

NEW MANAGEMENT MODELS BASED IN CLOUD-COMPUTING

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Abstract. This paper aims to widen the current state-of-the-art techniques of New Management Models. In recent years, the appearance of new web 2.0 tools, the exponential increase in open-source, remote collaboration software solutions, and the new social and labour paradigms, make necessary a deep review of the traditional management models. It becomes necessary to move to a new management model based on innovation, the information and communication technologies, and the software that supports these activities. While the PC and its applications were conceived to increase the individual productivity, the services and applications based in cloud computing enhance teamwork and collaboration, since they are based on a shared platform. The cloud-computing reveals itself as a proper tool to bring enterprises closer to each other, facilitating the collaboration between them, especially when considering the Small and Medium Enterprises.

Keywords: knowledge management, cloud computing, management models, virtual platform, small and medium-sized businesses.

Jel classification: L23, O33, M15

1. Introduction

Cloud computing can be an essential tool for the creation, development and growth of small and medium enterprises. The main reason for this is based on the fact that cloud computing has changed the Information Technology Service Business. Cloud Computing is an IT deployment model, based on virtualization, where resources, in terms of infrastructure, applications and data are deployed via the internet as a distributed service by one or several service providers. These services are scalable on demand and can be priced on a pay-per-use basis. (Böhm *et al.* 2011) Consequently, companies only pay for the IT services they consume. For this reason among other advantages related to cloud computing, there has been a radical transformation in the business world.

The aim of this paper is show the effect of the Cloud Computing revolution in the management models. For that purpose, the evolution of business models would be summarized taking into account is how cloud computing can influence the business management systems. It can be approached to this

issue from two points of view. The former how cloud computing can update the already existing business management systems, and the latter one - how cloud computing can launch other management system such as IT Service Management.

Nowadays Small Medium Enterprises have to face a wide range of challenges such as globalization, competitiveness, adaptability, speed of change, growth, technology and so on. How to tackle these challenges successfully depends largely on the implementation of an effective management system that could exploit and develop the potential in a company. In general, the goal of business management systems is to promote growth and competitiveness of the company. However, the boundary conditions change with time and management systems remain unchanging or evolve more slowly and should therefore be updated to achieve their objectives.

There is no bibliographical consensus about the optimal business management model, however, if there is a consensus about the need to use information systems in the company and the use of

indicators. These indicators can be variables and include rankings according to the management model to be used.

Another meeting point among the different bibliographical contributions is the use of the management of processes whose improvement could bring about an improvement in the indicators and therefore growth in business activity. In order to pilot the improvement of these indicators it is necessary to implement an IT solution of which there are many in the market.

The evolution of the environment with new information and even new uses and/or work procedures revolutionizes the business indicators and makes their adoption necessary. This is the case of Web 2.0. The Internet has evolved from a simple information repository with a search system as an entrance point to a social network that relates people and companies and offers services pursuant to those relationships and makes them possible. In general, when we mention the term Web 2.0 we are referring to a series of applications and Internet pages that use collective intelligence to provide interactive services online, giving the user control of their data (Antonova *et al.* 2009).

Web 2.0 provides us with these functions and they are supported by services offered in a ubiquitous manner (independent of the physical location), consumable from any system or person in any place, referred to as the “Cloud” or “Cloud Computing”. The introduction of cloud computing will drastically reduce fixed production costs, changing them into variables and adapted to manufacturing needs. This act shall have a positive impact in competitiveness for all sectors where expenditures in information technology are crucial (Etro 2009).

2. Business management models and the need for indicators

Management system refers to what the organization does to manage its processes or activities, so that its products or services meet the objectives it has set itself, such as: satisfying the customer's quality requirements, complying with regulations, or meeting environmental objectives. Management system standards provide a model to follow in setting up and operating a management system. This section attempts to provide a general vision of the progress of these systems to date without attempting to be exhaustive, only looking at their common characteristics.

The ISO 9000 standards have potentially been one of the quality management systems that has come into being to the greatest extent within companies. This quality model is focused on control of

the product and management procedure value chain that support these processes and cause them to be improved. The Plan – Do – Check – Act (PDCA) cycle is the operating principle of ISO's management system standards. It shows the need for some elements that will help us to measure results obtained to be able to value the fidelity of the different processes. This need is increased with the transition from the UNE-EN-ISO 9001/2/3:1994 to the UNE-EN-ISO 9001:2000 standard which emphasizes deployment of objectives and indicators.

The total quality management models or models of excellence arise with the goal of obtaining a management system that assures management and results quality including having a quality assurance system available that assures product and service specified requirements but also includes customer satisfaction, management of all company processes and the optimization of resources. Such excellence in management should lead to some excellent results in the broadest sense of the term, including accounting for results.

There are models of excellence developed by diverse authors, applicable to different models and companies customized by the companies themselves. The most accepted models are:

- “Malcolm Balgrige” 1986. Based on the United States National Quality Award. The model emphasizes the approach of systems to reach alignment of goals. The criteria are linked by means of cause-effect relationships.

- “Deming Prize”. National Quality Award of Japan. These prizes are based on how the company manages all activities, research and development, design, purchasing, production, inspection, sales, etc., that are essential for adequate quality control for its products and services.

- “EFQM Model”. European Model for Quality Management. The EFQM Excellence Model is a non-normative model, whose basic concept is the self-assessment based on a detailed analysis of the performance management system to guide the organization using the criteria of the model, which aims to help organizations better acquainted themselves and, in consequence, to improve their performance.

The Balanced Scorecard (BSC) is considered to be one of the most important planning and management models in recent times. It was created by S. Kaplan and David P. Norton (2008). This model is based on the translation of strategy defined by the company, in related objectives, measured by the indicators that allow for creation of action plans that join together behavioural criteria with all members of the organization. The BSC has been recently qualified as one of the most important and influential business management ap-

proaches in the last 75 years and has been adopted by more than 50% of the largest North American companies, even exceeding the most optimistic predictions published by the Gartner Group in 1997 (Kaplan 2008).

A relevant concept within the BSC is the strategy map. We will refer to the strategy map as the group of strategic objectives that are connected by causal relationships. (Banker *et al.* 2011)

The Tableau de bord (scorecard) is the original measurement system. It is based on methodology enacted by Rockart about critical success factors. The main nexus of union between BSC and the scorecard or tableau de bord lies in measurement. (Bourguignon *et al.* 2004). The BSC's end objective is the correct implementation of strategy by means of a discipline of definition of objectives, effectively related and aligned based on it. The tableau de bord or scorecard will enter the scene below, meaning once those objectives or Critical Factors are defined, the following step is the determination of adequate indicators for correctly following the undertaking.

The Scorecard concept comes from the idea of configuring an information diagram whose objective and basic utility is to adequately diagnose a situation. It is defined as the complex of indicators whose periodic tracking shall allow for there to be greater knowledge of the situation of the company or industry.

In 1986 Motorola created a Six Sigma process as a goal to reach company goals in substantially improving quality in five years. Today it is used by leading worldwide companies to guide their initiatives for customer satisfaction, continuous improvement, and cost reduction. (Kwak, Anbari 2006). The Six Sigma methodology used currently has become a tool to improve results and incorporate many elements of the Total Quality strategies, in addition to the statistical base that it had in its beginnings. This would thereby constitute an extremely powerful management tool that allows companies to achieve considerable economic savings while simultaneously improving customer satisfaction, all in a short period of time. For this, management identifies those projects that have the greatest economic impact and assigns the best professionals after training them intensively to work in such projects.

The Reengineering of Processes and Total Quality Management constitute two different and complementary manners of management in an organization. Their paths cross at the beginning of the 1990s when Reengineering came up (Grover, Malhotra 1997, Davidavičienė 2008). Total quality already had a long way behind it given that it started to be conceived of as it is since the end of

the 1960s and start of the 1970s. Both methodologies have experienced unequal development in industrialized countries. While total quality management has been relatively uniform, making its way through Japan, the United States, and Europe, the same cannot be said about Reengineering of processes. We can find examples of its application in many very diverse fields such as university education or aeronautical industries (Rio-Belver *et al.* 2009; Rio-Belver, Contreras-Romeral 2009).

All management models analyzed have their common base in management of processes and the majority use information tools that allow them to measure their results. They are based on indicators that fuel the scorecard. For the most part the indicators are obtained by means of information technology use implemented in the company; therefore, to manage the processes effective information technology solutions are needed with functionalities that better express their competitiveness, are scalable, modular, and affordable for SMEs. These tools are experiencing a revolution with the application of web 2.0 and the cloud computing concept. This fundamental technological revolution will affect business management systems.

3. Business perspective of Cloud computing

The emergence of the phenomenon commonly known as cloud computing represents a fundamental change in the manner in which IT services are generated, developed, deployed, adapted, maintained, and compensated. In this type of computing – cloud computing – everything an IT system can offer as a service, in such a way that users can access the available services “in the Internet cloud” without knowledge (or at least without being an expert) in management of resources that they used. (Li *et al.* 2009; Luftman, Zadeh 2011).

Cloud computing is a general concept (Wang *et al.* 2008; Zhang *et al.* 2010b) that incorporates software as a service, such as Web 2.0 and other recent software, also known as technology trends, where its common point is the trust in the Internet to satisfy the needs of user computing. As examples of cloud computing Amazon EC2, Google Apps, eyeOS, and Microsoft Azure are noteworthy, providing common online business applications accessible from a web browser, while the software and data is stored on servers.

The following is the basic definition of Web 2.0. all those Internet utilities and services that are held in a database, which can be modified by service users, whether in their content (adding, changing, or deleting information or associating data with the existing information), whether in the

form of presenting it or in simultaneous content or form. (Shang *et al.* 2011). Web 2.0 technologies can increase organizational effectiveness, efficiency and usability for company knowledge management systems (Antonova *et al.* 2009)

The promoters of the approach to Web 2.0 believe that the use of the web is oriented to interaction and social networks, that it can serve content that takes advantage of the effects of networks, whether or not it creates interactive and visual websites. This means that Web 2.0 sites act more as meeting points, or websites that depend on their users, rather than traditional websites. The Web 2.0 infrastructure is very complex and evolving but it includes server software, content redistribution, message protocols, navigators based on standards, and various client applications.

The international market for this type of systems is growing tremendously, equal to the number of users of the so-called Web 2.0. In addition, there are more companies every day who gear themselves to this market as a differentiation strategy and a way to get new customers. This statement is founded on the fact that the Internet penetration figures in Europe provided by the Internet World Stats organization in March, 2011 is at 83.8% and at 31.8% penetration for the social network Facebook.

Social networking introduced novel collaboration paradigms between network users and serious study is conducted on the use of such platforms for internal business purposes. However, one of most prominent research challenges is how to use social networking for external communications, customer support and of course, targeted marketing.

EU social networks, accounting for more than 200 million registered users, are able to improve competitiveness of the European web industry by collaborating with established EU ICT industry and academia (European Commission 2008).

The companies look ever more to “the cloud” to follow social developments. It will be in the interest of business enterprises to deploy some of these paradigms (social networks, blogging, open source) within their environments and with business intentions (Grossman 2009; Li *et al.* 2011; Marston *et al.* 2011; Wen *et al.* 2010; Zhang *et al.* 2010a). The “cloud”, “cloud computing” is an attempt to standardize an already existing situation of interoperability among applications and distributed services (Low *et al.* 2011). It is currently getting a strong push and is highly supported since it provides the best services to support the business. The business can now stop trying to understand and worry about IT capabilities and concentrate on what they do best. The recognized advantages are:

- Simplified IT management process-
- Improved

end-user experience- Decreased IT performance Challenges- Reduced the cost of infrastructure- Alleviated internal resource pressures.

The primary beneficiaries of this system are the small medium enterprises, the Educations Institutions (Ercan 2010; Mircea, Andreescu 2010), organizations engaged in Scientific Research and of course large companies. The cloud alternative is excellent for educational institutions due to sharing of services, reducing the investment necessary in information technology and increasing collaboration between students and professors.

From a business standpoint this new cooperative, collaborative, and social work system with shared services will result in business management of the same manner, making it more shared and participatory, at the same time reducing information system costs. It will reduce the costs of resources and increase aspects of globalization. Citing some data (Mohammed *et al.* 2010), research conducted by Easynet Connect has shown that United Kingdom small medium enterprises are increasingly eager to adopt cloud computing, with 47% planning to do so within the next 5 years. Of those companies which indicated their preparedness to move to cloud computing, 35% of them cited cost savings as the key driver.

Similar results were obtained by the European Network and Information Security (ENISA), an European Union agency. The ENISA survey found that 68% of the SME responses it received indicated that avoiding capital expenditure in hardware, software, IT support and information security is behind their possible engagement in cloud computing while almost 64% of the responses also indicated that flexibility and scalability of IT sources was the reason (ENISA 2009).

Cloud is likely to be an attractive option for many small medium enterprises, particularly in the current global economic crisis, due to its flexible cost structure and scalability (Nabil 2011).

Cloud Computing can offer several advantages to SMEs. The main advantages can be divided into three types: strategic, technical and economic advantages.

Strategic advantages such as productivity improvement. Increasingly, there is a need of teamwork. All digitized service infrastructure must be accessible anytime, at any device, at any connection and from any place at a reasonable and affordable prize. In principle, it is what we expect from the internet, but in reality it sets a number of demands. These demands relate both to the physical infrastructure and to the various aspects of the usability of the provided services. Services must be available seamlessly at any device and anywhere (Kloch *et al.* 2011). This increases the

flexibility of the company and therefore the productivity of their employees. Another strategic benefit lies in Outsourcing IT service. The central motives for outsourcing decisions are still mainly economical benefits, in particular flexibility of costs and cost savings, technological advantages, innovation, strategic aims, and business-oriented advantages, such as an increasing service quality or an increasing flexibility of the business (Böhm *et al.* 2011). One of the most obvious strategic advantages is the development of new business ideas, products and services. SMEs can carry out new business ideas that would be impossible before because the fact that time and costs associated with software and hardware requirements were too high. However, nowadays IT service providers are who assume these kinds of costs. The barriers to entry for a particular market or market segment for a startup company have been dramatically reduced and cloud computing may have tipped the balance of strategic advantage away from the large established corporations towards much smaller or startup companies. A small, dedicated, and talented team of individuals can now pool their individual talents to address a perceived market need without an immediate need for venture capital funds to provide the necessary IT infrastructure (Talukder, Zimmerman 2010). Another strategic advantage lies in the fact that SMEs have other business investment opportunities. The cost savings which are generated by the adoption of cloud computing allow companies to focus on other tasks of their own business such as greater investment in innovation.

Technical advantages in comparison with traditional systems such as flexibility. Companies only use the IT services they need at every moment. SMEs don't have to worry about great costs in IT infrastructures and wasting time on their implementation. There is a better disaster resistance and resilience to failures. IT service providers have duplicate systems that reduce the likelihood of loss of information or service in the event of a disaster. This is a large benefit for SMEs, the majority of which are poorly prepared for hardware failures and disaster recovery. Cloud storage can reduce downside risks at low cost (Talukder, Zimmerman 2010).

Economic advantages, there is a cost reduction in purchasing new computer systems, maintenance and labour costs. While the proper design of cloud applications requires high-level software development skills, their maintenance and support is vastly simplified in the cloud environment. Cloud providers handle all maintenance and support issues for both hardware and platform software at costs that are either bundled

into the usage fees or available in various configurations as premium services. This allows significant cost savings through reduced staff overheads (Talukder, Zimmerman 2010). One of most significant technical benefits is energy saving. SMEs can dramatically reduce or eliminate local servers, cloud computing provides direct utility cost savings as well as environmental benefits (Talukder, Zimmerman 2010).

On the other hand, when SMEs adopt cloud computing solutions they should take into account the following issues.

Security and privacy. How to ensure security, how to make access control, the data backup process, what happens when there is a data loss, it is meeting the data protection law.

Availability. What happens when there is a loss of internet connection, when there is an interruption of service and the economic damage related to them, it would be possible to work without internet access.

Standardization. It would be possible a quick and easy change to another provider, how to carry out a data migration.

All these aspects are covered in service level agreement (SLA). In this regard, IT Service Management plays a very important role. IT Service Management (ITSM) is the set of processes that allow planning, organizing, directing and controlling the provisioning of IT services. Among the concerns of ITSM, namely within the service level management process, are the requirements for services availability, performance, accuracy, capacity and security, which are specified in terms of service level agreements (SLA) (Correia, Brito e Abreu 2010).

Nowadays, the implementation of ITSM systems is a key element in the IT service providers. The main goals of a good IT service management should be to provide adequate quality management, to increase efficiency, to align business processes and IT infrastructure, to reduce the risk associated with IT services and to generate value chain.

4. Conclusions

Through the most extensive bibliographical analysis of management systems and IT tools that support them, a series of conclusions is reached that shall be specified below:

The "bibliographical consensus" Optimal Management Model does not exist; moreover, in the bibliography there are defences of some and critiques of others but a model determined as complete and optimal by all authors does not exist.

There is a common theme throughout the bibliography used about the need for using information systems, indicators, for the company, structures of a different manner by the different methods analyzed.

To a great extent management through company processes is defended. In order to achieve compliance with the objectives set forth in the company, the processes corresponding to the company should be improved, an improvement that shall be clear with the measures reflected with the process indicators.

The generalization of Internet and web 2.0 provokes changes in the structure of small medium enterprises. The possibility of simple connection from anywhere will strengthen business globalization. The company shall reduce its resources and investments in information technology by sharing resources, therefore converting a part of the fixed costs in variables. This act will increase competitiveness of sectors in which IT expenses are crucial.

Branding 2.0 processing will be integrated in the product department, for which it will be necessary to establish active social networking policies for social networks and their relationship with the market.

The small and medium company will be smaller, it will have less resources and more technology available at its reach at a lower cost. The management of processes is reduced, increasing management of people.

These conclusions indicate to us that the business management models shall adapt the new company to its new indicators and the reduction of structure. Cloud computing is not a business management model in itself but in the future the term cloud management shall be introduced as a new management model for cloud companies.

The conclusions in regard to the greatest benefits of cloud computing for SMEs rely on the fact that IT service reduces costs and increases the flexibility to extend or decrease IT resources. As a result, SMEs are better suited to changing market needs. Cloud computing allows SMEs the implementation of new innovative ideas without investing a large amount of resources. However, to manage these competitive advantages, SMEs have to take into account the impact of this implementation, the best way to manage a successfully change to cloud computing without risks and taking advantages of its potential, it is establishing the most suited service level agreement (SLA) for the company. SLA should be developed jointly by the company and service IT provider. Consequently, it is also a fact that IT Service Management is the

main tool to achieve the most efficient service level agreement for a company.

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