SOFTWARE-AS-A-SERVICE AND CLOUD COMPUTING, A SOLUTION FOR SMALL AND MEDIUM-SIZED COMPANIES

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Abstract: *Small and medium-sized companies are an important part of today's world economy, for their ability to offer new jobs but also for their capacity of innovation. At the same time, they are in a constant struggle with larger companies that take advantage of their negotiating power to impose their way of doing business to the SMEs. In an ICT enabled world, most large companies being intense ICT users, the lag of ICT adoption in SMEs may create a strong barrier between SMEs and large companies, promoting an over growing digital divide, the SMEs being in danger of being left out in some economic sectors. This paper aims at finding a possible solution in the Software-as-a-Service and Cloud Computing model, a rather new solution, yet more and more sought off by SMEs but also larger companies, especially considering the global financial and economic crisis, as well as evaluating the European Union's main views and policies regarding the SAAS – Cloud model.*

Key words: *software-as-a-service, cloud computing, small and medium sized company, information and communication technology, European Commission's information society policy, financial and economic crisis.*

1. Introduction

There still exists a large debate over the Information and Communication Technologies (ICT) and the benefits in the short and long term that they offer at the government, company and individual level, but there is one aspect in which most of the specialists agree on – ICT is already part of everyday life for the individual, company or government. Ranging from complex application systems, to simple communication tools like the e-mail, companies from around the globe include ICT in the relationships they develop inside and outside the company [1].

But the ICT sector is facing a major threat, the global crisis. The real GDP in 2009 of the European Union dropped by 4.1%, and for Romania, the decrease is estimated at around 8%, almost the double of the EU average [2] (Fig.1.).

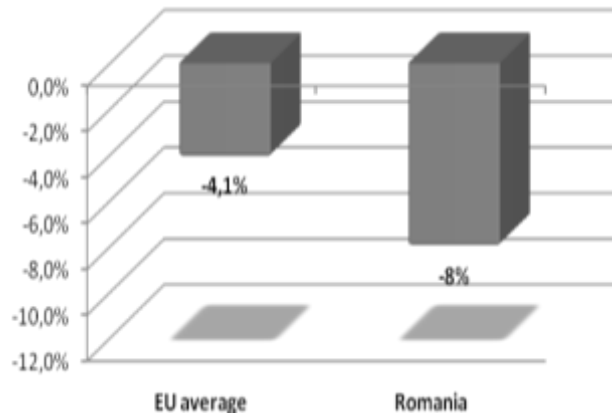[1] Faculty of Commerce, Academy of Economic Studies, Bucharest.

Fig. 1. *Real GDP evolution 2009 compared to 2008, %*
Source eurostat

In terms of unemployment, Romania has gone from 5,7% in the 3-rd quarter of 2008 to 7,2% in the 3-rd quarter of 2009, while in the EU the unemployment jumped from 7% to 9,2% for the same period [3] (Fig.2.).
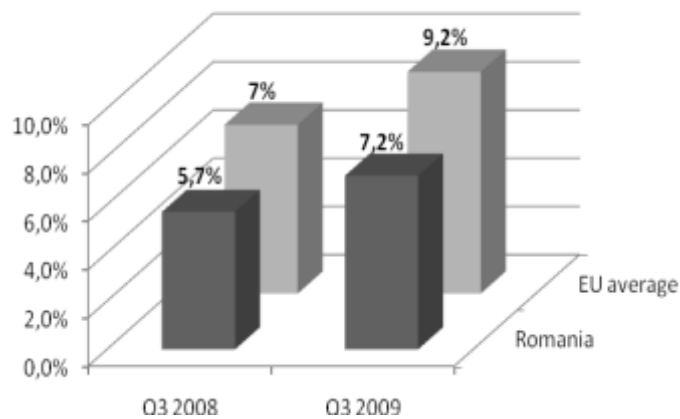

Fig. 2. *Rise of unemployment, %*
Source eurostat

Although the signs of a crisis were already visible, identifiable through the past crisis experiences [4], it was not possible to stop or slow down what is now a reality.

While the world finds itself in financial and economic crisis, companies of all types and sizes are reinventing themselves to maintain profitability or, at least, stay in business. And because the majority of the markets are shrinking, the main concern of the companies is to cut costs, and many are delaying, stopping or postponing investments of all sorts, including those in the ICT field.

In the latest European Commission sectoral study, ICT and e-Business Impact Studies – 2009", companies that participated in the survey stated that ICT had a strong impact in the innovation field for both new products or services, and for

new processes, even if the results where different for the two industries reviewed, the energy supply industry and the glass, ceramics and cement industry. The results showed that ICT was very important for the energy sector, with 89% of the innovators saying that their new products/services had ICT components, and 97% saying that the new processes are ICT supported In the glass, ceramics and cement industry, 42% stated that the new products/services had ICT components and 75% acknowledged the ICT support for the new processes [5]. Given the fact that innovation is an essential element in sustainable growth [6], this is just an example on the fact that the companies realize the crucial importance of the ICT.

Nevertheless, the ICT market was heavily hit in 2009 due to the global crisis, especially in underdeveloped, unstable new markets like Romania's [7, 8]. Although there are several estimates about the size and downfall of the Romanian ICT market, specialists measured a 2009 ICT market of around 1,3 - 1,5 billion euro, a decrease of at least 22% compared to the 2008 [9, 10], while the Romanian ERP market fell by 20%, to less than 100 million euro [11]. There was far less interest in complex projects, maintenance contracts were suspended, the hardware purchase decreased heavily [the PC market dropped to almost half the volume from 2008 [12], and the focus was on a fast return on investment (ROI) [13]. Even under these restrictive conditions, there still is a great potential in Romania, and it might give Romania the possibility of a strong come-back in a medium run [14].

One of the problems that put pressure on the ICT market, at a global level but especially valid for young markets like Romania, is the fact that small and medium enterprises (SME) are hardly involved in the ICT phenomenon. It is a widely accepted principle that most SMEs do not have the knowledge or the financial power to adopt e-business practices. Yet, they have to maintain commercial relationships with larger companies, that have a high adoption of ICT, and impose rules on the terms of collaboration that often present heavy burdens on the SMEs. In an expert survey conducted in June and July 2009, the respondents said that e-business adoption and understanding for the SMEs is a very important matter, but 85% agreed that the most important issue is the ability of the SMEs to improve their e-business capabilities in order to successfully participate in the large companies supply chains, otherwise they could be left out [15].

The purpose of this paper is to evaluate the Software-as-a-Service and Cloud Computing model as an alternative for the SMEs to the classical "on-premises" software model, traditionally expensive and carrying a complex implementation process, and the benefits that this model could offer to the SMEs in competing in the dynamic, crisis restrictive, ICT enabled business world.

2. ERP, SCM, CRM - Classical Approaches to ICT Enabled Business Solutions

The classic way of IT automation comes with the "on-premises" or "shrink-wrap" software, installed and exploited on the user's computer. From common operating systems like Windows, to complex ERP solutions like those offered by SAP, the software had to be installed on the user's computer − or, if we were talking about complex applications on computers acting like servers and clients, before the customer − individual or organization, could use it. But if a Windows licence is a relatively non expensive one, affordable

for the large and small company alike, when talking about ERP or CRM solutions in the traditional form, things change drastically.

The ERP represents an informational system created with the aim of integrating most or all of the internal functions of an organization, based on a special created software, or an adapted software to fit the demands of a particular company [16]. The ERP was meant to solve the information "silos" that were created by adopting ICT in an unstructured manner, using different IT solutions for different departments, solutions that couldn't "speak" to one another, so the communication between these solutions was difficult, required extra processing labor and produced a lot of redundant information. At top management level, it looked like having almost separate companies, that had a difficult time communicating with each other, and offered fragmented pieces of synthetic information, that had to be reprocessed and centralized in order to be used by the top management executives. All this extra work had a strong impact on the time element, by not being able to offer "fresh" information, always existing a smaller or larger delay between the moment when the actual process was completed, and the moment the managers were aware of that [17]. By integrating all the departments of a company into a single IT solution, the information was able to flow seamlessly, without delays, without redundancy or extra work, and with direct lower costs in terms of paper work and manual labor. But the main advantage of an ERP consists of the better and faster reports available to the managers of all levels, allowing them to make judgments based on real time information, and, theoretically, to make better decisions.

But there are costs associated with such advanced applications. An ERP is a complex solution, a "disruptive" one because of the amount of work and changes needed to implement such a solution that requires a full analysis and often redesigning of the information system. An ERP implementation often involves people from all the departments, at all levels, which need to understand and embrace, at a minimum level, the need for and benefits of the ERP for the implementation to be a successful one. A good implementation means a correct, efficient use of the system from the first operator to the middle and top executives, leading to what it is called a Class A implementation [18]. On the strict financial side, an ERP is in most cases a very expensive solution, ranging from tens to hundreds of thousands of Euros (Dollars) in business process analysis, licences, hardware, implementation, training, maintenance, costs that prevent the majority of SMEs to adopt such a solution, even if they could benefit from it in the same way as a large organization. Talking about time, an ERP implementation is a rather time consuming process, with as much as 30 months needed to implement a full size ERP solution, in which period outside consultants work with inside individuals and cause the disruption of the daily routine for a major part of the employees [19]. To respond to this issue, suppliers are also proposing accelerated implementation, which offer reduced period of deployment, reduced costs and disruption, but may cause significant problems in term on insufficient training, incomplete change management process, deficiencies in knowledge transfer [20].

Setting aside these issues, an ERP comes with downsides too. Apart from the elevated costs, one particular problem revolves around the rigidity of the systems one put in place, that require significant additional costs in time and financial

resources if the need to adapt it arises, leaving the company sometimes without response in the face of fast medium changes. Also, there is the question of the complexity of the system, which is found often difficult to work with. Another issue is the excessive centralization, which limit the freedom of acting for the employees, especially when it is about working in a different country/environment, and the overall situation and parameters are different from the ones in the main area of activity [21, 22].

While the ERP is focused on the inside of the company, two other concepts are meant to link the company with the outside partners, suppliers and clients/customers, through Supply Chain Management integration (SCM) and Client Relationship Management (CRM) applications.

The SCM is a process of coordination between members of a distribution chain in terms of production, storage and transportation activities with the objective of maximizing the end customer satisfaction while minimizing the costs of the entire system [23, 24, 25]. The fundamental concept in SCM is the collaboration between the members, which means close relationships developed along the entire distribution chain. In this field, the internet as communication medium and software that automate and integrate the companies along the chain provide the next step in SCM. The Internet was a big breakthrough, because of the low costs and widely accepted standards it offered compared to the initial EDI which limited the use of eSCM to, again, the largest and financial most powerful organizations. The eSCM also benefits from the new "pull" model in which the decisions of what and when to produce and deliver are taken according to the desires of the final consumer, eSCM offering a two way flow, one with the information from the consumer to the first supplier in the chain, and the other with the products or services towards the consumer.

Although the past experiences proved the utility of the SCM to those companies that had the resources and were willing to invest in such systems [26], the main barriers to adopt a eSCM are found at the core opposed objectives of different players in the chain, companies that are used to competition and not collaboration, that have the objective to maximize profits even at the expenses of the partners' well being, as well as the reduction in costs with inventory versus offering better services [27].

The CRM is the electronic platform that acts like support in the process of creating a long term relationship with the clients/customers [28]. It comes as a complement to the SCM, being a solution oriented at achieving a better communication and understanding of the clients, reaching into the preferences and particular problems of the clients, and especially end consumers. The CRM is focused on retaining the customers, starting from the principle that states it is easier and less expensive to keep a customer rather that win a new one, principle that was overlooked in the early days of the dot-com era, when huge amounts of money where spent on attracting customers, and sometimes none on keeping them [29]. Specialists consider that CRM is closely connected to what they call the 8-th P in the marketing mix, "Partnership", as in the close relation that is created and must be built with the client/consumer, partnership being probably the essential element of the new "pull" model discussed earlier [30].
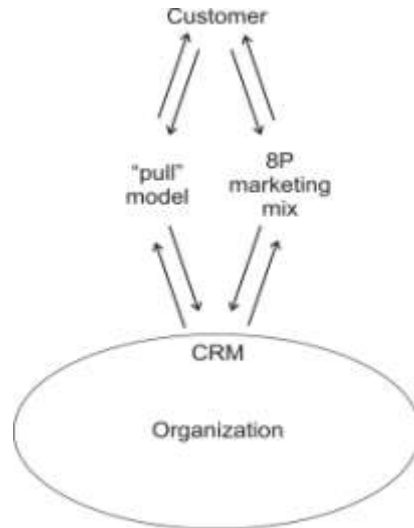
Fig. 3. *The CRM and the power of the customer*

CRM's objectives are on one side, offering better products/services for the consumer, together with helping him to save time, and on the other, save money for the company, and achieve better sales. And although CRM is a bestseller globally, the ROI is poor, compared to the ERP or SCM solutions [31], the main cause being the lack of consumer oriented policy in the company, company that bought and deployed a CRM solution hoping to solve the problem just by running the software.

3. The Alternative for SMEs – SAAS and Cloud Computing

The main issue for SMEs when talking about ICT adoption is cost. Hardware, software or additional services, the costs of implementing and maintaining an advanced solution such as ERP, CRM or SCM are prohibitive for the grand majority of the SMEs. Also, large companies, in the pursuit of better services, with lower costs, and increased flexibility started to look for different ways of solving part of their problems. With that in mind, two relatively new concepts arise, Software-as-a-Service

(SAAS) and Cloud Computing, which combined offer the company-user the possibility to eliminate licences and extra hardware costs, together with the maintenance costs associated with classical software deployment, and the power to access the application from virtually anywhere.

3.1. Software Delivered as a Service

SAAS means lending the software rather than selling it. SAAS is the distribution of software to end users remotely through the Internet. SAAS is software developed to be offered and "consumed" like a service. In SAAS, there is no installation on the users computers, the application runs at a remote location, typically the suppliers, the users being able to access it whenever they want or need it, thus the term of "on-demand" software. Also, it is payable on a monthly fee, as opposed to the traditional "on-premises" model [32, 33, 34, 35, 36, 37].

The SAAS model implies that the software if installed on the suppliers hardware, and offered through a subscription fee over the web to the

company-user. The beneficiary of the SAAS doesn't need to buy extra hardware, extra bandwidth, licences, doesn't pay for upgrades or maintenance, doesn't need specialized IT stuff. He pays just for being able to use the services, according to his needs. The company though will still have to pay for adapting the software and training – if needed, and depending on the vendor. Varying according to the complexity of the organization, it can have access to a full sized ERP, or a light CRM application. The deployment time is reduced, and being web-based, the users can access it from virtually anywhere there is an Internet connection, with a fixed or mobile device.
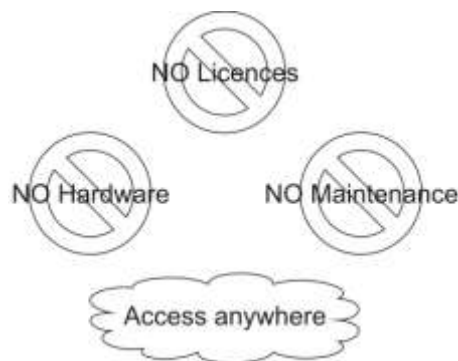

Fig. 4. *Core differences between "on-premises" software and SAAS – Cloud Computing model*

Theoretically speaking, the service could be switched on and off, the customer company being able to terminate the contract at any time, without significant costs. On the suppliers side, they have to develop the software, and also maintain a strong infrastructure to be able to guarantee a good level of computing power and accessibility.

With 6,8 to 9 billion $ market estimate, 3-5% from the total software market, 76% of the American companies having at least one SAAS subscription, and 9 out of 10 planning on using SAAS in 2009, the SAAS model is already making a strong step forward [38, 39].

The downsides of the SAAS model are in the novelty of the phenomenon that comes with distrust as a principle, the much less known vendors, and the trust that must be put into the hands of outsiders about more or less vital inside information. Also, it is about the fear of downtime, lower performance that an in-house hosted application, and the data protection from being lost due to system failures [40]. Least but not last, there are still unknowns regarding the total cost of ownership (TCO) over longer periods of time, versus the traditional model [41].

There are already many applications that are offered as SAAS, with CRM and human resources management at the top, conferencing and collaboration tools, CMS, internet telephony, but also very complex solutions such as ERP [42, 43].

With the short to medium term benefits, especially from the low and variable costs, the SAAS model fits much better than the classical on-premises model the needs and possibilities of the SMEs. But also, during this period of financial and economical stress, it is of interest for larger companies, even though it is believed that larger companies will still be maintaining key systems "in-house" [44].

3.2. Cloud Computing

Cloud Computing is a model for offering on-demand computing resources over the internet. The Cloud is in fact the Internet, so the term Cloud Computing could be "translated" as "computing over the internet", as opposed to the classical computing on the users own physical computer. Cloud computing is a concept closely related to the Virtualization and the Virtual Machines – sections of a physical's computer resources distributed according to a user/application needs.

There are strict or broader ways of defining the concept, going all the way to saying that everything outside one's firewall is in the cloud [45].

Cloud Computing has 3 major components: Software as a Service, Platform as a Service and Infrastructure as a Service, outlining the possibility of offering services, platform capabilities or infrastructure on-demand basis, allowing the user to access software - SAAS, deploy content using the instruments offered by the cloud provider - PAAS, or exploit the computing resources for any type of application in the IAAS model.
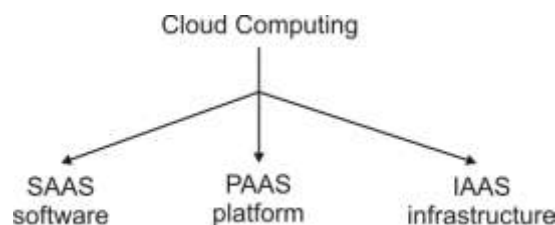

Fig. 5. *Components of Cloud Computing*

Taking into account who owns and who uses the cloud, there are several categories that arise – the private cloud, owned and exploited by only one company, existing on or off-premises; the community cloud, owned and managed by the community or a third party; the public cloud, owned by a company selling the services to the public audience; the hybrid cloud, a mixture of one of the above models [46].

The Cloud Computing system offers benefits for both the provider and the client. The client gets the computing resources he needs, without having to pay for and maintain underused hardware, and he gets the anywhere access benefit, as it is a web-enabled service. The provider gets better use for his hardware through efficient distribution of physical resources. The society as a hole benefits from the Cloud Computing, as there are less physical hardware equipments, with better

efficiency, meaning less energy consumption, and thus promoting a greener world.

The Cloud Computing concept is an attractive one, and it is becoming especially appealing in this crisis period. And while a survey concluded that 41% of senior IT professionals don't know what cloud computing is [47], another survey conducted in 2009 showed that 75% of the companies involved intended to allocate or increase budget in cloud technology development [48]. More, a third survey showed that companies devoted to the adoption of new technologies achieved 18% reduction on IT budgets and 16% reduction in data center power costs, due to the use of Cloud Computing [49].

The Cloud Computing has also downsides. One of the main issues is the security, the integrity of data and the risk of reputational impact in case of problems

in this field. Also, there are concerns over the lack of support, or the downtime of the infrastructure and the possibility to guarantee for the services - the Service Level Agreement (SLA). To address these concerns, some organizations emerged, ready to develop sets of rules on cloud computing and service levels guarantees, which are meant to help in the development and adoption of the new technology [50, 51, 52].

4. EU Policies Related to the SAAS Model

The broadband strategy is one of Europe's main objectives when it comes to the information society. While becoming obvious that ICT is the new era, with its benefits and drawbacks, the European Commission (EC) set as essential for the adoption of the ICT for both citizens and businesses the existence of adequate infrastructure. With the new types of rich online content, including audio and video content, with the rise of the user generated content in the web 2.0 era, good connection speed is of the essence. And on the other hand, speaking about companies and the ever more complex applications running on the internet, high-speed connectivity bundled with relatively low costs represent the only way for taking advantage of these opportunities [53], this being particularly valid for the SMEs and the SAAS-Cloud Computing model. Also, the EC believes that the development of the broadband internet will create around 1 million jobs in the EU, and generate 850 billion Euros in activity growth, while the World Bank estimates a 1,3% growth generated for each 10% extra broadband penetration [54].

Romania has one of the lowest rates of household broadband access in the EU, and scores last when it comes to broadband for companies, and this even without

taking into account companies with less than 10 employees [55, 56]. To address the issue, and to comply with the EC's recommendations, Romania adopted the National Broadband Strategy, setting the deadline in 2015 for full broadband accessibility, and unlocking 84 million Euros in 2009 in structural funds for the broadband infrastructure development [57, 58].

By developing the broadband access, Europe is paving the way for better, more complex applications, available to a larger share of companies. But there are still, like already stated earlier in this paper, problems in the adoption area, especially for SMEs, problems that are evolving because of the global crisis. There were concerns regarding the possible decrease in ICT investments [59], concerns that were correct, especially if talking about Romania. Taking all this into account, the EC is talking about the need to better control, regulate and help promote the adoption of ICT together with supporting the ICT R&D sector, because there is the danger of creating a digital divide inside each or most of the economic sectors - aside the ICT sector itself, between the heavily ICT enables companies, and the ones that are using little or none of the new technologies [60].

Speaking about SAAS and Cloud Computing, the issue was addressed in an European Commissioner's Viviane Reding speech in July 2009, when the Commissioner acknowledged the lag of the SMEs behind the large companies in ICT adoption, and the necessity of a new ICT distribution model, such as the SAAS and Cloud Computing, that could help create another million jobs in the EU, and offer new possibilities to countless SMEs in Europe to step into the modern economy. At the same time, it was underlined that the majority of these web services are developed, maintained and offered in or

from the US, leaving Europe behind in the world competition of ICT development [61]. The support for the SMEs adoption, and the promotion of the SAAS –Cloud model was set as a priority for the EC next five year period, along with a better access of digital content, a consumer friendly mobile payment environment and the better use of ICT solutions for a low carbon economy, thus outlining the importance of the model, and the true benefits that arise from the SAAS – Cloud model.

5. Conclusions and Recommendations

The SAAS – Cloud Computing model could be considered as a new born compared to the more traditional software usage models. The novelty of these concepts offer enough space for errors, contradictions, dilemmas and unknown, causing controversy and debates in professional and academic circles alike. While there are clear advantages, especially in terms of costs, flexibility and time of deployment compared to classical "on-premises" models, there are also issues that must be addressed, and answered, in terms of security and reliability of these solutions. As one company has to evaluate and assume both risks and benefits, it is fairly unanimous accepted that SMEs could take extra precautionary measures and deal with the risks, while taking advantage of the benefits.

The fact that the EC has set as a key priority the support for the SAAS –Cloud Computing model demonstrate the large acceptance and trust put into the system, and willingness to give the model the help and opportunity to prove itself.

As an important part of senior IT representatives is not familiar with these new technologies, further studies should focus on assessing the attitude towards the new model in the SMEs world, and also on success stories or failures in implementation and use of the new SAAS and Cloud model.

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