Knowledge cloud system for network collaboration: A case study in medical service industry in China

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ABSTRACT

This paper introduces a new service model in cloud computing – the knowledge as a service (KaaS) that facilitates the interoperations among members in a knowledge network. In this study, the KaaS is modeled as a framework of a knowledge cloud system which aims for the development of collaborative networks in medical service industry. The framework is applied in a case study of radiotherapy dynamic treatment service. The collaborative activities supported by knowledge cloud system are analysed. This study has investigated the essential components for the success of a private knowledge network for business network collaboration. This study shows the best practices of the formation of collaborative network facilitating by the knowledge cloud system in medical service industry which can be transferred to other industries.

1. Introduction

Networks can be simply defined as being the resource actors and their relationships with each other in a firm (Black & Boal, 1994). Network paradigm is a strategic organizational response to environmental pressures, providing an incentive to devolve and disaggregate business functions to specialist partners in collaborations and alliances (Cravens, Piercy, & Shipp, 1996). Networks provided firms with access to knowledge, resources, markets or technologies (Inkpen & Tsang, 2005). A collaborative network represents the joint organizational entity, infrastructure, business processes, resources, and relationships which support a shared effort to provide some collective benefit, whether it is a program, service, or a product (Agranoff & McGuire, 2001; Fedorowicz, Gogan, & Williams, 2006; Milward & Provan, 2006; Moynihan, 2005; Provan, Milward, & Brinton, 1995). Collaborative networks have several advantages, such as agility, complementary roles, achieving dimension, competitiveness, resource optimization, and innovation (Camarinha-Matos & Afsarmanesh, 2003). Thus, many organizations intend to establish collaborative networks with their business partners in order to gain above advantages.

However, the formation and operation of collaboration networks face several difficulties. Most obvious one is of technological nature, and referring mainly to issues such as inter- and intra-enterprise integration or interoperability (Chituc, Toscano, & Azevedo, 2008). Cloud computing is becoming an adoptable technology to address above issues. The term 'cloud' is derived from the idea of businesses and users being able to access applications from anywhere in the world on demand (Low, Chen, & Wu, 2011). No common standard or definition for cloud computing seems to exist (Grossman, 2009; Voas & Zhang, 2009). Cloud computing is an emerging application platform and aims to share data, calculations and services among users (Ercana, 2010). Organizations pay only for what they use with regard to computing and network resources, rather than having to invest in upgrading data centers, not to mention hiring requisite staff to deal with all the hardware and software (Wu, 2011). In collaborative network environment, cloud computing may provide a kind of service that facilitates the interoperations among members in a knowledge network. This service in cloud computing should be classified as the knowledge as a service (KaaS). Xu and Zhang (2005) have defined the concept of KaaS as the process in which a knowledge service provider, via a knowledge server, answers information requests submitted by some knowledge consumers. However, there is a lack of research in this area especially in real business case study. This study tries to model the KaaS as a framework of a knowledge cloud system for network collaboration.

In recent years, many research in collaborative networks have been conducted in manufacturing areas, such as product

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development (Danilovica & Winrothb, 2005), collaborative manufacturing mega-networks (Johansen, Comstock, & Winroth, 2005). Little research is taking place in service industry especially in medical service industry. This study aims to fill the gap in the area of the formation of the collaborative network. In this study, case study research method is employed to (1) draw the structure of the collaborative network for medical services; (2) explain how knowledge cloud system facilitates collaborative network activities; and (3) explore how KaaS can be deployed in the formation of a private knowledge network in medical industry in China. In the literature, the concepts of network organization, collaborative networks, knowledge networking systems, and cloud computing service are reviewed. A case study is presented to illustrate the structure of the collaborative network and infrastructure of the knowledge cloud system for this network. Finally, this paper contains implication in practice, theoretical contribution, limitations, suggestions for further research and conclusions.

2. Literature review

2.1. Network organization

Chisholm (1998) defined that a network is an organizational system capable of congregating individuals and institutions in a democratic and participative form, around common themes and/or objectives. Under a flexible and rhythmic structure, a network is established in horizontal relations, interconnected that takes the form of collaborative work. The network is supported by the motivation and affinity of its members, featuring itself as a significant organizational resource, either for personal relationships or for social structure. In practical terms, networks are communities, that are either virtual or face-to-face constituted.

A network organization can be defined as an environment around which people organize themselves to attain a common objective (Sailer, 1978).There are two views of a network organization: behavioral view and strategic view (Santoro, Borges, & Rezende, 2006). A behavioral view of a network organization is a social relations pattern over a set of persons, positions, groups, or organizations (Sailer, 1978). This social relations network is a more general grouping format: it does not have necessarily a goal to reach, but just connects people creating nodes for many kinds of interaction (Santoro et al., 2006). For example, Facebook is the world's largest social network, with 750 million users worldwide as July 2011 (The New York Times., 2011).

A strategic view of a network organization considers it as "long term purposeful arrangements among distinct but related for-profit organizations, which allow those firms therein to gain or sustain competitive advantage" (Jarillo, 1988). This type of network is a business oriented network that aims for provide world class excellence and flexibility to address dynamic and turbulent market conditions.

2.2. Collaborative networks

Collaborative networks represent a collection of heterogeneous organizations with different competences, but symbiotic interests that join, efficiently combine the most suitable set of skills and resources for a period of time in order to achieve a common objective, and make use of information and communication technologies (ICT) to coordinate, and support their activities (Chituc & Azevedo, 2006). Previous studies have identified some motives and benefits of collaborative networks. Lewis (1990) stated that the formation of collaboration networks aim: to increase the market share; to increase asset utilization; to enhance customer service (e.g., reduction in lead times, customer complains); to re-

duce the cost and time of product development; to share costs; to increase the quality of the products; to increase/enhance skills and knowledge; to have a technological gain as participating firm; to achieve economies of scale in production. Chituc and Azevedo (2005) supplemented that collaboration networks enable their members to have access to resources (e.g., skills, knowledge) that are usually well beyond those of a single player; to learn (e.g., to gain knowledge) from other participants in the network.

However, the adaption of collaboration networks has several inhibitors and challenges, such as clear organization, adequate workforce, finance, communication, loss of competence, development of the partnership, low acceptance, and intellectual property (Alexakis, Kolmel, & Heep, 2004). The success of collaboration networks depends on some basic commonalities among their members, such as common goals, common or interoperable ICT infrastructures and supporting services, real-time information sharing and flow among collaboration networks members, and common standards or common views on a number of areas (Camarinha-Matos & Afsarmanesh, 2003). While supporting above commonalities, the development of a compatible organizational infrastructure allowing collaborative network member organizations to share their resources becomes the most critical issue (Chituc & Azevedo, 2005).

2.3. Knowledge networking systems

There is a wide range of technological systems that facilitate collaborative networks activities. Knowledge management system is a kind of technological systems that helps to integrate the information that are exchanged among network members. Knowledge is different from data and information. Knowledge is defined as a fluid mix of framed experience, values, contextual information, and expert insight that provides a framework for evaluating and incorporating new experiences and information (Davenport & Prusak, 1998). Knowledge is understanding as well as the ability to transform itself into actions (skills) to obtain performance (Nooteboom, 1996). Knowledge management refers to the body of methods, tools, techniques and values through which organisations can acquire, develop, measure and distribute in order to provide a return on their intellectual assets (Snowden, 1999).

In organizational level, knowledge is grounded in a firm (Von Krogh, Roos, & Slocum, 1994) and organizational knowledge relates to the ability to differentiate an organization from competitors (Leonard-Barton, 1992). Knowledge management generally refers to how organizations create, share, and retain knowledge (Argote, McEvily, & Reagans, 2003). In collaborative networks level, knowledge should be ground in a collaborative network. Knowledge management in collaborative networks is the ways of managing the flow of knowledge among different network members. The knowledge needed to complete group tasks is distributed among group members and no individual needs to know all the detailed knowledge or to be fully cognizant of every aspect of the project (Cannon-Bowers & Salas, 2001). Knowledge networking in groups or teams is effective if its members know who has the required knowledge and expertise, where the knowledge and expertise are located, and where and when they are needed (Alavi & Tiwana, 2002). Therefore, valuable knowledge can be acquired through the knowledge networks (Dyer & Hatch, 2006).

ICT enables knowledge management activities for collaborative decision support, information sharing, organizational learning, and organizational memory (Caraynnnis, 1999; Chen et al., 2002; Harun, 2002; Hicks, Culley, Allen, & Mullineux, 2002; McCown, 2002; Ramesh & Tiwana, 1999; Robey, Boudreau, & Rose, 2000; Yoo & Kim, 2002). Internet is a kind of ICT that combines with some other network technologies and services, such as Intranet, Extranet, virtual private network (VPN), and wireless web, to construct a digital