International Journal of Information Management 33 (2013) 160–165

Contents lists available at SciVerse ScienceDirect

International Journal of Information Management

journal homepage: www.elsevier.com/locate/ijinfomgt

Knowledge management in the age of cloud computing and Web 2.0: Experiencing the power of disruptive innovations

Nabil Sultan*

University Campus Suffolk, School of Business, Leadership and Enterprise, Waterfront Building, Ipswich IP4 1QJ, United Kingdom

ARTICLE INFO

Article history:
Available online 26 September 2012

Keywords:
Knowledge management (KM)
Online social networking
Web 2.0
Cloud computing, Disruptive innovation

ABSTRACT

Organizations, of all types, live in an increasingly dynamic world. Much of this dynamism is generated by developments or innovations in technology, especially information and communication technology (ICT). Some organizations take advantage of this dynamism and create new products and business models and thrive. Others ignore it or take a long time trying to adapt to it and struggle, often with negative consequences. Some of these innovations, to use the terminology of Christensen, are of a "disruptive" nature such as the telephone, the Web and recently cloud computing. This paper explores the innovation phenomenon of cloud computing and Web 2.0 and specifically examines their impact on organizational knowledge.

1. Introduction

Making the most from their knowledge has always been organizations' Holy Grail. Some of these organizations design their methods to achieve this objective and others resort to experts who possess the tools (often technological) in order to take advantage of technological advances in Information Technology (IT). The latter option often commands a great deal of commitment and tends to be employed by large organizations that have the economic means to cope with its resource implications. Hence, many of the current enterprise KM systems (KMS) were often developed for large organizations that can afford to buy them and cope with their maintenance and operations. The amount of effort required for performing activities core to KMS, such as designing taxonomies, classifying information, and monitoring functionality, according to Nunes, Annansingh, Eaglestone, and Wakefield (2006) is often disproportionate to the resource capacity of most small to medium enterprises (SMEs). Moreover, typical KMS place emphasis on predetermined workflows and rigid "information-push" approaches (Malhotra, 2005) that reflect the philosophy behind working practices in large enterprises. In contrast, SMEs rely mostly on informal person-to-person communications and people-centric operations for KM (Desouza & Awazu, 2006) that often take place in largely ad-hoc and non-standardised ways (Nunes et al., 2006).

This view is further echoed by Reichental (2011) who also adds a behavioural dimension to the challenges of enterprise KMS. He argues that it is remarkably difficult to organize information in the right manner, make it searchable, and then present it so that the most relevant responses are placed at the top of the search results (as is the case with public search engines). Internal systems, according to this author, have no such equivalent and organizational information is hardly the example of pristine structure. While unstructured content is the king of the public Web, it is often the bane of the enterprise. Such systems can also be inflexible to meet the fluctuating needs of corporate end users and executives (Kaplan, 2010).

The situation is also compounded when employees are disillusioned by the effectiveness and effort required to use KMS and may resort to old habits such as asking colleagues or improvising in the absence of guidance (thus repeating mistakes or missing best practices). In such situations, the system often fails to be adopted – or at best is used by a small proportion of the organization – and no amount of resuscitation will then be enough to bring it back to life (Reichental, 2011). This view is further shared by Kaplan (2010) who also adds that many organizations were realizing that their employees were either not prepared to share information in order to protect their jobs or too busy to funnel information into such systems.

2. The era of utility ICT

Since cloud computing emerged in 2007 it attracted a great deal of attention from many quarters (e.g., authors, consultants, technology analysts, companies). The more interest it attracted the more attempts were made to define it. At one point, a study by McKinsey (the global management consulting firm) found that there were 22 possible separate definitions of cloud computing. In fact,

* Tel.: +44 7810377005.
E-mail address: nabil.sultan@yahoo.co.uk

0268-4012/$ – see front matter © 2012 Elsevier Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.ijinfomgt.2012.08.006

no common standard or definition for cloud computing seems to exist (Grossman, 2009; Voas & Zhang, 2009).

2.1. Definition

However, a comprehensive and jargon-free definition of cloud computing was attempted by Sultan and Sultan (2012). According to these authors, cloud computing is a modality, that uses advances in ICTs such as virtualization and grid computing for delivering a range of ICT services through software, and virtual hardware (as opposed to physical) provisioned (by data centres owned and operated by cloud providers and/or end users) according to user demands and requirements and delivered remotely through public (e.g., Internet), private networks or a mix (i.e., hybrid) of the two delivery modes. The provided ICT services include:

- business-related computer programs (software as a service – SaaS);
- fast and almost unlimited processing capabilities and large and almost unlimited storage facilities (infrastructure as a service – IaaS);
- development tools and hosting options for clients preferring to create and manage their own Web applications (platform as a service – PaaS).

Cloud computing services can be provided by cloud vendors through their data centres (public clouds) and end users (i.e., client organizations) using cloud software installed on their own data centres (private clouds) or installed on their own and other cloud vendors' data centres (hybrid clouds). The authors also draw attention to "community" clouds (often touted as another possible addition to the other three modalities). These types of cloud can be provided (often by one organization) and consumed by groups of organizations in businesses or professions similar to that of the providing organization. However, according to these authors, there are little examples to demonstrate the viability of this approach (Sultan & Sultan, 2012).

2.2. Advantages

When it first emerged in 2007, cloud computing received a mixed reaction. While some analysts saw merits in its application, others (including highly respected IT individuals) such as Richard Stallman, creator of the GNU operating system and founder of the Free Software Foundation and Larry Ellison, founder of Oracle, regarded it as a useless business model (Hasson, 2008; Johnson, 2008). But cloud computing continued to attract many followers and increasing numbers of ICT companies embraced it and began to offer many of their services in the cloud.

Having passed the fad stage, few people now doubt the economic attractions of this new computing service paradigm. Cloud computing delivers a variety of essential software and hardware services (e.g., applications, storage, processing power, virtual servers) over the medium of the Web (i.e., the cloud) on a pay-as-you-go price structure, thus offering scalability and obviating the need to make large investments in expensive hardware and software licenses and offering organizations significant cost advantages (Leavitt, 2009; Lin, Fu, Zhu, & Dasmalchi, 2009). Continuous upgrades of software and hardware have become common (and expensive) practices in many organizations. This situation is likely to be made worse in the current economic climate following the near collapse of the world's financial systems. Cloud computing can provide many of those organizations with the opportunity to continue to take advantage of new developments in IT technologies at affordable costs.

While cloud computing seems to make economic sense, some people think this can only be achieved in the long run. Reflecting on his company's successful implementation of a SaaS solution, Doug Menafee, CTO of the Schumacher Group, a leading US emergency and hospital medicine management company, admitted that a cloud solution could be more expensive to run in the short term due to the heavy connectivity demands that require the installation of expensive high speed cables such as fiber optics. He explained that it takes a three year ROI (return on investment) period to break even and over five years to realize the economic benefits (Brooks, 2010).

2.3. Cloudy issues

Despite, the economic and flexibility attractions of cloud computing there are still many issues that it needs to overcome: security, vendor-lock and outages are the most problematic (Sultan & Sultan, 2012). Security is no doubt one of the main concerns for organizations contemplating the adoption of this ICT service modality. A survey of 244 chief information officers and IT executives conducted in 2008 by IDC (International Data Corporation), the market research firm, revealed that 75% of the respondents rated security as their main cloud computing concern while performance and availability were the next two concerns for 63% of the respondents (Cisco, 2009). Moreover, various governments, such as those in the European Union (EU), have privacy regulations that prohibit the transmission of some types of personal data outside the EU. This issue, however, is no longer a problem as many cloud vendors now (such as Amazon, Microsoft and others) were able to establish some of their cloud data centres in various locations across the EU region and elsewhere in the world and can offer their cloud clients the option of where they want their data to be stored.

Organizations are likely to adopt a careful approach to cloud computing. Another survey by EDUCAUSE, US-based non-profit organization that promotes the intelligent use of information technology in higher education, involving 372 of its member institutions revealed that a great proportion of the respondents with use cases that involved cloud-based services reported that data privacy and data security risks were among their top barriers to overcome (Goldstein, 2009).

Another concern is vendor-lock and outages. Currently, many cloud providers offer their services through proprietary Application Programming Interfaces (APIs). This means that organizations that sign up for the services of cloud providers will find it difficult to change cloud providers in the same as way as, for example, changing an electricity supplier.

Furthermore, failure of a cloud provider that hosts client data in its data centres can have serious repercussions for those clients who trusted their data with that provider. This issue could force potential cloud users to go for well-established and large companies that are more likely to be around for many years to come (e.g., Microsoft, Amazon, Google, IBM, Salesforce.com).

Lastly, reliability can also be a serious problem for cloud users. Many of the big cloud providers such as Salesforce.com, Amazon, Google and Microsoft saw their systems afflicted with outages which affected large scores of their customers (Clarke, 2011; Leavitt, 2009; Naughton, 2009). One of the latest such events occurred in April 2011 when Amazon's EC2 (Elastic Compute) cloud service experienced an outage when its northern Virginia data centre site was affected. Amazon attributed the incidents to a networking glitch that caused many of its storage volumes (used to store data when an EC2 instance is created) to create new backups of themselves, thus filling up Amazon's available storage capacity and kicking off a series of connectivity problems that affected many of the cloud provider's customers (Pepitone, 2011). For more stories of similar outages see Raphael (2011). Outages are not

limited to cloud computing platforms. Some of the online social networking sites (especially Facebook) had their fair share of this problem (Johnson, 2010). The latest outage to afflict Facebook was in February 2012, one day after its filing for IPO (initial public offering) (Brown, 2012).

2.4. Addressing the cloudy issues

The aforementioned concerns are genuine and real. However, there are efforts to address some of those problems emanating from different quarters. Portability is likely to be increasingly important as the number of cloud providers increase. One of the solutions to this problem would be to base the APIs of cloud solutions on open source message communication standards such as SOAP (Simple Object Access Protocol) or REST(Representational State Transfer). In some situations this is already happening. For example, cloud solutions such as Amazon Web Services and Microsoft's Azure can now be accessed through the SOAP and REST protocols. The need for inter-cloud interoperability was highlighted by Vint Cerf, a co-designer of the Internet's TCP/IP, who likened the current lack of cloud communication standards to that of computer networks in the early 1970s (Krill, 2010). Moreover, there are also efforts by some organizations such as the Cloud Computing Interoperability Forum intended to address this issue (Grossman, 2009). IEEE, the Open Data Center Alliance (ODCA) and the distributed management task force (DMTF), the latter two working in partnership. The issue of security is, nevertheless, a controversial one. Many analysts believe that security is likely to be more robust in a cloud environment, given the massive resources of cloud providers, than one maintained in-house (Ashford, 2009; Financial Times, 2009; Linthicum, 2009). Nevertheless, many cloud providers are now offering hybrid solutions where clients are given some level of control over the security of their data (Taneja Group, 2011).

3. The disruptive powers of Web 2.0 and cloud computing

New technologies, especially those of a radical nature, are often looked upon, initially, with cynicism or dismissed as useless inventions. William Orton, the President of Western Union (once a major US communications company specializing in telegraphy), described Alexander Graham Bell's telephone invention as "an electric toy" when his company declined to buy the inventor's patent for US$ 100,000. The telephone eventually killed telegraphy and led to the demise of Western Union. Only a few years ago online social networking was regarded as a diversion for young adults and is now part of retail companies' strategies and a critical component of organizations' larger marketing efforts. The same situation applied to bloggers who were once derided as inconsequential and marginal but now command the respect reserved for editors (Russell Reynolds Associates, 2011). Online social networking was further catapulted into mass fame in 2011 following the Arab uprisings in the Spring of that year which resulted in the fall of a few dictatorial regimes and demonstrated very clearly the power of shared knowledge and collective action. Shirky (2008) was prophetic when he commented on the power of collective behaviour that can emanate from using online social networking:

> "Our electronic networks are enabling novel forms of collective actions, enabling the creation of collaborative groups that are larger and more distributed than at any other time in history. The scope of work that can be done by noninstitutional groups is a profound challenge to the status quo."

What is interesting is that cloud computing and online social networking are now emerging as useful tools for assisting organizations' KM efforts and for addressing the traditional problems that often dogged such efforts in the past. Previous efforts of organizations in addressing issues relating to KM were often hampered by technological, organizational and financial and behavioural obstacles. Traditional in-house content management and database access products were often too difficult and complicated to deploy and administer and too inflexible to meet the fluctuating needs of corporate end-users and executives. These technological challenges translated into significant planning, design, implementation and operational costs which created financial hurdles that were too high and derailed many KM projects. Most importantly, many organizations found that their employees were not prepared or willing to share information that they considered essential for protecting their jobs or too time-consuming to funnel into a corporate database. This behavioural (or cultural) problem was often too much to overcome (Kaplan, 2010). As well as reducing the technical challenges of KM by eliminating many of the system requirements, cloud computing is also offering organizations more scalable and secure solutions packaged in a more elastic and economical form.

While cloud computing can take care of the technical and financial constraints of KM, online social networking is emerging as a powerful tool for addressing its behavioural problems. Research suggests that working people are more likely to seek work-related advice from fellow workers than from a knowledge-base system. In a study conducted by Tom Allen of Massachusetts Institute of Technology (MIT), it was found that engineers and scientists were roughly five times more likely to turn to a person for information than to an impersonal source such as a database or a filing cabinet (Cross, Parker, Prusak, & Borgatti, 2001). In a study involving 40 managers, Cross et al. (2001) asked those professionals to reflect on a recent project that was important to their careers and to indicate where they obtained information critical to the project's success. The study revealed that those managers overwhelmingly received this information from other people far more frequently than from impersonal sources such as their personal computer archives, the Internet or the organization's KM database.

O'Dell and Hubert (2011) argue that online social networking tools are reinvigorating KM by making it easier for employees to participate in knowledge creation and that, by borrowing ideas from Facebook, organizations have been able to help employees connect across disparate regions. And since a majority of employees are already familiar with the features of such tools and have seen their value, according to these authors, organizations – and KM programs – would benefit from taking advantage of this situation.

The concept of disruptive innovations was first raised by Christensen and his colleagues and developed into a theory known as the "theory of disruptive innovation" (Christensen, 1997; Christensen & Raynor, 2003; Christensen, Anthony, & Roth, 2004). According to this theory, there are mainly two types of disruptive innovations: new market and low-end disruptions. New market disruption occurs when an innovative product attracts customers who were prevented from acquiring similar products due to cost and/or complexity issues. Examples of such innovative products include Sony's first battery-powered transistor pocket radio, Canon's desk photocopier, etc. Low end disruption affects the low end of the original business or mainstream value network by attracting customers who are served by this level of the business. One example of this type of disruption was the Korean automakers' entry into the US market. The Korean automakers did not create a new market; they simply attracted the "least attractive" customers of the targeted businesses.

A hybrid of the two types of disruption can also be found. The American low cost Southwest Airlines is one example of a hybrid disruption. It initially targeted people who were not flying (those who used cars or buses) but later pulled customers out of the low end of the major airlines' value network as well. In addition to the simplicity and the affordability they bring, disruptive innovations,

according to this theory, occur less frequently and tend, initially, to have performance problems.

From this brief description, it is evident that cloud computing has many of the attributes of a disruptive innovation (Sultan & Sultan, 2012). For example, it has the potential to destabilize existing ICT markets (e.g., those that rely on providing traditional on-premises ICT solutions) and create other business opportunities that did not exist before (e.g., consuming ICT, both as software and hardware) when needed, according to demand and with less requirements for infrastructural expenses (e.g., hardware, staff). Disruptive innovations that create new markets, according to this theory, can occur when characteristics of existing products and services (e.g., size, price, complexity) limit the number of potential consumers or force consumption to take place in inconvenient or centralized settings. Bell's telephone, Sony's transistor radios, Apple's personal computers and eBay (among others) are examples of new-market disruptive innovations. They were able to create growth by making it easier for people to do something that historically required a great deal of expertise or great wealth.

The penetration of cloud computing and online social networking into the KM market lends support to this theory. Current evidence suggests that many ICT providers see great growth potential in creating commercial opportunities by targeting the KM market with solutions based on a metered use of ICT and Web 2.0 technologies which historically required a great deal of expertise and was often the reserve of resourceful organizations or individuals.

The theory also suggests that disruptive innovations often tend to initially have performance problems. The aforementioned concerns of cloud computing and the loss of service experienced by some of the main online social networking sites are clear examples of the initial performance issues that often characterize disruptive innovations.

4. KMS in the new cloud and Web 2.0 environment

Given the compelling economic attractions of this computing service modality, many organizations are likely to embrace it despite its current problems. Gartner (the global IT research and advisory company) anticipates a massive cloud computing explosion, fuelled largely by the economic turmoil of the last few years. In a recently published report, Gartner expects the global cloud services revenue to reach nearly US$150 billion by 2014. This level of spending, according to Gartner's Vice President, Ben Pring, is directly related to increased economic pressures which made organizations scrutinize every expenditure (Hickey, 2010).

SMEs are likely to be among the main beneficiaries of this computing service due to their limited resources which constrain their ability to make large ICT investments (Sultan, 2010a, 2010b, 2010c, 2010d; Sultan, 2011). Given the resources issues of KMS, cloud-based KMS could present SMEs with an opportunity to take advantage of a domain traditionally reserved for large and resourceful organizations.

Furthermore, the increasing popularity of online social networking and its emergent reputation as a valuable knowledge-sharing tool has further increased the affordable options to many organizations, particularly SMEs, for their KM needs. Indeed, many of the newly emerging KM products seem to offer cloud and social networking functionality.

Cloud vendors with a well-established record in this market seem to be capitalizing on this KM trend. Google has recently named one of its internal groups "the knowledge group", known previously as the search group (Arrington, 2011), mostly likely in recognition of the importance of the issue of knowledge for the future of search engines. Saleforce.com, a pioneer in cloud-based Customer Relationship Management (CRM) systems, Microsoft and IBM have all introduced KM solutions based on cloud computing and Web 2.0 technologies. In this article, two KM enterprise solutions: one from Microsoft, called SharePoint", and one from Salescorce.com, called "Service Cloud", will be introduced.

4.1. Microsoft

Microsoft is emerging as one of the leading providers of KM tools. The SharePoint platform (in version 10 when this article was written) is no doubt its flagship enterprise technology in this regard. Providing this platform on a cloud basis with the release in 2011 of Office 365 (Microsoft's new productivity suite) is likely to increase its attraction further. This cloud-based software, renamed SharePoint Online, allows users to create and publish websites without any programming involved, just by selecting or modifying components such as themes, templates, Web parts (widgets), and data structure elements available within this platform. With little effort and technology expertise, site administrators can create sophisticated structures such as blogs, wikis, newsfeeds, discussion boards, surveys, and email distribution lists that are commonly found in the best Web-based communities and portals. If more sophistication is required development tools such as SharePoint Designer and/or Visual Studio can be used.

SharePoint Online provides end users with the opportunity to take an active role in providing content. Some of its features look similar to online social networking sites, but applied in a business setting. For example, the Suggest Friends feature in Facebook has an analogue in SharePoint Online. The tool comes with an automated colleague suggestion service that bases its suggestions on users' reporting structures, memberships in SharePoint Online communities, e-mail lists and contacts.

As is customary with Microsoft, many of its products tend to integrate well with each other. The case of SharePoint is no exception. It is designed to have extensive integration with its cloud-based Office suite as well as the traditional, locally installed version. For example, you can easily create Office documents and save them directly to SharePoint Online. Furthermore, like many other enterprise KMS, it also enables users to create and deploy corporate taxonomies through its Taxonomy Manager (Kroenke & Nilson, 2011; Rehmani, 2011).

4.2. Saleforce.com

Service Cloud is Salesforce.com's enterprise KMS. The new release of this platform (Service Cloud 3) was unveiled in March 2011. It is designed to enable companies to monitor blogs, forums and online social networks and capture conversations about their brands through Radian6 technologies. Radian6 is a company, bought by Salesforce.com in 2011, that uses tools for social media listening, tracking and monitoring. It was bought by Salesforce.com in 2011. While the previous version allowed users to answer questions on a company's Facebook page, Service Cloud 3 provides a deeper integration with the online social network by enabling users to convert Facebook wall posts and comments into cases within the platform and have someone respond to them. That way, you can service those customers with the same processes that you would use for more traditional channels. Salesforce.com has also added the same functionality for Twitter and allows users to create cases and share knowledge from Tweets and conversations. This was demonstrated by KLM (the Dutch Airline) in 2010 when its customers were stranded at Schiphol airport due to the volcanic ash that came from Iceland and clogged all traditional channels of communication, e.g., phone, KLM, which uses both the Service Cloud and Salesforce.com's Radian6 technology (as part of its service strategy) turned to Twitter to connect with customers, and earned

major kudos for doing so, thus demonstrating to the world how social media really changed the game for customer service (Honig, 2011). And a new Radian6 application will enable users to work entirely within Service Cloud 3 but still engage with customers via Twitter, Facebook and other online social channels including blogs, video and photo sharing sites. Leveraging its built-in social analytics, the product allows company staff to prioritize interactions across any channel and tailor support strategies to meet changing sentiments on the social Web. Companies will also be able to scale their operations in order to manage high volumes of service issues, including the millions of conversations that are happening every day on online social media sites (PR Newswire, 2011; Rao, 2011). Salesforce.com also has "Chatter", a cloud-based and Facebook-like platform that allows companies to embed "private" and "protected" social networking capability into their collaboration systems.

4.3. A new KM world order?

Other cloud vendors will no doubt take advantage of this new commercial opportunity and it will not be long before we see many cloud-based KM solutions that make Web 2.0 technologies an integral component of those solutions.

Even governments are waking up to the opportunities of Web 2.0 technologies and cloud computing. A US Federal Knowledge Management Group tasked with researching the implications of using Web 2.0 technologies commented in its report and recommendation (Schroeder, Joubert, Meyer, Steinhauser, & Walker, 2009):

> "One of the greatest benefits of Web 2.0 and social software comes from their routine application and use in government business and operations. While targeted approaches utilizing these tools for public relations and outreach are valuable, the tools themselves are a valuable asset to information and knowledge management efforts within organizations. . .
>
> Tools which enable the development and maintenance of social networks among employees help not only to catalog and identify expertise, but can also enable the transfer and capture of critical information and knowledge. . .Such tools can interoperate with one another, acting as a seamless layer of information and knowledge management, which transcends the inherent limits of traditional organizational structure."

The European Union's Pedagogically sustained Adaptive Learning Through the Exploitation of Tacit and Explicit knowledge (PALETTE) spawned initially the eLogbook initiative, a free Web-based collaborative solution. The project was co-funded by the European Commission within the Sixth Framework Programme and developed by the Swiss Federal Institute of Technology in Lausanne (EPFL). The purpose of eLogbook was to support tacit and explicit knowledge management in communities of practice (CoPs) (El Helou, Gillet, Salzmann, & Rekik, 2008).

In a recent discussion by this author with a member of the EPFL team she indicated that a new version of this collaborative solution, now called "Graasp", is already operational (see: graasp.epfl.ch). When asked about the potential users of such solution she listed a number of possibilities:

- At the workplace for project teams to define milestones, organize and share information.
- In the context of a formal course for posting shared material and discussions.
- A reading club for posting links to interesting books, etc.
- A research team using it to share interesting resources.

The increasing popularity of the CoP approach is beginning to attract the attention of many analysts. O'Dell and Hubert (2011) argue that it is KM's killer application as they addresses the *raison d'être* of KM, which is: "connecting employees to get answers at a teachable moment, collecting content important to a community of employees, retaining content when employees leave the community, and keeping content fresh by capturing ongoing dialogue". They list three US companies (ConocoPhillips, Fluor and Schlumberger) as being leaders in developing successful CoP solutions.

In the World Economic Forum held in Davos, Switzerland in January 2012, Neelie Kroes Vice-President of the European Commission responsible for the Digital Agenda announced the setting up of the European Cloud Partnership. Although the tone of the speech was more in favour of efficiency and economics, it nevertheless highlighted the increasing importance of cloud computing in the political agenda (Europa, 2012):

> "Cloud Computing will change our economy. It can bring significant productivity benefits to all, right through to the smallest companies, and also to individuals. It promises scalable, secure services for greater efficiency, greater flexibility, and lower cost. . .
>
> (S)tandards, certification, data protection, interoperability, lock-in, legal certainty and others – are particularly troublesome for smaller companies. They are the ones who stand to benefit the most from the Cloud – but who don't have a lot of spending power, nor resources for individual negotiations with Cloud suppliers."

5. The people dimension

No KMS, no matter how sophisticated, is likely to succeed without the enthusiasm, input and participation of people. Facebook, Twitter, Wikipedia and other online social networking and knowledge tools succeeded because people liked them and saw value, fun and personal satisfaction in them. However, organizations that contemplate the adoption of such tools should be made aware of important facts. For example, a large proportion of the content created on online social networking sites is the contribution of a small proportion of the people who use those tools. On Facebook, for example, 80% of the content is posted by 20% of users and only one in five Twitter account holders have ever posted anything and 90% of content is posted by 10% of the users (O'Dell & Hubert, 2011). To maximize the value of these social tools such organizations will need to encourage as many of their staff as possible to engage and contribute to content creation. They will need to employ change management methods to achieve this objective. Furthermore, senior managers will need to demonstrate their desire to learn and position themselves as an example to other subordinates and also to signal their desire for cultivating a knowledge-sharing culture (O'Dell & Hubert, 2011).

6. Conclusion

KM is entering an era where ordinary people and employees are expected to make significant contribution to knowledge creation and management, helped by a new KM thinking and a breed of new tools and KMS based on two disruptive innovations: Web 2.0 and/or cloud computing. Past KM technologies and approaches often proved to be expensive to implement and difficult to use. The new approach is expected to herald a new age of knowledge-rich and knowledge-savvy world. Most interestingly, this new KM world order is unlikely to be the reserve of resourceful organizations, as was the case in the past. Organizations with limited means, such as SMEs and CoPs, will also play an important role in the new

KM era, thanks to the aforementioned innovations and a cultural change in KM's landscape.

References

Arrington, M. (2011). *Google dissolves search group internally, now called "knowledge"*. Available from: http://techcrunch.com/2011/05/03/google-dissolves-search-group-internally-now-called-knowledge/. Accessed 02.02.12.

Ashford, W. (2009). Cloud computing more secure than traditional IT, says Google. *Computer Weekly*. Available from: http://www.computerweekly.com/Articles/2009/07/21/236982/cloud-computing-more-secure-than-traditional-it-says.htm. Accessed 10.03.12.

Brooks, C. (2010). Medical management firm turns to cloud computing. *Search cloud computing*. Available from: http://searchcloudcomputing.techtarget.com/news/1508378/Medical-management-firm-turns-to-cloud-computing. Accessed 07.02.12.

Brown, B. (2012). *Facebook ripe for ridicule as it suffers outage a day after IPO filing*. Available from: http://www.networkworld.com/news/2012/020212-facebook-outage-255672.html. Accessed 02.04.12.

Christensen, C. M. (1997). *The innovators dilemma: When new technologies cause great firms to fail*. Boston, MA: Harvard Business School Press.

Christensen, C. M., Anthony, S. D., & Roth, E. A. (2004). *Seeing what's next: Using theories of innovation to predict industry change*. Boston, MA: Harvard Business School Press.

Christensen, C. M., & Raynor, M. E. (2003). *The innovator's solution: creating and sustaining successful growth*. Boston, MA: Harvard Business School Press.

Cisco. (2009). The Cisco powered network cloud: An exciting managed services opportunity. *White paper*. Available from: http://www.cisco.com/en/US/solutions/collateral/ns341/ns525/ns537/white_paper_c11-532553.html. Accessed 05.01.12.

Clarke, G. (2011). *Microsoft 'sorry' as Hotmail bug hits 17,000: Load balancing without a safety net*. Available from: http://www.theregister.co.uk/2011/01/04/microsoft_apologizes_empty_hotmail/. Accessed 05.01.12.

Cross, R., Parker, R., Prusak, L., & Borgatti, S. P. (2001). Knowing what we know: Supporting knowledge creation and sharing in social networks. *Organizational Dynamics*, *30*(2), 100–120.

Desouza, K. C., & Awazu, Y. (2006). Knowledge management at SMEs: Five peculiarities. *Journal of Knowledge Management*, *10*(1), 32–43.

El Helou, S., Gillet, D., Salzmann, C., & Rekik, Y. (2008). Feed-oriented awareness services for e-logbook mobile users. *International Journal of Mobile Learning and Organisation*, *2*(4), 305–317.

Europa. (2012). Neelie Kroes Vice-President of the European Commission responsible for the Digital Agenda Setting up the European Cloud Partnership. *World Economic Forum*. Davos, Switzerland, 26th January, 2012. Available from: http://europa.eu/rapid/pressReleasesAction.do?reference=SPEECH/12/38. Accessed 02.02.12.

Financial Times. (2009). Getting to grips with the cloud. *Financial Times*. Available from: http://podcast.ft.com/index.php?sid=21&pid=621. Accessed 03.04.11.

Goldstein, P. (2009). Alternative IT sourcing strategies: From the campus to the cloud. *EDUCAUSE Center for Applied Research*. Available at: http://net.educause.edu/ir/library/pdf/EKF/EKF0905.pdf. Accessed 02.02.11.

Grossman, R. (2009). The case for cloud computing. *IT Professional*, *11*(2), 23–27.

Hasson, J. (2008). Cloud computing is for the birds. *FierceCIO*. Available from: http://www.fiercecio.com/story/cloud-computing-birds/2008-10-11

Hickey, A. (2010). *Cloud computing, SaaS boom fueled by recession*. Available from: http://www.crn.com/software/225701016;jsessionid=RYE3URCMO12QVQE1GHPSKH4ATMY32JVN?queryText=boom. Accessed 03.02.11.

Honig, A. (2011). *Mastering social customer service with salesforce service cloud*. Available from: http://blogs.innoveer.com/2011/07/27/mastering-social-customer-service-with-salesforce-service-cloud/. Accessed 12.02.12.

Johnson, B. (2008). *Cloud computing is a trap, warns GNU founder Richard Stallman. The Guardian*. Available from: http://www.guardian.co.uk/technology/2008/sep/29/cloud.computing.richard.stallman. Accessed 02.05.11.

Johnson, R. (2010). *More details on today's outage*. Available from: http://www.facebook.com/note.php?note_id=431441338919. Accessed 02.02.12.

Kaplan, J. M. (2010). The cloud's answer to the knowledge management challenge. *E-Commerce Times*. Available from: http://www.ecommercetimes.com/story/The-Clouds-Answer-to-the-Knowledge-Management-Challenge-70363.html?wlc=1278951103. Accessed 04.02.12.

Krill, P. (2010). Cerf urges standards for cloud computing. *Info World*. Available from: http://www.infoworld.com/d/cloud-computing/cerf-urges-standards-cloud-computing-817. Accessed 15.02.12.

Kroenke, D., & Nilson, D. (2011). *Microsoft Office 365 in Business*. Indiana: Wiley.

Leavitt, N. (2009). Is cloud computing really ready for prime time? *Computer*, *42*(1), 15–20.

Lin, G., Fu, D., Zhu, J., & Dasmalchi, G. (2009). Cloud computing: IT as a service. *IT Professional*, *11*(2), 10–13.

Linthicum, D. (2009). Should failures cast shadows on cloud computing? *Intelligent Enterprise*. Available from: http://intelligent-enterprise.informationweek.com/blog/archives/2009/09/should_failures.html. Accessed 14.02.12.

Malhotra, Y. (2005). Integrating knowledge management technologies in organizational business processes: Getting real time enterprises to deliver real business performance. *Journal of Knowledge Management*, *9*(1), 7–28.

Naughton, J. (2009). There's silver lining to Google's cloud computing glitch. *The observer*. Available from: http://www.guardian.co.uk/technology/2009/mar/01/gmail-outage-cloud-computing. Accessed 02.06.11.

Nunes, M. B., Annansingh, F., Eaglestone, B., & Wakefield, R. (2006). Knowledge management issues in knowledge-intensive SMEs. *Journal of Documentation*, *62*(1), 101–119.

O'Dell, C., & Hubert, C. (2011). *The new edge in knowledge: How knowledge management is changing the way we do business*. New Jersey: Wiley.

Pepitone, J. (2011). *Amazon EC2 outage downs Reddit, Quora*. Available from: http://money.cnn.com/2011/04/21/technology/amazon_server_outage/index.htm. Accessed 22.02.12.

PR Newswire. (2011). *Salesforce.com unveils service cloud 3, the Next Generation of Social Contact Centers*. Available from: http://www.prnewswire.com/news-releases/salesforcecom-unveils-service-cloud-3-the-next-generation-of-social-contact-centers-117308363.html. Accessed 15.03.12.

Rao, L. (2011). *Salesforce debuts a more social service Cloud 3 with Chatter, Facebook and Twitter Integrations*. Available from: http://techcrunch.com/2011/03/02/salesforce-debuts-a-more-social-service-cloud-3-with-chatter-facebook-and-twitter/. Accessed 22.02.12.

Raphael, J. R. (2011). *The 10 worst cloud outages (and what we can learn from them)*. Available from: http://www.infoworld.com/d/cloud-computing/the-10-worst-cloud-outages-and-what-we-can-learn-them-902?page=0,2. Accessed 13.02.12.

Rehmani, A. (2011). *Customizing SharePoint Online with SharePoint Designer 2010*. Available from: http://msdn.microsoft.com/en-us/library/hh428136.aspx#CustomizingSPOWithSPD2010_UsingSharePointDesigner2010. Accessed 05.04.12.

Reichental, J. (2011). *Knowledge management in the age of social media*. Available from: http://radar.oreilly.com/2011/03/knowledge-management-social-media.html. Accessed 10.02.12.

Russell Reynolds Associates. (2011). *A perfect storm: CEO succession challenges in retail*. Available from: http://www.russellreynolds.com/content/perfect-storm-ceo-succession-challenges-retail. Accessed 07.04.12.

Schroeder, D., Joubert, D., Meyer, P., Steinhauser, L., & Walker, A. (2009). *Report and recommendations on Web 2.0 and social software federal knowledge management working group of the federal knowledge management initiative*. Available from: http://wiki.nasa.gov/cm/wiki/?id=7733. Accessed 06.04.11.

Shirky, C. (2008). *Here comes everybody: How change happens when people come together*. Penguin.

Sultan, N. (2010a). Cloud computing: Making headway with the scientific community. In *High performance computing*. New York: Nova Science Publishers. (pp. 37–50)

Sultan, N. (2010b). Cloud computing in education: A new dawn? *International Journal of Information Management*, *30*(2), 109–116.

Sultan, N. (2010c). What can cloud computing offer to scientific research? *International Journal of Computer Research*, *18*(1), 379–393.

Sultan, N. (2010d). Cloud computing and SMEs: A match made in the recession! In *ISBE (The Institute for Small Business and Entrepreneurship) Conference* 2–4 November 2010, London.

Sultan, N. (2011). Reaching for the 'cloud': How SMEs can manage. *The International Journal of Information Management*, *31*(3), 272–278.

Sultan, N., & Sultan, Z. (2012). The application of utility ICT in healthcare management and life science research: A new market for a disruptive innovation? In *The European Academy of Management conference EURAM* 6–8 June 2012, Rotterdam, The Netherlands.

Taneja Group. (2011). *An overview of the cloud market*. Available from: www.tanejagroup.com. Accessed 25.02.12.

Voas, J., & Zhang, J. (2009). Cloud computing: New wine or just a new bottle? *IT Professional*, *11*(2), 15–17.

Nabil Sultan is Professor of Information Management and Enterprise and Division Head at the School of Business, Leadership and Enterprise (University Campus Suffolk). Prior to that he was Award Director of International MBA at Liverpool Hope University's Business School. He is also Visiting Professor at the Department of Management and Organization (Vrije University Amsterdam). Professor Sultan has a colourful professional career and research background. He spent his early working years in the Arab Gulf region and later headed a UK business. He also worked for the UNDP in Aden and New York before moving into academia in the late 1990s working initially at the University of Liverpool. He has a strong research background and interest in information management, cloud computing, leadership, ethics and socio-economic development in the Arabian Peninsula.