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## Conference Paper

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IRENET - Society for Advancing Innovation and Research in Economy, Zagreb

*Suggested Citation:* Fetaji, Majlinda; Morina, Labinot; Fetaji, Bekim; Ebibi, Mirlinda (2017) : Devising and Evaluating B2B Conceptual Model for B2B Portal for Mobile Interactive Devices Using Man Whitney U Test, In: Proceedings of the ENTRENOVA - ENTERprise REsearch InNOVation Conference, Dubrovnik, Croatia, 7-9 September 2017, IRENET - Society for Advancing Innovation and Research in Economy, Zagreb, pp. 111-118

This Version is available at:

<https://hdl.handle.net/10419/183767>

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# Devising and Evaluating B2B Conceptual Model for B2B Portal for Mobile Interactive Devices Using Man Whitney U Test

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## Abstract

The focus of this research study is set in devising and evaluating the efficiency of B2B conceptual model for mobile interactive devices 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 multiple languages. 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. Many of these people use interactive devices 60-70% percent of the time compare with computers. The research focus was set to investigate and asses' 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 web portal for mobile devices. Through the Case Study investigated several impacting factors. Also evaluated the usability and user-friendliness of the developed B2B model and used Man Whitney U test to determine the impact. Insights and recommendations are provided.

**Keywords:** B2B business to business, B2B conceptual model, Man Whitney U test, web portal for mobile devices

**JEL classification:** A11

## Introduction

According to (BROWN et al 2012) during the last decade, Information Technology (IT) has been the primary force driving the transformation of business.

Many businesses according to (LAPLACA et al 2009) realize their sales or base their sales on online sales and all of this by enabling the various portals called B2B portals. Business-to-Business portals have taken a dynamic increase in nowadays, which indicate so much on functionality of many companies around the world, and in many cases we can say: today many companies exist only online and they simply ca not exist if they don't improve their online portals to sell their products.

Many of the business companies today do not have physical stores but all their sales are done online using their portal, like amazon, ebay. Aliexpress, and many others. If their portal is not usable and preferred by the user then they will bancrot or

otherwise if users like it then they will succeed and all that is based on their portal usability.

However another challenge today according to (BOEHM et al 2013) and (BROWN et al 2012) is also developing B2B portals for mobile device, like smart phones, tablets etc. As we know in these times we are using different mobile device for example smart phone, and we have different smart phones with different screens sizes. Design and development methods has been significant to develop B2B portals especially to be fully functionality for mobile device (ex. smart phone and tablets).

It is very important that during the development of B2B portals for mobile device to strictly follow the rules (Carstensen et al 2001), also the testing phase is very important as discussed by (Dennis et al 2008) regarding the usage of mobile devices. Therefore the research study has been focused in testing the user interface interaction on mobile device especially for smart phones and tablets.

## Problem statement

According to [1] for the first time in history people uses mobile phones and tablets more to visit online stores than using computers. Looking at data from over 100,000 ecommerce stores that are using the Shopify platform, we saw that 50.3% of traffic is coming from mobile (40.3% from mobile phones, 10% from tablets) and just 49.7% from computers.

Nowadays people mostly use mobile devices to buy something and relize and perform business services using smart phones, tablet etc. This equipment's are mainly used for Internet surfing and also to perform business services using smartphones for buying or ordering products online. One of the main problems of equipment's such as are Smart Phone or tablet is their screen size which are not similar in size difference comparing to computer desktop [5]. In essence the problem lies in which way the data should be presented and the way B2Bportal should be designed in order for users not to come along by any difficulties while using desktop as in mobile devices. So we know that smart phone screen size is lot of smaller compering to a monitor. The problem is that it is very difficult to present the same information's on mobile device as it is presented the same way as on an monitor, 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 exciting problem to present the best way of using it without the difficulties. As mentioned above one of the main problem is the testing phase as well (Gorton et al 2011). During the testing phase (Dennis et al 2008) we must be aware of how careful we should be with the way we choose the testing and in the selection of testing groups. Therefore testing of application itself has been special as it's testing methods for mobile devices (Marczyk et al 2005). Differently said, the testing must contain the groups or various mobile devices users from the ones as basic level users to those users having better knowledge in the use of mobile devices and have special experience in use of mobile devices while purchasing or during navigating with B2B portals.

## Objectives of the study

1. To analyse the importance and benefits of B2B portals as well as managing issues with external stakeholder.
2. To determine the role of the B2B portal and the data centralization.
3. To identify the impact of B2B portal in facilitating businesses in the aspect of performance and availability.

4. To investigate the importance of development B2B model in developing the most suitable and user B2B portal and approximating their opportunities to the needs of business in Balkans.

## Significance of the study

This study is important for all those who deal with the development of web applications especially the ones dealing with development of B2B portals. This study itself contains analysis of similar projects (LAPLACA et al 2009) or similar to B2B portals that currently can be found on the market or are already in use which are containing the analyzing instructions how to develop an B2B portal application for equipment's desktop and mobile equipment's such as Smart Phones, Tablets, etc. Therefore the main importance of this project is to decode the essence idea of which steps should be taken in order B2B portal to be able to work on all devices like desktop and mobile devices where the portal will remain with the same content no matter on which device is used.

During this research it has been developed (or built) B2B portal which is dedicated for businesses in the region areas like Kosovo, Albania, Macedonia and Montenegro. This portal enables product registrations which are for sale and its quantity. It enables you to know about what other companies have in stock and their quantity. This B2B portal is developed in Microsoft's technology using programming languages like C # and ASP and SQL database and bootstrap is used as framework for responsive page.

The importance and the main goal of this project is to create an conceptual model and show the steps to be followed in order to create the B2B portal which has been compatible to all devices, the goal is to create analysis where mistakes has been shown as most of the companies or developers make during developing portals, creating the privation in advance not to make mistakes which will make an B2B portal not compatible for mobile devices.

Another importance of this project that is worth mentioning is how important is to implement or use of Bootstrap framework in order the web page to be well optimized or responsive to all desktop and mobile devices. Part of this research is the importance of testing the application in various equipment's as well.

## Research methodology

The research methods used in this study consist of literature review from published research, collection of primary data through quantitative methods such as questionnaires and statistics analysing tools.

The following research question has been studied:

1. What are the potential benefits of using B2B portal in mobile devices?
2. What are the benefits of creating a conceptual model for developing B2B portal for mobile devices?
3. Which are the main steps or which steps do you need to follow to develop B2B portal for mobile devices?
4. What are the benefits of using Bootstrap Framework?
5. How important is to test a B2B portal User Interface on mobile devices (ex. smart phones and tablets).

The following hypotheses have been raised and analysed:

H1 The developed B2B model of B2B portal will improve substantially the management of issues with external stakeholders

H2 B2B model of B2B portal improves business efficiency and satisfaction

H3Usability and user-friendliness of developed B2B model of B2B portal improves the efficiency and increases user satisfaction.

## Case study analysis

The case study investigates the capabilities of the B2B model in developing B2B portal by investigating several impacting factors through comparing the user results with the performance by analysing the reports generated by a specific query from the system.

The "Development of a Specialized B2B Online Portal for desktop and mobile devices" as case study project through the Regional Development Agency South which is implementing a project "Organization of Matchmaking Services for Specific Industries".

"B2B Online Portal" has been developed in two parts. The Public part which includes: Logo; Information about the project; in site search; Contact form; links to social networks (Facebook, Twitter); Login form to the Private part.

Private part of 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 product categories; List municipalities 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. This document describes the creation of a B2B Online Portal, its structure with the development model and operational mode. To complete the development of this project have used 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)

## Data analysis

By analysing the data from the questionnaires consisting of 20 questions divided in three sections

We have two conditions, with each participant taking part in only one of the conditions. The data are ratings (ordinal data), and hence a nonparametric test is appropriate - the Mann-Whitney U test (the non- parametric counterpart of an independent measures t-test).

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

Where:

U=Mann-Whitney U test

N1 = sample size one

N2= Sample size two

Ri = Rank of the sample size

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

We will calculate  $n_1$ ,  $n_2$  and  $n_x$   
 The number of participants on this test are 16  
 $N_1 = 8$   
 $N_2 = 8$   
 $N_x = 8$   
 $U = 8 \times 8 + 8 \times (8 + 1) / 2 - 81.5$   
 $U = 64 + 8 \times (9) / 2 - 81.5$   
 $U = 64 + 36 - 81.5$   
 $U = 100 - 81.5$   
 $U = 18.5$

## Results

Table 1  
 Participant data analyses

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

By using MAN-Whitney U-test nonparametric test, two tailed variables in SPSS program to generate this report.

Figure 1  
 Ranks and test statistics (1)

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		

Figure 2  
Ranks and test statistics (2)

Test Statistics <sup>a</sup>	
	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 <sup>b</sup>

a. Grouping Variable: Group  
b. Not corrected for ties.

Figure 3  
Descriptive statistics

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

The table above is very useful because it indicates which group can be considered to be having the higher rank, the group with the highest main rank. In this case, the Group A (group1) have higher rank than Group B (group2). Based on these statistics data we can see that for Group A it was easier to find local producer and businesses to communicate with them, to order products, or sell to clients, than group B which use more general web B2B application for worldwide selling products, they do spend more time, need to undertake more steps, this is the reason they rate lower points for group A. Based on these they were ranked lower than group A. From this data, it can be concluded the results are significant because  $p=0.161$  and  $U$  is 18.5.

In general we can say that interface in B2B application it's very important for users, every details is important when you create a UI. By creating good user interface both on mobile devices and desktop devices you can help users to navigate easier, search products easier, communicate, create relations, also make them feel more secure with themselves while they are ordering or use web application. If users fail to finish the task while using B2B web app, they will create the idea the system doesn't work appropriately and they will not use it any longer. Every UI needs to be very easy to use and clearly understandable and need to be compatible for different kind of mobile devices. The engineers when they draw mockups, they have to be sure what do they want to include inside the mobile web application, they need always to include important parts like, menu, products, details about products and as much as they can all figures needs to be very clear defined.



## Conclusion

We can conclude that the system is positively evaluated from the users of the system. This means that the level confidence on using the system has a statistically significant relationship. Through this research we intended to identify the most suitable form of analyzing, designing and evaluating the developed B2B model of B2B portal for mobile devices

Recommendation to avoid while developing mobile web B2B application

1 - Forgetting the mobile customer

Remember that good mobile sites are useful – they help visitors complete their tasks, whether that's reading an interesting article or checking your store's location. Don't get caught in the trap of only creating a mobile-formatted site (one that looks pretty on mobile) because it stripped away all useful functionality. Instead, remember to build a mobile-friendly site (one that's truly useful for mobile customers and optimized for customers most common tasks).

2 - Implementing the mobile site on a different domain, subdomain, or subdirectory from the desktop site

While Google supports multiple mobile site configurations, creating separate mobile URLs greatly increases the amount of work required to maintain and update your site, and introduces possible sources of technical problems. You can often simplify things significantly by using responsive web design (RWD) and serving desktop and mobile on the same URL! Responsive web design is Google's recommended configuration.

3 - Working in isolation rather than looking around for inspiration

Check out other sites in your space or your competitors for inspiration and best practices. While you may not be the first in your industry with a mobile site, you have the benefit of being able to learn from those before you. The Mobile Playbook and Google Multi-screen Success Stories are also full of ideas. (Developers, 2015).

We recommend giving effort to increase the user experience on e-applications and also increase the confidence towards e-applications by organizing trainings and by presenting users the real advantages of B2B portals.

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