On cloud computing and applications to IT and economics

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Abstract— **In this paper, we present results on cloud computing and its application to business and economics**

*Index Terms—***Cloud computing, IT, economics**

I. INTRODUCTION

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 Livingsocialthat have established themselves as the sector leaders.

The group buying industry had an estimated value of approximately $2.7 bilion 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. PRELIMINARIES

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 compaines 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 informations there is an increasing need for companies to move their business or part of business to the Internet. E-commerce systems which operates 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 costumer 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

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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.

III. WORL OVERVIEW

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 bilion in 2014. to €185.39 bilion in 2015. which represents an increase of 18.4%. In the US, online sales are expected to rise from $306.85 bilion in 2014. to $349.20 bilion 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

Gruop buying

With the growth of internet and smartphone usage, access to various services and informations 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 milion 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. Acorrding to data from 2012. there were more than 50 different group buying sites in Croatia .

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 sceptical when it comes to purchasing throught 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 informations about products and offers are accurate and that the user support is fast in their responses.
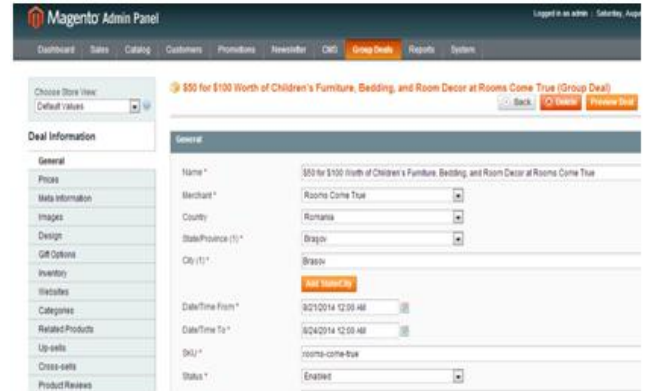

Figure 1. Magento administration panel

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 throught „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

Further more, 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].
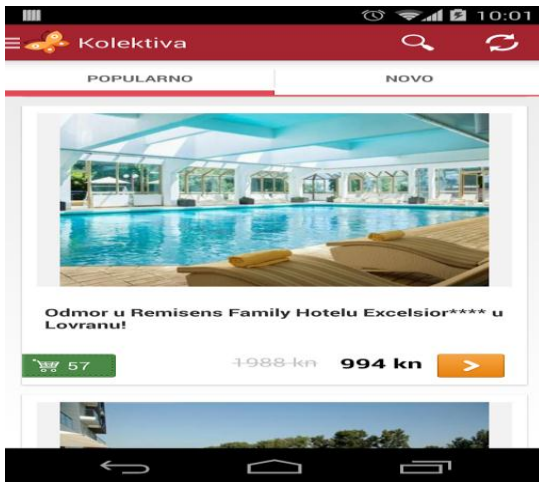

Figure 2. Kolektiva.com mobile apps for iOS and Android phones

IV. REVIEW 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 appereance the current 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 alldigital 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].

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 costumers, 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].

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- transfering 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) bandwith and memory size can be garanteed through Service-level Agreement (SLA) contract [11].

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 securitybecomes shared with the cloud provider. The remote usage of IT resources requiresan 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 boundarywithout introducing vulnerabilities, unless cloud consumers and cloud providers happento support the same or compatible security frameworks which is unlikely withpublic 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 thathave custom-built solutions with dependencies on these proprietary environments, itcan be challenging to move from one cloud provider to another.

Another consequence of overlapping trust boundaries relates to the cloud provider'sprivileged access to cloud consumer data. The extent to which the data is secure is nowlimited to the security controls and policies applied by both the cloud consumer andcloud provider. Furthermore, there can be overlapping trust boundaries from differentcloud 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 enviroment. 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 significanty 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 is 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 usersand 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 enviroment-* responsibility for successful cloud environment usually takes the head of the IT department. All problems that can not be solved must be reported to the head of IT to ensure more efficient solution [11] .

V. SUMMARY

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 appereence of new and attractive types of markets like group buying has made many products and services more accessible especially nowdays when consumers from many countries around the world are affected by recession.

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 tehnologies such as cloud computing that can reduceup-front capital expenses which allows for the capital to be redirected to thecore business investment.

Implemetation 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.

Reasearch 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 discribed 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 accross multiple web browsers and devices which is very important due to increasing number of m-commerce users and diversity on smartphone market.

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