Decision Tool Based on Cloud Computing Technology

Zabalza-Vivanco J¹, Rio-Belver R², Cilleruelo E³, Acera-Osa F.J⁴, Garechana G⁵

Abstract This article analyzes the design of a decision tool based on cloud technology whose main aim is to present different applications existing in the Software as a Service (SaaS) market and how these applications can help business priority areas meet their challenges. This tool is intended to be a driving force for cloud adoption, above all in Spanish Small and Medium-Sized Enterprises (SMEs).

Keywords: Cloud Computing, Technology Management, Decision Tool, Innovation, SMEs, Spanish SaaS Market

1 Introduction

This paper describes the process of making a decision tool based on cloud computing technology. The article consists of five sections. Firstly, a definition of cloud is outlined. Secondly, the current status of cloud in the world related to its economic impact is presented. Thirdly, this section is devoted to the cloud situation with regard to Spanish SMEs describing the main characteristics, benefits, barriers

¹ Juncal Zabalza-Vivanco (e-mail: juncal.zabalza@ehu.es) University of the Basque Country, SP-01006 Vitoria-Gasteiz, calle Nieves Cano 12
² Rosa Rio-Belver (e-mail: rosamaria.rio@ehu.es) University of the Basque Country, SP-01006 Vitoria-Gasteiz, calle Nieves Cano 12
³ Ernesto Cilleruelo (e-mail: ernesto.cilleruelo@ehu.es) University of the Basque Country, SP-48030 Bilbao, Almed. Urquijo s/n
⁴ Francisco Javier Acera-Osa (e-mail: javier.acera@tecnalia.com) Tecnalia, Parque Tecnológico de Álava, E-01510 Miñano-Álava, calle Leonardo Da Vinci 11
⁵ Gaizka Garechana (e-mail: gaizka.garechana@ehu.es) University of the Basque Country, SP-48008 Bilbao, Elkano 21
and concerns as well as the upcoming trends. Fourthly, the design of the tool itself is characterized. Moreover, the reasons for its creation and its design stages are defined. Finally, the fifth section contains the most important conclusions.

Although there is no general definition of cloud computing (Grossman 2009, Voas, Zhang 2009), one of the most used definition is from the National Institute of Standards and Technology (NIST) which states: "cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort or service provider interaction" (NIST 2011). In cloud computing IT service providers offer their services grouped into three categories, Infrastructure as a service (IaaS), Platform as a service (PaaS), and Software as a service (SaaS). In addition, there are four deployment models: Private, Community, and Public (Zabalza-Vivanco et al. 2012, Miller, Veiga 2009, Sultan 2010, Talukder, Zimmerman & Prahalad 2010).

Globally, it is estimated that in 2014 cloud services will generate revenues of US$ 55,500 million with growth rates close to 30% and a market share of approximately 12% (IDC 2010). In addition, cloud is expected to be the main driving force behind IT sector development and SMEs will be the strategic market. Moreover, it is forecasted that 13.8 million jobs will be created in the 2011-2015 period (IDC 2012).

North America is the largest opportunity for SaaS, as well as being the most mature of the regional markets (Gartner 2011). Furthermore, Gartner says that European cloud adoption will lag behind U.S. by at least two years. The main reasons for this statement are European privacy rules, multicountry business processes, a deep euro crisis and a lingering recession (Gartner 2012).

The economic impact in Europe and Spain during the 2010-2015 can be translated into: a total economic benefit of roughly €763 billion, the implementation of new business development opportunities for existing companies (€127,000 million), the emergence of new businesses, especially SMEs (€215,000 million), cost savings (€140,000 million) and the creation of 2.3 million jobs (CEBR 2010).

2 Cloud Computing in SMEs in Spain

Currently, Spanish SME competitiveness is achieved through enhancing key aspects such as marketing, internationalization, human resources recruitment, financial efficiency, level of technology implementation and so on. So cloud technology seems to be the right way to manage this improvement in competitiveness (ONTSI 2012).

For this reason, it is necessary to determine the situation of cloud in Spain. For that purpose, ONTSI has conducted a survey with a sample of 1500 microenterprises and SMEs. The main results are presented below:
• Characteristics of deployed cloud computing solutions
  – 9.8 % of SMEs deploy some kind of cloud solution and 21% of enterprises aware of the existence of cloud admit to using it. However, 54.9 % of enterprises admit having no knowledge about cloud computing.
  – The most common form of implementation is the private cloud with 59.9%. Secondly, the public cloud accounts for 33.8%. Thirdly, the hybrid cloud reaches 13.9%. Finally, the community cloud stands at only 1.7%.
  – The preferred service model is IaaS (76.1%) outdoing storage services at 68.5% followed by backup services with 22.4%. With regard to SaaS, over half of SMEs deploy it. Finally, PaaS is the least used with only 18.8%.
  – 47% of enterprises use the cloud services in a cross-cutting way, instead of deploying them for a particular area. 35% of SMEs have used cloud in sales and merchandising areas (e-commerce, websites, client management solutions, and so on). Whereas 18% use it for production and 12% for finance management.

• The significant benefits of using cloud services: time saving (71%), cost savings (63%) and the improvement of enterprise productivity (48%).

• The main concerns related to cloud use: data security and confidentiality (55%), the loss of control over the process (26%), acquired dependence on the service provider (21%), problems with regard to availability (18%), and the integrity of the contracted services (17%).

• The most important barriers when entering cloud computing: lack of knowledge concerning its benefits (63.1%), budget restrictions (30.5%), high costs with regard to recruitment (24.9%), difficulty of migration (18.2%), responsibility of the provider (17.8%), doubts about availability (14.2%), and dependence on the provider (4.3%).

This introduction to cloud technology occurs in different ways and depends largely on company size, for example 100 percent of large companies are forecast to adopt it by 2015 (CB consulting 2012). Moreover, the largest increase occurs in SMEs reaching 69% in 2015, up from 13.9% in 2011 (CB consulting 2011). All experts agree on the fact that SMEs will focus on the public model and the demand will be for SaaS applications (ONTSI 2012).

3 Design of a Decision Tool Based on Cloud Technology

It is clear that we can highlight that there is a huge lack of knowledge concerning what cloud computing is as well as its most significant benefits. In particular, 54.9% of microenterprises and SMEs confess to having no knowledge of cloud technology. This circumstance results in a loss of SME competitiveness, contrasted with the fact that this technology model is particularly beneficial for SMEs
(Nabil 2011, Kloch, Petersen & Madsen 2011). Furthermore, the lack of knowledge concerning its benefits (63.1%) is stressed as the greatest obstacle to entry into the cloud (ONTSI 2012). However, the largest increase concerning cloud adoption will happen in SMEs reaching 69% in 2015, up from 13.9% in 2011 (CB consulting 2012). For these reasons, a decision tool based on cloud technology has been designed. The main purpose of this tool is to provide the principal existing SaaS applications available on the market, which will help us in the management and enhancement of the most decisive areas within a company. Besides this tool, cloud knowledge in relation to SMEs can be complemented by other information sources specifically geared towards the business world (Marston et al. 2011, Hugos, Hulitzky 2010).

Turning to the question of methodology, it is clear that it is the section that describes the objectives of the experiment and the methods which are expected to achieve. Consequently, the methods of data collection should be described. In addition, materials, participants, duration of the investigation and the procedures for its implementation should be included.

The methodology used in the research summarized in the following flowchart:

Fig. 1 Methodology

Below we describe in more detail the elaboration phase of the decision tool itself, which can be divided into two distinct stages: the development of the decision tree and its implementation.

- Stage one: the elaboration of a decision tree (Quinlan 1986, SPRI 2010) which is a diagram that shows conditions and actions in a sequential fashion. Furthermore, this method allows us to show the relationship between each condition and the set of possible actions associated with it. Moreover, it provides a graphical view to aid the decision making process, indicates the variables that are assessed and what actions should be taken as well as the sequence in which decision-making must be executed. Additionally, decision tree is characterized by only one path that will be followed depending on the variable’s value. In this case, our decision tree is aimed at providing cloud solutions to develop major business strategies particularly for SMEs. To this end, the decision tree is made up of three levels. Firstly, the company type which refers to the num-
ber of employees and business sector, in addition to the identification of business priority areas which is composed of two different approaches. The former of which, business strategy, consists of the following aspects:

- Cost reduction and Time Saving with regard to the current process.
- Growth: New Clients and/or New markets
- Differentiation: Meeting Customers’ Needs And Developing new products and/or services

The latter, relationships, included among which:

- Clients: Better Client Management.
- Providers: Improve Provider Management.
- Other Agents: Government and/or banks and financial institutions.

Secondly, these actions must be carried out in order to improve the previous business priority areas. What is more, this stage contains the decision tree conditions which are constituted by three priority stages: high, medium and low preference. Finally, the cloud tools allow SMEs to execute the preceding actions by means of their implementation. As a consequence, the expected benefit is achieved. We would like to stress the fact that a key element of this decision tree was the creation of a collection of cloud tools which is known as documentary database and that consists of a set of 51 SaaS applications that were analyzed and classified (SaaSDirectory 2012). To this end, several cloud applications available in the SaaS market were examined. The result was a set of SaaS applications which are grouped into the subsequent sections: Online Billing, Online Accounting, Personal Management, Project Management, Backup and Storage, Document Management, Content Management System (CMS), Customer Relationship Management (CRM), e-commerce, eMailing Marketing, Social Networking Management, Feeds Management, e-learning, Event Organization, Collaborative Platforms, Web development, Video, Communication, Business Intelligence, Production Management, Warehouse Management, Diagrams, ERP, Quality Management, and Customer Service and Support.

- Stage two: the development of the decision tool using the decision tree. The decision tool was implemented by deploying LimeSurvey which is a free, open source online survey application written in PHP based on a MySQL, PostgreSQL or MSSQL database, distributed under the GNU General Public License. Designed for ease of use, it enables users to develop and publish surveys, and collect responses (Schmitz 2012). The surveys include branching (conditions), templates, token control and provide basic statistical analysis in order to process the results. The tool is structured as follows: initially, the size and sector of the company will be indicated. Then the company will have to
identify those areas which have high, medium or low priority in order to improve the company situation. In the next step, some recommended actions will be shown which will improve those areas that have been designated in the previous step. Finally, SaaS applications which allow the company to implement these actions will be suggested. The following images show the whole process graphically:

**Fig. 2** Company size and sector, and the identification of priority areas

**Proveedores: Mejora de la Gestión de Proveedores**

**Acciones Básicas**

- Recebir y Enviar Facturas de Clientes y Proveedores en Formato Digital
- Suscripción a las Redes Sociales
- Suscripción a los feed RSS de Competidores y Sitios Especializados del Sector
- Integra el Proceso de Compra con el de Contabilidad y el Pago de Facturas

**Fig. 3** Recommended actions to enhance priority areas
Fig. 4 The set of SaaS applications in order to implement the recommended actions

The resulting benefit of accomplishing this decision tool by SMEs relies on the fact that companies obtain as a result, a number of cloud solutions or tools that will enable them to improve their priority areas indicated in the initial phase. As a consequence, by means of this set of cloud solutions, which fit the needs of each company, SMEs can reduce costs, improve the management of their customers, suppliers, employees and other agents such as the Administration and banks. Besides being an aid for growth toward new markets as well as enhancing the task of creating new products or services. Note that on the final screen the fundamental features of each cloud tool is shown. In addition, if you click on any tool’s name, you may be directed to its provider web page.

4 Conclusions

In Spain the rapid expansion of cloud will occur in the near future. Furthermore, SMEs will be a strategic market for Cloud Service Providers. Although, it could be argued that this is now a reality, it is also a fact that a large number of SMEs are not yet aware of either the existence of cloud technology or its benefits for the business sector. Therefore, it is necessary to implement mechanism to overcome these problems which can be considered as impediments for cloud adoption. Consequently, a decision tool based on cloud computing has been created, the main objective of which is to show the different SaaS applications available on the market and how these applications can enhance and manage the business priority areas.

It is clear that SaaS applications are deployed in a cross-cutting manner in the whole company rather than in particular areas. Moreover, we can emphasize commercial and sales areas along with others such as productive aspects, finance management, quality, human resources and innovation.

On the other hand, the Spanish SaaS market is still in its infancy, particularly in comparison with American one. Furthermore, there is a reduced service catalog which is ill-adapted to solving specific business areas of the company. It is also a
fact that there are many bogus solutions within the cloud concept which create confusion in the market. It is important to remember that SaaS service offerings do not usually mention the migration process which they should be taken into account because of the difficulty. Thus it must be analyzed carefully.

We can conclude by saying that cloud computing is especially beneficial for startup companies, SMEs, entrepreneurs and companies that need to make new investments or do not have a stable infrastructure. For these companies this technology leads to a significant saving, in addition to increasing flexibility and competitiveness.

5 References