



Challenge of Cloud Computing for SMEs: A Case of Baltic Countries

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Abstract

Small Business Act for Europe pinpoints that small and medium size businesses have the key role in the EU economy. Small and medium size enterprise (SME) policy framework developed in 2008 for EU member states puts special emphasis on the development of ICT. Therefore, the purpose of the research is to evaluate the situation with the small and medium size enterprises regarding use of cloud computing for their business activities. SMEs in Baltic countries were selected as a case study to highlight the main challenges which restrict the efficient exploitation of cloud computing solutions. Qualitative research methods i.e. in-depth interviews with cloud experts and managerial authorities of SMEs in Baltic countries were used in this research. Results of the interviews were analysed using Technology – Organization – Environment model which helps to structure favourable and unfavourable conditions for cloud computing in the Baltic countries. Based on opinions of SMEs the research reveals the potential for the development of cloud computing and obstacles for successful implementation of this new solution. The paper takes into account both supply and demand side and other impacting factors and provides solutions on how to overcome barriers for implementation of cloud computing. The main value of the paper is usage of Technology-Organization-Environment model for the analysis of interview results which allows to reveal justified conclusions about the existing situation and provide implementable recommendations for SMEs regarding cloud computing technology.

Keywords: Cloud Computing, Small and Medium Size Enterprises, Entrepreneurship

Introduction

Small and medium size enterprises (SME) are taking the key place in the European Union (EU) economy. A comprehensive SME policy framework has been developed by the European Commission (2008) with a special emphasis on the information and communication technologies. Bajenaru (2010) mentioned that because of the resource limitations SMEs should consider to use such information and communication technology (ICT) systems as cloud computing and other alternatives in comparison to traditional "in-house" information technology (IT) systems which require considerable amount of financial resources. As noted by Zabalza (2012) cloud computing (CC) allows keeping IT resources (data, infrastructure and applications) in the Internet as a "pay-for-use" service managed by one or more providers.

Cost and time saving, increased efficiency, flexibility and scalability of resources, increased collaboration in innovation, quick recovery of data in case of emergency, better communication with a client are mentioned among key advantages of cloud computing. On the contrary, security and confidentiality, legislation and compliance, switching costs and lack of control often are highlighted as the main drawbacks of CC services.

According to Giannakouris (2014), cloud computing is novel and relevant for the Baltic economy however, the usage of CC services in Baltic countries is relatively low if compared with Northern European countries i.e. in 2014 it was 6% in Latvia and 13% in Lithuania whereas in Denmark it was 38% and in Finland 51%. Nevertheless, Giedrimas (2011) pinpointed that over the last years all Baltic countries were engaged in various activities which promote cloud computing i.e. in Baltic Grid project called Baltic Cloud which was created to develop infrastructure for the joint cloud in Latvia, Estonia, Lithuania and Belarus.

Based on the fact highlighted in the study carried out by Milian (2013) that Internet infrastructure in Baltic countries is one of the most developed in Europe i.e. Internet speed in Latvia, Lithuania and Estonia is one of the fastest in the world, the paper analyzes how do SMEs in Baltic countries perceive cloud computing technology and what are the reasons for the slow spread and implementation of CC technology in the Baltic SMEs. The aim of the paper is to research the situation with small and medium sized companies in Baltic countries, to understand factors and reasons behind the managerial choices of IT systems by creating a framework which is adjusted for peculiarities of geography of the study. Results of the research are analyzed using Technology – Organization – Environment (TOE) model, which helps to structure and understand favorable and unfavorable conditions for cloud computing development within the region.

Theoretical Framework

According to Gartner (2009), cloud computing can be defined as a computing style, which provides external users with access to scalable and flexible IT facilities over the Internet. Tsai (2012) noted that cloud computing architecture involves three levels i.e. software as a service (SaaS) where all softwares are installed on external servers, platform as a service (PaaS) where operating systems are installed on external servers and infrastructure as a service (IaaS) where data or networking components are stored on external servers. Several advantages of cloud computing can be highlighted on the micro level. Zabalza (2012) mentioned that cost reduction and time saving have been mentioned as the main economic advantages, whereas in KPMG Cloud Survey Report (2014) it was stressed that improved labour flexibility, better customer service and communication with partners as well as improved data analytics are the main benefits regarding increased flexibility of resources. McCarthy (2012) also

mentioned that communication and collaboration in technology innovation and data analysis as well as improvements of sustainability can be highlighted among organizational benefits on micro level. However, Law (2013) stressed that easy disaster recovery and higher auditable security are considered to be important factors concerning data security and backup system on the micro level.

When discussing financial benefits of cloud computing which lead to considerable changes in the cost structure, than according to Etro (2011) growth of enterprises, new development of labour market i.e. creation of new jobs, reallocation of labour in the IT sector as well as change in government expenditures and indirect change in revenues due to taxes can be considered as the main impact factors on the macroeconomic situation. In terms of challenges concerning the adoption of cloud technology security risk, lack of control, lack of customization, economic disadvantages and compliance are mentioned as the main drawbacks.

The main criticism of cloud computing is related to the fact that the service is completely based and independent on Internet technology which always implies a certain security risk. The security problems may emerge as the result of failing to verify the physical infrastructure i.e. location of information and methods used for data protection are often unknown for the majority of SMEs. Several authors including Belicove (2013) emphasize that lack of control in case of emergency is another drawback of cloud computing. For example, the cloud computing platform of Amazon during the last three years experienced at least three major interruptions which resulted in losing information of clients.

Lack of customization and compatibility is analyzed by Yi-Wen (2015) who stresses that in general benefits from cloud computing are varying from industry to industry. Regarding economic disadvantages, Keskin and Taskin (2015) have described the pricing model of

cloud computing where high switching costs were stated as the main drawback. Sommer (2013) also mentioned that potential growth of costs in the cloud computing providers' industry including rise of amount of payment for extension of storage capacity can be highlighted as another economic drawback. Finally, compliance i.e. legal aspects of storage of personal data outside the companies in the cloud are another concern of cloud computing which need to be taken into account.

Several studies including research carried out by Neves (2011), Carcary (2014) and Tsai (2012) revealed that the main impediments which impact the decision of managers to adopt or not adopt cloud computing in their companies are fear of capital investment and complexity, lack of realizing possible benefits, lack of technical resources as well as lack of time and IT skills, security issue, data ownership and protection and also philosophy of managers and their subjective opinion. Risk of intellectual property leakage, high switching and not determined final costs as well as problems of integration with existing systems were also mentioned as impediments for use of cloud computing in SMEs.

In terms of drivers for adoption of cloud computing in small and medium size companies, Gutierrez, Boukrami and Lumsden (2015) in their study revealed that pressure of competitors, technology efficiency and pressure from the business partners are the main factors which stimulate the introduction of new technologies in the companies. Another research carried out by KPMG (2014) also revealed that cost efficiency, facilitation of labour flexibility and improvement of communication with clients and business partners can also be named as favourable aspects for the introduction of cloud computing.

Kushnir (2010) noted that in Baltic countries density of micro, small and medium enterprises (MSME) per 1000 people is quite

high i.e. in Latvia and Estonia it is around 31-40 and in Lithuania it is 41-50 MSMEs per 1000 people. The same indicator for the USA is around 21-30. All three Baltic countries have also well-developed ICT infrastructure including Internet speed and broadband connections. Nevertheless, research carried out by Meijere (2017) revealed that despite the considerable benefits which can bring the usage of the latest information technology solutions, many companies in SME segment are not ready to invest in IT and increase performance and competitiveness of their companies. Similarly, Vasiljeva (2017) recommended that in order to get most benefits, SMEs should align their business needs with cloud computing technology as well as that all technical, organizational and legal aspects should be taken into account to mitigate possible risks of cloud computing.

Regarding adoption of innovation, Rogers (1983) has developed a five stage innovation adoption model which consists of knowledge, persuasion, decision, implementation and use. The innovation adoption model apart from all five above mentioned stages called as communication channels also include prior conditions for innovations. There might be a case when Knowledge – Persuasion – Decision stages transform into Knowledge – Decision – Persuasion stages. For example, because of collectivistic behaviour which was a part of the historical development in Eastern Europe some managers in Baltic countries might choose Knowledge – Decision – Persuasion stages as a typical approach for the adoption of innovation because they would assume that initiative and motivation for adoption of new

technological solutions should come from the government or industry associations.

In order to research innovation adoption process both on a company's as well as on region's level, Technology – Organization – Environment or TOE model is often used as a theoretical basis for analyzing the adoption of cloud technology which is described in the research carried out by Alshamaila (2013). According to the TOE model, the innovation adoption process is defined by technological, organizational and environmental aspects. Technological context covers internal technologies which are already implemented in the company as well as external technologies which are used in the market but are not implemented in the company. Baker (2011) stressed that the internal technologies which place a certain boundaries for the scale and speed of technological change in a company are important in the process of innovation adoption. Organizational context covers such features of a company as its size, managerial design, communication links and amount of available resources in general. Each of those factors can either facilitate or prevent implementation of innovation. Finally, environmental aspect includes market situation, industry characteristics and other external factors which form business surroundings.

Based on the literature review, Table 1 summarizes major strengths, weaknesses, opportunities and treats related to the implementation of cloud technologies in the companies.

Table 1: SWOT analysis of cloud computing implementation (designed by authors)

Strengths	Weaknesses
<ul style="list-style-type: none"> - cost saving - time saving - improved efficiency of resource utilization - scalability and flexibility of system capacity 	<ul style="list-style-type: none"> - unclear final cost of cloud computing utilization - dependency on the Internet connection - lack of speed - lack of customization

Opportunities	Threats
<ul style="list-style-type: none"> - enhanced communication with partners/clients - easier collaboration in innovation - guaranteed fast recovery of lost data - opportunity of 24/7 real time management 	<ul style="list-style-type: none"> - security and confidentiality problems - loss of control over data - intellectual property theft - could be more expensive than in-house systems

Research Methodology

Multiple-case study method which provides an opportunity to research differences and similarities within each setting and across diverse settings of the cases was used in this study. Data are based on primary sources. Semi-structured in-depth interviews with nine senior executives of Baltic SMEs and four cloud computing experts were conducted to discover their attitude concerning cloud computing. In-depth interviews provide a possibility to outline new issues and aspects of the problem as well as new opinions and challenges which was also stressed in the study carried out by Barnham (2015). Decision making authorities were selected for the interviews including senior executives or IT managers. Because of geographical differences, interviews were conducted using Skype video calls.

Concerning development of interview questions, those were formulated in a way that covers all important aspects and issues of the TOE model which is applied when analyzing interview results. Based on the factors and purposes of the interview all questions were designed in three parts i.e. 1) questions about implemented IT systems, selection of in-house solutions, internal infrastructure; 2) experience with cloud computing and attitude towards cloud technology; 3) discussion on common perspective for the cloud potential and reasons for relatively slow implementation of technology in Baltic countries. In order to facilitate discussion and elaboration on the topic from interviewees, the questions of the interviews were designed as open-ended. Manual coding method was used to process information gained during the interviews

which then can be analyzed by the TOE model.

A purposive sampling method was used to cover diverse set of companies i.e. in terms of industry, size, structure etc. Patton (1990) highlighted that the important advantage of purposive sampling is a possibility to focus on relatively small sample which contains participants of information rich cases. The main focus was on companies which have implemented and utilized IT systems in their daily business operations. The sample consisted of two parts. The first part included companies both from IT and non-IT industries. The main selection criterion was the operation of the company in the market for at least three years, being SME in terms of number of employees and turnover and diversification of industries and business activities across the sample. The second part of the sample consisted of independent IT professionals and cloud providers in order to get an independent observation and opinion regarding technology supply and impediments for implementation of cloud computing.

Main Findings and Analysis of Results

Questions for the in-depth interviews were grouped in three blocks. Each block covered around ten to fifteen questions. The first block included questions about the internal and external IT system used in the company i.e. "Does the company has an internal IT system?", "Does the company experience lack of capacity of the resources?", "Does the company use backup services?" The second block of questions covered questions related to experience with cloud computing technology for example, "When did the company start to use cloud computing and

what was the reason?”, “How expensive is it to rent the cloud?”, “Do you have any negative experience with the cloud?”. Finally, the third block of questions was dealing with opinion regarding the potential of cloud computing in the Baltic countries and impediments for the spread of technology i.e. “What would be the impediments for the SMEs in Baltic countries to employ cloud technology?”, “Which companies will benefit the most from the implementation of cloud computing?”, “What would be the potential of cloud computing technology in the Baltics during the next 3-5 years?”.

Summarising answers expressed by the representatives of small and medium size companies revealed that almost all companies within the sample used some kind of cloud technology. Respondents appreciated security and backup systems of cloud computing providers and considered them sufficient. The reasons for shifting to cloud computing was almost the same across the sample i.e. necessity to make data accessible from any place and device, need of scalability of IT resources as well as need in automatization of standard manual processes and provision of safe backup of the company’s IT system.

When asked about the main advantages of cloud computing, respondents from SMEs mentioned flexibility, scalability and accessibility. Some respondents also stressed that cloud computing is especially beneficial for small and medium size companies. Regarding impediments for the spread of technology, the majority of interviewees stated that fear of technology and mentality of people are the primary obstacles. Lack of knowledge and weak promotion of cloud computing and its benefits were also mentioned as restricting reasons of introducing new technologies in companies.

The second group of interviewees i.e. independent IT experts and cloud providers shared their opinions about general vision of the cloud as well as about impediments for cloud development both from supply and

from demand side. Device independency, high speed of work, efficiency, scalability and flexibility were highlighted as advantages of the cloud. Experts also pinpointed the possibility to avoid high initial investments and shift from capital expenditure to operational costs of the cloud technology. Although the majority of reliable cloud computing services are not free of charge, cost advantage of the cloud was mentioned as an important positive aspect because a company by using cloud technology can decrease its spending for electricity, own data centre support and security implementation as well as for IT personnel. Security considerations and time consuming for shift of big data amounts were mentioned as potential drawback of the cloud.

Lack of partners in Baltic countries who provide cloud services as well as lack of promotional activities for cloud computing which link to poor knowledge among Baltic entrepreneurs on the topic about the cloud were mentioned as impediments for cloud computing from the supply side. Some respondents stressed that because of business threats some local hardware companies are reluctant to promote cloud to their clients which results in absence of the local marketing programmes for the cloud. Security and compliance considerations, consideration about performance and technical specifications, reluctance to change and move by IT department, fear of new technology and lack of education were mentioned as the main obstacles for successful cloud development from the demand side.

Aggregated results of the interviewed sample were analysed using Technology-Organization-Environment model and its three contexts of cloud computing adoption. In terms of technological context which covers such factors as advantage, uncertainty, compatibility, complexity and trialability, relative advantage of cloud computing including flexibility, scalability, accessibility, improved efficiency, speed of work, facilitated capacity of resources, was

understood by the majority of respondents across the sample. Factor of uncertainty concerning security and reliability was observed during the interviews both with representatives of SMEs and IT experts. Lack of knowledge and experience with the cloud which is closely linked to poor marketing activities also rises uncertainty among potential clients. Compatibility was noted by all respondents as a significant factor for innovative technology implementation and it should match the technological needs of the company and be in line with other software application which is not always a case of the cloud technology. Complexity of cloud technological context was highlighted as favourable for the technology spread and easiness of utilization was mentioned by the majority of respondents. Finally, trialability was stressed as an important factor for the adoption of cloud technology and those companies which could test the cloud during some EU supported project had smooth and fast cloud adoption process.

Size, top management support, innovativeness and openness to new technologies and prior technology experience are key factors which form the organizational context. The theoretical aspect of company size concerning the adoption of new technologies is not clearly defined in the literature. Respondents considered that it would be easier for SMEs to implement cloud applications as they are more flexible and efficient in decision making which facilitate cloud adoption. Top management support and management attitude towards cloud computing was a crucial factor for shifting or not shifting to the cloud technology. Respondents also mentioned that fear to loose jobs concerning IT personnel can be a direct impediment for the positive managerial decision. Many interviewees also pinpointed that fear of new technology can be considered as the main obstacle against the innovativeness and openness to new technologies. Nevertheless, during the interviews IT experts noted that rate of innovativeness in Baltic countries is on the medium level, therefore companies and their

managers have average openness to innovations. Prior technology experience in organizational context was also mentioned as an important factor because those managers which have used some cloud solutions earlier would be more open and ready to implement cloud technology to larger extent.

When applying the TOE model, competitive pressure, industry, market scope, supplier support and legal aspect are factors which form environmental context. Although in the previous research carried out by Alshamaila (2013) competitive pressure was mentioned as a factor with strong impact on the decision making process within a company, across the interviewed sample this factor was never directly mentioned as important for the adoption of innovation. In terms of industry factor, some respondents stated that every industry can benefit from cloud solutions. During the interviews, a positive correlation between internationalization and globalization of a company and utilization of cloud services was observed. It means that the market scope i.e. operation of a company in several countries facilitates implementation of cloud technology. Regarding supplier support all respondents agreed that a large number of providers offer cloud services in the market. However, the interviewees also noted that due to weak promotional channels and lack of IT consultancy, the promotion of cloud services is weak across the Baltic countries. Based on interview results, legal aspect was added to the environmental context of TOE model because this factor plays a significant role in the process of cloud technology diffusion in the Baltic countries. According to the opinion of experts confusion concerning data storage regulations which were created during the past decade is an important drawback. Limitation to use the EU funds for IT development regarding implementation of the cloud also relates to the legal aspect i.e. cloud expenditure is not covered by the eligibility criteria of the fund as it is considered to be mostly operational cost. Finally, according to the official statistics mentioned in the study carried out by

Schneider (2015), relatively high rate of shadow economy in the Baltic countries is also an important part of the legal aspect which strongly acts against the implementation of cloud technology.

Conclusions and Recommendations

Summarising analysis based on TOE model, it can be concluded that the technological context is partly applicable for the adoption of cloud technology. The majority of clients understand the relative advantage of this solution and can deal with complexity issues. Nevertheless, uncertainty and lack of trust exist even among experienced users of the cloud, and therefore form significant impediment for dissemination of cloud computing. Among other revealed drawbacks there were problems with compatibility and customization of the cloud as well as poor trialability possibilities for it.

The organizational context of the TOE model is more favourable. Although the innovativeness of the region is on a satisfactory level, fear of technology still exists. The managerial factor would not be an impediment for cloud solutions if the IT personnel would support the shift to new technologies.

The environmental context contains significant impediments for the adoption of cloud computing in Baltic countries. Although the market scope of companies in the Baltic countries is relatively favourable, lack of information and marketing activities about new technological solutions has created limited awareness about the benefits of the cloud. Therefore, uncertainty regarding security and reliability of the cloud is increasing and spreading among the target audience without logical rationale.

The relatively small sample size of respondents can be mentioned as one of the weaknesses of this study. Mainly the management side of the company was interviewed and answers from the managers were analysed and discussed. In order to gain

more objective overview of the company, representatives from other departments and especially IT staff should also be interviewed. The fact that all interviews were conducted via Skype can be named as another drawback because it might create some barriers in communication and some non-verbal language and emotions which would be present during the face-to-face interviews, might be missed out. Therefore, as for further research the sample size of companies to be interviewed as well as the number of interviews within the company should be increased. Also, as different impediments were revealed during the interviews, further research can analyse each of them more in depth. For example, the grey economy in relation to cloud computing as well as promotional activities for increasing trust and usage of the cloud by customers can be highlighted as directions for further research.

Based on analysis and conclusions, the following recommendations can be made to facilitate the introduction and use of cloud technology in the SMEs of Baltic countries:

- Cloud technology promotion targets should be shifted from IT department to management of the company;
- Marketing programmes on industry level and also on governmental level should be implemented;
- IT consultancy within the Baltic region should be developed;
- Educational activities aimed for the promotion of cloud solutions should be increased by the use of conferences, managerial courses and seminars etc.;
- Regulations on data storage should be clarified and delivered to the companies;
- Eligibility regulations of the EU funds should be adjusted to speed up IT industry development especially regarding the simplification of application procedure and extending the funds for the operating expenses.

To conclude, cloud technology has remarkable potential in the Baltic countries and there will be a rapid growth of technology in the nearest future. However, the industry of cloud computing and the IT associations should carry out a wide range of various activities to facilitate the introduction of cloud solutions in the companies and to eliminate existing impediments.

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