

Adoption of Cloud based Knowledge Management

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Abstract— *By taking a look at the high costs of utilizing and updating old knowledge management systems along with their related issues and problems, cloud based knowledge management systems become an obvious solution to share and effectively use organizational knowledge. In this paper, a framework to present knowledge management services on the main layers of KaaS and SaaS is first presented. Then, indexes were defined by holding interviews with senior IT managers of public and private companies. These indexes were presented in terms of risks and advantages relevant to the presented framework and also factors concerning the organization and environment. Finally, a model was designed to illustrate factors that impact the acceptance of cloud based knowledge management.*

Index Terms—KMS, Cloud computing, Adoption, KaaS.

I. INTRODUCTION

A. What is Knowledge Management?

Knowledge management is a concerted effort to capture critical organizational knowledge and to share knowledge within an organization for improved decision making, efficiency and innovation. It involves capturing knowledge, intelligence, employee's value-added experiences and maintaining them as the organization's assets. With the appearance of knowledge management as a valuable discipline, products such as knowledge management systems were developed for organizations under the name KMS. Knowledge management is in fact the capacity of organizations in producing value from knowledge. Organizations must use three knowledge management key elements (employees, processes and content) to purchase applicable technological solutions. Public and private organizations along with their working environments have changed dramatically. Organizations are forced to make necessary changes to their infrastructures to cope with competitive and environmental changes. Much of their scientific assets are in the form of knowledge gained from experience.

B. What is Cloud computing?

Cloud computing is known as one of the latest innovations in modern technology. Cloud computing refers to utilizing computing resources (software and hardware) from servers using a network. In other words, users can access required

resources using any computer connected to the internet as a web service instead of installing them on their own PC. Software applications are installed on high speed network servers and are accessible to users via the internet. User files are also stored on the servers and are accessible using any internet connected computer. The main motivation for using cloud computing is being relieved from technicalities concerning data sharing on the internet. Users can easily access their resources by registering an account on an internet cloud (a network consisting of shared data by various companies). In addition, users may use server applications for receiving IT based services even without having the necessary infrastructures. This is another prominent advantage of using cloud computing.

II. KNOWLEDGE MANAGEMENT SYSTEM

A. Clients also benefit from using a scalable knowledge management system:

- Information shared throughout enterprise. This would improve teamwork, simplify office document integration and outlook synchronization
- Publish content. This includes static content and social networking
- Personalized pages for distinct enterprise information and personalization
- Easy to search for required content including documents
- Generate forms and workflows
- Web parts development including data integration, customization and personalization
- Single user interface

B. Clients may face potential challenges in managing knowledge assets:

- Great volume of data to be integrated into a single platform including a vast number of unclassified data
- Inadequate process harmony which results in hosting various tools on different platforms
- Considerable amount of time lost on searching for relevant content due to lack of efficient search engine
- Ineffective communication channel to aid in solving business problems

- No centralized governance policies causing adoption of convenient systems by users
- Reluctance to change and adopt organizational guidelines
- Increased costs and scalability concerns

C. Possible solutions regarding the potential challenges may include

- To ensure smooth transition to a cloud based system, online software can replace conventional content sharing methods
- An enterprise application support team can be introduced to ensure platform/application support
- Definition of a standardized set of frameworks and templates to design a transition model for data migration to cloud
- Gradual content transfer from various data sources to an online environment
- Centralized asset library to enhance reusability

III. CLOUD BASED KNOWLEDGE MANAGEMENT

Cloud technologies are used to aid knowledge sharing due to recent advancements in internet technologies and its widespread popularity. The fundamental advantage of cloud based technologies is that it can be utilized throughout organizations. Organizations need to reevaluate and modernize their KM Management strategies to keep up with technological developments. Due to a wide range of knowledge and content within organizations, supervision and control over content is complicated along with higher licensing costs. The solution is to take up an extensible knowledge management system to satisfy organizational needs. Once successful transition to a cloud based KM system is made, the organization will experience the following benefits

- Reduced licensing charges by using a single content management system
- Reduced ownership charges due to transition to cloud
- Enhanced efficiency and cooperation throughout enterprises via a unified system
- Reduced risks due to improved flexibility and scalability
- Worldwide user profiles consolidation and improved security due to centralization
- Navigation and branding consistency by using a single KM tool instead of multiple tools
- Improved induction through centralized training ensuring the system is enhanced to full potential
- Enhanced content accessibility via a central data store

First, a framework for a cloud based knowledge management system was presented. The details of this framework are presented in the figure 1

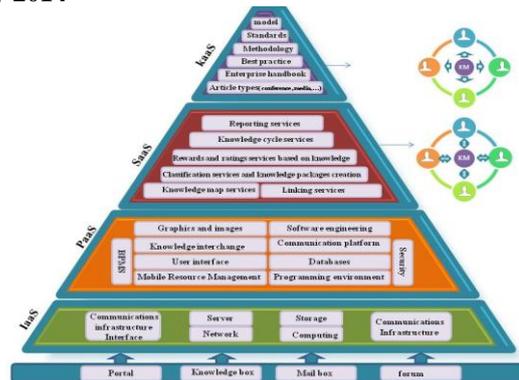


Fig 1-Framework for Cloud Based KM

In this section each layer is discussed further

A. Infrastructure as a Service (IaaS)

IaaS enables organizations to utilize servers, devices, network, and storage disks whenever they require. A software technology called virtualization which consists of physical resources as servers allow IaaS providers to present clients with affordable and practically unlimited instances of servers. As an alternative to purchasing servers or hosted services, clients are able to network virtual machines together as required. Companies use IaaS to upgrade their applications versions without the need to procure physical IT resources. The details of this layer are presented in the figure 2

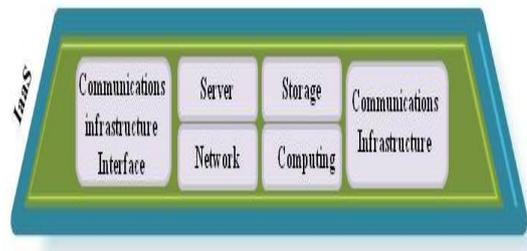


Fig 2-IaaS layer

B. Platform as a Service (PaaS)

PaaS is an applications platform. These platforms are developed using tools hosted in the cloud and accessed through a browser. This layer is placed on the infrastructure layer's virtual machines. PaaS solutions have enabled more and more people to develop and maintain web based applications without possessing specific expertise. Organizations IT departments are billed according to the usage of this service over the internet. The details of this layer are presented in the figure 3



Fig 3-PaaS layer

C. Software as a Service (SaaS)

Services at this layer are typically applications that do not need to be developed e.g. email, customer relationship management etc. These applications are cloud based and are accessible to web users or organizations on a pay-as-you-go, anytime-anywhere basis. Organizational services may be charged monthly or by usage whereas services presented directly to clients such as email is normally free. Microsoft's Online Services are an example of this solution. In this layer, focus is on sharing, processing, and classifying knowledge along with employee assessment based on cloud technology. Employees also affect knowledge management and will add to the quantity of organizational knowledge through group interaction and can utilize the great volume of knowledge created along with the organization's great assets. The details of this layer are presented in the figure 4

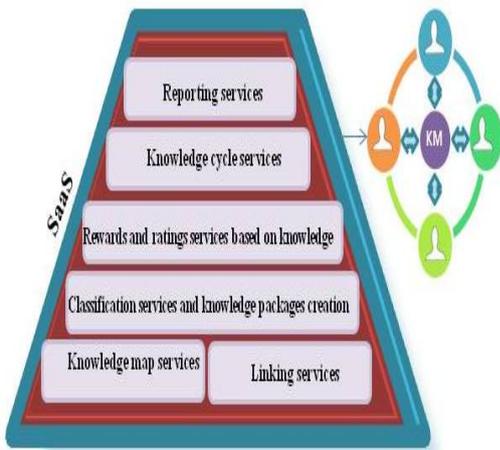


Fig 4-SaaS layer

In this layer, knowledge management services are presented using cloud technology such as:

Some of the sub-services provided by knowledge map service are as follows:

- Various organization knowledge maps, experts and knowledge seekers search engines

Some of The sub-services provided by the Linking service are as follows:

- Links between experts and knowledge seekers, Virtual knowledge meetings, forums on unanswered questions, communication with experts after searching

Some of The sub-services provided by Knowledge cycle service are as follows:

- New knowledge presentation, knowledge validation, knowledge utilization announcements

Some of The sub-services provided by Rewards and ratings service based on knowledge are as follows:

- Rewards for knowledge producers, knowledge ratings for organization knowledge seekers, rewards for knowledge users

Some of The sub-services provided by Classification service and knowledge packages creation are as follows:

- Organization knowledge classification, organization knowledge compilation as learnt lessons, organization knowledge deficiencies and knowledge application

submissions for experts, organization knowledge package preparations

Some of The sub-services provided by Reporting service for managers are as follows:

- Organization knowledge processes reports, managers supervision on organization knowledge transfers, organization knowledge comparative reports (separated in terms of work fields), reports concerning knowledge distribution within the organization (separated in terms of departments), rewards distribution reports, employee knowledge level reports

D. Knowledge as a service (KaaS)

KaaS is used to access specific and necessary knowledge at any time from any location. This type of service uses cloud computing as a strategy and tool to ensure core competency. In general, by utilizing this service, the need for organizations to employ expert personnel will substantially reduce along with risks originating from human error. For all organizations especially smaller and newly established companies, risk management and the ability to utilize knowledge and expertise are an essential part of organizational strategies. In essence, KaaS is a combination of knowledge based processes and organizational systems which enable knowledge management at organizational level. This layer focuses on effective use of knowledge and information while separating efficient and required knowledge. In other words, this layer makes the need for organizational agility and quick access to knowledge in a timely manner without previous experience possible. Knowledge overload will not be a problem in this layer. During conducted interviews with IT companies' senior managers, it was concluded that customer experience analysis, knowledge-rich articles research, various multimedia, workflow assessment, events analysis, risk management, environment analysis, costs management, successful business model analysis, business cycles analysis, utilization of successful business managers experiences, and applied business intelligence are some of the most significant issues in KaaS concept. The details of this layer are presented in the figure 5

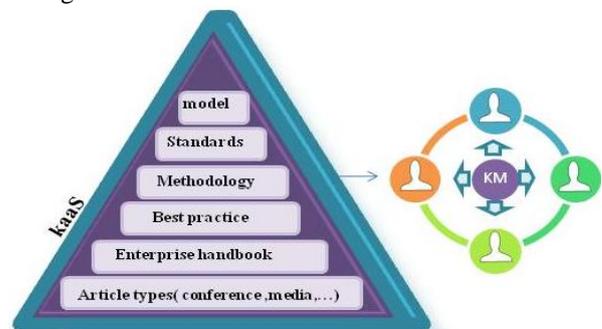


Fig 5-KaaS layer

IV. ADOPTION OF CLOUD BASED KMS

The acceptance rate for cloud based knowledge management systems was assessed from both the providers

and clients perspectives Interviews were conducted with senior IT managers to highlight indexes required for accepting cloud based knowledge management. In this measurement model for the adoption of cloud based knowledge management services, assessment was carried out from four perspectives in Figure 6

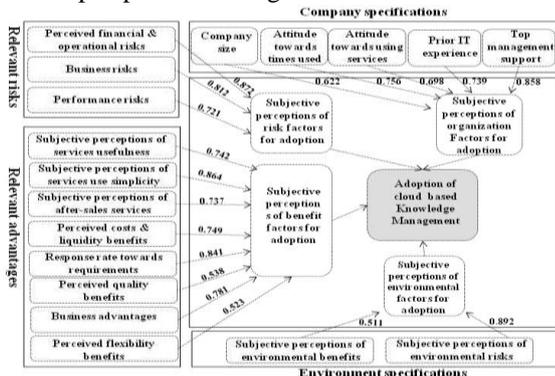


Fig 7-adoption of cloud based KM

These four perspectives are explained further below:

1) Relevant risks such as :

- Business risks refers to insisting on the use of old and hereditary knowledge management systems and resisting in the acceptance of modern technologies, The existence of coherent and integrated solutions in presenting cloud services from organizations providing a KMS system, problems concerning service integration, problems concerning service integration, constant internet connective requirement, slow rate of service implementation and traditional knowledge management system institutionalization. , trusting service providers in terms of accessibility and organizational information security and trusting service providers in terms of accessibility and organizational information security.
- Perceived financial & operational risks refers to the lack of symmetry between economical advantages, investments, and cheaper knowledge management software, return on investment and the fact that achieving a cost-benefit and profitability status is time-consuming, customers comprehensive understanding about the basic issues of knowledge management and cloud computing, the existence of a suitable model for the pricing of cloud-based knowledge management services, the existence of a suitable model for determining cloud-based knowledge management services utilization, unlimited storage capacity, data reliability irrelevant to computer shutdown, hosting latest documents and knowledge, worldwide accessibility to organizational documents and easier group cooperation.
- Performance risks refers to the loss of human resources, equipment, records, and facilities, misuse of (property, infringements, and waste of capital), collateral damage to clients, personnel and others.

2) Advantages such as:

- Subjective perceptions of services usefulness refers to the increase in efficiency and effectiveness, simultaneous group or individual work on documents and projects, immediate access to updated knowledge, eliminated costs

related to updating and upgrading organizational software, improved efficiency within businesses, independence from devices and locations, multiuser feature , concerns regarding ownership of organizations valuable knowledge, worldwide accessibility to organizational documents and easier group cooperation.

- Perceived costs & liquidity benefits refers to affordable use of mentioned knowledge services, high costs for updating and upgrading old knowledge management systems permanent software, reduction in costs of operation and maintenance.
- Response rate towards requirements refers to spanning all services requested in accordance with the organizations requirements and sufficient capabilities listed in each system.
- A perceived quality benefit refers to the increase in the organizational level of knowledge and improvement of employee’s experiences and skills. Perceived flexibility benefits refer to flexibility of IT and knowledge processes, decrease in employee errors and organizational agility in times of crisis.

- Business advantages refers to having the necessary skills regarding IT and knowledge management concepts, adaptability to the needs of organizational knowledge management and the benefits of cloud, the existence of a suitable model for determining cloud-based knowledge management services utilization, easy accessibility to cloud services and flexibility in presenting services based on the industry’s needs and finally the development of organizations intellectual capital.
- Subjective perceptions of services simplicity refers to general ease of use, ease of target achievement, subjective perceptions of after-sales services ease of initial services integration/deployment, integration with old systems and comprehensive support by service providers.

3) Company specifications such as:

- Company size refers to the size of the company; small & micro organizations, medium-sized organizations and large-scale organizations.
- Attitude towards times used refers to hesitance due to uncertainty in future decisions.
- Attitude towards using systems refers to tendency to use knowledge map services, linking services, knowledge cycle services, rewards and ratings services based on knowledge, classification services, knowledge packages creation and reporting services.
- Top management support refers to devoting time to the (ICT) program in proportion to its cost and potential reviewing plans, following up on results and facilitating management problems involved with integrating ICT with the management process of the business.
- Prior technology experience refers to the extent of a user’s experience with previous similar technologies.

4) Environment specifications such as:

- Subjective perceptions of environmental benefits refers to efforts to shape and consolidate a culture for using knowledge management and cloud computing technologies , customers comprehensive understanding

about the basic issues of knowledge management and cloud computing

- Subjective perceptions of environmental risks refers to Political, economical, technological etc sanctions, legal and political constraints such as inability to store information in datacenters based in foreign countries, internet quality and lack of independence for internet provision. [1]–[4]

The measurement criteria for the following indexes are presented. In this research, (sign test) was used for assessing compatibility indexes by interviewing 370 IT managers. The hypothesis is as follows:

- Hypothesis 0: indexes presented were not compatible with IT managers opinions ($\mu \leq 3$)
- Hypothesis 1: indexes presented were compatible with IT managers opinions ($\mu > 3$)

Each index is calculated using Z, then it is compared with Z (0.5). If the value of Z is greater than 1.645, then H₁ is accepted. In table 1, indexes, number of individuals under hypothesis 1, the values of Z for approval of indexes stated by IT senior managers, path coefficients or correlation coefficients between each index and the adoption of cloud based knowledge management system are presented.

Table 1. Indexes for adoption of framework presented

| Indexes | X ⁺ | Z | Path coefficient |
|---|----------------|-------|------------------|
| Company size | 307 | 12.68 | 0.622 |
| Attitude towards times used | 324 | 14.45 | 0.756 |
| Attitude towards using systems | 316 | 13.62 | 0.698 |
| Top management support | 358 | 17.98 | 0.858 |
| Prior technology experience | 345 | 16.63 | 0.793 |
| Subjective perceptions of services usefulness | 319 | 13.93 | 0.742 |
| Subjective perceptions of services use simplicity | 355 | 17.67 | 0.864 |
| Subjective perceptions of after-sales services | 317 | 13.72 | 0.737 |
| Perceived costs & liquidity benefits | 322 | 14.24 | 0.749 |
| Response rate towards requirements | 351 | 17.25 | 0.841 |
| Perceived quality benefits | 299 | 11.85 | 0.538 |
| Perceived flexibility benefits | 291 | 11.02 | 0.523 |
| Business advantages | 333 | 15.38 | 0.781 |
| Performance risks | 311 | 13.10 | 0.721 |
| Perceived financial & operational risks | 360 | 18.19 | 0.872 |
| Business risks | 349 | 17.05 | 0.812 |
| Subjective perceptions of environmental benefits | 284 | 10.29 | 0.511 |
| Subjective perceptions of environmental risks | 366 | 18.81 | 0.892 |

V. CONCLUSION

In this study attempt was made to present two perspectives in providing knowledge management services. The SaaS and KaaS perspectives were then presented. In the KaaS solution, the necessity for organizations in hiring experts was omitted and instead, their required information is provided as a

service. In the SaaS solution, a services and sub-services package is provided to satisfy organizations requirements for knowledge. Finally, indexes for assessment of acceptance level for these services were presented. The results of this study indicate that top management support, subjective perceptions of services use simplicity, response rate towards requirements, perceived financial & operational risks, business risks, and subjective perceptions of environmental risks are vital indexes that play a major role in accepting the presented framework. Our findings allow providers to define their customer segments and service offerings more precisely. Cloud computing service providers can improve their business portfolios and focus on the right aspects of cloud services. Also, companies can align their methods to define a cloud strategy by proposing properties and significant preferences. Moreover, it presents a starting point for researchers to enhance the limited foundation of cloud service properties relevant to customers and to study customer groups from other organizations such as the public sector or larger enterprises.

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AUTHOR’S PROFILE

Abouzar Sadeghzadeh was born in 1985 and graduated with a B.Sc. honors degree in electronics and telecommunications engineering from the University of Bradford, UK in 2006. He then completed a M.Sc. degree in radio frequency and communications engineering the following year from the same university. His M.Sc. thesis is titled “Mobile Information System” which concerns mobile technology and its uses. Upon completing his studies he worked for Huawei Technologies as a project manager before joining various other companies in IT fields namely IT consultancy in MAGFA ITDC (Information Technology Development Center).

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