B2B page speed is by using online tools.
- Analyzing if they are using responsive design, which way they support their B2B mobile users and what are the main keys to keeping their B2B portals to support mobile devices.
- An example of how as a responsive or non-responsive web page looks.
- Comparisons between Alibaba VS Amazon to identify strengths and weaknesses.
- Research if the B2B web portal is secure enough to make online purchases.

This chapter will continue with two software development models that are chosen by most ecommerce B2B web portals. The chapter below describes basic factors which are used by companies that have chosen the right development model to build their various software applications and B2B web portals.

2.2. Software Development Models

2.2.1. Waterfall Model

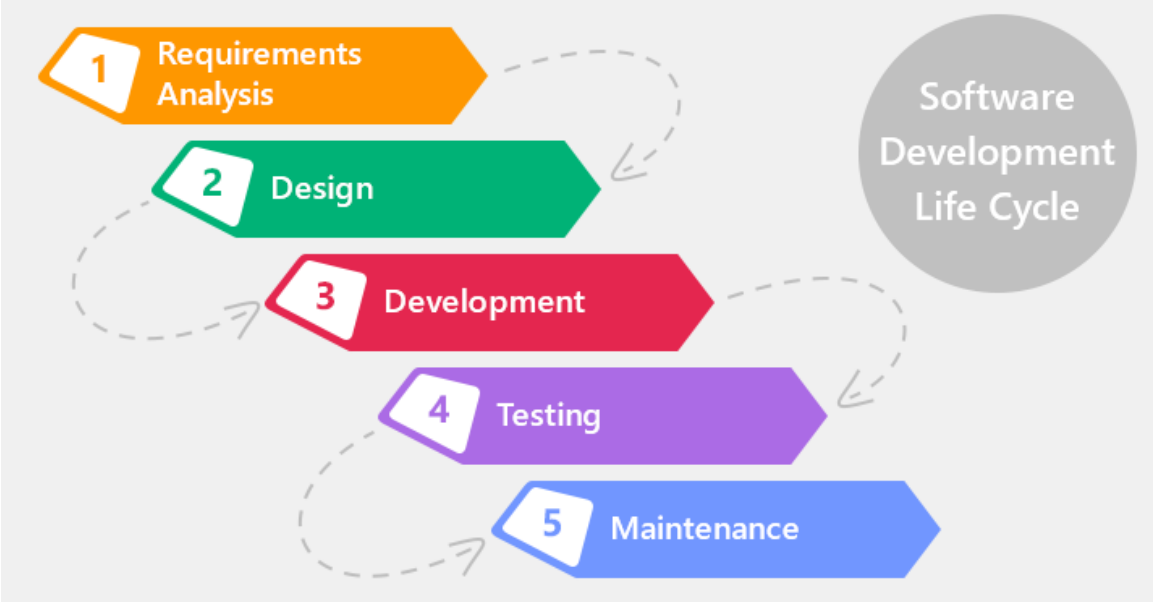


Figure 1- Waterfall Model[1]

According to (Powell-Morse, 2016) The Waterfall Model is a software development process. The Waterfall Model is a logical progression much like cascading steps. The Waterfall Model is like cascading steps divided in to six stages of falling water. The Waterfall Model was implemented in many projects and divided into 5 phases with large parts. The Waterfall Model doesn't provide any feedback between phases. The Waterfall Model can be successful only if each phase is analyzed critically. The Requirements (Feasibility) Phase the first phase, can only be successful if the requirements are evaluated carefully and described well. The next phase can only be successful only if the team has analyzed all details. All stages are related, but if the team fails at the first phase the complete project will fail. When using Waterfall Model , if the

[1] **Source: Gordiyenko. S (2014)** Software Development Life Cycle (SDLC). Waterfall Model

project must move back to any of the previous stages all the work should start over again at the phase where the project must return. According to (Hales, 2016) each phase must be completed before another begins. This Waterfall Mode can't run down the whole cliff while each pool is completely filled. This means you cannot continue to the next phase if you didn't completely finish the current phase.

Requirements (Feasibility study) - This stage is significant in this project according to (Lo, 2006) these stages as all other stages in the Waterfall Model team need to be very clear with the requirement of what the application should have, but not how it should be. Having detailed information about your project is much better than returning to this phase later. It is highly recommended to create an document that contains a good description of requirements which are mainly specified for background problems, factors of business risk, goals and criteria.

Design - In the second stage the team needs to choose the best model business logic, analyze and understand all written required functions in the previous phase. All the requirements need to be reviewed with the costumer.

Coding – When the design is completed the coders start to implement the code based on the previous phase.

Testing - After the implementation and integration phases are complete, the system is tested and debugged of any faults left in previous phase will be removed here.

Operation & Maintenance - After the software is completed by coding and testing, the installation process begins by integrating parts together; This phase is one of the longest phases as it needs to fix all errors and make necessary improvements.

Situations when the Waterfall Model is most applicable:

1. Straightforward low risk applications - the weakness of the Waterfall Model is that it provides no mechanism for 'backtracking' to an earlier stage if problems are found. In some cases, where the application is well understood this may not be a problem.
2. Experienced staff - experienced staff are more likely to foresee the problems.
3. Clear requirements - the most common reason for back-tracking is incomplete or misunderstood requirements.
4. Requirements are unlikely to change as mentioned above
5. Stable technology - where state of the art hardware, software, or techniques are being used there is a greater likelihood of having to rework earlier stages as technology and understanding changes.

If these circumstances do not prevail another model for development should be selected.

Pros	Cons
Best for project that deal with physical objects, from a construction project to hardware installation project.	Requires substantial scope and schedule planning before work begins
Best for projects with defined task and phases that must be completed in a specific sequence	Scope changes can be slow and require formal change control process
Project plans are repeatable for identical or similar projects in future	Less effective for software design, especially when you have a big team.

Waterfall model pros and cons table (Sussex, 2013)

In conclusion the significant weak point of Waterfall Model is that if we make a wrong choice during the project by choosing a wrong design, we will be not able to identify other choices until the last phase. Therefore, in some cases the project cannot be successf. According (Lotz, 2013) the Waterfall Model is preferred for small projects and for projects with very clear requirements.

2.2.2. Agile - Extreme Programming & Scrum

Agile is a very popular development model according to (Shore. J, Warden. Sh, 2007)**.** Many famous companies in the world like Microsoft, Yahoo, Google use agile development model with their teams. According to the book "The Art of Agile Development" you can use Agile only when you ask this question "Will agile development help us be more successful?" Only when you can answer this question can you know if Agile development is right for you. If you are having trouble with any of these parts: achieving personal, technical, and organizational successes in your company or project, agile development might help.

Agile is more complicated than we might think. Agile development is not a process that you can follow step by step, Agile is rather philosophical in its self. Agile methods are the way of working a process. Extreme and Scrum are the methods or processes, which support Agile philosophy.

Agile with Scrum

According to (Cohn, 2010) when the project become too large it is more complicated to manage or keep track of tasks and changes, this complication is not made better by adding additional engineers to the team. It is critical for companies to manage large projects well. Using scrum method can be successful with large projects.

One of the main part of scrum method are series of sprint, sprint are no more than a month, or commonly two weeks. On each day of the sprit teams have a daily meeting including scrum master and product owner. Meetings discussions are what has been done on the previous day and what will they work on that day. The primary expectation of Scrum development is that each sprint team needs to bring the software to a potentially shippable state.

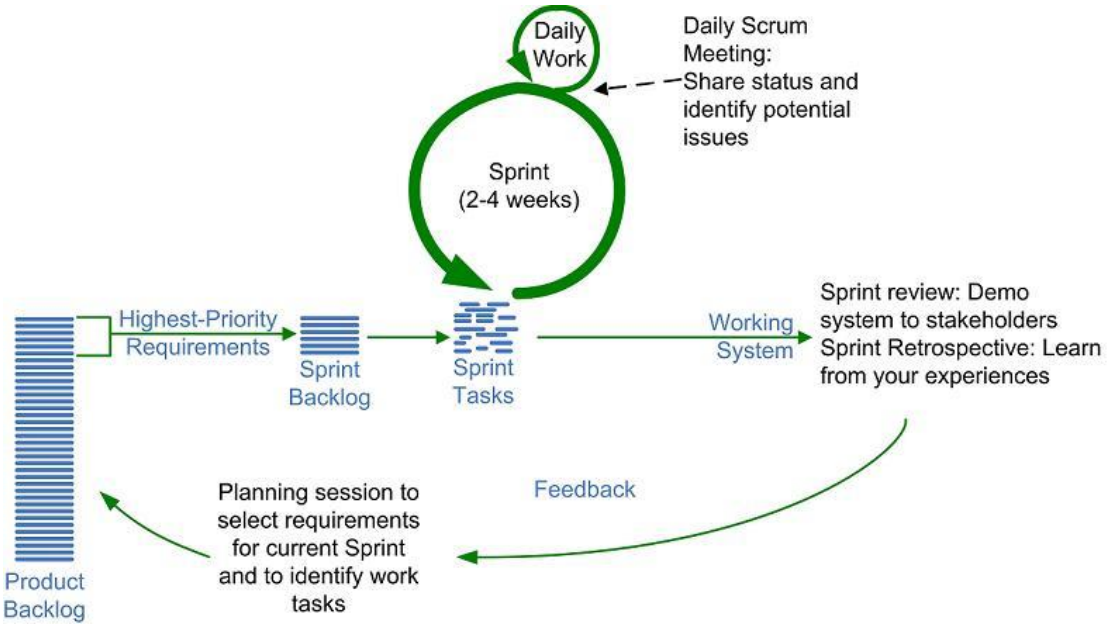


Figure 2 - Agile Scrum construction [2]

Scrum team roles in the project:

[2] **Source: Ambler.S. (2015) Strategies for Scaling Agile Software Development.**

The product owner Serve as the costumer proxy by representing the interest of the stack holders.

The Scrum Master is different than a traditional managers, Scrum master do not divide daily tasks to the team or giving tasks to individual person. A main responsibility of scrum master is to move projects forward by trying to eliminate impediments.

The Teams are responsible for developing the software (product), usually teams group are 5-9 members and they are self-organized for getting the work done.

Extreme Programming (XP)

According to (Beck. K. Andres. C, 2005) 'Extreme programming is about social change it's about letting go of habit and patterns that were adaptive in the past, but now get in the way of doing best work. Prepare for success. Don't protect yourself from success by holding back. Do your best and then deal with consequences. That's extreme'.

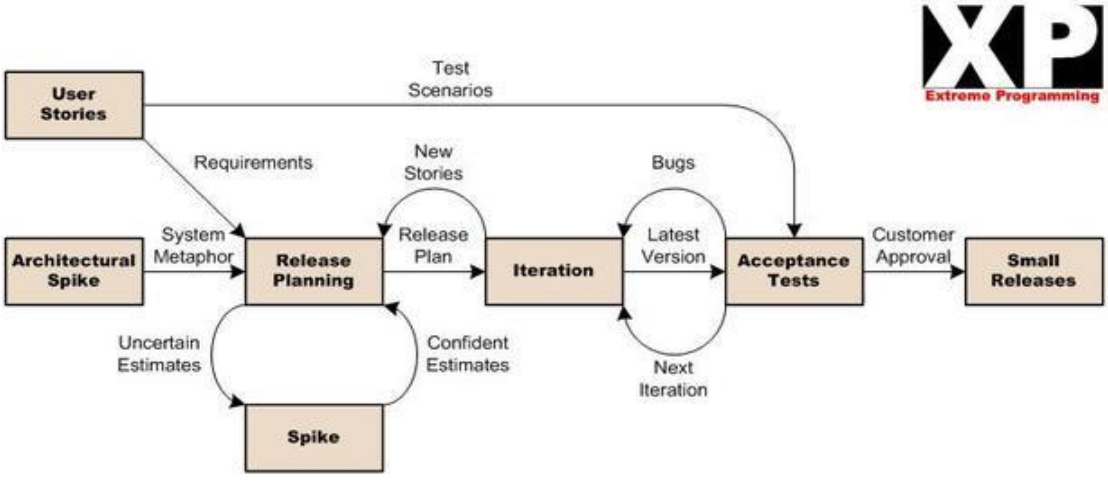


Figure 3 - Diagram of extreme programming[3]

[3] **Source:** Diagram of extreme programming as explain to Beck .k, & Fowler, M (2004)

According (Shore. J, Warden. Sh, 2007) XP is a methodology for small to medium team developing in the face or rapidly changing requirements. According to (Mohammadi, Sh. Nikkhahan B. Sohrabi S., 2009) one of the main differences between XP and other methodologies is having an "on-site customer" practice; because XP emphasizes on full time customer involving in the team.

According to (Shore. J, Warden. Sh, 2007) And (T.S.RAMYA KRISHNA, CH. PHANI KANTH, CH.V.PHANI KRISHNA, T.V.VAMSI KRISHNA, 2011) there are 5 base activities that XP proposes for a development process:

- **Exploration phase:** In this phase the user stories are been collected by meetings and it is been updated regularly.
- **Planning phase:** In this phase they will be giving priorities according to the user stories through which they can proceed to the next step.
- **Iterations to Release phase:** It is the most important phase, in this the analysis, design and testing takes place in here through pair programming.
- **Production zing phase:** In this small release are been taken place, and is been shown to the customer for user approval.
- **Maintenance phase:** By the customer approval updating the project will be done in here.

Pros	Cons
Best for project that deal with service-oriented and non-physical deliverable like code, copywriting and design projects	Not suited for projects with strictly defined requirements and scope
Allows for quick course correction based on stakeholder feedback.	Uncertainty around scope and schedules can make stakeholders and executives nervous.
Empowers project team to work creatively and efficiently	Requires vigilant backlog and documentation maintenance and tech department management
Includes engagement and collaboration from all team members	

Agile model pros and cons table according (Sussex, 2013)

2.3. General Information About B2B Portals

What is B2B? According to (Laudon, K. & Guericio, C., 2014) ‘B2B e-commerce involves business selling to other businesses and it is the largest form of e-commerce, we noted that business-to-business (B2B) e-commerce selling is 10 times larger than B2C e-commerce, even though most of the public attention is focused on B2C. For instance, it is estimated that revenues for all types of B2B e-commerce in the United States it is in total around $4.8 trillion in 2013, while only $419 billion for all types of B2C e-commerce.‘

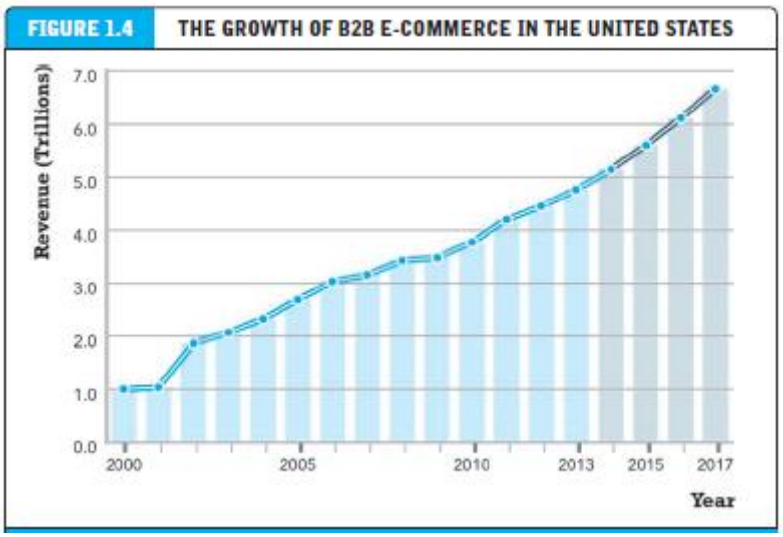


Figure 4 - B2B e-commerce in the United States is about 10 times the size of B2C e-commerce. In 2017, B2B e-commerce is projected to be about $6.6 trillion [4]

[4] **Sources**: Based on data from U.S. Census Bureau, 2013; authors' estimates.

B2B Portals like Alibaba and Amazon are very big success story in the world. We can say that Alibaba and Amazon have changed the style of selling around the world. For example, we have many businesses around the world that uses their B2B application for operating and running their businesses. According to (Rapoza, 2016) China and Amazon are changing the style of selling, many companies are closing physical stores because it's easier for costumer to buy a printer, or a part of printer, on Amazon online, than to go look in different physical stores. An example of this is the Staples Company. They have shut down hundreds of stores in the US and will shut down many others in the UK and Europe.

According to (Briggs, 2016),B2B applications on desktop devices was a big challenge in previous years for businesses. The next challenge for many businesses in coming years will be B2B mobile ecommerce out of 63% of businesses that claim customers can order products or make purchases online, only 17% have a native mobile commerce app, or a B2B web page, that is responsive on all mobile devices.

Currently B2B portals have been created for different group's targets. Many companies create B2B portals for their needs, such as IBM, HP, etc., that will serve their partners worldwide. Some have a B2B portal which supports only desktops user while some have created B2B portals for mobile devices. In additional others have created an app that is specific for different kinds of devices like IPhone or Android. There are B2B web portals as well that support different types of devices using various browsers such as Google Chrome, Internet Explorer, Safari. There are many examples in use of B2B portals for online worldwide businesses such as Alibaba, Amazon and many others. Making B2B usable and user friendly for mobile devices is profitable and can help businesses gain a competitive advantage over their competitors.

Why is it valuable for businesses to focus their resources on mobile devices? According to (Lütke, 2014) In 2014 more people started to use mobile phones and tablets for visiting online stores rather than using computers. There are 53% mobile devices (smart phones, tablets) users and 47% using desktop computers. According to (Chaffey, 2016) in 2017, mobile devices users percentage is as follows: 71% in USA, Canada 62%, UK 61%, China 71%, 91% Indonesia.

Unlike other web pages, mobile web sites run on the company's server as well, or they run outsource servers companies in cloud. B2B web portals which support mobile devices are built by using various web tools and technologies. For example: HTML, PHP, and MYSQL/SQL or HTML, C#, ASP.Net, CSS3, jQuery as web components, and programming language C#, and SQL database. It depends on the development company which technology is going to be chosen. According to (Laudon, K. & Guericio, C., 2014) mobile sites operate more slowly than traditional web pages on desktop computers that are connected to a wired network. Whereas smartphones have slower processor and other components comparing to the computer.

According to (Besimi, 2011) B2B portals are in two categories; public market places and private channels. The private ones are usually closed to the public. It can be web service or an application, but usually they are based on web services. It can be usable only when the owner invites you to join, accepts your registration after you have applied to join, or by giving you permission to use it as a company partner. For example Volkswagen is using private B2B channel.

The B2B public type is usable for everyone. These are marketplaces that allow communication and publication of articles without restrictions to the users in that marketplaces. A good example of open/public B2B is Amazon.com, Alibaba.com etc.

2.4. B2B Frameworks for SMEs

According to (Besimi.A & Dika.Z, n.d.) (Shim.S & Pendyala.V & Sundaram.M & Gao.J., n.d.) (Advani, n.d.) Many SMEs want to be part of B2B ecommerce but it's not as simple as it looks. SMEs face many challenges to become part of the online market or part of B2B e-commerce. They can be a part of B2B by implementing any of the B2B frameworks in their business operation to define business processes, transportation, or messaging. According to (Shim.S & Pendyala.V & Sundaram.M & Gao.J., n.d.), to operate across business boundaries businesses must follow a standard transaction exchange protocol by using the common framework in place that protocol can handle all transactions framework can provide desired functionality, but the B2B framework must provide basic features such as: standard data format, security, ontology, and content management.

According to (Shim.S & Pendyala.V & Sundaram.M & Gao.J., n.d.) one of the most important issues in all frameworks is to implement the framework the right way. According to (Shim.S & Pendyala.V & Sundaram.M & Gao.J., n.d.) businesses that are trying to implement a B2B framework are bewildered by a variety of standards that are pointed in different directions. According to (Besimi.A & Dika.Z, n.d.) ebXML is one of the biggest frame works are used by SME's today.

Feature	eCo	BizTalk	cXML	RossetaNete	ebXML
Security	Optional	Uses existing standards	Authentication used in Message Header	SSL with HTTML, digital certificates and signatures	Security optional, SSL with HTTL digital certi. and signatures
Communication Protocol	HTTP	HTTP / MSMQ	HTTP	HTTP / CGI	HTTP, SMTP, FTP
Repositories	Local	Centralized	Not Specified	Not Specified	ebXML, Registry, local or centralized
Message Format	XML documents	BizTalk documents made of BizTags	XML documents	XML documents	XML documents
Ontology	Common business Library	Collection of BizTags	Collection of XML tags	Technical and business dictionaries	Collection of XML tags with technical specification
Document Conversion	Not specified	BizTalk Mapper offers conversion	Not specified	Not specified	Not specified
Automated Business Process	It is mentioned in documentation but not specified	BizTalk Server allows automatic processing	Not addressed	Allows to define but no tool to automate them	Allows to define but no tool to automate them
Implementation	COTS	BizTalk Server, COTS	COTS	COTS	COTS

Figure 5 - : Comparison between B2B Frameworks [5]

According to (Yeung.W.L., 2013) in the U.S., the Center for Disease Control and Prevention has built the public health information network based on ebXML framework for exchanging clinical and business messages, while In Hon Kong ebXml message is used in Digital Trade for logistic and financial industries.

According to (Besimi, 2011) if any public market places like Amazon or Alibaba would implement the component of the B2B framework standardization in their process as they would not need to use any specific software, instead they can use an existing system's services to participate and offer their products and compete in the e-market.

[5] **Source:** Comparison and Implementation Challenges in E-Commerce and M-Commerce (B2B) Web Sites, author: Advani, N. page nr.48.

2.5. Responsive Web Design

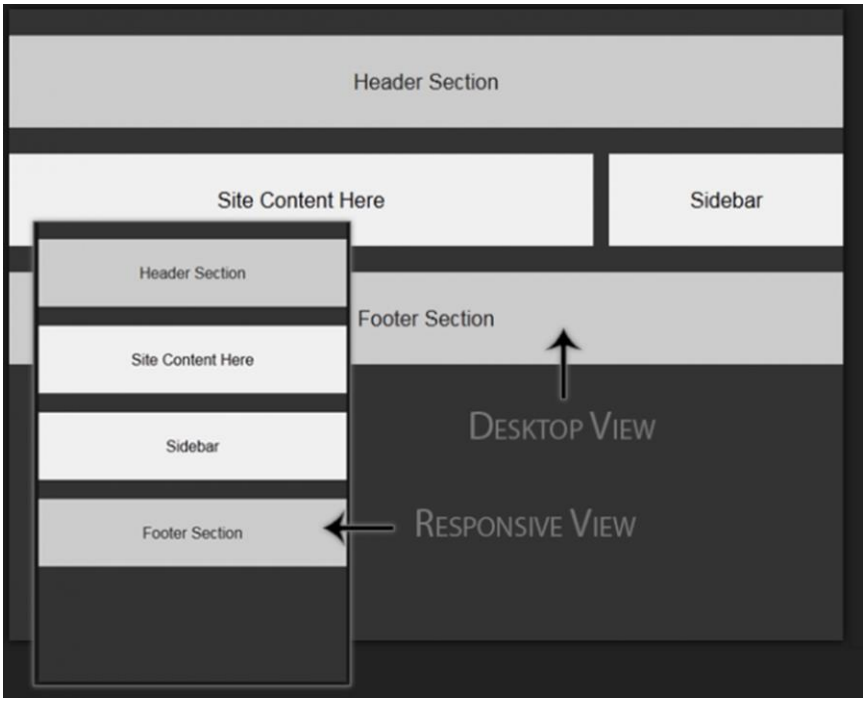
According to (Johnson, 2017) mobile friendly websites are responsive and are based on an RWD web design approach which makes it possible to resize the page depending on the screen size. Even the largest companies such as Google recommend using RWD. The idea is that "mobile friendly website are responsive web sites" .There are two ways of making a web page or B2B web portal usable for mobile devices. First redirect users to a mobile site created only for mobile devices, and second use responsive web design. Why is RWD effective? It is effective because RWD changes automatically based on the dimensions and layouts of each device. Today there are many RWD frameworks. Available such as: Bootstrap, Foundation 3, Titan and Less Framework etc. According to (AWWWARDS, 2017) bootstrap is one of the most powerful framework web development.

Responsive (RWD)	
Advantages	**Disadvantages**
RWD are much better for SEO	**It takes more time to develop if you do not use any existing framework**
Design looks similar on all devices (main parts)	**Takes more time to load page until all the pictures are loaded and resized.**
One site for all devices	
You don't need double maintenance	
Reduces the possibility of the common mistakes that affects mobile sites.	
Makes easier for user to share same URL.	

According to (Cass, 2015) there are two notable ways to make your website into a responsive site: Choose a lightweight and fast theme that is optimized for mobile devices and add CSS3 media queries into your website design to make the concept of CSS3 media queries that are clearer, here is an example of snipped code that when it is added to your style sheet makes your website design responsive (RWD).

```
<!DOCTYPE html>
<html lang="en">
<head>
<meta charset="utf-8">
<meta http-equiv="X-UA-Compatible" content="IE=edge,chrome=1">
<title>EN EXAMPLE OF RESPONSIVE WEBPAGE</title>
<meta name="viewport" content="width=device-width; initial-scale=1.0">
<style>
body{
		margin: 20px 0;
		font-family: Arial;
		background: #333;
}
.wrapper{
		width: 1024px;
		margin: 0 auto;
}
header{
		width: 100%;
		float: left;
		padding: 25px 0;
		text-align: center;
		background: #CCC;
		color: #222;
		margin: 0 0 20px 0;
}
footer{
		width: 100%;
		float: left;
		padding: 25px 0;
		text-align: center;
		background: #CCC;
		color: #222;
		margin: 20px 0 0 0;
}
.content{
		width: 70%;
		float: left;
		padding: 25px 0;
		text-align: center;
		background: #F0F0F0;
}
.sidebar{
		width: 28%;
		float: right;
		padding: 25px 0;
		text-align: center;
		background: #F0F0F0;
}
@media only screen and (max-width: 1024px) {
		.wrapper{
			width: 100%;
		} }
@media only screen and (max-width: 480px) {
		.content{
			width: 100%;
			margin-bottom: 20px;
		}
		.sidebar{
			width: 100%;
		} }
</style>
</head>
```

Output



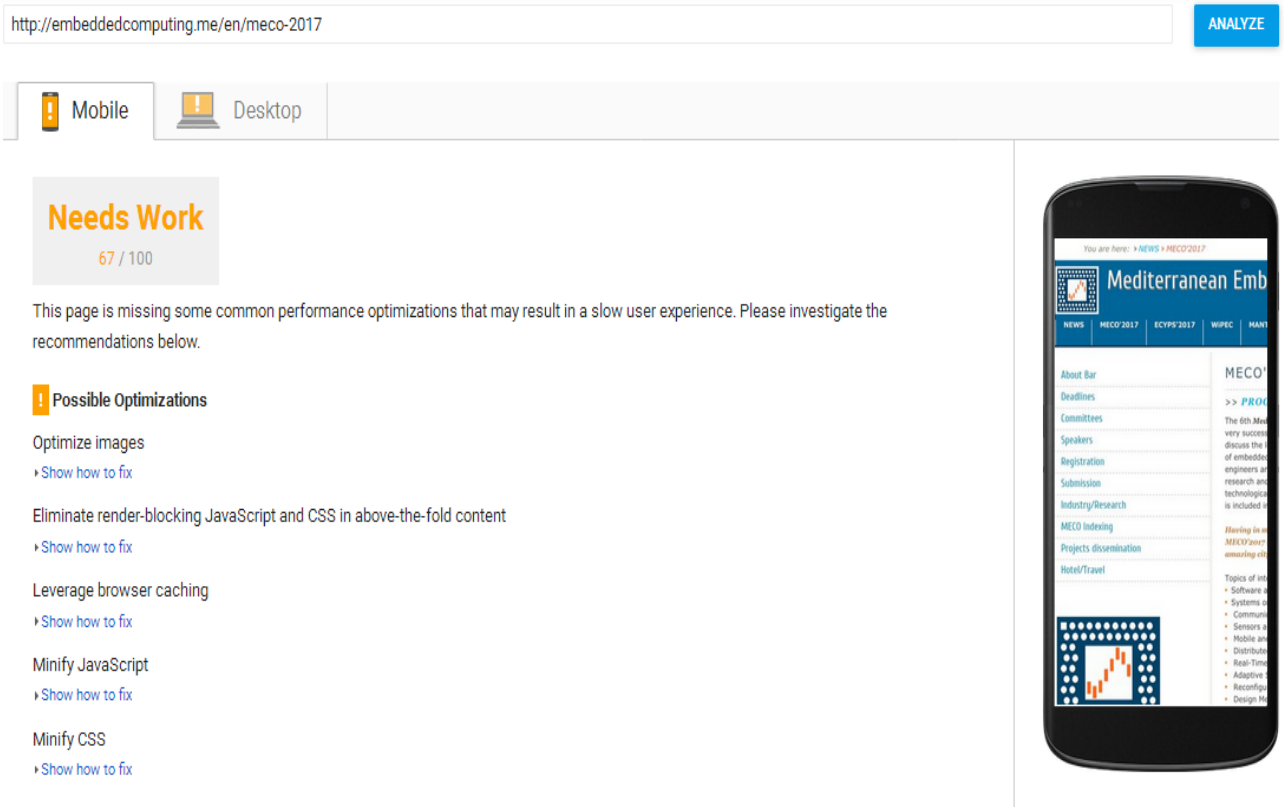


Figure 6 - An example of non-responsive webpage

2.6. Background Research - Analyzing Existing B2B portals

2.6.1. Alibaba.com

Alibaba is the largest retail company in China. It was founded in 1999 as an online marketplace to connect Chinese suppliers and businesses around the world. Alibaba use a B2B webpage and B2C that expands every year. According to (OUYANG, 2016) Alibaba has 10 Million active sellers, 439 Active byers, and 450 mobile active users. It is a multilingual B2B which supports 15 languages, usable in 190+ countries and in 2 million online shops. It supports 40+ types of industries and it is the number one B2B platform in the world. This B2B creates a perfect opportunity for linking not only Chinese suppliers and businesses, but worldwide companies. When this project started in 1999 was the idea to support chines producers and was developed only for use on desktop computers. After couple of years they made a very good web B2B portal for selling and business communication. Often B2B web portals have a public side and back side. The public side is the side which is used by costumers (front side) and the back side is used by the company and might be linked with CRM to manage all services.

According to (Matteson, 2014) when alibaba.com started selling products online using mobile space they launched their online web for mobile devices they had 500 million customers at the beginning that used phones to make online purchases. When you visit their B2B you can see that they have a B2B web portal created only for mobile devices. It can be identified from the URL which is m.alibaba.com. They have an application named Alibaba.com B2B Trade App that you can install on most of Smartphones and tablets. Alibaba still has a separate page for mobile devices.

Compared to other B2B portals, Alibaba is a more advanced B2B by having more options/modules in B2B portal. The main parts of Alibaba B2B functions are a place where you can sign in or register an account, products categories as a module which allows customers to explore all listed products and a place where you can search for a product by choosing a specific category by typing word phrase. B2B Alibaba has created a unique module for costumers to request a quotes from businesses or producers. The Alibaba B2B portal also has an option to find suppliers by region. Another amazing service provided by Alibaba B2B is a verified supplier's identity. Alibaba B2B has identified most of the suppliers in China and, for many of them they give a trade assurance certificate. Alibaba also has good logistical software and shipping services which allows buyers to track shipping products. One of the issues which many users are often confuse by is how secure are payments online when using Credit Cards and other online payment services. The Alibaba B2B portal uses an independent online payment platform called Alipay. Alipay provides a secure payment system which satisfies both suppliers and customers. How does this work? When you order product your money is not released until you confirm successful delivery. When you confirm delivery Alibaba releases money to the supplier. They also have a full refund or partial refund option as a solution in case the product is not been delivered or the product is not how the producer/supplier described in B2P portal. One of the most important facts is that all of your information is encrypted. According to online an article at Alipay provides advanced encryption technologies to ensure all payments and transactions remains protected Alipay uses a risk management framework to quickly detect potential threats.

Generally speaking the Alibaba B2B e-commerce contents and all of the models presented in desktop computers are also presented when using the mobile devices that are differently organized. On smart phones the categories are illustrated with an Icon with 3 lines which means it is the Menu, and the links for top suppliers are illustrated with pictures. So, when comparing the B2B Alibaba web portal by using Desktop

computer and Smartphone devices we can see that there are small differences in the view, but the contents still remain the same.

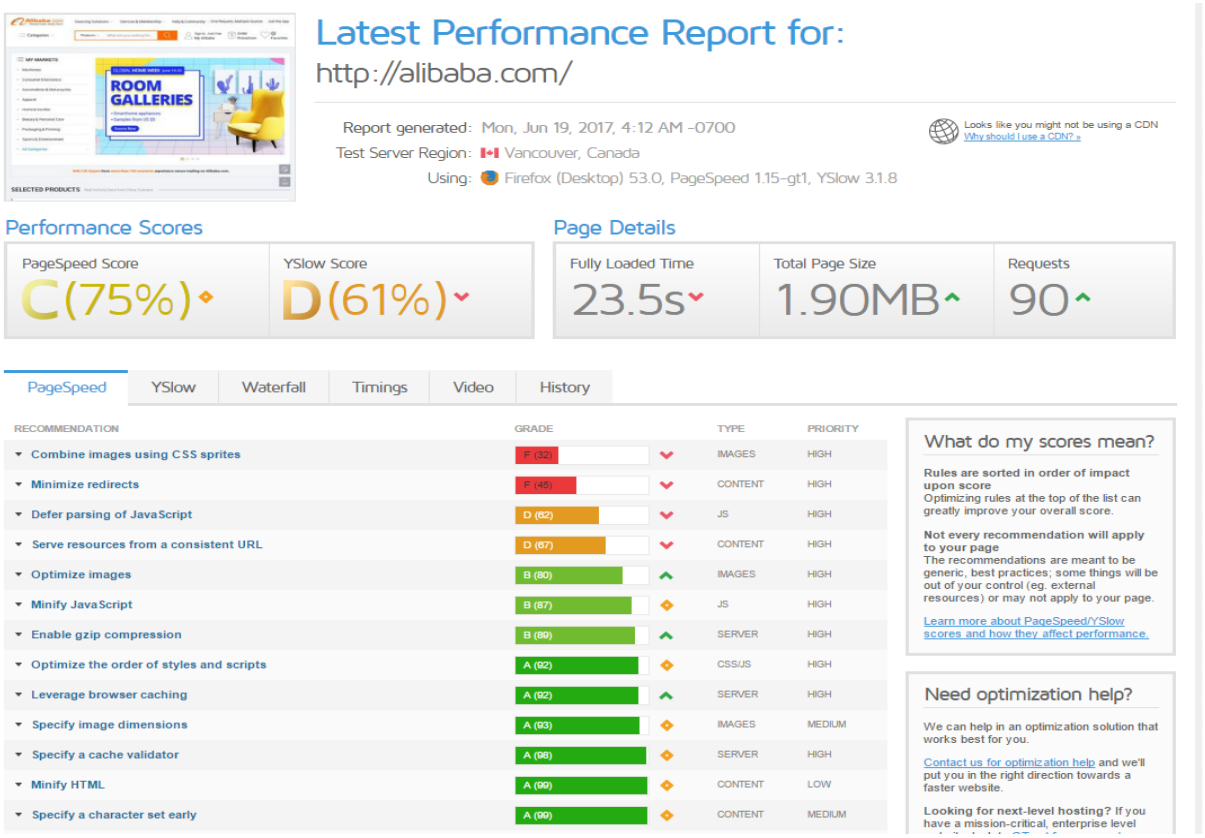


Figure 7 - Performance Testing for Alibaba Portal

2.6.2. Amazon

According to (Alex, n.d.) 'Amazon is the world's online marketplace; a place for buyers and sellers to come together and trade almost anything!'.

Amazon began as the biggest market of multiple products by selling online books. When books started to be sold they expanded by selling other products. Their online buying process is similar to other B2B portals. Jeff Bezos, an Amazon founder, developed good e-business model with both product information and attractive design by having a very professional photography and page layouts. The idea of amazon is to earn income

through selling your own products, earn money through membership fees, royalties and commissions. According to (Layton, 2006) Amazon runs on Linux based technology. In 2005 Amazon had the world's three largest Linux databases rrunning in Oracle.

Amazon is a B2C portal as well, but has a part called Amazon for businesses. Unlike other competitors, Amazon does not include auction-style sales as other competitors. Amazon allows businesses to register and create their own page and they can sell directly on Amazon. By creating their own page they can list items for a nominal fee per transaction or per subscription.

According to (Laudon, K. & Guericio, C., 2014) If you access amazon by using different devices, it is a very interactive B2B web portal. The Amazon site is cleaner and it is an interactive site suitable for navigating all the parts and User Interface is well defined by buttons, text size, search field, shopping card etc. Amazon is a responsive B2B web portal. As a responsive site it does not show all the information on first front- end page. It has limits when you use mobile device by using any of web browser. Amazon and Alibaba have developed a dedicated application for the most usable smartphones on the market for Android and IOS mobile operating systems.

According to (Sutherland, 2014) Dr.Jeff Sutherland, the co-creator of the Scrum Software Development Method said 'Google, Amazon and Apple could crush Spotify in a nanosecond if the company wasn't perpetually striving to be faster, better, and cheaper. To survive, Spotify has to be Agile. They have to keep on running out ahead.' Amazon use agile software development methodology in some ways.

	Amazon	Alibaba
Holds Inventory	Yes	No
Consumer Credit Services	Co-branded Credit Card	No
Advertising Services	Yes	Yes
Available Technology Platform	Yes (Amazon Web Services)	Yes
E- Payment Service	No	Alipay
Direct Sales	Yes	No
Matches Buyers and Sellers	Yes	Yes (via 1688.com)
Individual Storefronts	Yes	Yes
Manufactures Proprietary Goods	Yes (Kindle/Fire)	No
Content Provider	Yes (streaming videos/e-books)	No
Publisher	Yes (books/music/films/ technology)	No
Membership Fees	Yes (Prime)	Yes

Table: Comparison between Amazon vs Alibaba B2B e-commerce [6]

According to (Blystone, 2015) another big difference between these two competitors is: Amazon holds inventory and has warehouses around the world, while Alibaba has created a software platform that facilitate the exchanges of goods and services. This means it is easier to scale software for Alibaba rather than to scale warehouses for Amazon.

2.7. User interface (UI) & User experience (UX)

To be a successful B2B web portal the ecommerce web portal needs to be well designed and user friendly by providing an enhanced user experience. A complex UI that is difficult to use in a B2B web portal that supports mobile devices will prohibit continued use. According to (Ihamäki, 2014) it is quite common to hear people complain about the usability of B2B web portals especially when they use B2B web portals with web

[6] **Source:** Zuchi.K. (2014,October) Navigating E-commerce: Alibaba, Ebay and Amazon

browsers. B2B web portals usually have different kinds of user groups with different requests or needs, however we have users with more or less experience and both should be taken in consideration. B2B portals are usually designed to support all groups of users.

According to (Ihamäki, 2014) 'Basic usability principles for learnability, memorability, error prevention and recovery, efficient and satisfaction are especially important in B2B context' to desktop and mobile users.

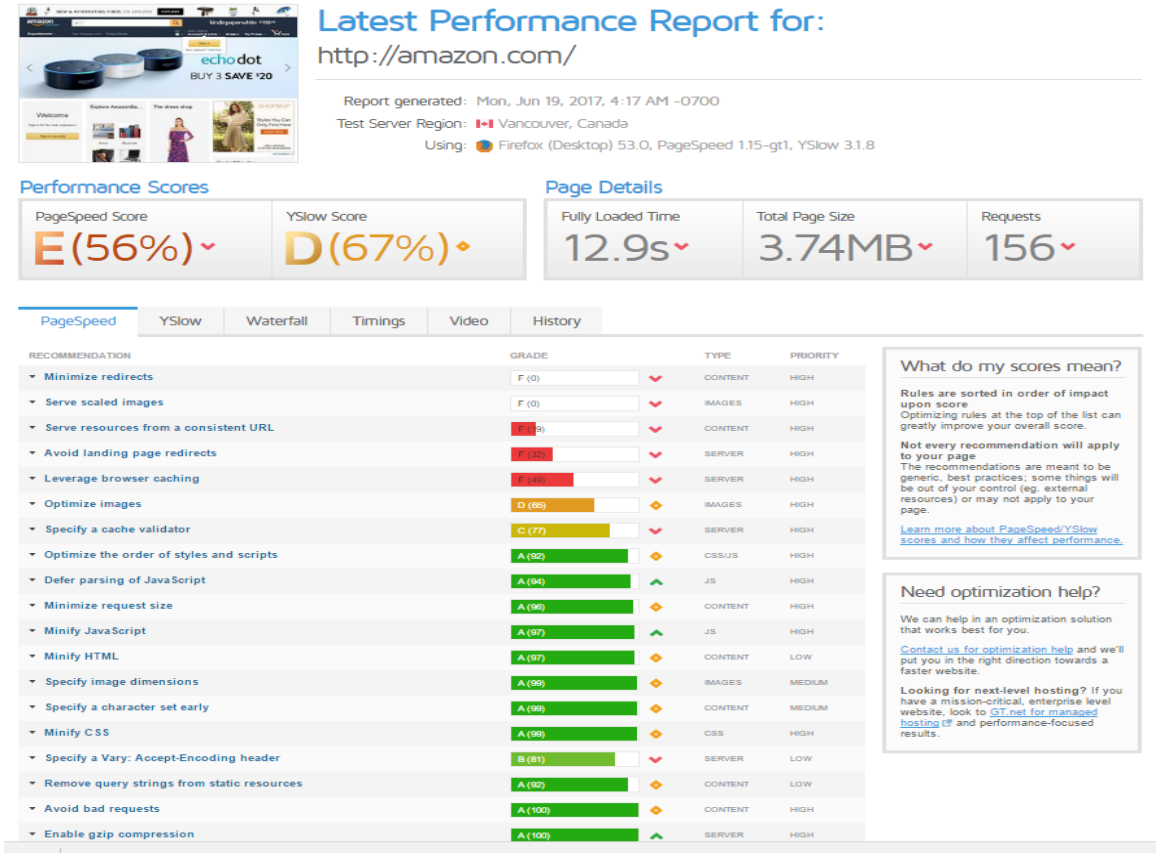


Figure 8 - Performance Testing for Amazon Portal

2.8. Test Your Webpage by Using Google's "Mobile-Friendly" Tool

This online application allows you to test your webpage in order to see how responsive it is on mobile devices. This is a perfect tool to analyze your webpage or web applications responsiveness on all devices. This tool is very helpful for developers working on their projects. This tool enables the comparisons on web pages to see the differences on mobile, desktop or tablet devices.

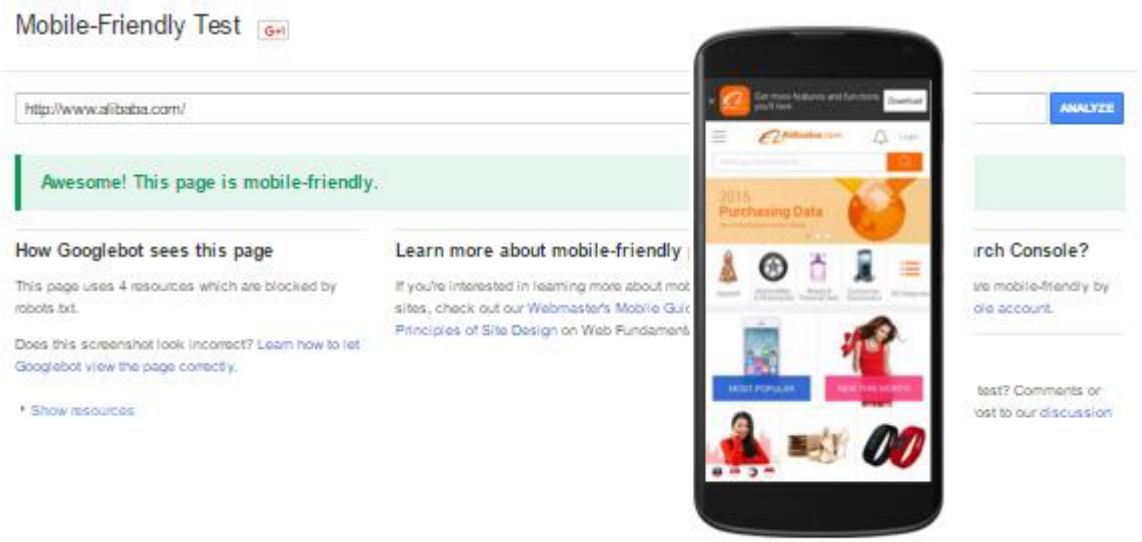


Figure 3: Mobile-Friendly test for Alibaba B2B.

This page is a very responsive and user friendly webpage according to "mobile-friendly" tools. During this master thesis many B2B web portals were tested but Amazon is to clear winners with its clearness and quickness. You can finish ordering products on this web page without spending too much time on it. The links, icons, product descriptions, categories, and menus and are very well organized. This tool generates a report which might be very helpful identifying any of the problems if left on the site.

2.9. Google's Page Speed Insights

This Google tool helps fix issues and make webpage speed better. This shows how to fix or what should be fixed to increase webpage speed, it shows what changes should be considered, while showing the user experience on the web pages. This tool has few rules which test the web page based on these rules. Here is an example of testing speed from the alibaba.com test page.

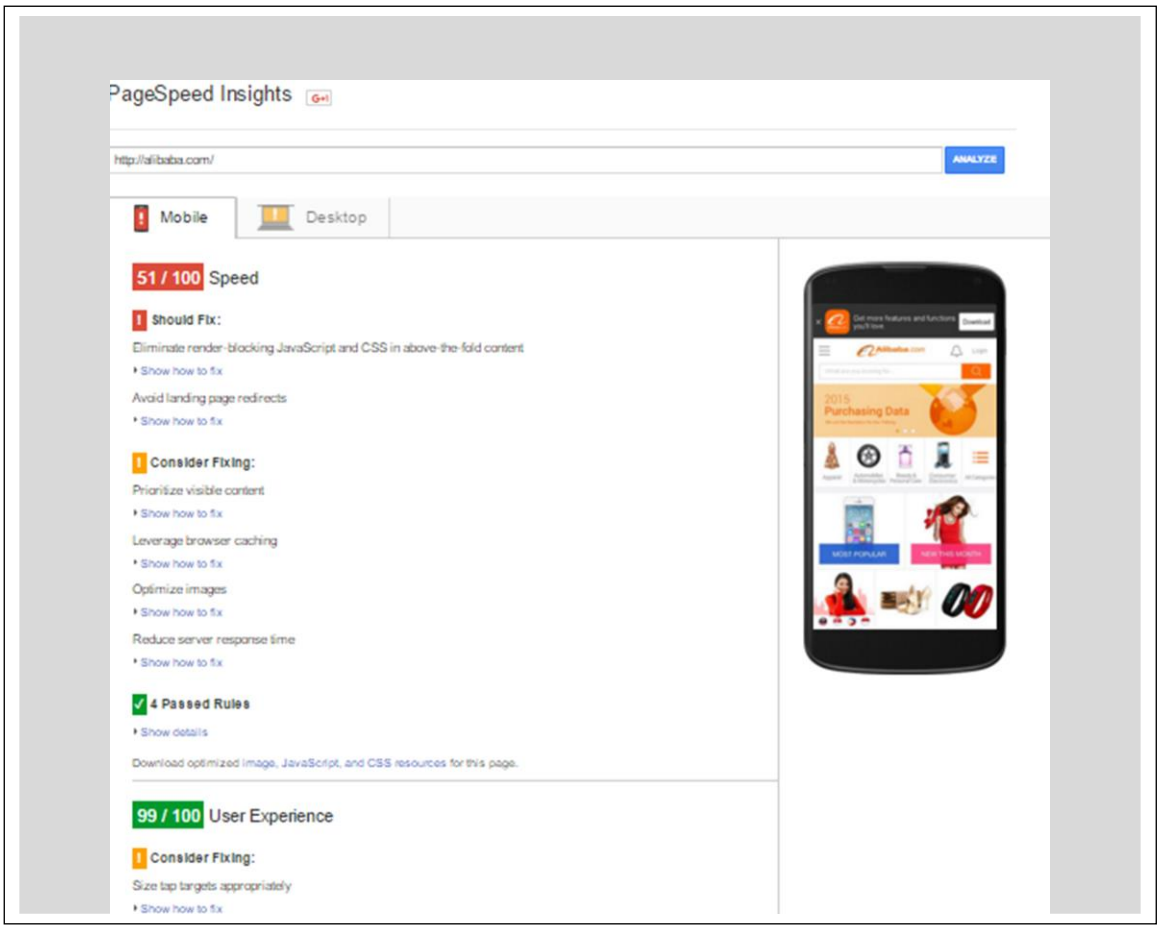


Figure 4: Page Speed Insights for Alibaba B2B web portal

2.10. Top Three Mistakes During the B2B Development Process

Beginner's [7] needs to remember three things avoid when developing mobile web B2B application in the following ways:

- Forgetting their mobile customer - It is necessary to have a good mobile site or user-friendly mobile site as they are very useful for costumers. Many sites forget their costumers when they build sites for their companies. It's very helpful for the costumer if the web page is designed with them in mind and usable on variety of devices.

- Google suggests that we simplify things by using responsive web design and have the same web page for desktop and mobile devices. Do not to create or implement a website on different domains and sub domains for desktop and mobile sites, because this increases the amount of work that takes to update and maintain your web site or B2B web portal.

- Do not work in isolation – Its better to get inspiration from other competitors. You are not the first in market to create sites for mobile or B2B web portal which support mobile devices. It is good practice to get ideas from other competitors. This should be seen learning from others who have successfully implemented a B2B web portals should be viewed in a positive light.

[7] https://developers.google.com/webmasters/mobile-sites/get-started#hire-developer

2.11. Summary

Literature reviews and all comparisons between B2B web portals show that choosing the right development model/method is very important. Developing a B2B web portal which supports mobile devices is highly recommended. Testing the UI and UX by using different kind of tests for user interface is crucial. All books and online resources show that every day we have new users utilizing mobile interactive devices to release online purchases in order to communicate and increase their profits by using different types of B2B web portals. In conclusion, today at least half of the B2B portals users come from mobile devices.

According to (Chaffey, 2016) it has been shown that every year we have more users utilizing mobile interactive devices. It is crucial for a mobile device web page to be well developed or close to perfect. In 2016-2015 most of the B2B web portals created two different types one for desktop users and another one for mobile users. During these two years most of these B2B methods are not in use any longer as it requires more energy consummation to keep the page updated, as you have to work twice more for the same webpage. From this perspective the cost for having two separate unresponsive B2B web portals is much higher. Many of the companies that develop webpages, or B2B, B2C, are trying to make the sites responsive. According to (Tawfik, 2014) mobile devices are more unique today, mobile devices have given the costumer a new way to interact with the business world by eliminating all world barriers along the way.

3. Research Methodology

The research methods that are going to be used for this master thesis will cover literature review from the secondary sources, collection of primary data through qualitative and quantitative methods such as questionnaires, interviews, and statistical analysis tools such as “Google Analytics” and SPSS.

The quantitative data will be mainly collected from questionnaires that are particularly designed for this research as well as questionnaires with group of people who will maintain the system and a group of people from the companies who will use this system for ordering products and communicating.

Also the qualitative data will be collected from surveys and interviews with group of people. They will participate online to fill the surveys and will be a part of interviews)

3.1. Usability Testing

Usability testing will be realized in order to evaluate and enhance the application. Usability testing is an effective way to see how easy is to use something when testing it with real user. Data analyses and all results will be used to re-engineer and improve the existing design of the application. We will use usability testing as a method to evaluate the B2B portal for usability.

During usability testing, the user sample sizes that are available in most design teams are extremely small; usually the group of 3 to 10 users. Therefore, the testing procedure will focus on a small number of user tasks, presumably those which are the most critical ones.

3.2. Man Whitney U test

The Mann-Whitney U test is an alternative test to the independent sample t-test. It is a non-parametric test used to compare two population determining differences in the groups. It is also used to test whether two population means are equal or not. It is used for equal sample sizes, and is used to test the median of two populations. Usually the Mann-Whitney U test is used when the data is ordinal. Wilcoxon Rank Dum, Kendall's and Mann-Whitney U test are similar tests that are equivalent to the chi-square test. (Love, 2005)

Assumptions:

Mann-Whitney U test is a non-parametric-test, hence it does not assume any assumptions related to the distribution. There are, however, some assumptions.

1. The sample drawn from the population is random.

2. Independence within the samples and mutual independence is assumed.

3. Ordinal measurement scale is assumed.

Calculation:

$$U = n_1 n_2 + \frac{n_2(n_2+1)}{2} - \sum_{i=n_1+1}^{n_2} R_i$$

Where:

U=Mann-Whitney U test

N_1 = Sample size one

N2= Sample size two

R_i = Rank of the sample size

According (U-Test, n.d.) the Mann-Whitney U test is used for every field. They are most frequently in use is psychology, medical/nursing, and business. For example, in psychology, it is used to compare attitude or behavior. In medicine it is used to determine the effect of two medicines whether they are equal or not. It is also used to know if the particular medicine cures the ailment or not. In business, it can be used to know the preferences of different people, and it can be used to see if the changes depend on location.

However, in this master thesis the Mann-Whitney U test will be used to measure how well user interface a developed for use on desktop computers, especially for mobile devices users with experience or without experience.

4. Conceptual Design and Development

In this chapter the software development life cycle is divided in two main phases: Design and Development. We will use the Waterfall Model as a software development methodology. Use of the Waterfall methodology is usually preferred for small teams and this B2B web portal was developed from a very small team. All requirements were well defined with an agency that supports these business in order to be a presented in the SEE online market. As a small team with experience in design, programming, and database and, taking into consideration a deadline was short to complete the application, we have decided to use the Waterfall Methodology Software Development Life Cycle to complete all phases. One by one starting from: analyzing requirments, design, development, testing, and maintenance. While developing this B2B web portal we did not use any existing B2B frameworks as the agency requirements were not suitable for use and the requirements were unique as well.

4.1. Design

Design is a significant phase for every project. In this part of master thesis, we will define all steps and identify all input requirements. Before we start to design and develop the project we held many meetings with RDAS. We been explained how they register businesses, entities, activities and how they try to create a network for these businesses in the SEE region. We have been provided with a few documents that clarify how to register businesses, their entities, products etc. All documents provide by RDSA are attached as appendix in the end of this master thesis.

4.2.1. Requirements

As with all other software, before we started to develop this B2B web application we gathered and analyzed all information from “Regional Development Agency South”.

The main objectives of this initiative are to induce and create valuable networks between current domestic and potential exporters operating in Economic Region South (municipalities of Prizren, Suharekë/Suva Reka, Rahovec/Orahovac, Malishevë/Mališevo, Mamushë/Mamuša and Dragash/Dragaš) and potential foreign buyers, thus contributing to the improvement of sale channels and reducing the costs of identifying market opportunities This will improve access to domestic and foreign markets by using this B2B e-commerce to support both desktop and mobile devices.

The idea of this project is to develop a specific B2B web portal that supports businesses in sectors:

- agricultural products
- food processing
- handcrafts
- wood processing
- production of construction materials
- cultural tourism

The objectives will be achieved through provision of B2B meetings, development of potential business/buyer lists for specific sectors and development of a specialized B2B online Portal. The aim of this (B2B) Business to Business web portal is to facilitate the needs of business communities in Kosovo, as well as the needs of their regional counterparts.

This B2B web portal ensures that local producers and exporters are given an opportunity to market their products, find potential buyers, and plan their future activities. Each producer has its own Info Page within this Web Portal. With the help of this B2B web portal, entrepreneurs will be able to directly contact their business counterparts.

4.2.2. Analysis Requirements

Analysis requirements will provide better technical information regarding the development a B2B web portal that supports both desktop and mobile devices. These are initiated through the Regional Development Agency South that is implemented project named "Organization of Matchmaking Services for Specific Industries".

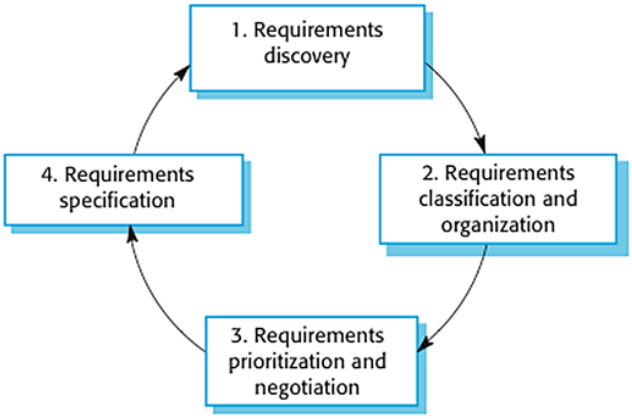


Figure 9 - The requirements elicitation and analysis process [8]

It is important, in every project to go through the elicitation and analysis process requirements. By using a cycle of analyzing requirements we can clarify, classify, and prioritize a better idea of requirements by analyzing all documents.

In our case, we have analyzed all documents provided by stakeholders. These are business registration forms and products registration forms completed by hand. Going through this process with stakeholders we have identified a few common mistakes users usually make. Allowing users to add products by themselves without pre-defining types of data by administrator, will create a significant problem in the future. For example, users can add data in a grammatically incorrect way, by typing "Cola" instead of Coca-Cola.

[8] 3 **Source**: Somerville, I. (2011). SOFTWARE ENGINEERING. Boston: Pearson.

4.2.3. Defining Functional Requirements

B2B Online Portal will be developed in two parts.

Public:

The key functions of the public part will include the following:

- Logo;
- Information about the project;
- Advance text box search;
- Contact form;
- Provide links to social networks (Facebook, Twitter);
- Login form to the Private part.

Private:

The key functions of the B2B Online Portal will include the following functions:

- A Multi-user B2B web application platform;
- Info pages for every producer;
- List of unlimited products for every registered producer;
- List of categories product;
- Municipalities list covered by the project, including names and their GPS Coordinates (Latitude and Longitude);

The B2B web application platform will have an advanced search module and multi-language content. Each producer will have its own Info Page within this Web Portal. It is planned that the producer will be given a username and password to gain access in order to enter business data and to update. Potential buyers will also obtain their usernames and be able to search for the products, quantities, and prices. In addition, they will be able to directly contact and chat with the producer without leaving the portal.

This is the first B2B Online portal in Kosovo developed for these types of businesses. At the beginning, 300 entrepreneurs from Albania, Macedonia, Montenegro and Kosovo will be registered as members of this B2B web portal. As requested by the agency (RDAS) this type of B2B portal should be a private portal, closed for guests and visitors. Only the businesses registered by administrator permission will have access to all recorded data in B2B web portal that are registered and updated by businesses and administrator.

4.2.4. Defining Non-Functional Requirements

- The B2b web portal needs to be developed in web technologies to support different devices in different browsers (Google Chrome, Internet Explorer, Safari, etc.).
- The system should be easy to use and easy to learn (user-friendly)
- The uptime system should be up and running 99% of the time.
- At the beginning the system should support 300 users
- The system needs to be easily recovered in case of any damage.

4.2.5. Describing Two Main Process with Use Case Diagrams

What is the Use Case Diagram? According (Diagram, 2015) , the Use Case Diagram is a graphic depiction of the interactions among the elements of a system. The Use Case Diagram can be used to describe the functionality of system in a horizontal way. With Use Case Diagrams, we can summarize some of the relationships between actors, use cases, and systems. We can show the main function, but not all the details. The Use

Case is a methodology used in systems to analyze, identify, clarify, and organize system requirements.

UML Use Case Diagrams have 5 major elements: actors, the system itself, the use cases/services, that system knows how to perform and the lines which represent the relationships between elements.

With Use Case Diagrams, software engineers often explain the processes and functionality of a system. In our case, we will use UCD to represent the functionality of our system from a top-down perspective. Below we will use two Use Cases Diagrams that describe the process of businesses registration in B2B web portal and the process of registration product quantity in various languages. One process is indicated by the administrator and the other one is initiated by the user and reviewed by administrator.

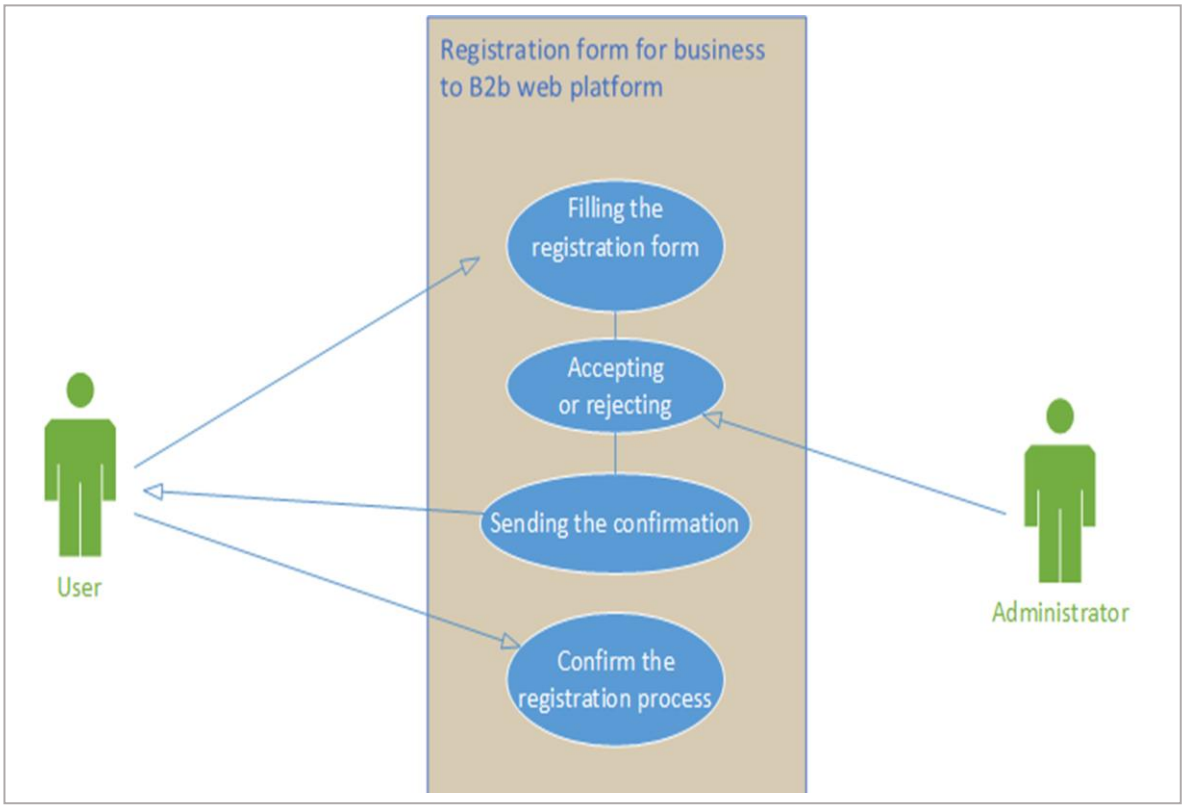


Figure 10 - UCD - Registration form

This type of B2B it's a type of private or closed B2B web portal, businesses can be registered only if they are a type of category requested by an administrator. The first year will be free of charge. In the future businesses would need to pay small amount of money for membership in order to become a part of this B2B web portal.

The Use Case Diagram below represents the process of registering products online.

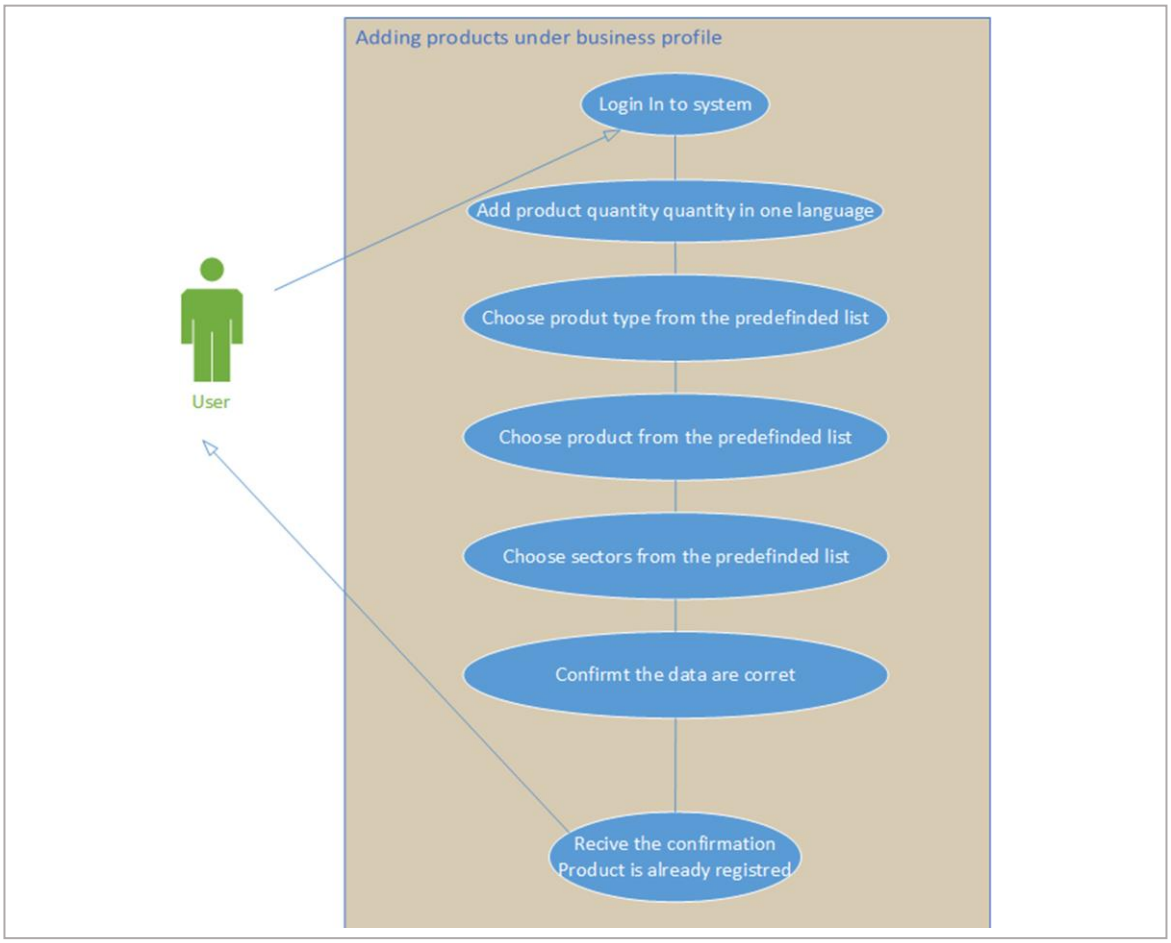


Figure 11 - UDC - Adding product quantity in system

All of these data are pre-defined from administrator. Review and acceptance from the administrator is not required. Good featurse of this B2B web portal are when the user

adds product quantity and the user adds the product in mother tongue language which is reviewable in four other languages too.

4.2.6. B2B Project Activities

Below are described the tasks has been done to complete the project. This plan will be completed with the client cooperation:

- Feasibility and the Study of the project
- Analysis of the Feasibility and the study
- Database Design, architecture and development
- Implementation of architecture and System Design
- Logo and Web Design
- Acceptance of Logo and Web Design
- Implementation of design
- Integration & Testing of the Application
- Deployment and installation
- Managing data entry process
- Training for responsible staff
- Performance testing period

4.2. Development

After finalizing the requirements and completing the design phase, the next phase is to develop gathered information by analyzing and processing it. Below in subchapters we will continue with development phase.

4.2.1. Implementation Schedule

Required time for implementation of this project is as below:

Days	Description
2 Days	Feasibility and the Study of the project
1 Day	Analysis of the Feasibility and the study
5 Days	Database Design, architecture and development
3 Days	Implementation of architecture and System Design
4 Days*	Logo and Web Design
2 Days*	Acceptance of Logo and Web Design
3 Days	Implementation of design
1 Day	Integration & Testing of the Application
1 Day	Deployment and installation
3 Days	Managing data entry process
1 Day	Training for responsible staff

Total time for implementation of the project is 20 days. *6 Days will be spent parallel with the implementation together with other various processes.

4.2.2. Conceptual Model

The interaction between users with the application and the database is presented visually in the following figure.

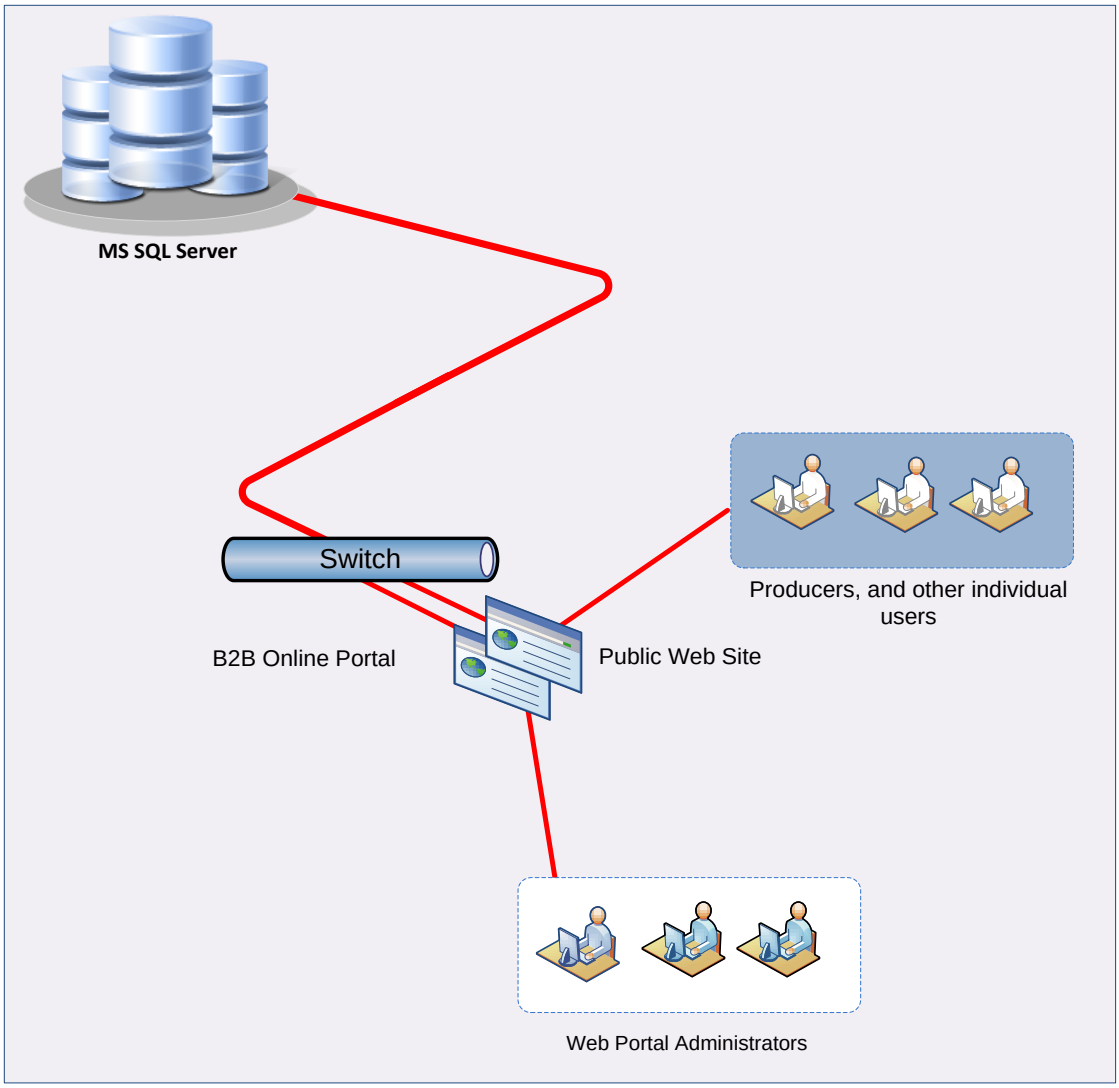


Figure 12 - B2B Conceptual Model web platform, visual description

4.2.3. Using Three Layer Architecture Software Architecture

While working on this project we have chosen to use three architectural layers for various reasons. Based on many articles evaluated while preparing for this project, we made the decision to adopt three architectural layers.

What is three layers architecture?

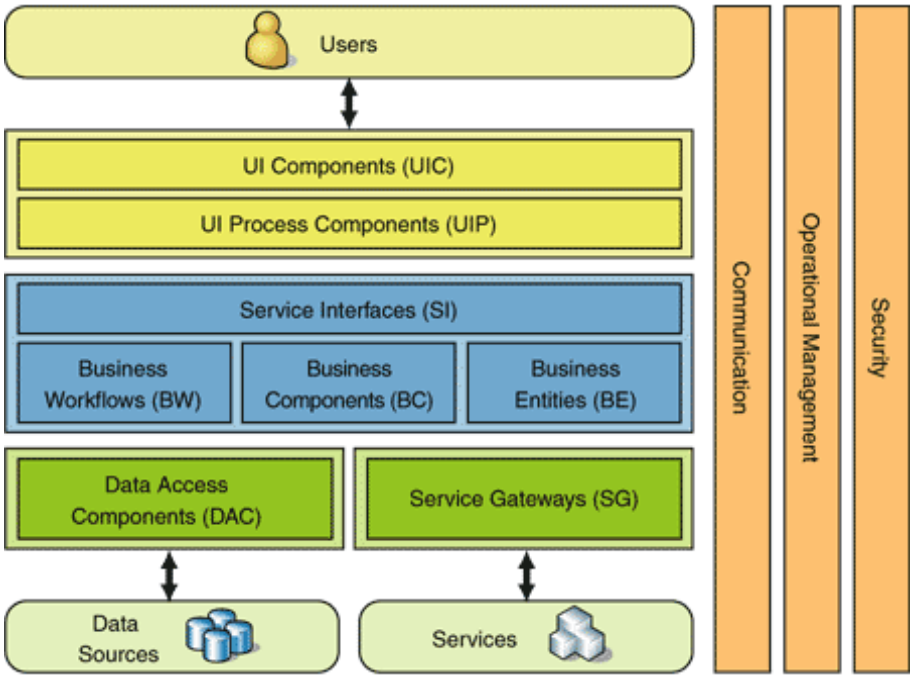


Figure 13 - Three-Layered Services Application[9]

According to (Fowler.M, Rice.D, Foemmel.TH, Hieatt.E, Mee.R, Stafford.R., 2002) Breaking down system into layers has a number of important benefits. The three layers are:

[9]**Source:** Microsoft Developer webpage - https://msdn.microsoft.com/en-us/library/ff648105.aspx

- **Presentation**

  Presentation is how to handle the interaction between the user and the software. The presentation layer provides the application's user interface (UI). Typically, this involves the use of Windows Forms interaction, and ASP.NET technologies for browser-based interaction.

- **Business**

  This is called the middle layer.It is made out of various segments for utilizing at least one programming language such as .NET .This business layer improves the usefulness of the application.

- **Data**

  The data layer provides access to external systems such as databases. ADO.NET. is involved as the primary .NET technology. However, it is common to use other technologies such as .NET XML capabilities.

Benefits of using multi-layer architecture:

I. **Flexibility** - the system or component can be easily modified for application use.
II. **Maintainability** - software system or component is easily easy modified for error correction, improve performance, adopts to environmental changes.
III. **Reusability**- software module can be used more than once.
IV. **Scalability** - systems or component are easily adjusted to loading changes.

4.2.4. Multi Languages

The system is provided in four languages (English, Albanian, Serbian and Macedonian). In this case, users will have the variety of languages to select from on the web application. The B2B system has the option to extend the system with additional languages if needed.

4.2.5. B2B Web Application Layers

Below is a print screen of the B2B Web portal application which gives us a better idea of layer architecture.

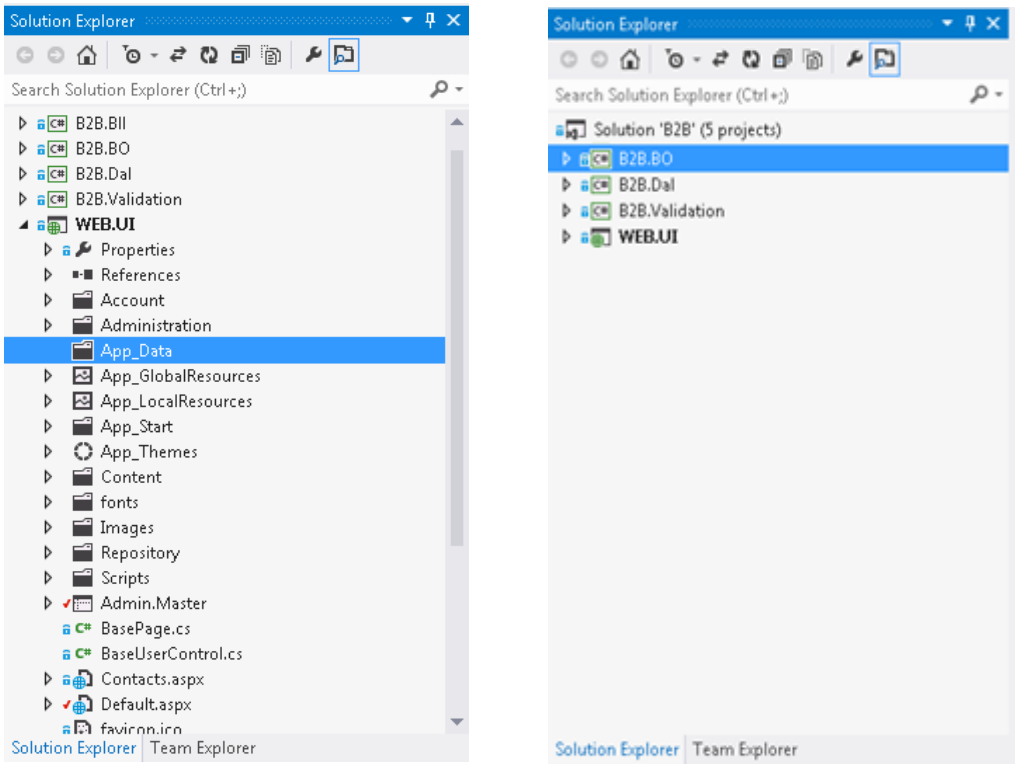


Figure 14 - Multi Layers architecture and folders view in B2B project

4.2.6. Technology

To complete the development of this project we use Microsoft Technologies:

- Programming language: **C#**
- Web Components: **ASP.NET, HTML5, CSS3, jQuery**
- GUI & Responsive Design: **Bootstrap Framework**
- Database: **SQL Server 2008 R2**
- Reporting: **Reporting Services (SSRS)**

4.2.7. Database and Relationship Between Tables

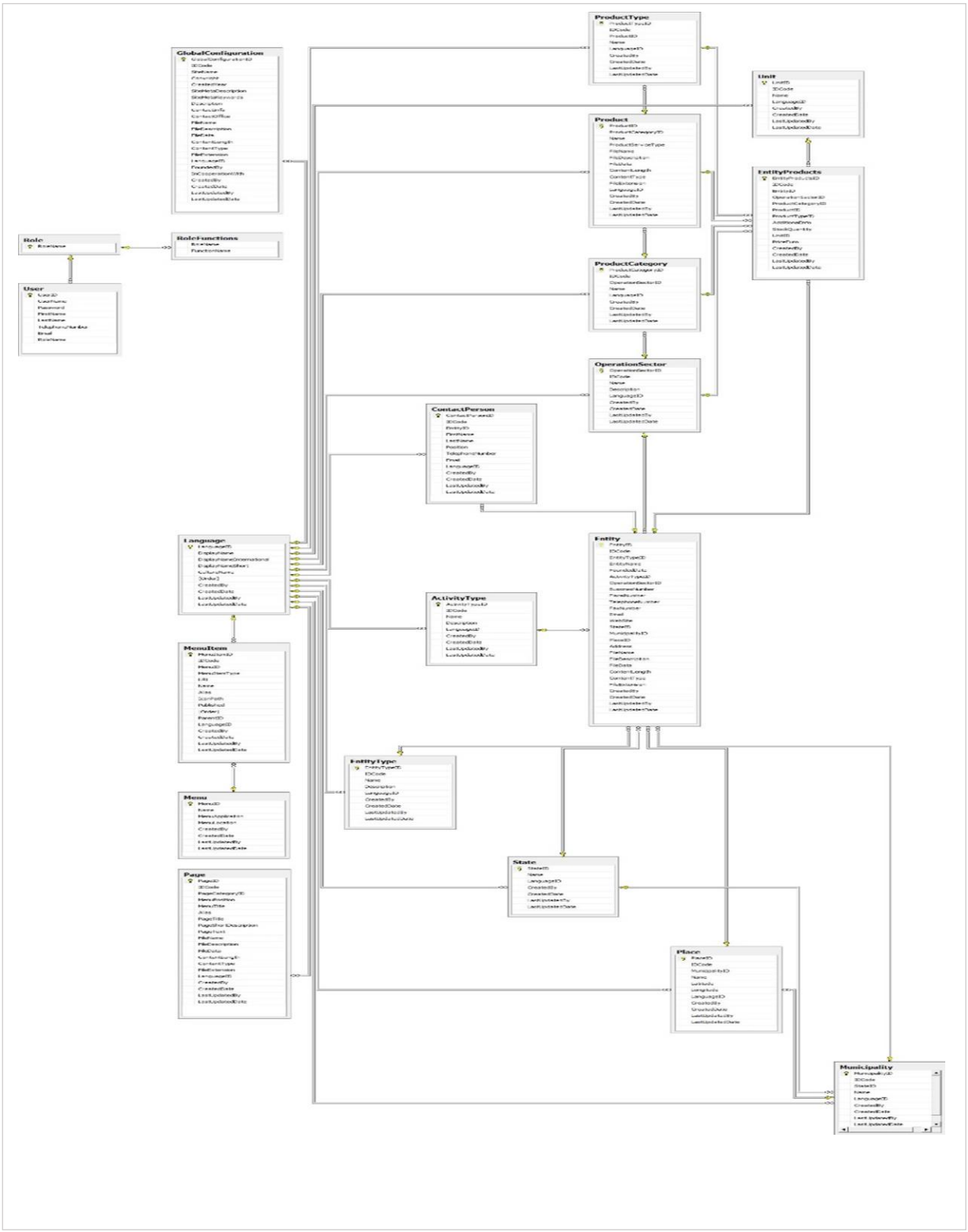
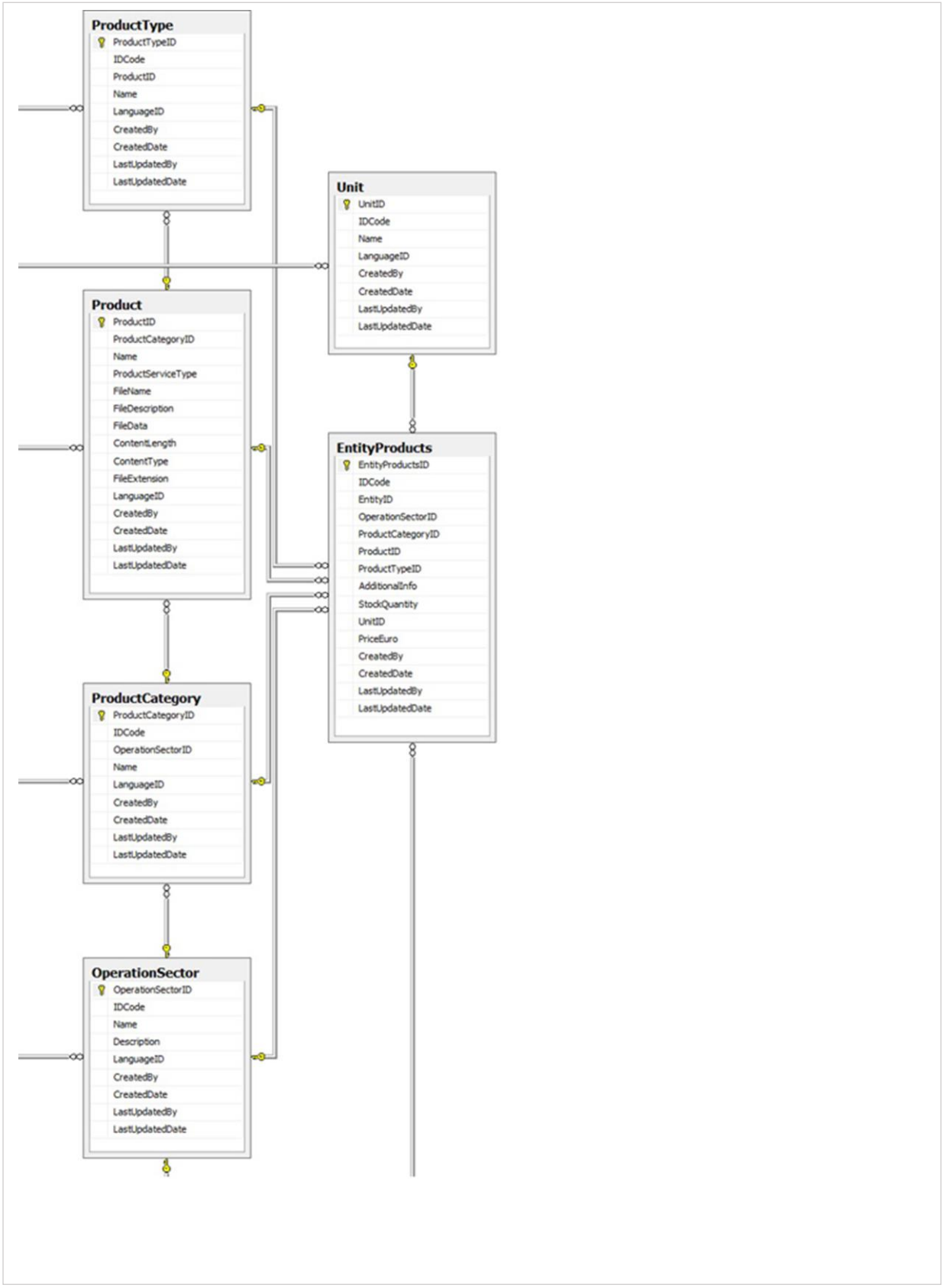
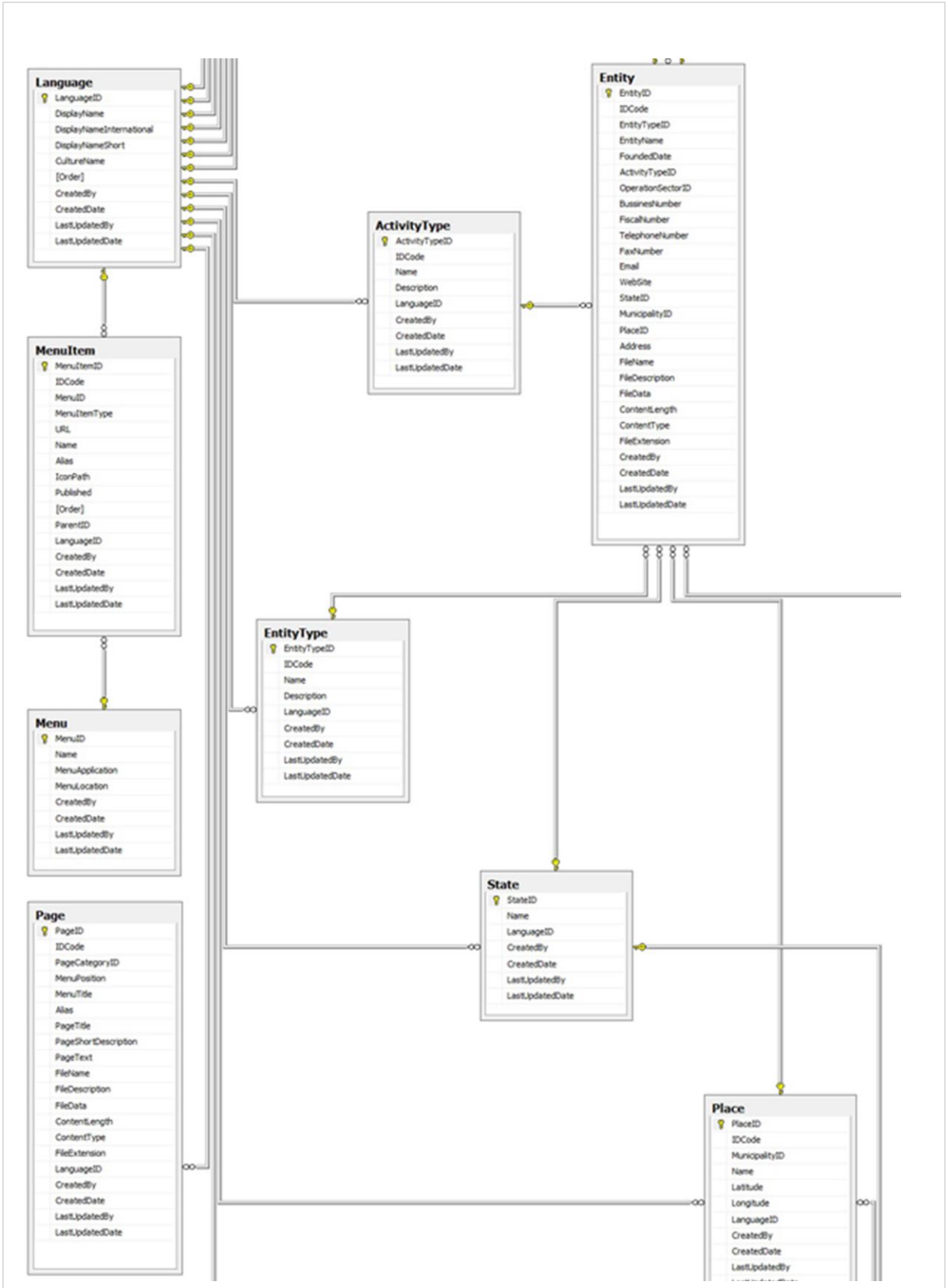


Figure 15 - B2B Web portal system database


ProductType
ProductTypeID
IDCode
ProductID
Name
LanguageID
CreatedBy
CreatedDate
LastUpdatedBy
LastUpdatedDate
Unit
UnitID
IDCode
Name
LanguageID
CreatedBy
CreatedDate
LastUpdatedBy
LastUpdatedDate
Product
ProductID
ProductCategoryID
Name
ProductServiceType
FileName
FileDescription
FileData
ContentLength
ContentType
FileExtension
LanguageID
CreatedBy
CreatedDate
LastUpdatedBy
LastUpdatedDate
EntityProducts
EntityProductsID
IDCode
EntityID
OperationSectorID
ProductCategoryID
ProductID
ProductTypeID
AdditionalInfo
StockQuantity
UnitID
PriceEuro
CreatedBy
CreatedDate
LastUpdatedBy
LastUpdatedDate
ProductCategory
ProductCategoryID
IDCode
OperationSectorID
Name
LanguageID
CreatedBy
CreatedDate
LastUpdatedBy
LastUpdatedDate
OperationSector
OperationSectorID
IDCode
Name
Description
LanguageID
CreatedBy
CreatedDate
LastUpdatedBy
LastUpdatedDate


Language
LanguageID
DisplayName
DisplayNameInternational
DisplayNameShort
CultureName
[Order]
CreatedBy
CreatedDate
LastUpdatedBy
LastUpdatedDate
ActivityType
ActivityTypeID
IDCode
Name
Description
LanguageID
CreatedBy
CreatedDate
LastUpdatedBy
LastUpdatedDate
Entity
EntityID
IDCode
EntityTypeID
EntityName
FoundedDate
ActivityTypeID
OperationSectorID
BussinesNumber
FiscalNumber
TelephoneNumber
FaxNumber
Email
WebSite
StateID
MunicipalityID
PlaceID
Address
FileName
FileDescription
FileData
ContentLength
ContentType
FileExtension
CreatedBy
CreatedDate
LastUpdatedBy
LastUpdatedDate
MenuItem
MenuItemID
IDCode
MenuID
MenuItemType
URL
Name
Alias
IconPath
Published
[Order]
ParentID
LanguageID
CreatedBy
CreatedDate
LastUpdatedBy
LastUpdatedDate
EntityType
EntityTypeID
IDCode
Name
Description
LanguageID
CreatedBy
CreatedDate
LastUpdatedBy
LastUpdatedDate
Menu
MenuID
Name
MenuApplication
MenuLocation
CreatedBy
CreatedDate
LastUpdatedBy
LastUpdatedDate
State
StateID
Name
LanguageID
CreatedBy
CreatedDate
LastUpdatedBy
LastUpdatedDate
Page
PageID
IDCode
PageCategoryID
MenuPosition
MenuTitle
Alias
PageTitle
PageShortDescription
PageText
FileName
FileDescription
FileData
ContentLength
ContentType
FileExtension
LanguageID
CreatedBy
CreatedDate
LastUpdatedBy
LastUpdatedDate
Place
PlaceID
IDCode
MunicipalityID
Name
Latitude
Longitude
LanguageID
CreatedBy
CreatedDate
LastUpdatedBy

We have crated database in the SQL server for this B2B web portal. The database has totally 23 tables in total, and most of the tables are linked to or related with table Language with relationship “many to one”. 14 of these tables are linked with table Language. This is one of the feature of this project.

In this subchapter we are focused on explaining two project how the database works and how the tables are related.

Focusing on describing two tables “Language” and “Product”. As we can see from the print screen below, we have four languages that are recorded on database: **English, Albanian, Serbian and Macedonian**.

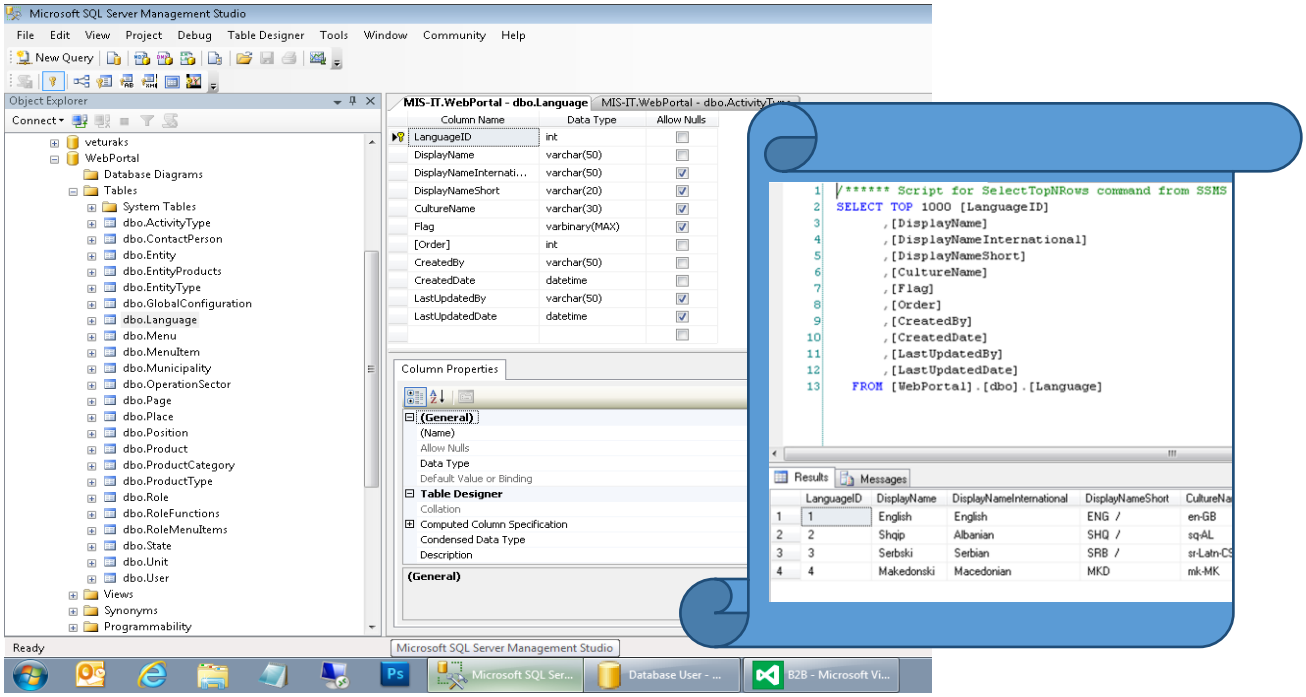


Table content: 1. General Configuration, 2. Menu Item, 3. Pages, 4. Unit, 5.Product, 6. Product type 7.Type, 8. Product Category, 9. Operation Sectors, 10.ContactPerson, 11. Activity Type, 12. Places, 13. Municipality, 14.State. All of these tables are related with table Language. The relationship between Table Language and others is “many to one”.

The code shown below defines public class named ‘Language’ in C# and also with store procedures in SQL how to insert & update language to the system. The code below is taken to show how one of the classes would look on this B2B web portal.

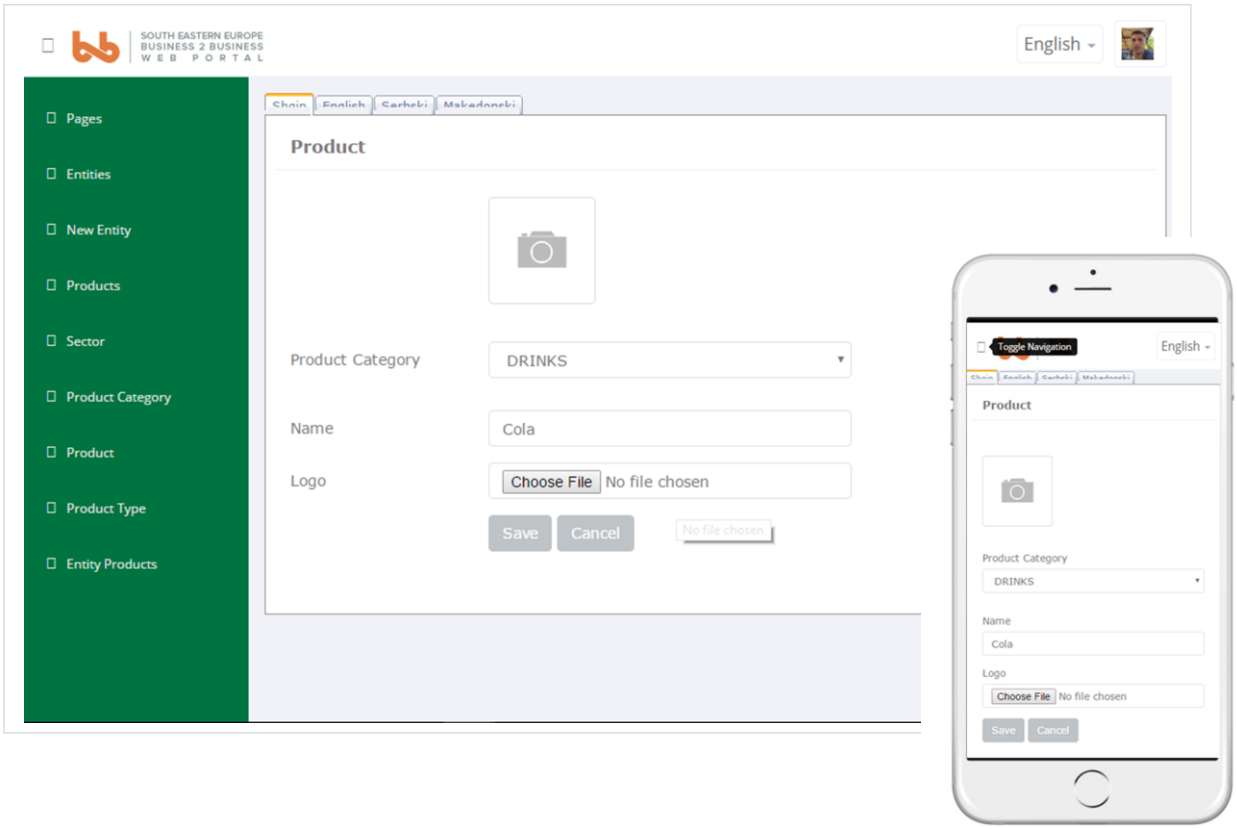
```
using System;
using System.ComponentModel;
using System.Diagnostics;
using B2B.Validation;
namespace B2B.BO
{
public class Language : BusinessBase
{
        [DataObjectFieldAttribute(true, true, false)]
        public int LanguageID { get; set; }
        [NotNullOrEmpty(Key = "DisplayNameNotEmpty")]
        public string DisplayName { get; set; }
        public string DisplayNameInternational { get; set; }
        public string DisplayNameShort { get; set; }
        public string CultureName { get; set; }
        public byte[] Flag { get; set; }
        [NotNullOrEmpty(Key = "OrderNotEmpty")]
        public int Order { get; set; }
        [NotNullOrEmpty(Key = "CreatedByNotEmpty")]
        public string CreatedBy { get; set; }
        [NotNullOrEmpty(Key = "CreatedDateNotEmpty")]
        public DateTime CreatedDate { get; set; }
        public string LastUpdatedBy { get; set; }
        public DateTime LastUpdatedDate { get; set; }
}}
```

The store procedure in the SQL database below shows how we insert or update languages in database if we would want to insert new language or update existing languages.

```
USE [WebPortal]
GO
/****** Object:  StoredProcedure [dbo].[sp_LanguageInsertUpdateSingleItem]    Script Date: 05/02/2017 13:36:17
******/
SET ANSI_NULLS ON
GO
SET QUOTED_IDENTIFIER ON
GO
ALTER PROCEDURE [dbo].[sp_LanguageInsertUpdateSingleItem]
(	@LanguageID int,
	@DisplayName varchar(50),
	@DisplayNameInternational varchar(50) = NULL,
	@DisplayNameShort varchar(20) = NULL,
	@CultureName varchar(30) = NULL,
	@Flag varbinary(MAX) = NULL,
	@CreatedBy varchar(50),
	@CreatedDate datetime,
	@LastUpdatedBy varchar(50) = NULL,
	@LastUpdatedDate datetime = NULL )
AS
DECLARE @ReturnValue int
IF (@LanguageID IS NULL) -- New Item
BEGIN
	DECLARE @varMaxID int
	SELECT @varMaxID=ISNULL(MAX(LanguageID),0) FROM [Language]
	SELECT @varMaxID=@varMaxID+1
	DECLARE @Order INT = (SELECT MAX([Order]) + 1 FROM dbo.[Language])
	IF(@Order IS NULL)
		BEGIN
			SET @Order = 1
		END
	SELECT @ReturnValue = @varMaxID
	INSERT	INTO [Language]
		(
			[DisplayName], [DisplayNameInternational], [DisplayNameShort],[CultureName], [Order],
			[Flag],[CreatedBy],  [CreatedDate], [LastUpdatedBy], [LastUpdatedDate]
		)
	VALUES
		(
			@DisplayName,  @DisplayNameInternational, @DisplayNameShort,  @CultureName,
			@Order,  @Flag, @CreatedBy, @CreatedDate, @LastUpdatedBy,  @LastUpdatedDate
		)
END ELSE BEGIN
	SELECT @ReturnValue = @LanguageID
	UPDATE [Language]
	SET
		[DisplayName] = @DisplayName,  [DisplayNameInternational] = @DisplayNameInternational,
		[DisplayNameShort] = @DisplayNameShort,  [CultureName] = @CultureName,  [Flag] = @Flag,
		[CreatedBy] = @CreatedBy,  [CreatedDate] = @CreatedDate, [LastUpdatedBy] = @LastUpdatedBy,
		[LastUpdatedDate] = @LastUpdatedDate
	WHERE	[LanguageID] = @LanguageID

END	IF (@@ERROR != 0)	BEGIN	RETURN -1	END	ELSE	BEGIN		RETURN @ReturnValue	END
```

4.2.8. Product Registration in B2B Web Portal

Adding a product is one of the main function of this B2B web portal, below his the user interface print screen and a code to show the details of how the procedure of registering product in the system is happening. To have a better idea of how the system works I have to copy a part of code from project in this document.



This is the view from the administrator side. This shows how the administrator add and register products in the system in four different languages; by predefining data for users to eliminate common mistakes when adding their products quantity in the system, giving them limited permission only.

Below we have a defined a class as 'Product'. As shown below class 'Product' is very important or is the main part of this B2B web portal. This class is same as the database it is linked with the other classes are linked with 'Category', 'Product Type' and 'Entity'.

```
using System;
using System.ComponentModel;
using System.Diagnostics;
using B2B.Validation;
namespace B2B.BO
{
   public class Product : BusinessBase
   {
      #region "Private Variables"
      private EntityProductsCollection _entityProductss = new    EntityProductsCollection();
      private ProductTypeCollection _productTypes = new ProductTypeCollection();

      #endregion
      #region "Public Properties"
      [DataObjectFieldAttribute(true, true, false)]
      public int ProductID { get; set; }
      [NotNullOrEmpty(Key = "IDCodeNotEmpty")]
      public int IDCode { get; set; }
      [NotNullOrEmpty(Key = "ProductCategoryIDNotEmpty")]
      public int ProductCategoryIDCode { get; set; }
      [NotNullOrEmpty(Key = "NameNotEmpty")]
      public string Name { get; set; }
      public int ProductServiceType { get; set; }
      public string FileName { get; set; }
      public string FileDescription { get; set; }
      public byte[] FileData { get; set; }
      public int ContentLength { get; set; }
      public string ContentType { get; set; }
      public string FileExtension { get; set; }
      [NotNullOrEmpty(Key = "LanguageIDNotEmpty")]
      public int LanguageID { get; set; }
      [NotNullOrEmpty(Key = "CreatedByNotEmpty")]
      public string CreatedBy { get; set; }
      [NotNullOrEmpty(Key = "CreatedDateNotEmpty")]
      public DateTime CreatedDate { get; set; }
      public string LastUpdatedBy { get; set; }
      public DateTime LastUpdatedDate { get; set; }
      public EntityProductsCollection entityProductss
      {   get { return _entityProductss; }
         set { _entityProductss = value; }  }
      public ProductTypeCollection productTypes
      {   get { return _productTypes; }
         set { _productTypes = value; }       }
      #endregion  }}
```

This is store procedure in SQL for inserting and updating products in database.

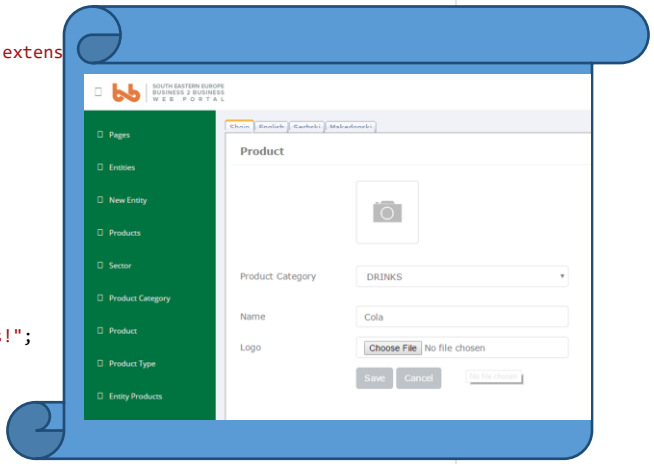
```
USE [WebPortal]
GO
/****** Object:  StoredProcedure [dbo].[sp_ProductInsertUpdateSingleItem]    Script Date: 05/02/2017 13:32:56 ******/
SET ANSI_NULLS ON
GO
SET QUOTED_IDENTIFIER ON
GO
ALTER PROCEDURE [dbo].[sp_ProductInsertUpdateSingleItem]
(	@ProductID int,
	@IDCode int,
	@ProductCategoryIDCode int,
	@Name varchar(100),
	@ProductServiceType int = NULL,
	@FileName varchar(100) = NULL,
	@FileDescription varchar(500) = NULL,
	@FileData varbinary(MAX) = NULL,
	@ContentLength int = NULL,
	@ContentType varchar(300) = NULL,
	@FileExtension varchar(10) = NULL,
	@LanguageID int,
	@CreatedBy varchar(50),
	@CreatedDate datetime,
	@LastUpdatedBy varchar(50) = NULL,
	@LastUpdatedDate datetime = NULL
)
AS
DECLARE @ReturnValue int
IF (@ProductID IS NULL) -- New Item
BEGIN
	DECLARE @varMaxID int
	SELECT @varMaxID=ISNULL(MAX(ProductID),0) FROM [Product]
	SELECT @varMaxID=@varMaxID+1
	SELECT @ReturnValue = @varMaxID
	INSERT	INTO [Product]
		(	[IDCode], [ProductCategoryIDCode], [Name], [ProductServiceType], 	[FileName],
			[FileDescription], [FileData], [ContentLength], [ContentType], [FileExtension],
			[LanguageID], [CreatedBy], [CreatedDate], [LastUpdatedBy], [LastUpdatedDate])
	VALUES
		(	@IDCode, @ProductCategoryIDCode, 	@Name, 	@ProductServiceType,
			@FileName, @FileDescription, @FileData, @ContentLength, @ContentType,
			@FileExtension, 	@LanguageID, @CreatedBy, @CreatedDate, @LastUpdatedBy,
			@LastUpdatedDate )
END
ELSE
BEGIN	SELECT @ReturnValue = @ProductID
	UPDATE [Product]
	SET
		[IDCode] = @IDCode, [ProductCategoryIDCode] = @ProductCategoryIDCode,
		[Name] = @Name, 	[ProductServiceType] = @ProductServiceType,
		[FileName] = @FileName,
		[FileDescription] = @FileDescription,
		[FileData] = @FileData,
		[ContentLength] = @ContentLength,
		[ContentType] = @ContentType,
		[FileExtension] = @FileExtension,
		[LanguageID] = @LanguageID,
		[CreatedBy] = @CreatedBy,
		[CreatedDate] = @CreatedDate,
		[LastUpdatedBy] = @LastUpdatedBy,
		[LastUpdatedDate] = @LastUpdatedDate

	WHERE	[ProductID] = @ProductID

END	IF (@@ERROR != 0)	BEGIN	RETURN -1	END	ELSE	BEGIN	RETURN @ReturnValue	END
```

In this project we used ‘Mappers’ to realize a communication between application and database. These files are saved under the layer ‘B2B.dal’. By using mappers we communicate with the database and call the SQL store procedures to save products, update, or delete any product in the database. All functions in our B2B web application are used with ‘Mappers’ to communicate with database.

```
Saves a Product in the database.
The new ProductID if the Product is new in the database or the existing ProductID when an item was updated.</returns>
public static int Save(Product myProduct)       {
            if (!myProduct.Validate())          {
throw new InvalidSaveOperationException("Can't save an invalid Product. Please make sure Validate() returns true before you call Save."); }
            int result = 0;
            using (SqlConnection myConnection = new SqlConnection(AppConfiguration.ConnectionString))
            {  using (SqlCommand myCommand = new SqlCommand("sp_ProductInsertUpdateSingleItem", myConnection))
                {   myCommand.CommandType = CommandType.StoredProcedure;
                    if (myProduct.ProductID == -1 || myProduct.ProductID == 0)                  {
                        myCommand.Parameters.AddWithValue("@productID", DBNull.Value);          }
                    else
                    {   myCommand.Parameters.AddWithValue("@productID", myProduct.ProductID); }
                    if (myProduct.IDCode == null)
                    { myCommand.Parameters.AddWithValue("@iDCode", DBNull.Value); }
                    else
                    { myCommand.Parameters.AddWithValue("@iDCode", myProduct.IDCode); }
                    if (myProduct.ProductCategoryIDCode == null)
                    { myCommand.Parameters.AddWithValue("@ProductCategoryIDCode", DBNull.Value);}
                    else
                    {myCommand.Parameters.AddWithValue("@ProductCategoryIDCode", myProduct.ProductCategoryIDCode);
                    }
                    if (string.IsNullOrEmpty(myProduct.Name))
                    { myCommand.Parameters.AddWithValue("@name", DBNull.Value); }
                    else
                    {myCommand.Parameters.AddWithValue("@name", myProduct.Name); }
                    if (myProduct.ProductServiceType == null)
                    {myCommand.Parameters.AddWithValue("@productServiceType", DBNull.Value); }
                    else
                    { myCommand.Parameters.AddWithValue("@productServiceType", myProduct.ProductServiceType);
                    }
                    if (string.IsNullOrEmpty(myProduct.FileName))
                    { myCommand.Parameters.AddWithValue("@fileName", DBNull.Value); }
                    else
                    { myCommand.Parameters.AddWithValue("@fileName", myProduct.FileName); }
                    if (string.IsNullOrEmpty(myProduct.FileDescription))
                    { myCommand.Parameters.AddWithValue("@fileDescription", DBNull.Value);
                    }
                    else
                    { myCommand.Parameters.AddWithValue("@fileDescription", myProduct.FileDescription);}
                    if (myProduct.FileData == null)
                    {   myCommand.Parameters.Add("@fileData", SqlDbType.Image);
                        myCommand.Parameters["@fileData"].Value = DBNull.Value; }
                    Else   { myCommand.Parameters.AddWithValue("@fileData", myProduct.FileData); }
                    if (myProduct.ContentLength == null)
                    { myCommand.Parameters.AddWithValue("@contentLength", DBNull.Value); }
                    else
                    { myCommand.Parameters.AddWithValue("@contentLength", myProduct.ContentLength); }
                    if (string.IsNullOrEmpty(myProduct.ContentType)) {
                        myCommand.Parameters.AddWithValue("@contentType", DBNull.Value); }
                    else
                    {myCommand.Parameters.AddWithValue("@contentType", myProduct.ContentType); }
                    if (string.IsNullOrEmpty(myProduct.FileExtension))
                    { myCommand.Parameters.AddWithValue("@fileExtension", DBNull.Value); }
                    else
                    { myCommand.Parameters.AddWithValue("@fileExtension", myProduct.FileExtension); }
                    if (myProduct.LanguageID == null)
                    {myCommand.Parameters.AddWithValue("@languageID", DBNull.Value); }
                    else
                    { myCommand.Parameters.AddWithValue("@languageID", myProduct.LanguageID); }
                    if (string.IsNullOrEmpty(myProduct.CreatedBy))
                    {myCommand.Parameters.AddWithValue("@createdBy", DBNull.Value); }
                    Else { myCommand.Parameters.AddWithValue("@createdBy", myProduct.CreatedBy); }
                    if (myProduct.CreatedDate == null || myProduct.CreatedDate == DateTime.MinValue)
                    { myCommand.Parameters.AddWithValue("@createdDate", DBNull.Value) }
                    Else
                    { myCommand.Parameters.AddWithValue("@createdDate", myProduct.CreatedDate); }
                    if (string.IsNullOrEmpty(myProduct.LastUpdatedBy))
                    { myCommand.Parameters.AddWithValue("@lastUpdatedBy", DBNull.Value); }
                    else
                    {myCommand.Parameters.AddWithValue("@lastUpdatedBy", myProduct.LastUpdatedBy); }
                    if (myProduct.LastUpdatedDate == null || myProduct.LastUpdatedDate == DateTime.MinValue)
                    { myCommand.Parameters.AddWithValue("@lastUpdatedDate", DBNull.Value); }
                    else
                    { myCommand.Parameters.AddWithValue("@lastUpdatedDate", myProduct.LastUpdatedDate); }
                    DbParameter returnValue;
                    returnValue = myCommand.CreateParameter();
                    returnValue.Direction = ParameterDirection.ReturnValue;
                    myCommand.Parameters.Add(returnValue);
                    myConnection.Open();
                    myCommand.ExecuteNonQuery();
                    result = Convert.ToInt32(returnValue.Value);
                    myConnection.Close();} }
            return result;}
```

The last part left to describe is a part of saving product on B2B portal. It is the method we have created to perform communication. The method below is used in the back side of the form we call this method to communicate with 'Mapper' Product in Layer 'B2B.DAL'.

```
// Metoda e cila ndodhet ne form  per insertimin apo ruajtjen e produktit ne database duke komunikuar me
llayerin B2B.DAL

 protected void SaveButton_Click(object sender, EventArgs e)
        {
            if (ProductCategoryDropDownList.SelectedItem.Value != "-1")
            {
                B2B.BO.Product pc = new B2B.BO.Product();
                if (IdCode != 0)
                {
                    pc = ProductDB.GetItemByIDCodeAndLanguageID(IdCode, LanguageID);
                    if (pc.Name == null)
                    {
                        pc.CreatedBy = CurrentUser.UserName;
                        pc.CreatedDate = DateTime.Now;
                    }
                    pc.IDCode = IdCode;
                }
                else
                {
                    pc.IDCode = LastIdCode;
                    pc.CreatedBy = CurrentUser.UserName;
                    pc.CreatedDate = DateTime.Now;
                }
                //ProductServiceType{1=produkte, 2=sherbime}
                pc.ProductServiceType = 1;
                pc.Name = NameTextBox.Text;
                pc.ProductCategoryIDCode = int.Parse(ProductCategoryDropDownList.SelectedItem.Value);
                if (ImageFileUpload.HasFile)
                {
                    string FileExtension = System.IO.Path.GetExtension(ImageFileUpload.FileName).ToLower();
                    if (FileExtension == ".jpg" || FileExtension == ".bmp" || FileExtension == ".png")
                    {
                        pc.FileData = ImageFileUpload.FileBytes;
                        pc.FileName = ImageFileUpload.FileName;
                        pc.FileDescription = "Photo";
                        pc.ContentLength = ImageFileUpload.PostedFile.ContentLength;
                        pc.ContentType = ImageFileUpload.PostedFile.ContentType;
                        pc.FileExtension = System.IO.Path.GetExtension(ImageFileUpload.FileName);
                    }
                    else
                    {
                        MesazhiLabel.Text = "Files Only with this extens
                        return;
                    }
                }


                pc.LanguageID = LanguageID;

                pc.LastUpdatedBy = CurrentUser.UserName;
                pc.LastUpdatedDate = DateTime.Now;

                ProductDB.Save(pc);

                MesazhiLabel.Text = "Te dhënat u ruajtën me sukses!";
                DisableControls();
            }
        }
```



4.2.9. Bootstrap Framework

In order to have a responsive design for our developed web application we used a well know front-end framework called Bootstrap. Boot strap is a very good solution because it is free and has open source collection tools that serve to create web sites. It includes HTML and CSS based design temples: forms, navigation, typography and other that components interface parts. The Java Script extension as optional.

Bootstrap easily and efficiently scales our website and application with a single code base, from phones , tablets and desktops with CSS media queries.

4.3. Bootstrap features

With Bootstrap, we get extensive and beautiful documentation for common HTML elements, dozens of custom HTML and CSS components, and awesome jQuery plugins.

Below is the part of Admin Master Page code used to identify the size screen of users. The code below shows the master page of the Admin side which is saved under the UI layer. Under the Folder App Themes design is included with all the web themes and code to make this page responsive for all devices. Below we have a print screen how the B2B admin master page looks as a responsive site.

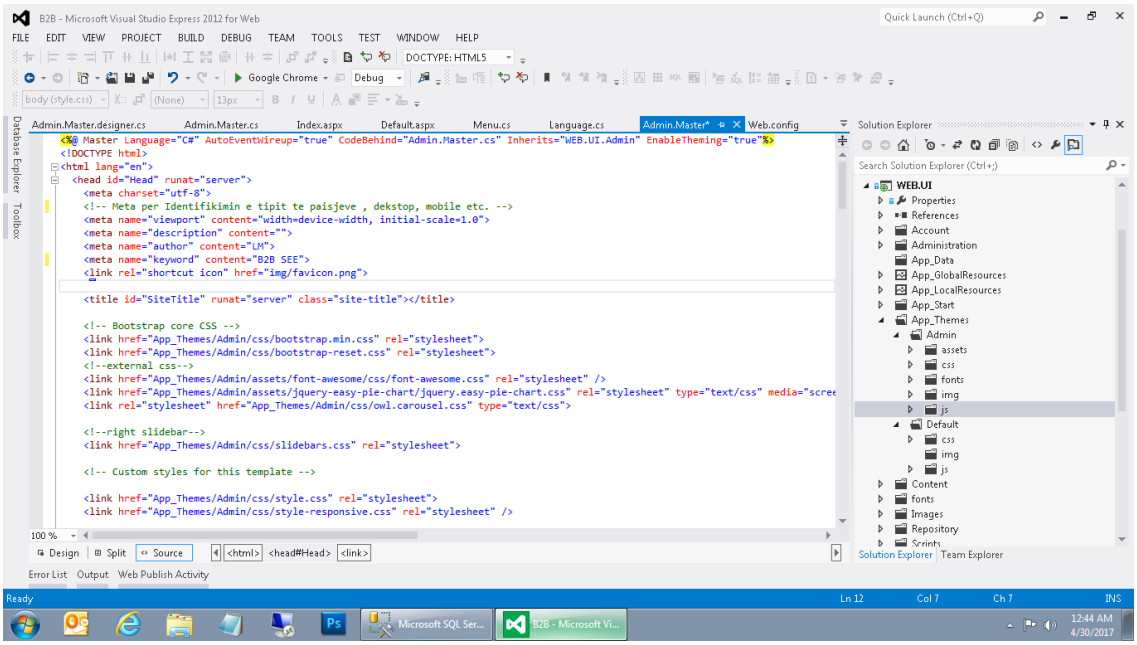
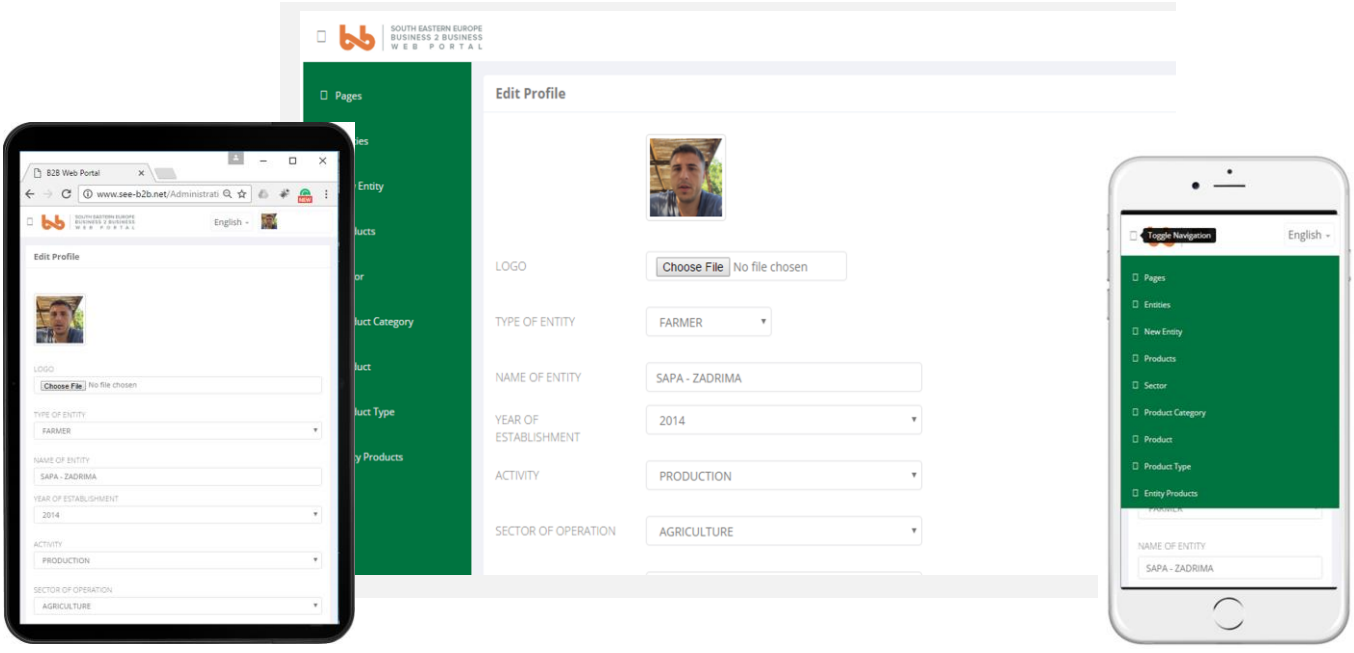
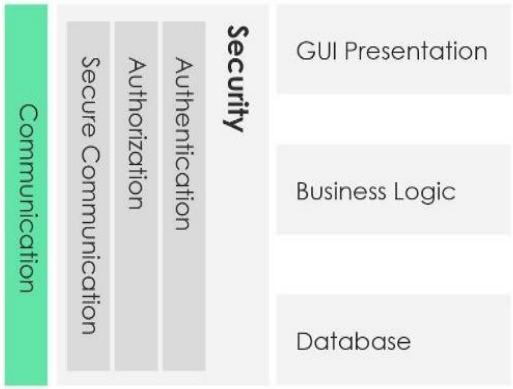


Figure 16 - Admin Master page, Meta tags to identify s screen size devices



Security has a special role that will only allow authorized persons to approach in the module. All of this will be possible based on the security regulations that are described as followed: The security rules have to do with ***Authentic, Authorization, secure communication*** *as shown in the figure.*



Authentication

Authentication is one of security layers. This mechanism enables the identification of users. Authentication must be implemented in the application layer GUI. The security layer forces the user to identify the credential records (e.g. Username and password). Other types of records are also a biometric credential, Smart-Cards, Physical keys, digital certificates, etc.

Authorization

Authorization, in terms of the security layer, is to identify the rights for each authentication. This layer will determined who has the right to act. For determining the authorizations the rights and privileges of the user should be assigned. Rights and privileges of the user defines the concept of what the user can operate with within the application. Technically term "privileges" refers approaching data tables or files. Privileges and rights can be assigned depending on the user, but the easy method for managing the user privileges it is recommended to use group based on their roles.

Most tables or other objects that have to do with privileges are assigned with the privilege of reading. When the user tries to delete an outward action it will set the Error (Exception) which will display the message : You do not have right for this ACTION.

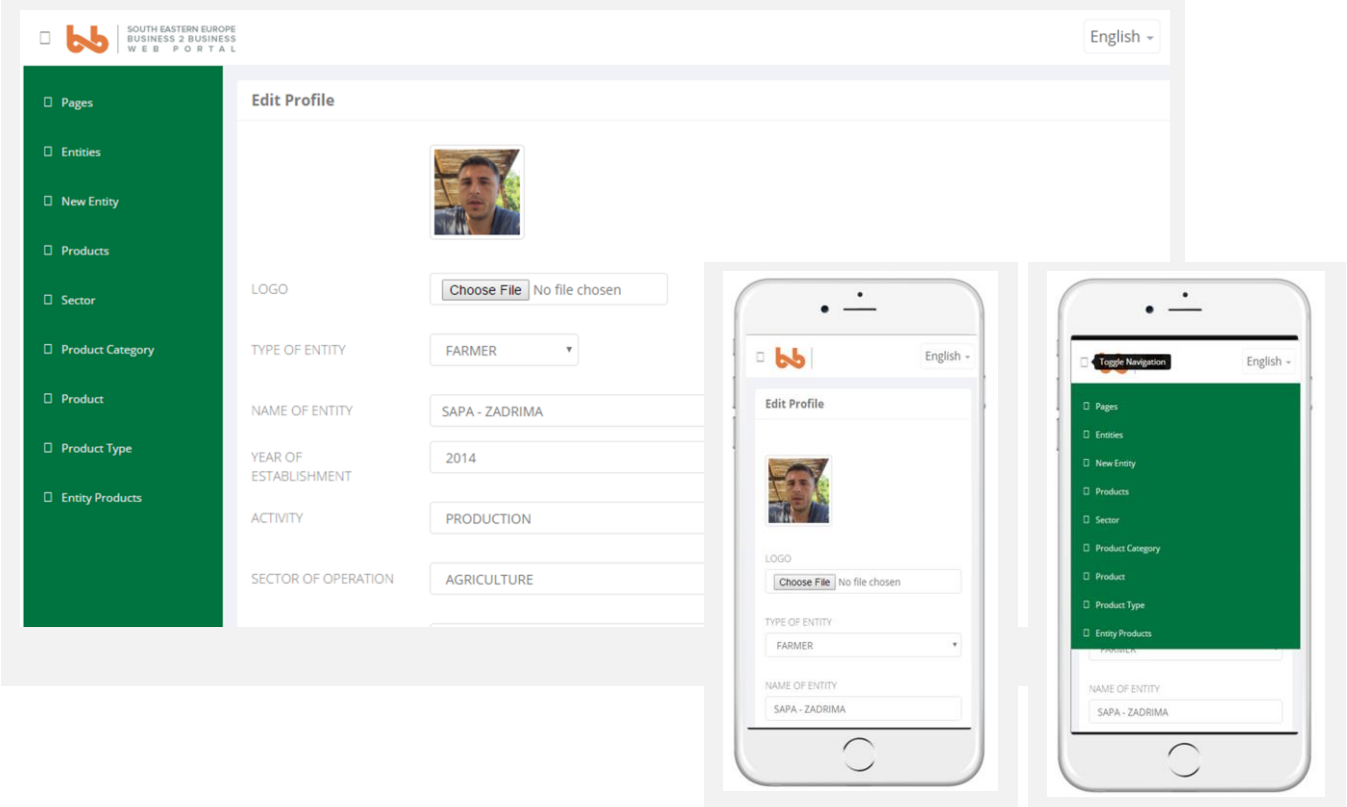
In the end choosing the three layers architecture was the best decision as it contains the highest level of security.

4.2.11. Administrative User and Operational User Profiles

User Roles: Web Application for the clients provide different types of users with specific roles. There are two different roles.

Web Application have a superior user the Administrator, and a type of user that will be limited (Producers) that will refer to specification set by the Administrator. The application, however, won't limit the possibility of adding new user types. In this case increases will be done by cooperating closely with the client.

The administrator can manage the site only in the English language by using a desktop computer or mobile device (smart phone). Below we have a print screen that shows how the system would look from the administrator's side on a computer and on a mobile device (IPhone 6 model). As can be seen see from the print screen the administrator can manage pages, entities, product, product type, categories, and sectors.



4.2.12. Backup

Due to the nature of the work and the importance of a secure application, it is necessary to preserve the records daily. This is implemented with Backup which allows storage for certain periods of times; daily, weekly, monthly, also it enables storage in certain locations for example: Prime location assigned by the administrator.

The system will back up all data which are separated in the cloud server. Cloud data backup it is highly recommended because it saves data in a separat place where the main server is.

4.2.13. Data Entry

The Data Entry process is done in cooperation with the client after the first version of the B2B Portal is delivered. It is constantly reviewed by administrator. As most of the data is pre-defined in the database, there is a minimal possibility of adding data in the wrong format.

4.2.14. Reporting

In order to be able to create, deploy, and manage reports from the organization use SQL Server Reporting Services to provide a full range of ready-to-use tools .We are going to use programming features as that enable us to extend and customize reporting functionality. Reporting Services is a server-based reporting platform that provides a comprehensive reporting functionality for a variety of data sources.

By using the Reporting Services we were able to create tabular, interactive, graphical reports, relational free-form, and multidimensional reports, along with XML-based data sources. The other Reports features that can be include are rich data visualization including charts, maps, and spark lines. We generated the variety of view form formats and export reports to applications such as Microsoft Excel, Word or PDF. These reports can be accessed through Web-based connection.

Figure 17 - Reporting by using SQL Server Reporting Services

4. Results and Data Analyses

One of the main focuses of this master thesis is testing the user interface usability and how user friendly the system is on mobile devices and computers. We had two teams, with eight persons in each group. Groups A and B used different types of devices. Group A: used Desktop computers and Group B: used smart phones (Iphone5) with 4 inch screen. The main task was to find the nearest producer and find information about the producer from Kosovo, Albania, Macedonia, Serbia, and Montenegro .The information they are seeking where is the : email address phone number using our B2B web application at the same time they adding a quantity of products in system. Both groups of 8 participants tested the same application, but on different devices by using any type of web browser such as Google Chrome or Mozilla Firefox. At the end of testing they rated the experience according to an assessment with points from 1 to 10.

Participants had two tasks to complete, the team observed and measured time to completing tasks, menu error, selection error, repeat task, frustrations, satisfaction, help calls, and other errors. At the end of the test they rated the overall likelihood of using a B2B web-based application on mobile devices and desktop computers. As we mentioned in chapter “Development” at the very beginning we had 300 entrepreneurs that used this B2B web application, but only 16 of them were a part of testing the B2B web application to determine how usable the user interface is and how user friendly the system is. The reports generated during the testing session have been attached in the appendix part of this master thesis

In this chapter we analyzed data and realized how important is to have a specific B2B web application with good user interface and a user friendly B2B web portal that is dedicated to a group of businesses or companies to help them fulfill their needs. They

were also able to communicate with each other, understanding that by using B2B web application on their mobile phones they can increase sales and profits.

We used the Man Whitney U-test to analyze the data that was gathered during the test session. This was completed with two groups who were experienced in using mobile phones but they were not experienced in using it with the B2B web application.

By using Google Forms, we gathered all information about these 16 participants. If there is a need to generate an additional report we can use this data over again. We have created a google form to fill in before the testing session.

4.2. Pre-Test Questionnaire

By using a pre-test questionnaire we gathered all needed information from our participants. It is very important, as in all other types of testing, to have basic information for participants.

Thank you for considering being a volunteer for the Usability Test.

The results from the Usability Test will be used to help improve a dissertation project, which involves a computer software product's ease of use. The usability test will require 10 minutes of your time.
Please answer the following questions.

Name: _____

[Optional] Email: _____

[Optional] Mobile Phone: _____

Please write your age: _____

Sex: [ ] Male [ ] Female

[ ] Right handed [ ] Left handed

Please answer the following questions about your computer experience:

1. Are you a student?

[ ] Yes

[ ] No

2. How long have you been using Mobile Devices? _____

3. What kind(s) of programs have you worked with? Check all that apply.

[ ] Word Processing

[ ] Spreadsheets

[ ] Graphics

[ ] Other(s) specify _____

4. Have you ever created a mobile application?

[ ] Yes

[ ] No

5. Do you know how to create a mobile application?

[ ] Yes

[ ] No

6. How often, you usually use computers?

[ ] Daily [ ] Every second day [ ] Every third day [ ] Rare and just for email [ ] Rare

7. How would you rate your computing knowledge?

[ ] Beginner [ ] Average [ ] Good [ ] Very good [ ] Excellent

Thank you for completing the questionnaire. I really appreciate your consideration and time. Your help is most valuable for this project. Thank you!

During the testing both applications used this assessment form to measure time, bugs.

Task n#	User Comments	Types of assistants needed	Time for:				M	S	E	R	O	H	F	*
			k comp lation	p sea	rb	m err								
				1	0									
				Time to Learn:			Total:							
				Time to Learn:			Total:							
				Time to Learn:			Total:							
				Time to Learn:			Total:							
				Time to Learn:			Total:							
				Time to Learn:			Total:							

Legend: M – Menu Error R – Repeat task F- Frustrations

S – Selection error O – Uses online Help

* - Subjective Satisfaction (very high high average low very low)

5 4 3 2 1

E – Other errors H - Help calls

The research required participants to complete two tasks. The data was rated using a nonparametric test (The Mann-Whitney U test). The table below shows the assessment rating of 16 participants divided in two groups.

Group A			Group B		
Participant	**Rating**	**Rank**	**Participant**	**Rating**	**Rank**
1	**8**	**13.5**	1	**4**	**2.5**
2	**9**	**15.5**	2	**5**	**7**
3	**7**	**12**	3	**6**	**10.5**
4	**4**	**2.5**	4	**9**	**15.5**
5	**5**	**7**	5	**5**	**7**
6	**5**	**7**	6	**5**	**7**
7	**6**	**10.5**	7	**4**	**2.5**
8	**8**	**13.5**	8	**4**	**2.5**

The table below explains ranking with this case study.

RATING	**4**	**4**	**4**	**4**	**5**	**5**	**5**	**5**	**5**	**6**	**6**	**7**	**8**	**8**	**9**	**9**
RANK	**2.5**	**2.5**	**2.5**	**2.5**	**7**	**7**	**7**	**7**	**7**	**10.5**	**10.5**	**12**	**13.5**	**13.5**	**15.5**	**15.5**
FINDING	**Average of ranks**				**Average of**					**Average of**		**A.**	**Average of**		**Average of**	
RANKS	**1,2,3,4**				**ranks 5,6,7,8,9**					**ranks 10,11**		**12**	**ranks 13,14**		**ranks 15,16**	

Explanation how we rank numbers

Scores were ranked together ignoring the group assignments. Starting from the lowest score which gets rank 1 the next gets a rant of 2. If two or more scores were identical this is called tie. This all together get the average of the ranks that they would have obtained, had they been different from each other. This case the research found four

scores with value of 4. Therefore average of the rankings were 10/4 =2.5. The same method was used with the other numbers by grouping and finding ranks.

This is Man-Whitney U test formula:

$$U = n_1 n_2 + \frac{n_2(n_2+1)}{2} - \sum_{i=n_1+1}^{n_2} R_i$$

Below is the explanation of statistical Man-Whitney U test as a non-parametric test with the mathematical method used in the case study.

Where:
U=Mann-Whitney U test
N_1 = sample size one
N2= Sample size two
R_i = Rank of the sample size

Based on the formula we calculate the T1 and T2

Therefore for T1= 13.5+15.5.12+2.5+7+7+10.5.13.5 = 81.5

Therefore for T2 = 2.5+7+10.5+15.5+7+7+2.5+2.5=54.5

Based on the formula select the larger total rank from Group A and Group B

Calculate n1, n2 and nx

The number of participants on this test was 16

N1 = 8

N2=8

Nx=8

U = 8x8+8x(8+1)/2-81.5

U= 64+8x(9)/2-81.5

U= 64+36-81.5

U= 100-81.5 U = 18.5

The data gathered with participant during the test session was analyzed by using the statistical MAN-Whitney U-test nonparametric test, two tailed variable were used in the SPSS program that generate this report. The idea of this test was to test the UI and UX and see if there were any significant difficulties when using mobile devices to complete tasks. This statistical test was used to determine usability for mobile devices, and client satisfaction with the B2B system especially with the user interface.

The table below shows generated data in the SPSS application by using the statistical method Man-Whitney U-test.

Descriptive Statistics

	N	Mean	Std. Deviation	Minimum	Maximum	Percentiles		
						25th	50th (Median)	75th
Rank	16	8.5000	4.64399	2.50	15.50	3.6250	7.0000	13.1250
Group	16	1.5000	.51640	1.00	2.00	1.0000	1.5000	2.0000

Mann-Whitney Test

Ranks

	Group	N	Mean Rank	Sum of Ranks
Rank	1.00	8	10.19	81.50
	2.00	8	6.81	54.50
	Total	16		

Test Statistics[a]

	Rank
Mann-Whitney U	18.500
Wilcoxon W	54.500
Z	-1.453
Asymp. Sig. (2-tailed)	.146
Exact Sig. [2*(1-tailed Sig.)]	.161[b]

a. Grouping Variable: Group

b. Not corrected for ties.

The table above is in determining which group had the highest ranking. In this case, Group A had a higher ranking than Group B

Based on the statistics generated to date the results are not significant.

Based on the results there were no significant differences between the Group A and Group B regarding the test results. Both groups completed the test approximately in the same way not depending on which devices there were using to complete the tasks.

Generally speaking the interface in the B2B application was very important for users. Every detail is important when you create a UI. By creating good user interface, both on mobile devices and desktop devices you can help users navigate, search products easier, communicate and create relations, more easily while also making the user feel secure while ordering or using the B2B web application. If users failed to finish the task while using the B2B web app, they created the idea that the system did not work appropriately and they will no longer use it.

According to (Bhumbar, 2016) every UI needs to be easy to use and clearly understandable making it compatible for different kinds of mobile devices. When engineers create mockups, they have to be sure what they want to include in the mobile B2B web application. They always need to include important parts like: menu, products, details about products and all figures needs to be clearly defined.

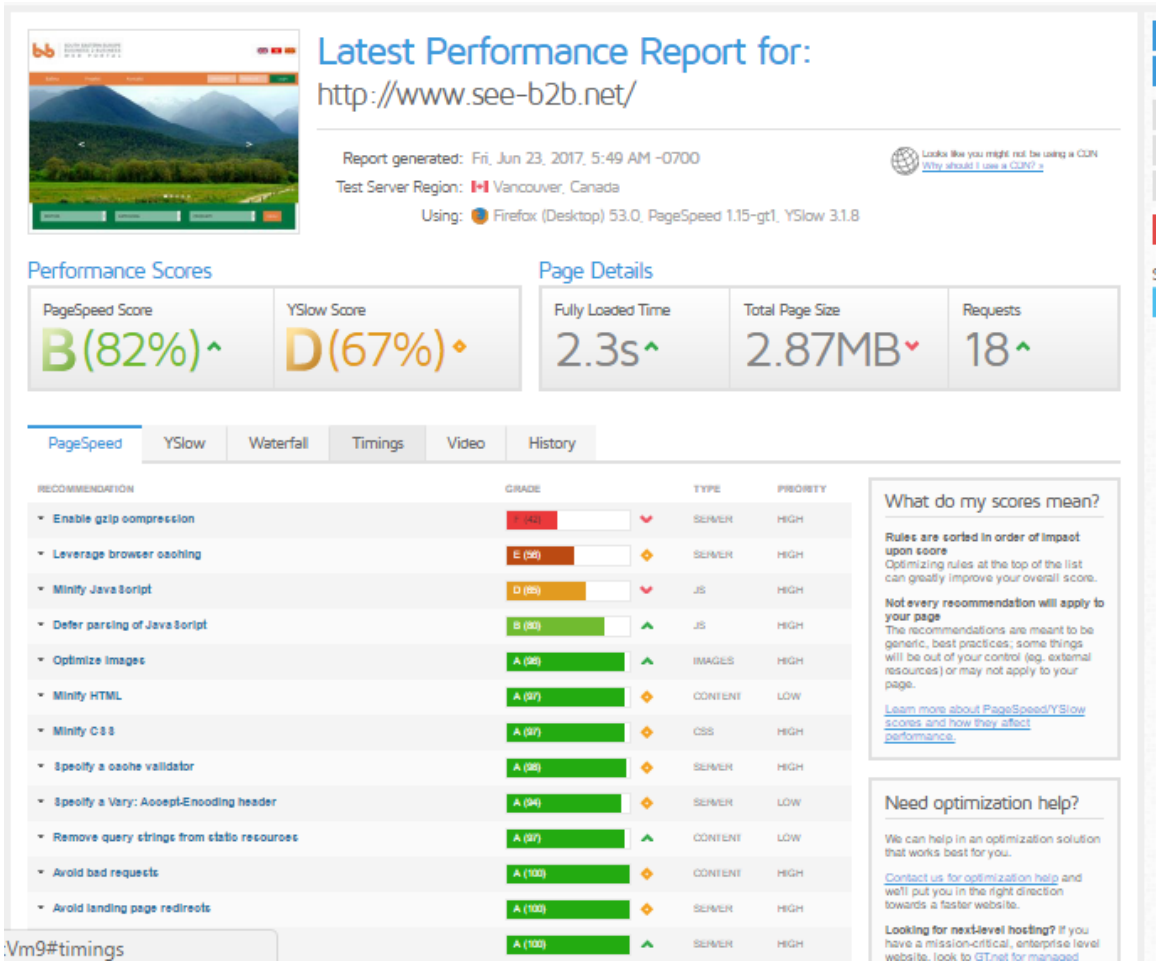


Figure 18 - Test performance for B2B SEE

5. The Importance of This Thesis

The importance of this thesis was to determine the benefits of using B2B portals on mobile devices to help businesses increase their company profits by selling products as well buying what they need using mobile devices like smart phones or tablets. This thesis serves as a guide for other people or companies that plan to develop different types of portals for mobile devices, especially the ones with the B2B portals.

The main focus of this thesis is to develop a conceptual model for developing B2B portal for mobile devices (smart phones, tablets).In the future this thesis can serve people and various companies to understand the exact main requirements to develop B2B portal compatible for desktop and mobile devices.

Additionally, this thesis tested and analyzed the usability of the B2B portal on mobile device by using related t-test to test User Interface and tested functionality by completing two different tasks by users and analyzing data by using MAN- Whitney U-test.

At the end of this master thesis the number of users who are using Mobile devices to purchase online products is increasing dramatically every day. Based on online researches, after 2014 the B2B has increased sales as people started to use mobile devices more. It is important to have a good B2B web portal or application for mobile devices, which is user-friendly.

6. Conclusion

Through this research we intended to identify the most suitable form of analyzing, designing and evaluating the developed of B2B model of B2B portal for mobile devices. During the research we noted a significant difference in user interface and desing, when clients used a desktop verses a mobile devices. These differences made a user uncomfortable as they accessed a variety of platforms on different devices. As a result we have determined that every B2B portal must have consistent brand identity in both a desktops and mobile devices. Readiness and clarity of all products, in detail, on all devices is the most important aspect of a B2B Portal. Showing less product information when user accesses a site with a mobile device like a smartphone makes the user think he has made a mistake. It takes more time to find the right product and can mean profit losses for the company.

Page speed is another important part when users use a B2B web portal. The code needs to be clearly written and in good condition. It is important to excellent technique and approach on B2B web portals. Access needs to be quick, loading pages needs to be fast, and all other steps need to be fully functional. The B2B web portal, all pages, code, and pictures need to be optimized well. It is highly recommend that every page is tested by using Page Speed Insights tool that was created by Google developers to test your site speed or another speed test tool. During the testing phase we noticed that if the code runs slowly or the images were not optimized well, the user is not satisfied as the page is loading slowly.

Today there are many existing B2B web portals but most of them are not compatible for mobile devices. The use on mobile devices is difficult when referring to their way of designing, development, and evaluation phases. By using this thesis as a guide, it would be clear enough to see what the portal should contain in order to be compatible for

mobile devices. Users will understand which phase and test needs to be followed to develop or design a web portal compatible with all platforms such as, PC, Smartphone and Tables.

We can conclude that the system is positively evaluated from the system users. Users are satisfied with the B2B portal as they did not face any difficulties in using it. Our research on this master thesis would be helpful for all students or anyone who wants to run a similar project for B2B web application. Using this as an example, they would learn how to find main parts or components to create and build a B2B web application.

7. Appendix

Documents provided by “Regional Development Agency South”

Operational activities of RDA South are certified and in full compliance with ISO 9001:2008 Quality Management Standard

LLOJI I ENTITETIT	☐ SH.A; ☐ SH.P.K ; ☐ BIZNES INDIVIDUAL (BI); ☐ EKONOMI FAMILIARE; ☐ FERMER[1]; _____TJETËR;		
EMRI I ENTITETIT*		**VITI I THEMELIMIT***	
VEPRIMTARIA:	☐ PRODHUESE; ☐ SHËRBYESE; ☐ TREGTARE; _____TJETËR;		
SEKTORI I OPERIMIT	☐ SEKTORI I PËRPUNIMIT TË SHQEMIT; ☐ SEKTORI I MATERIALEVE NDËRTIMORE ☐ SEKTORI I BUJQËSISË; ☐ SEKTORI I PËRPUNIMIT TË DRURIT ☐ SEKTORI I PUNIMEVE ARTIZANALE; ☐ SEKTORI I TURIZMIT KULTUROR ☐ _____TJETËR;		
NUMRI I BIZNESIT		**NUMRIFISKAL**	
ADRESA E ENTITETIT			
SHTETI		**KOMUNA**	
VENDI		**ADRESA**	
KONTAKTET E ENTITETIT			
NUMRI I TELEFONIT			
E-MAIL		**UEB FAQJA**	

[1] ***VËREJTJE:*** *NË RASTET KUR LLOJI I ENTITETIT ËSHTË* ***FERMER*** *ATËHERË* ***EMRI I ENTITETIT*** *DHE* ***VITI I THEMELIMIT*** *NUK PLOTËSOHEN*

Address: Rexhep Ademaj 23 – 20000 Gjilan – Kosovo
Tel: +381 (0)29 222 188 – e mail: info@rda-south.org – web: www.rda-south.org
Bank Account: 20-12-0000192107-63 TCB Bank – Branch in Gjilan
Fiscal: 0000384965

PËRSONI KONTAKTUES	
EMRI	
MBIEMRI	
POZITA	
NUMRI I TELEFONIT	
E-MAIL	

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LISTA E PRODUKTEVE QË OFRON ENTITETI

#	SEKTORI	KATEGORIA	PRODUKTI	LLOJI I PRODUKTIT	INFO SHTESË	SASIA NË STOK	NJËSIA[1]	ÇMIMI NË EURO
1								
2								
3								
4								
5								
6								
7								

[1] *SHEMBULL: COPË, KG, LITËR, METËR*

Address: Remzi Ademaj 23 – 20000 Pejzaj – Kosovo
Tel: +381 (0)29 222 108 – e mail: info@rda-south.org – web: www.rda-south.org
Bank Account: 20-12-0000192107-43 TEB Bank – Branch in Pejzaj
Fiscal: 6000384945

List of Group B – Using Mobile phone iPhone 5

Task n#	User Comments	Types of assistants needed	Time for: Task	Time for: Help	Time for: Recover	Time to Learn	M	S	E	Total	R	O	H	F	*
User 1	It is difficult for us in industry products of agroculture to use mobile for detailing [?]		2	2	3	Time to Learn:	1	4	1	Total: 13	3	–	–	4	4
User 2	–	–	2	1	2	Time to Learn:	2	2	1	Total: 10	2	–	1	2	5
User 3	It takes more time for me to make improvement on using the mobile device		2	2	2	Time to Learn:	1	1	1	Total: 10	2	–	1	2	6
User 4	Its very helpful for me this application.	–	2	1	0	Time to Learn:	–	–	1	Total:	1	–	–	1	9
User 5	–	–	2	2	2	Time to Learn:	1	2	1	Total: 10	1	–	1	4	5
User 6	–	–	2	1	2	Time to Learn:	2	1	2	Total: 10	3	–	1	2	5
User 7	–	–	2	1	3	Time to Learn	2	2	2	Total: 10	1		1	2	4
User 8	New system for use we need more time	Helping with finding products	2	1	4	Time to Learn	1	2	2	Total: 11	3		2	1	4

05/03/2017

List of Group A - Using Desktop

Task n#	User Comments	Types of assistants needed	Time for: Task	Help	Recover	M	S	E	R	O	H	F	*
User 1	/	Loginform he forgot username	2	1	0	-	-	-	1	-	1	-	8
				Time to Learn:		Total: 2							
User 2	/	/	2	1	0	-	1	-	-	-	-	-	9
				Time to Learn:		Total: 1							
User 3	/	Assistance for adding quantity	2	2	1	1		-	2	-	/	2	7
				Time to Learn:		Total: 5							
User 4	← can not ... very well in Serbian Language	Product Language	2	2	2	-	-	1	3	-	2	1	4
				Time to Learn:		Total: 7							
User 5	/	/	2	1	0	1	4		2	-	1	2	5
				Time to Learn:		Total: 9							
User 6	/	/	2	3	1	-	3	-	2	-	2	2	5
				Time to Learn:		Total: 9							
User 7	/	/	2	2	2	1	4	1	1		1		6
				Time to Learn		Total: 8							
User 8	Pre defined data are very helpful	/	2			1		1	-	-	-	-	8
				Time to Learn		Total: 2							

05/03/2017

Operational activities of RDA South are certified and in full compliance with ISO 9001:2008 Quality Management Standard

LISTA E PRODUKTEVE QË OFRON

#	SEKTORI	KATEGORIA	PRODUKTI	LLOJI I PRODUKTIT	INFO SHTESË	SASIA NË STOK	NJËSIA	ÇMIMI NË EURO
1	BUJQËSI	PEMË	MOLLË	DELISHES		3000	KG	1
2	BUJQËSI	PEMË	MOLLË	JONATAN		2000	KG	0.8
3	BUJQËSI	PEMË	DARDHË	TURKE		1000	KG	1.5
4								
5								
6								
7								

Address: Rruga Adem Jashari 23 – 20000 Ferizaj – Kosovo
Tel: +381 (0)29 222 108 – e mail: info@rdasouth.org – web: www.rdasouth.org
Bank Account: 20-12-0000192107-43 TEB Bank – Branch in Ferizaj
Fiscal: 600038494S

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