Proceedings in Conference of Informatics and Management Sciences

The 4th International Virtual Conference

ICTIC 2015

23. - 27. March 2015

Slovak Republic

Published by: EDIS - Publishing Institution of the University of Zilina
Univerzitna 1
01026 Zilina
Slovak Republic

Editors: Ing. Michal Mokrys; Ing. Stefan Badura, Ph.D.

ISBN: 978-80-554-1002-9

cdISSN: 1339-231X

eISSN: 1339-9144

Pages: 144

Printed in: 100 copies

Publication year: 2015

- All published papers undergone single blind peer review.
- All published papers are in English language only. Each paper had assigned 2 reviewers and each paper went through two-tier approval process.

Open Access Online archive is available at: **http://www.ictic.sk/archive**
(proceedings will be available online one month after the publication release).

In case of any questions, notes or complaints, please contact us at: **info(at)ictic.sk**

Section Chairman Committee

George Botzoris

• About:

George N. Botzoris has the Diploma of Civil Engineering, Master in Business Administration, and Ph.D. in Transportation. He is Assistant Professor at the Section of Transportation of Democritus University of Thrace – Department of Civil Engineering (Greece)(http://www.civil.duth.gr/index.en.shtml), where he has been teaching since 2008 the courses: Transport Economics, Transportation Planning, Airport Engineering, Railway Engineering, Transportation Statistics, Transportation Management, and Advanced Transportation Engineering (the last two courses in the postgraduate program 'Systems Engineering and Management' http://sem.eng.duth.gr/english/index.html). He has written to this day more than 80 scientific papers that have been published in international and Greek scientific journals as well as conference proceedings. His research interests includes transportation economics and finance, public transport planning, management and marketing, travel behavior analysis and modeling, analysis and forecast of demand, project management and evaluation, sustainable mobility and effects of transport activities on the environment.

• Affiliation:

Assistant Professor at the Section of Transportation of Democritus University of Thrace – Department of Civil Engineering

• Scientific specialization:

Transport Economics, Transportation Planning, Airport Engineering, Railway Engineering, Transportation Statistics, Transportation Management, Advanced Transportation Engineering

• Country:

Greece

Dr. Subhash Chander Dubey

• About:

Subhash Chander Dubey graduated in Electronics and Communication Engineering from National Institute of Technology, Srinagar (J&K) India in 1993. He received his Postgraduate in Electronics and Communication Engineering from Indian Institute of Technology, Roorkee (IITR)-India in 2004. He completed his PhD in FPGA based Chip Design for DC-DC converters from IITR in 2012. He is an Associate Professor in the Department of Electronics and Communication; he is also holding the Charge of Headship of Electrical Engineering, Govt. College of Engineering and Technology, Jammu (J&K). Currently, he is on the Editorial Board and Reviewers Board of eighteen international Journals. He has been acting as Reviewer for many Journals of international repute like IEEE Transaction on Industrial Electronics, IEEE Transaction on Power Electronics, IET Journal of Power Electronics, Australian Journal of Electrical and Electronics, Journal of Electrical Engineering (Springer)International Journal of Computer and Electrical Engineering (IJCEE), Journal of Electrical and Electronics Engineering Research (JEEER), International Journal of Renewable Energy Research (IJRER), International Journal of Power Electronics and Drive Systems (IJPEDS), International Journal of Electrical and Computer Engineering (IJECE), International Journal of Digital Information and Wireless Communications (IJDIWC), Journal of News in Engineering (NiE) etc. He has been the Member of Technical Program Committee/Editorial Board /International Scientific Committee of twenty four International conferences held at different countries like India, Slovakia, Turkey, , Italy, Malaysia, Thailand, Australia, South Africa, Switzerland, Hong Kong etc. His fields of interest include Micro-Electronics, Low-power VLSI designs and FPGA based design, FPGA based controller design, DC-DC Converters for low voltage applications-topologies and their control.

• Affiliation:

Associate Professor (ECE) and Head Electrical Engineering, Govt. College of Engineering & Technology

• Scientific specialization:

Electronics and Communication Engineering

• Country:

India

eISSN: 1339-9144, cdISSN: 1339-231X

ISBN: 978-80-554-1002-9

Dorothy Nduku Hodson

• About:

Dorothy Nduku has been a member of the Scientific & Reviewer Committee's for Science-com conferences (University of Zilinia and Thomson Ltd, Slovakia); and a participant at Science-com conferences and regional conferences with University of Dar es Salaam Business School (UDBS), Tanzania in business and marketing disciplines. Ms. Nduku is a MBA/Marketing graduate (United States International University - Africa (USIU-A) and holds a postgraduate professional diploma in Marketing Chartered Institute of Marketing - UK (CIM/UK).

• Affiliation:

Independent researcher and consultant for Marketing Strategy Services (self-employment)

• Scientific specialization:

Business and Marketing research, Strategy and Information systems

• Country:

Kenya

Tiberiu Socaciu

• Affiliation:

Assoc. Prof. Ph.D. at University of Suceava

• Scientific specialization:

Computational Financial Engineering, Parallel Computing, Symbolic Calculus, InfoSec

• Country:

Romania

eISSN: 1339-9144, cdISSN: 1339-231X

ISBN: 978-80-554-1002-9

International Scientific Committee and Reviewers Committee

Cornelia ANGHEL DRUGĂRIN
Eftimie Murgu University, Romania

Mohamed Anis Dhuieb
Ecole Centrale de Nantes, France

Daniel Badulescu
University of Oradea, Romania

Stefan Badura
University of Zilina, Slovakia

Ana-Maria Bercu
Alexandru Ioan Cuza University of Iasi, Romania

Jolanta Bieńkowska
University of Lodz, Poland

Katarzyna Boratyńska
WARSAW UNIVERSITY OF LIFE SCIENCES – SGGW, Poland

Michelle Burger
Department of Construction Economics, South Africa

Sorin Cananau
University POLITEHNICA of Bucharest, Romania

Ubaldo Comite
University "Giustino Fortunato" – Benevento, Italy

Cristina Damian
Stefan cel Mare University of Suceava, Romania

Mihaela Diaconu
''Gheorghe Asachi'' Technical University, Romania

Maria DOLORES SANCHEZ-FERNANDEZ
UNIVERSITY OF A CORUÑA, Spain

Agnieszka Gawlik
Opole University of Technology, Poland

Nicoletta González-Cancelas
Technical University of Madrid, Spain

Liliana Hawrysz
Opole University of Technology, Poland

ROBERTO CARLOS HERRERA LARA
Army Corps of Engineers - CEE / EP - Petroecuador., Ecuador

Katarzyna Hys
Opole University of Technology, Poland

Subhash Chander Dubey
Govt. College of Engineering and Technology, Jammu, India

Mariana Iancu
BIOTERRA University of Bucharest, Romania

Manuela Ingaldi
Czestochowa University of Technology, Poland

Nicholas Jewczyn
Ashford University, San Diego, CA 92123

Patrik Kajzar
Silesian University in Opava, School of Business Administration in Karvina, Czech Republic

Kayvan Kaseb, Iran

Izabela Konieczna
The Jan Kochanowski University, Poland

Balázs Kotosz
University of Szeged, Hungary

Emil Kršák
Faculty of Management Science and Informatics, Slovakia

Binod Kumar
JSPM Jayawant Technical Campus, Pune, India

Maciej Laskowski
Lublin University of Technology, Poland

Regina Lenart
The University of Economics and Humanities in Bielsko-Biała, Poland

Jorge Luís Casas Novas
University of Évora, Portugal

Jolanta Maj
Opole University of Technology, Poland

Noelia Malla García
Complutense University of Madrid, Spain

Eliana Mariela Werbin
National University of Cordoba, Argentina

Elisabete Mendes Duarte
Polytechnic Institute of Leiria, Portugal

Martha Mendez Bautista
Universidad EAN, Colombia

Grzegorz Michalski, Poland

Anuranjan Misra
Bhagwant Institute of Technology, Ghaziabad, India

Angelo R. N. Molson
Ministry of Interior Affairs, Civil Engineering, Greece

Isabel Mª Martín Monzón
Universidad de Sevilla, Spain

Sónia Morgado
Instituto Superior de Ciências Policiais e Segurança Interna, Portugal

EDWARD MUNTEAN
University of Agricultural Sciences and Veterinary Medicine, Romania

Ladislav Mura
University of Ss. Cyril and Methodius in Trnava, Slovakia

George N. BOTZORIS
DEMOCRITUS THRACE UNIVERSITY, Greece

Dorothy Nduku Hodson
Marketing Strategy Services, Kenya

Janusz Nesterak
Cracow University of Economics, Poland

Bernard OKELO NYAARE
JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY, Kenya

Małgorzata Okręglicka
Czestochowa University of Technology, Poland

Remigiusz Olejnik
West Pomeranian University of Technology, Szczecin, Poland

Artur Gomes de Oliveira
Sergipe Federal Institute of Education, Science and technology, Brazil

Fernando Osuna Pérez
University of Granada, Spain

Carlos P. Caldeira
University of Evora, Portugal

eISSN: 1339-9144, cdISSN: 1339-231X

ISBN: 978-80-554-1002-9

eISSN: 1339-9144, cdISSN: 1339-231X
ISBN: 978-80-554-1002-9

Sections discussed at the Conference

Marketing
Strategic Management and Planning
Econometrics and statistical methods
Financial markets, asset prices, international finance
Banking, corporate finance, accounting
International trade
Other economical disciplines, which are not listed
Computer architecture, parallel computing, massive computation and cloud computing
Informatics and information systems
Software engineering, operating systems, programming and computer languages
Human computer interaction and interface, visualization and natural language processing
Web application, internet development and web services
Artificial intelligence, intelligent systems and multi agent systems
ICT in medicine, humanities, education, science, etc.
ICT for Business, Management and Economy
ICT creates E-commerce, e-business, computational finance

eISSN: 1339-9144, cdISSN: 1339-231X

ISBN: 978-80-554-1002-9

Conference Sponsors and Partners

www.The-Science.com

THOMSON Ltd.

Slovak Republic

Faculty of Management Science and Informatics

Slovak Republic

Science & Technology Park Zilina

Slovak Republic

Published by

EDIS
Publishing Institution of the University of Zilina

Univerzitna 1
01026 Zilina
Slovak Republic

eISSN: 1339-9144, cdISSN: 1339-231X
ISBN: 978-80-554-1002-9

Preface

This proceeding book contains the papers accepted and presented at the **4th International Virtual Conference of Informatics and Management Sciences** (ICTIC 2015), which was held online, during **March 23 – 27, 2015**. ICTIC 2015 was organized by **Thomson**, Slovakia and **Faculty of Management Science and Informatics, University of Zilina**, Slovakia. Each submitted article was reviewed by at least two members of international Scientific Committee (Reviewers) and referred by conference Technical Committee. Section Chairman Committee was established as steering committee and only the most comprehensive papers, selected by Reviewers, were presented during the conference dates. The ICTIC 2015 proposed valuable and effective opportunity for researchers to present their achievements. Together 24 papers is published in this book of the highest scientific value and standards.

ICTIC is dedicated to the theoretical foundations of Informatics and Management Sciences and provides a forum for researchers and scientific interaction in areas such as Computer Science, Applied Informatics, Management and Marketing, Economy, Business and Financing. All processes and committees, established in this conference, move the ICTIC forward into acknowledged Scientific forum. Therefore we would like to thank all members of mentioned committees, partners supporters and organizers for their contribution.

With best regards

doc. Ing. Emil Kršák, Ph.D.

Dean of Faculty of Management Science and Informatics
University of Žilina, Slovakia

March, 2015

eISSN: 1339-9144, cdISSN: 1339-231X
ISBN: 978-80-554-1002-9

Table of Contents

eISSN: 1339-9144, cdISSN: 1339-231X

ISBN: 978-80-554-1002-9

Cloud based architecture of e-commerce systems for offering group buying services

Dragan Peraković, Marko Periša, Josip Čavar
Department of Information and Communication Traffic
Faculty of Transport and Traffic Sciences
Zagreb, Croatia

Abstract- **Paper introduces group buying services as one of the newer business model whose appearance contributed to the development of electronic commerce and electronic markets as we know them. First step is the analysis of current state in global electronic market, and review of group buying market in Croatia and the World. Next step is to analyze FPZ's students (Faculty of Transport and Traffic Sciences-FPZ) trends in use of group buying services. Furthermore, it is shown how one of the most visited group buying websites in Croatia uses different solutions to create content, collect data and protect end-users. Last step is to show how implementing a cloud solution can have positive effects for both new or existing e-commerce businesses.**

Keywords- e-Commerce; group buying; services; architecture; cloud computing;

I. INTRODUCTION

The development of e-commerce was preceded by the emergence of the Internet. The Internet emerged in the United States in the 1970s but did not become visible to the general public until the early 1990s when more than one million computers around the world becomes interconnected. Since then, the Internet has become the world's largest market in trading goods, services and information.

Internet (electronic) markets are developing with an increased number of business websites which occurs in greater competition between companies that are included in market flows through their websites.

E-commerce as a part of e-business allows business transactions over the internet where the parties involved are either selling or buying. This type of business is the fastest, cheapest and often considered to be the most profitable form of trade due to simplicity and low costs.

As one of the newest models in e-commerce, group buying services expanded really quickly across the world. Suzaan Hughes and Chantal Beukes from Monash University in South Africa in their research „Growth And Implications Of Social E-Commerce And Group Buying Daily Deal Sites: The Case Of Groupon And Livingsocial“ write about phenomenon of group buying services and companies like Groupon and Livingsocial that have established themselves as the sector leaders.

The group buying industry had an estimated value of approximately $2.7 billion in 2011 which presents 137% increase from 2010 [1]. To explain a concept of group buying services it is important to show benefits and possible drawbacks for sellers and consumers, analyze the architecture of such websites, gathering, processing and safety of sensitive data such as credit card numbers when making payments and finally to find possible solutions like cloud computing that can have a positive impact on group buying industry.

II. CHARACTERISTICS OF E-COMMERCE AND USERS HABITS ON CROATIAN GROUP BUYING MARKET

Today e-commerce represents one of the most successful type of business that enables companies to be more efficient and flexible in their internal operations, to work more closely with their suppliers, and to be more responsive to the needs and expectations of their customers. E-commerce relies on the World Wide Web service which is the starting point for all the companies who tend to do this type of business. With the development of the Internet, smartphone market and social networks that are becoming the main source of information there is an increasing need for companies to move their business or part of business to the Internet. E-commerce systems which operate on internet need a stronghold in internal information system and background applications covered with ERP which integrates the activities of various departments within the company as well as CRM that is used for customer relationship management.

According to ITU (International Telecommunication Union) statistics from 2014 43.6% of households in the world have an internet access. Europe is the region with the highest Internet penetration rate in the world (78%), followed by The Americas (57.4%). In Croatia 64% of the households had a broadband subscription at the end of 2013, lower than the EU average (78%) and 4 percentage points higher than at the end of 2012. As for mobile broadband it remains the fastest growing market segment, with continuous double-digit growth rates in 2014. Globally, mobile-broadband penetration will reach 32% by end 2014. almost double the penetration rate just three years earlier (2011.) and four times as high as five years earlier (2009) [2]. It is predicted that this huge growth of smartphone and internet usage will have a major effect on e-commerce, marketing and medias.

A. Global trends in e-commerce

E-commerce and m-commerce have changed the way that consumers, even those who still visit physical stores, approach shopping. According to „The Centre for Retail Research“, online sales in UK, Germany, France, Italy, Spain and Poland are expected to grow from €156.28 billion in 2014. to €185.39 billion in 2015 which represents an increase of 18.4%. In the

eISSN: 1339-9144, cdISSN: 1339-231X
ISBN: 978-80-554-1002-9

US, online sales are expected to rise from $306.85 billion in 2014. to $349.20 billion in 2015. On the other side, the world fastest growing e-commerce market is the asia-pacific region with China on top [3].

TABLE I. ONLINE RETAIL IN DEVELOPED EU COUNTRIES IN 2014. AND FORECAST FOR 2015. SOURCE: CENTRE FOR RETAIL RESEARCH

Online Retail Sales	Online sales (£ bn) 2014	Growth 2014	Online Sales (£ bn) 2015	Growth 2015	Online Sales (€ bn) 2015
UK	£44,97	15.8%	£52,25	16.2%	61,84 €
Germany	£36,23	25.0%	£44,61	23.1%	52,79 €
France	£26,38	16.5%	£30,87	17.0%	36,53 €
Spain	£6,87	19.6%	£8,15	18.6%	9,64 €
Italy	£5,33	19.0%	£6,35	19.0%	7,51 €
Netherlands	£5,09	13.5%	£5,94	16.8%	7,03 €
Sweden	£3,61	15.5%	£4,17	15.5%	4,93 €
Poland	£3,57	22.6%	£4,33	21.0%	5,12 €
Europe	£132,05	18.4%	£156,67	18.4%	185,39 €

As for Croatian market the numbers at e-commerce market are not so good. In 2013 only 26% of Croatians purchased goods or services online within the previous 12 months according to European Commission. That means that Croatia was well below the EU average of 47% [4].

TABLE II. USE OF E-COMMERCE IN CROATIA. SOURCE:EUROPEAN COMMISSION

Indicator (including brakdown and unit)	Croatia value (2013)	EU28 value (2013)
Ordering goods or services online - All individuals (in % of individuals)	26	47
Cross border e-Commerce - All individuals (in % of individuals)	7	12
Enterprises selling online - Large enterprises (in % of enterprises)	26	35
Enterprises selling online - SMEs (10-249 persons employed) (in % of enterprises)	18	14

B. *Gruop buying*

With the growth of internet and smartphone usage, access to various services and information is simplified which leads to appearance of new forms of e-commerce. One of the latest is group buying that has spread around the world rapidly. Group buying model can simply be defined as buying with the aim of receiving quantity discount. Group buying is offered by group buying website which acts as connection between sellers and buyers. It usually appears in the form of B2C model where transaction occurs between companies and consumers but the market development results in appearance of B2B model where exchange of goods or services are made between businesses.

One of the most known group buying websites in the world is Groupon. It was founded in 2008. In USA and it is also today's absolute leader on the market not only on sold coupons, but also on the number of cities covered-70 North-american and 140 worldwide [5]. Also according to statista.com it is the most visited group buying website in the USA with more than 30 million unique visitors monthly which represents 59.1% of all group buying users in USA [6].

Founder of first Croatian group buying website is Kolektiva.com that appeared in 2010. After which the number of group buying sites continued its rapid growth. According to data from 2012. there were more than 50 different group buying sites in Croatia .

C. *Student's trends in group buying*

A web survey posted on Facebook groups of FPZ's students resulted in 67 answering it. The survey consisted of 17 questions that have shown the trends in using group buying services, frequency of purchasing, different ways of accessing sites and overall satisfaction.

The survey has shown that 67% of respondents use group buying services and that they use them in most cases at least once a month (42%). The most common reasons for using group buying services are low prices and diversity of offers. When it comes to ways of purchasing it seems that they are still more likely to use their PCs or laptops (82%) while 18% of them use smartphones. Although the most visited group buying sites in Croatia (Kolektiva, CrnoJaje, KupiMe) have their mobile apps for iOS and Android devices it can be concluded that users are still skeptical when it comes to purchasing through their smartphones [5].

According to the analysis the student's seem to be satisfied with group buying market in Croatia. Their answers shown that sites design is attractive and that they can easily navigate and search for products. They also confirmed that the information about products and offers are accurate and that the user support is fast in their responses.

III. THE ARCHITECTURE OF GROUP BUYING SERVICES

This section will give the insight on the architecture of first Croatian group buying website, Kolektiva.com. Fig.1 shows a website architecture which consists of foreground and background operations. Foreground operations are mainly used by users who are visitors or members of site. They can search for deals that are active, make a purchase, manage orders, messages and personal information. On the other side are background operations that are managed by system administrators, content creators or any other member of a team that have administrator access.

Background operations include:

- Product information management
- Costumer management and segmentation
- Order management
- Product category management
- Report management

eISSN: 1339-9144, cdISSN: 1339-231X
ISBN: 978-80-554-1002-9

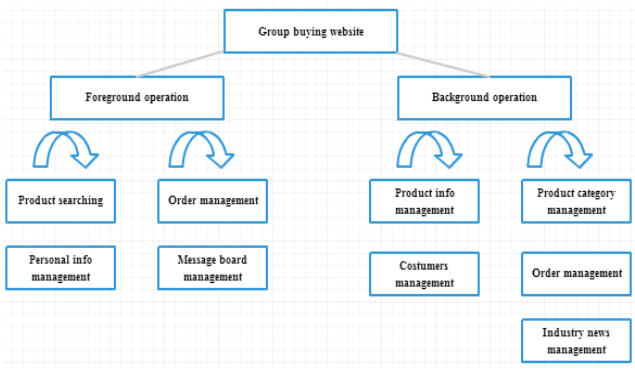


Figure 1. Architecture of group buying website

Kolektiva as a solution for its successful business uses Magento e-commerce platform. As it is shown in Fig.2, Magento is complete software and e-commerce platform that contains a large number of tools and features which gives the companies complete control over the look, content and functionality of their sites. It uses MySQL relational database management system, PHP programming language and the elements of open-source, object-oriented web application framework ZEND that is implemented in PHP5 programming language.

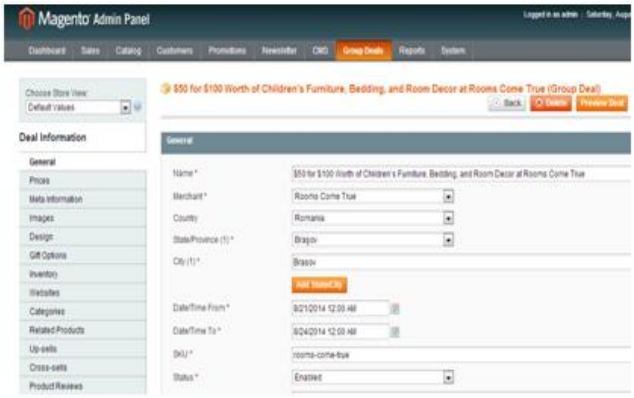


Figure 2. Magento administration panel

Magento is compatible with Linux x86, x86-64 (32-bit and 64-bit) operating system and it is commonly used in combination with Apache web server as is the case with Kolektiva.com. Apache HTTP server is standard in distribution of web services that contributed to the development of World Wide Web and guarantees the availability of the majority of todays websites.

For simplicity and safety developers use a variety of add-ons when designing and making a website such as:

- Various JavaScript libraries like jQuery for easier transition through HTML documents, Facebook SDK to add „Like“ button or registering through „Facebook login“, SWFObject for Adobe Flash content, Script.aculo.us for user interface improvements
- Content Delivery Network is used to serve end users with high availability and high performance
- SSL certificate is used to increase security of website, especially when processing credit card payments

Furthermore, there are various of tools that helps administrators of website to control the content, manage e-mails, advertise, segmenting costumers and observing their habits. These are tools such as:

- Google Analytics, Facebook Domain Insights
- DoubleClick, AdSense,
- Mandrill, Emarsys

Kolektiva.com in response to market demands created apps for iOS and Android operating system. In 2013. it was recognised as one of best mobile shopping applications in nine countries in Central and Eastern Europe, Russia and Turkey.

Credit card purchasing on every group buying site in Croatia is secured with T-Com Pay Way system. T-Com Pay Way uses latest standards in data security such as SSL protocol with 128-bit encryption combined with MD5 hash algorithm. ISO 8583 protocol ensures that the data that has been exchanged between T-Com system and authorization centers (American Express, MasterCard, Visa, Diners) are secured in private network that is protected from unauthorized access with a double layer firewall [5].

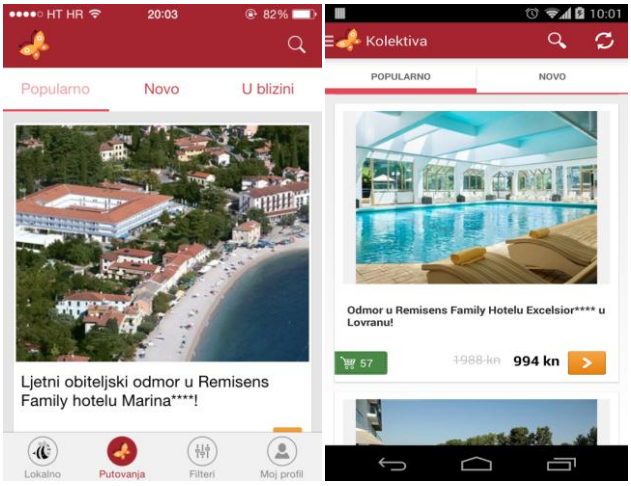


Figure 3. Kolektiva.com mobile apps for iOS and Android phones

IV. IMPLEMENTATION OF CLOUD COMPUTING

Cloud computing has emerged as a compelling paradigm for managing and delivering services over the internet. It was a desire of IT professionals to increase the capacity and to add new features to systems without investing in new infrastructure. Group buying services like any other ecommerce company which core business is not IT sees plenty of potential in cloud computing. The finance department looks at public cloud and sees an easy way to avoid unnecessary capital expenditures, overhead and head count. Business units see Software as a Service (SaaS) versions of applications that are easy to get up and running and don't require any maintenance.

Cloud computing includes any service which is based on contract or „pay as you go“. With his appearance the current

eISSN: 1339-9144, cdISSN: 1339-231X
ISBN: 978-80-554-1002-9

capabilities of IT are enhanced, regarding the ability of computer and software usage. End users access the applications in the cloud through web browser or mobile phone applications, while software and user data are located on remote servers [7].

Cloud computing consists of three basic architectures of service delivery that are defined as: Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS). The mentioned service models have the following definitions:

- *Software as a Service (SaaS)*. The capability provided to the consumer is to use the provider's applications running on a cloud infrastructure. The applications are accessible from various client devices through a thin client interface such as a Web browser (e.g., Web-based email), or a program interface. The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, storage, or even individual application capabilities, with the possible exception of limited user-specific application configuration settings.
- *Platform as a Service (PaaS)*. The capability provided to the consumer is to deploy onto the cloud infrastructure consumer-created or -acquired applications created using programming languages and tools supported by the provider. The consumer does not manage or control the underlying cloud infrastructure including network, servers, operating systems, or storage, but has control over the deployed applications and possibly application hosting environment configurations.
- *Infrastructure as a Service (IaaS)*. The capability provided to the consumer is to provision processing, storage, networks, and other fundamental computing resources where the consumer is able to deploy and run arbitrary software, which can include operating systems and applications. The consumer does not manage or control the underlying cloud infrastructure but has control over operating systems, storage, deployed applications; and possibly limited control of select networking components (e.g., host firewalls).

Also, there are three basic deployment models for implementing cloud technology. These models are:

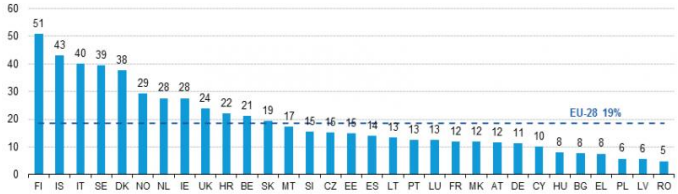
- *Private cloud.* The cloud infrastructure is provisioned for exclusive use by a single organization comprising multiple consumers (e.g., business units). It may be owned, managed, and operated by the organization, a third party, or some combination of them, and it may exist on or off premises.
- *Public cloud*. The cloud infrastructure is provisioned for open use by the general public. It may be owned, managed, and operated by a business, academic, or government organization, or some combination of them. It exists on the premises of the cloud provider.
- *Hybrid cloud.* The cloud infrastructure is a composition of two or more distinct cloud infrastructures (private, community, or public) that remain unique entities, but are bound together by standardized or proprietary technology that enables data and application portability (e.g., cloud bursting for load balancing between clouds) [8].

According to Gartner's research from 2012. approximately one third of all digital content will be in the cloud by 2016. also in the next 10 years 80% of all resources, stored data and e-commerce will be in the cloud [9].

A. *Cloud computing in e-commerce*

Cloud computing and e-commerce are two concepts that are extremely popular because both of them are cost-effective. Cloud model brings significant cost savings to an organization, while e-commerce allows marketers to link directly to suppliers, distributors and customers, radically reducing the time for order and delivery. Eurostat's research has shown that 19% EU based enterprises were using cloud computing in 2014 mostly for hosting e-mail systems and storing electronic data. 46% of those enterprises used the advanced cloud systems which mainly relate to financial and accounting applications, CRM or computing resources to run new business applications [10].

TABLE III. USE OF CLOUD COMPUTING SERVICES IN 2014. (EU28-% OF ENTERPRISES) SOURCE: EUROSTAT



B. *Cloud computing benefits and challenges in e-commerce*

Even though e-commerce market and cloud-based solutions maturity provide a number of benefits that enhance the business, there are also many challenges to be considered when moving on cloud. Benefits of cloud-based versus traditional e-commerce solutions:

- Scalability- instead of purchasing new computer equipment and their installation and configuration which are a new expense for company, processing power and storage disks can be found in the cloud,
- Speed- transferring to cloud is much faster and easier than establishing a traditional infrastructure,
- Pay-as-you-go – Cloud model reduces initial investment and delivers a solution for seasonal or promotional discounts that can cause unwanted blockage on traditional client-server infrastructure during a lot of user requests,
- Quality of Service (QoS) – Cloud computing guarantees increased reliability and saves users from the threat of losing unrecoverable data. Processing power, I/O (Input-Output) bandwidth and memory size can be guaranteed through Service-level Agreement (SLA) contract [11].

eISSN: 1339-9144, cdISSN: 1339-231X
ISBN: 978-80-554-1002-9

Moving a business to cloud also presents challenges and issues and its not something to be taken lightly. It affects a number of different components of the business itself, from information security, performance, infrastructure and more. The moving of business data to the cloud means that the responsibility over data security becomes shared with the cloud provider. The remote usage of IT resources requires an expansion of trust boundaries by the cloud consumer to include the external cloud. It can be difficult to establish a security architecture that spans such a trust boundary without introducing vulnerabilities, unless cloud consumers and cloud providers happen to support the same or compatible security frameworks which are unlikely with public clouds. Also, due to a lack of established industry standards within the cloud computing industry, public clouds are commonly proprietary to various extents. For cloud consumers that have custom-built solutions with dependencies on these proprietary environments, it can be challenging to move from one cloud provider to another.

Another consequence of overlapping trust boundaries relates to the cloud provider's privileged access to cloud consumer data. The extent to which the data is secure is now limited to the security controls and policies applied by both the cloud consumer and cloud provider. Furthermore, there can be overlapping trust boundaries from different cloud consumers due to the fact that cloud-based IT resources are commonly shared. [12].

In order to successfully implement cloud solution users need to follow a number of steps that take into account the size of the company and maturity of their IT departments:

- *Gathering the experts*- it is important that cloud users gather development team who will select strategy and implementation plan of cloud services that will be part of overall IT environment. Cloud computing has created a revolution in technological world in which business leaders recognized the cloud as medium for approaching to their users/costumers. The adoption of cloud is seen as a strategic business decision that improves the efficiency of IT and also helps to achieve global business objectives.
- *Develop business cloud strategy*- cloud presents interesting possibilities of business models for companies of all sizes. It is important to: educate employees, to understand the necessary services and functionalities, to establish short and long term plans, set clear goals and metrics for measuring progress, understand the legal and regulatory requirements and monitor results for a long period.
- *Select the model of implementation*- In order to determine which model of implementation is the best for business requirements it is necessary to take into account key factors such as migration costs, security threats and elasticity. With the private and public cloud models there is also a hybrid cloud model in which user uses his own IT resources to perform routine tasks and optionally access to one or more private or public clouds during the high traffic period.
- *Cloud model selection*- in order to determine which service model (e.g. IaaS, PaaS, SaaS) is best for company it is necessary to consider the advantages and disadvantages of each model. Furthermore, the maturity of IT department together with the size of company significantly influences on the choice of service model.
- *Determine who will develop, test and implement cloud services*- determining the most effective methods for the design, development and deployment of cloud services are not an easy job so it is necessary to make a decision that matches the demands and opportunities of the company. There are four options that can be considered: development and implementation within the company, development and implementation is left to cloud provider, independent provider of cloud services development and finally to purchase a complete cloud solutions.
- *Integrate with existing services*- there are several ways to establish a connection between the cloud and existing services. If the company has already established a way for the adoption of open standards infrastructure, then the cloud should be built on what already exists. This increases the possibility of interoperability between cloud and existing services. The integration of open standards in the company can be managed through the use of standardized APIs. API will be the channel between the open standards that support cloud services with existing services. API will "shoot" the data being transmitted from cloud services and translate it into a format that is recognizable to existing services.
- *Develop and manage of SLA contracts*- service level agreement is very important to set clear expectations for service between users and cloud providers. Each participant in the cloud is bound to have a defined SLA. SLA establishes responsibility for specific activities and allows each side to understand the risks before signing the contract. The level of service depends on the sensitivity of information being processed.
- *Manage cloud environment*- responsibility for successful cloud environment usually takes the head of the IT department. All problems that cannot be solved must be reported to the head of IT to ensure more efficient solution [11] .

V. CONCLUSION

With his constant growth the internet has been responsible for changing the global industries. One of the most affected is retail industry where electronic markets are taking over offline shopping. The appearance of new and attractive types of markets like group buying has made many products and services more accessible especially nowadays when consumers from many countries around the world are affected by recession.

eISSN: 1339-9144, cdISSN: 1339-231X
ISBN: 978-80-554-1002-9

Based on the conducted research it can be concluded that Croatian and global e-commerce and group buying markets have a constant growth rate. E-commerce together with group buying is constantly changing and it is important to stay in touch with new technologies such as cloud computing that can reduce up-front capital expenses which allows for the capital to be redirected to the core business investment.

Implementation of cloud technology can be an efficient solution when used in business like group buying, where each company has data with a very large number, such as structured client data, product data and transaction data. Because this technology centralizing storage, memory, processing and bandwidth that can reduce the cost of the infrastructure, so it can save the budget and increase corporate profits especially in cases when companies run their business regionally or globally.

Research of FPZ's students trends has shown that they are actively using group buying sites and that the main reasons for purchasing are huge savings and variety of offers. Therefore, it can be concluded that when creating an offer, service providers should take in consideration diversity of products not only their prices.

There are a lot of e-commerce software that enable businesses to run their online stores. As it was described in this paper, Croatian group buying site Kolektiva.com uses Magento as background for their online store which is one of the best ecommerce platform on market. Since it is a open source its full code as well as a number of add-on and adjustments is available to users from a variety of sources. Also with integration of HTML 5 into latest versions, Magento store owners can offer better mobile shopping experiences across multiple web browsers and devices which is very important due to increasing number of m-commerce users and diversity on smartphone market.

REFERENCES

[1] S. Hughes, C. Beukes : Growth And Implications Of Social E-Commerce And Group Buying Daily Deal Sites: The Case Of Groupon And Livingsocial, International Business & Economics Research Journal (August 2012), Volume 11, Number 8

[2] International Telecommunication Union (2014, April),The World in 2014:ICT Facts andFigures(online) Available:http://www.itu.int/en/ITU-D/Statistics/Documents/facts/ICTFactsFigures2014-e.pdf

[3] Centre for Retail Search, Online Retailing: Britain, Europe, US and Canada2015,Available:http://www.retailresearch.org/onlineretailing..php,accessed:February 3th, 2015.

[4] European Commission, Digital Agenda for Europe Available:https://ec.europa.eu/digitalagenda/en/scoreboard/croatia#ecommerce, accessed: February 5th 2015.

[5] J.Čavar: The architecture of e-Commerce system for offering group buying services, Final master thesis: Faculty of Transport and Traffic Sciences, University of Zagreb, p.10 – 12, 2014

[6] Statista,Groupon-Statista-Dossier,available: http://www.statista.com/study/10918/groupon-statista-dossier/, accessed : February 6th 2015.

[7] CARNet CERT (2010), Cloud Computing (online). Available: www.cert.hr/sites/default/files/NCERT-PUBDOC-2010-03-293

[8] M.Periša, D.Peraković, S.Šarić, "Conceptual Model of Providing Traffic Navigation Services to Visually Impaired Persons", Promet – Traffic&Transportation, Vol. 26, 2014, No. 3, 209-218

[9] Gartner, Forecast: Consumer Digital Storage Needs, 2010-2016, available: http://www.gartner.com/newsroom/id/2060215, accessed: February 6th 2015.

[10] European Commission, Statistics Explained, available: http://ec.europa.eu/eurostat/statistics-explained/index.php/Cloud_computing__statistics_on_the_use_by_enterprises, accessed: February 6th 2015.

[11] ISACA (2011, September 26th), Cloud Standards Customer Council: Practical Guide to Cloud Computing Version 1.2 , (Online). Available: https://www.isaca.org/Groups/Professional-English/cloud computing/GroupDocuments/CSCC_PG2CCv1_2.pdf

[12] T.Erl, Z.Mahmood, R. Puttini, Cloud Computing: Concepts, Tehnology & Architecture. Upper Saddle River, NJ: Prentice Hall, 2013, p. 46-47.

eISSN: 1339-9144, cdISSN: 1339-231X
ISBN: 978-80-554-1002-9

Published by: EDIS - Publishing Institution of the University of Zilina
Univerzitna 1
01026 Zilina
Slovak Republic

Editors: Ing. Michal Mokrys; Ing. Stefan Badura, Ph.D.

ISBN: 978-80-554-1002-9

cdISSN: 1339-231X

eISSN: 1339-9144

Pages: 144

Printed in: 100 copies

Publication year: 2015

- All published papers undergone single blind peer review.
- All published papers are in English language only. Each paper had assigned 2 reviewers and each paper went through two-tier approval process.

Open Access Online archive is available at: **http://www.ictic.sk/archive**
(proceedings will be available online one month after the publication release).

In case of any questions, notes or complaints, please contact us at: **info(at)ictic.sk**

ICTIC 2015

Proceedings in Conference of Informatics and Management Sciences

The 4th International Virtual Conference

23. - 27. March 2015

Slovak Republic

ISBN 978-80-554-1002-9
cdISSN 1339-231X
eISSN 1339-9144