

Potential of Cloud Storage Application as Knowledge Management System

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Abstract—This study discusses the results of analysis on cloud storage application in the term of facilitating knowledge management. The analyses used in this study are exploratory which broadly seeks to address the research question, intended to document major functions of cloud storage application. The sample of current cloud storage application was explored and analyzed to compare the features in different categories. The result of this study revealed common features shared among existing cloud storage application and some missing features for most applications. The result also suggests that to better facilitate knowledge acquisition, knowledge distribution or sharing, and knowledge development, cloud storage application needs to include some extended functions.

Index Terms—Cloud computing, cloud storage, knowledge management, knowledge management system.

I. INTRODUCTION

Today, as the concept of cloud computing emerged, many industries are taking this concept into consideration in terms of supporting and improving business processes and activities. Cloud storage application derived from cloud computing concept has become more and more popular among people especially knowledge workers due to high availability of the Internet and easy accessibility of the browser. At the same time, knowledge management is essential concept concerned by the organizations to make sure that people can apply their knowledge to obtain the most benefit for the companies. Therefore, most organizations implemented knowledge management system to facilitate knowledge management process such as knowledge creation, maintaining, and utilization.

This paper is to identify how cloud storage applications facilitate knowledge management by examining all functionalities of cloud storage applications applied to knowledge management activities. The paper then pursues to find out cloud storage applications limitations in term of the purpose of facilitating knowledge management. Finally, the potential of cloud storage application utilization as knowledge management system will be concluded.

II. LITERATURE REVIEW

Knowledge is a justified personal belief that improves the ability of an individual to take action more effectively. In this case, action refers to physical skills and competencies (e.g.,

carving, or playing sports), cognitive activity (e.g., problem solving), or both (e.g., surgery involving physical skills and cognitive actions where the knowledge of medicine and human anatomy needs to be used) [1]. In many information systems literatures, the definitions of knowledge further differentiate among knowledge, information and data [1]. Data is facts and raw numbers (unprocessed items), information is data that has been processed and interpreted to obtain a meaningful context, and knowledge is information that has been verified and assumed to be true [1].

There are two kinds of knowledge; tacit and explicit knowledge [2]. Tacit knowledge or unarticulated knowledge is private, practical, context precise, and difficult to formalize. Tacit knowledge normally rests inside the persons' heads; therefore, it is hard for sharing or communication with others [2]. Explicit knowledge on the other hand can easily be written down and codified [2]. Thus, it is easier to communicate or share with others than tacit knowledge [2]. Nevertheless, tacit knowledge still needs to be captured because the only sustainable competitive advantage of the organization may be knowledge of workers [2]. Tacit knowledge regularly transfers via information channels of communication known as communities of practice (CoP) [2]. Communities of practice are identified as an important mechanism through which individual and group knowledge is created and transferred [3]. CoPs that are facilitated by web-technologies are referred to as web-facilitated communities of practice or virtual communities of practice [3]. Thus, it can be supposed that socialization, mentorships, apprenticeships, and face-to-face communication encourages transferring of tacit knowledge to assist individuals and teams to accomplish any work more effectively [2].

Knowledge management (KM) as defined by [2] is "a systematic process for obtaining, shaping, maintaining, utilizing, sharing, and reproducing tacit and explicit knowledge to enhance the organizational performance, increase organizational adaptability, increase values of products and services, and create new knowledge-intensive products, processes and services." Knowledge Management is also the process that enables the high availability of relevant information for individuals to use effectively whenever needed [2]. Undoubtedly, knowledge has increased organizational value limitation if it is unshared. Hence, the key challenge of managing knowledge is the ability to integrate and apply specific knowledge of organizational members to create and sustain competitive advantage [4]. According to [5], the organization has developed measurable processes to create and capture knowledge, organize and share knowledge, and apply knowledge to achieve organizational objectives and to create value in the

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organization. These processes need to be cyclically performed by the organizational members to accomplish effective knowledge management [5].

Conventionally, knowledge creation and transfer has occurred through various methods such as face-to-face communications, counseling, staff development, and job rotation [1]. However, as organizations expand virtually and globally, these traditional approaches may become inadequate and need to be supported by more efficient electronic means [1]. The organization also search for an explicit strategy to better create and integrate knowledge in the organization and that is the beginning of Knowledge Management Systems (KMS), information systems designed specifically to facilitate the collection, classification, integration, and distribution of organizational knowledge [1]. KMS benefits include the capability of organizations to be more responsive, flexible, innovative, and productive [1]. In addition, KMS must be able to support collaboration between managers and project members which is a significant activity in many large or medium-scale projects [6]. As a result, knowledge management systems and processes must support knowledge discussion and reproduction to allow individual and organizational learning and innovation, as well as the dynamic representation and adaptability of organizational information and knowledge [6].

Cloud computing, is an emerging application platform and has drawn much attention from industries and academic fields [7]. The term cloud computing was first stated in 1997 but it only has become a fashionable term recently. The term 'cloud' is metaphorical and usually refers to a massive pool of resources such as hardware and software that are usable and easily accessible over the Internet [7]. The main objective of Cloud computing is to share data and services among organizational users in IT environment [8]. Cloud computing consists of the utilization of hardware resources and software services as an essential platform across several host computers linked by an organization's intranet or the internet. Cloud computing is primarily a new business model whereas a cloud supplier provided hardware and software infrastructure, or an application as a service to its customers [8]. Furthermore, cloud computing can reduce IT barriers to innovation; for example, Facebook and YouTube, the global online applications are the innovation made possible by cloud computing concept [9].

Current literatures pointed out the link between KMS and cloud computing and claimed that it is a key factor to improve organizational performance. Numerous researches are concentrated on KM improvements by using cloud computing technologies which have formed new dimensions for social networking and cooperation [10]. Cloud computing enhanced services and open access management and overcame the organizational boundary limitations by allowing automatic update and access to the newest and most relevant knowledge [11]. Cloud-based KMS implementation will save the organization a great deal of budgets because the organization does not need to buy, run, maintain, and upgrade their own hardware and software infrastructures [7], [8]. As a result, the organization can have the opportunity to acquire other necessary IT capacities that may be unaffordable in the past [7]. Reference [12] also suggested that SMEs normally have

limited resources which cause them unable to invest in large ICT infrastructures; SMEs therefore are likely to obtain benefits from cloud-based KMS. Besides, many recent KM products appear to include cloud and social networking functionality because online social networking becomes increasingly popular and it is valued as a knowledge-sharing tool [12]. Nevertheless, designing a KMS can be a challenging task as KMS needs to answer the expectations of managers concerning the proper use of knowledge to gain profits [10]. KMS architecture therefore needs to be combined with Web 2.0 technologies, as well as Cloud Computing concept [10]. At the same time, Cloud Computing and its business models are still being developed to reach maturity and standards; security, privacy and compliancy are still challenging to ensure system reliability [11]. At present, it is unclear regarding the types of business applications suitable for Cloud Computing support and a number of legal and policy issues concerning Cloud Computing need to be addressed as well [11].

Those existing literatures focused on building a new cloud-based KMS or discussed about transferring an existing KMS to cloud-based environment to achieve the purpose of facilitating knowledge management. However, none of those literatures ever actually considers utilizing existing cloud storage application in the manner of facilitating knowledge management or use it as a KMS before, especially those cloud storage application are mostly offered at free cost with sufficient storage capacities. Cloud storage application is the application derived from cloud computing concept and it increases in popularity not only for the organization but also for the individual especially those who use smart phones or tablets. Examples of cloud storage application in today market are Google Drive, Dropbox, OneDrive (formerly SkyDrive), Box, and etc [13]. Only one work has clearly identified functions of cloud storage application and the comparison among four cloud storage applications; Google Drive, Dropbox, Evernote, and SkyDrive [13]. However, the mentioned work is limited due to focusing on the use of cloud storage applications on mobile devices with android operating system, as well as Evernote is more likely note-taking software [13]. Therefore, this study will explore cloud storage application in general and attempt to identify common functions of cloud storage application in regard of facilitating knowledge management activities. Google Drive, Dropbox, OneDrive, and Box which are among the leading cloud storage applications will be analyzed to obtain a common list of functions. Then, those functions will be analyzed in terms of facilitating knowledge management. This work can be beneficial to the organizations especially small and medium enterprises that need to start focusing on KM and need some free or low cost tools to facilitate KM activities.

III. RESEARCH FRAMEWORK AND HYPOTHESES

Research questions related to cloud storage application and knowledge management are addressed as follows;

RQ1: How can cloud storage applications facilitate knowledge management?

RQ2: Is there any functionality that cloud storage

applications could be extended to better support knowledge management activities?

RQ3: Would cloud storage applications be used as knowledge management systems?

Research hypotheses related to this study are identified and followed by the framework illustration as shown in figure 1;

H1: Cloud storage applications can facilitate knowledge management in several activities.

H2: Cloud storage applications can be used as knowledge management systems with extended functions.

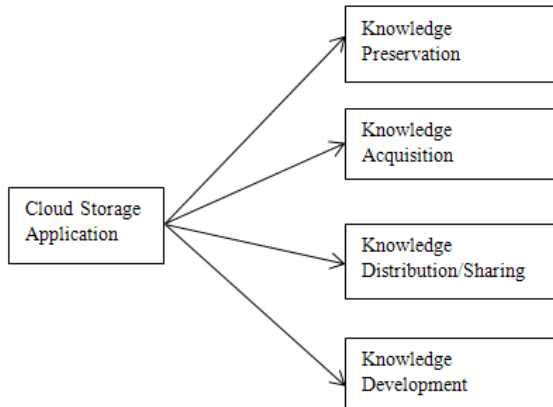


Fig. 1. Cloud storage application facilitating KM framework.

IV. METHODOLOGY

The selection of four cloud storage applications in the market; Google Drive, Dropbox, OneDrive and Box depends on their similarity and popularity. These four applications then are carefully explored through the actual use of these applications on both computers and smart phones and the official data from companies' websites in order to compare the features of applications in different categories. The research also attempts to extend a list of main functions, originally from the work of [13], to provide newly revised main functions based on importance of knowledge management contribution. However, due to lack of research funding, these features are considered based on free subscription.

The main functions of cloud storage applications which will be examined through the sample of applications are summarized as follows:

- 1) Free Storage (Up To) – Storage capacity for free subscription
- 2) Expandable Storage Availability – Storage capacity can be expanded with fee
- 3) File Size Limit – Maximum file size for each file stored in application
- 4) Folder Sync – File synchronization across multiple devices
- 5) PC Access – Application accessibility through personal computers
- 6) Mobile Access – Application accessibility via mobile devices
- 7) Full-text Search – Ability to search full text inside documents
- 8) Version History – Ability to keep track of old and

current versions of files

- 9) Permission Settings – Owner's ability to set permission of files or folders
- 10) Sharing / Distributing Links – Ability to share or distribute files to others
- 11) Events Tracking – Ability to keep track of all events occurred within the application
- 12) Simultaneous Document Editing – Allowing multiple users edit document concurrently
- 13) Adding Tags – Ability to add tags to each file
- 14) Commenting on Files – Ability to add comments to each file

These functions will also be discussed how each of them can facilitate knowledge management activities, consisting of knowledge acquisition, preservation, sharing, and development.

V. RESULTS AND DISCUSSION

From Table I Comparison table, all main functions have been mapped with one or more related KM activities. Firstly, function no. 4, 5, 6, and 7 can facilitate knowledge acquisition activity in which a person could gain access to obtain knowledge through multiple devices such as desktops, laptops or notebooks, tablets, and smart phones with various operating systems. The same set of knowledge can also be retrieved across multiple devices through the process of folder synchronization. All four applications undoubtedly support these accessibilities and synchronization. The owner of cloud storage account can also acquire knowledge from searching function which is a basic function for most of cloud storage service providers. Almost all service providers allow users to search for the file by the file name; however, only Google Drive allows users to perform searching for full text inside the document. This function is extremely useful as many users hardly remember the file name but they can recall some keywords related to the desired subject. Thus, Google Drive is argued to be the best in supporting knowledge acquisition.

Next, several functions, like function no. 1, 2, 3, and 8, support knowledge preservation while explicit knowledge can be stored and preserved for future use. Storage and file size limit varies among these four applications, Google Drive and OneDrive seem to provide the best with free storage limit. Dropbox requires a referral in order to obtain 16GB of free storage; otherwise only 2GB of free storage is provided as normal. For file size limit, the outstanding one is Dropbox with unlimited file size, followed by Google Drive, OneDrive, and Box respectively. In addition, the ability to keep track of file versions is considered having the contribution to knowledge preservation. This simply means that the user can always refer back to historical explicit knowledge retained in knowledge repositories.

Besides, function no. 9 and 10 are considered facilitating knowledge distribution and sharing in which the application provides various methods of sharing file such as sending distribution links to specific files or inviting collaborators to access specific folders. In doing so, these four applications

similarly encourage explicit knowledge sharing among different users either registered or unregistered users. Permission settings are also essential in order to define the level of privacy concerning knowledge sharing; for example, during the process of sharing the owner can control who can access the particular folders and who can modify the content of the particular file. All these four applications offer these settings to the user as well. Nevertheless, all these four applications still lack of functions better supporting tacit knowledge sharing such as forums, blogs, Wikis, RSS Feeds, and social networks.

TABLE I: COMPARISON TABLE

No.	Features	Related KM Activity	Google Drive	Drop box	One Drive	Box
1	Free Storage (Up To)	Knowledge Preservation	15GB (W/ Gmail)	16GB (W/ Referrals)	15GB	10GB
2	Expandable Storage Availability	Knowledge Preservation	Yes	Yes	Yes	Yes
3	File Size Limit	Knowledge Preservation	1TB (depends upon file type)	Unlimited	10GB	250M B
4	Folder Sync	Knowledge Acquisition	Yes	Yes	Yes	Yes
5	PC Access	Knowledge Acquisition	Yes	Yes	Yes	Yes
6	Mobile Access	Knowledge Acquisition	Yes	Yes	Yes	Yes
7	Full-text Search	Knowledge Acquisition	Yes	No	No	No
8	Version History	Knowledge Preservation	Yes	Yes	Yes	Yes (W/ Upgrade)
9	Permission Settings	Knowledge Distribution /Sharing	Yes	Yes	Yes	Yes
10	Sharing /Distributing Links	Knowledge Distribution /Sharing	Yes	Yes	Yes	Yes
11	Events Tracking	Knowledge Development	Yes	Yes	Yes	Yes
12	Simultaneous Document Editing	Knowledge Development	Yes	No	Yes	Yes
13	Adding Tags	Knowledge Development	No	No	No	Yes
14	Commenting on Files	Knowledge Development	No	No	No	Yes

Lastly, function no. 11, 12, 13, and 14 assist in knowledge development activity whereas the application provides means to improve existing knowledge and create new knowledge. These examined cloud storage applications allow users to track all events to get insight on different types of tasks occurred by different persons during the process of developing knowledge. Dropbox is only one which does not allow multiple users edit the document simultaneously while the other three comply with this idea in order to encourage users to enhance existing knowledge, thus lead to knowledge innovation. The ability to add tags and comment on files is also the feature that would encourage knowledge development as every time the person adds tags to the file, the existing knowledge is annotated and linked to new concept. Similarly, when the person comments on the file, tacit knowledge is added and shared among collaborators and that can assist collaborators to advance knowledge or even become the origin of newly generated knowledge. From the investigation, most applications do not allow users to adding tags and commenting on files, except Box which allow users to adding tags to the particular file and commenting on the particular file. Therefore, Box is the only application which best facilitate knowledge development.

VI. CONCLUSION AND RECOMMENDATIONS

Cloud storage applications as explored in this paper can facilitate several knowledge management activities such as knowledge acquisition, knowledge preservation, knowledge distribution/sharing, and knowledge development. All four applications have the functionalities that support knowledge preservation, storage and file size limit slightly varies. All four applications assist in knowledge acquisition by offering similar features related to data accessibility and synchronization. However, only one application, Google Drive, supports full-text search enabling users to search the text inside the document. Other cloud storage applications should extend search function in this mentioned approach to better facilitate knowledge acquisition. For knowledge distribution and sharing, existing functions provide users with several sharing methods such as sharing links or sharing folders but it is recommended that extended functions such as forums, blogs, Chats, Wikis, RSS feeds, and social networks could better facilitate tacit knowledge sharing. Furthermore, most cloud storage application should provide functions like adding tags and commenting on files to facilitate knowledge development. In conclusion, cloud storage applications can be utilized as knowledge management systems by extending some proposed functions as discussed previously. Future work in this area might be extending list of main functions and increasing the number of sample of cloud storage application. Perhaps with appropriate research funding, the researcher can explore and confirm the list of advanced functions provided for business subscription package. Investigating users' experiences and satisfaction on each cloud storage application would also enable the researcher to discover which functions are most important in users' perspectives and which functions would encourage users to use cloud storage application to facilitate knowledge management effectively.

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