Social Networking based Ubiquitous Electronic Libraries on Cloud Platform

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Abstract. *Cloud Computing has unfurled a new panorama for the organizations striving to cut down the computing costs as well as to execute painless IT. Although, the concept of cloud computing is still in its infancy due to lack of confidence and awareness among people, the present paper attempts to explore the prospects of a Ubiquitous electronic library model on a cloud platform combining Social networking competencies.*

Keywords: Cloud Computing, Social Networking, Electronic Libraries, Cloud Library, Cloud Library Models

1. Introduction

Novelties are imperative to float with the inescapable drift of change. The first decade of the twenty-first century has not witnessed a world without computing power where the pervasive availability of information is pivotal to the development of a nation. Information plays a crucial role in the societal development and moreover, access to right information at the right time can open new doors for furthering study and advanced research. With the prolonged expansion of digitized and electronic resources, the rise of the Internet, and a sea of subscribed and free online resource users are overburdened with heaps of information. Libraries of all types and sizes are now embracing to cloud computing solutions. There is a need to tame this aggravating level of information pollution and develop a solution using the available technologies. The present paper addresses the problem by combining the competencies of cloud computing and social networking for developing a ubiquitous electronic library. The role of the ubiquitous library in the context of development, national unity as well as competitiveness is vital for any nation today. The world itself is being transformed from a production-based economy into a knowledge-based economy and any nation that has aspirations of playing a meaningful role in the new economy must work on developing an innovative information delivery system. (Sidek, 2010).
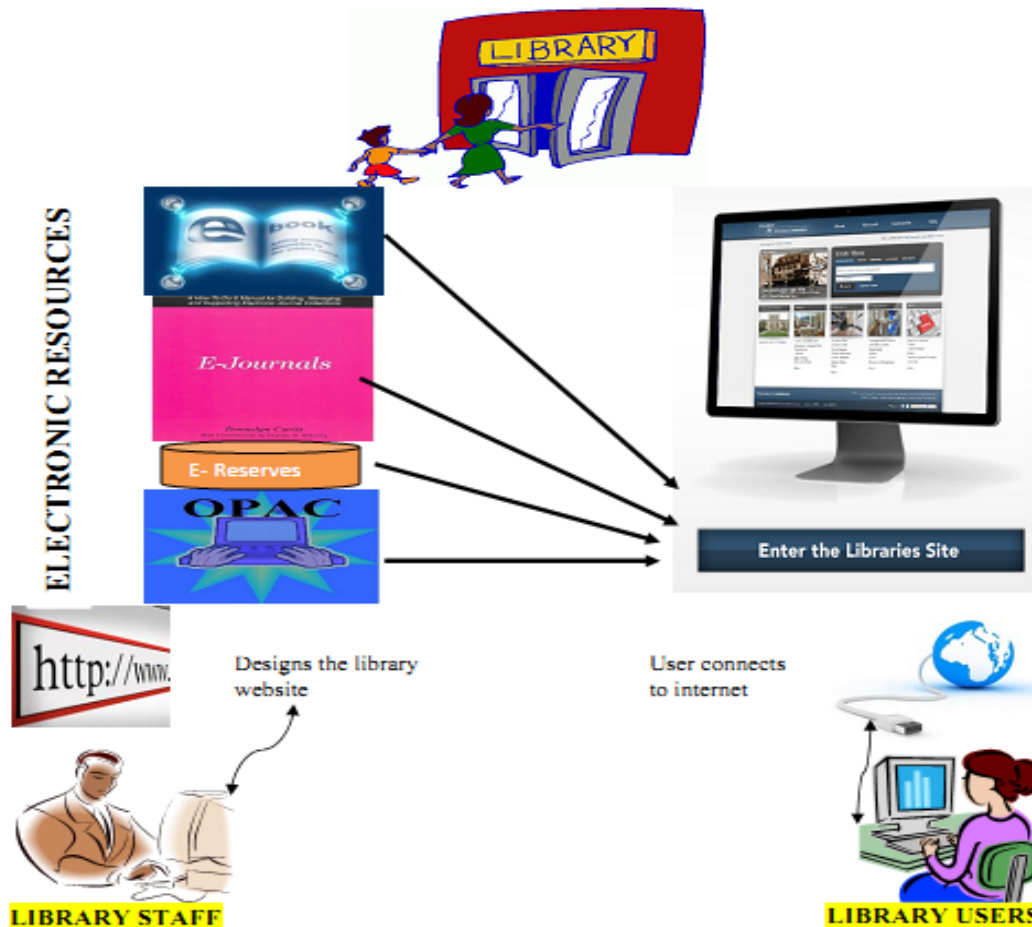
2. Ubiquitous electronic libraries

An electronic library contains documents in digital format that exhibit digital coherence where internet connectivity is inescapable for accessing the documents. It does not have physical or logical location, no restriction to entry, no authority control and is fluid and transient. The term electronic library refers to a system in which information is stored electronically and made accessible through electronic systems and networks. It provides collection and/or services in e-format using various types of media. (Singh, 2005).

In the present decade, e-resources are the lifeblood of library and information centers. There has been a remarkable shift of users from printed to electronic resources. Libraries also prefer digital collections for many reasons, including, but not limited to, the following: digital journals can be linked from and to indexing and abstracting databases; access can be from the user's home, office, or dormitory whether or not the physical library is open; the library can get usage statistics that are not available for print collections; and digital collections, save space and are relatively easy to maintain. When total processing and space costs are taken into account, electronic collections may also result in some overall reductions in library costs (Montgomery and King 2002).

3. Traditional electronic libraries model

Traditional electronic libraries relied on internet for providing electronic resources to end user. Through a library website, electronic libraries disseminate e-resources to the end user. Libraries serve as a gateway to the users.

4. Social Networking

During the first decade of the current millennium, the term "*social networking*" has become almost ubiquitous in certain circles. Active interaction between people has made it an interesting proposition. (Singh & Yuvaraj, 2012). The metamorphosis of the computing power from Web 1.0 to Web 2.0 can be viewed as a cyclical gyration of centralization versus decentralization. The transition of computing power can be divided into five categories: Web 1.0 (publication of hypertext documents), Web 2.0 (social and co-created web), Web 3.0 (Semantic and intelligent web), Web 4.0 (mobile, machine and object web), and Web 5.0 (sensory-emotive web) *(Kambil, 2008)*

It refers to an online service for building social relation among people who share their activities and interests. It constitutes representations of the user through profiles along with his links and added services. (Singh & Yuvaraj , 2012). A social network is a set of individuals connected through socially meaningful relationships, such as friendship or information exchange (Wasserman.. Et al.,1994)

Social network sites are web-based services that allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system. (Boyd & Ellison, 2007). Social networks are formed when people interact with each other (Garton, Harythornthwaite & Wellman, 1997). Combined with cloud computing

social networking has provided real time interaction and support service unlike earlier version of Web. In library and information centres, where most of the user needs are unexpressed it is a good platform to interact and understand the user needs and ensure optimal information satisfaction at the user end for which is libraries endeavor.

5. Cloud Computing

Cloud is used as a metaphor for the internet. It is a big league of effortlessly usable virtualized computing assets (hardware, platforms and services) offered over the internet. As a collective term, (Gartner, 2009) defined a style of computing in which massively scalable IT-related capabilities are provided as a service to external customers using internet technologies. Cloud computing is based on three important principles that depend on each other and can only provide additional value if implemented in concert (Kossmann and Kraska, 2010). These are: automation, virtualization and pay-as-you-go pricing model.

However, at its heart the concept of cloud computing is all about sharing resources, minimizing organizational expenditure and collaboration between networks and organizations which is highly fruitful to libraries. (Weiser and Brown, 1996) described three waves of computing: the mainframe wave, when many people shared a computer; the personal computer wave, when each person has their own computer, where each person shares many computers, most of which remain invisible. This was the foundation of the passage of cloud computing.

Cloud computing is an elixir of computing life offering centralization of computing issues & decentralization of computing power. In Cloud Computing an organization performs its task of approaching the required application through a web browser over the internet. Somewhere over the internet the applications reside in the cloud which is unknown to the user. The Cloud Computing service provider carries all the computational work and users get the result. In a cloud computing paradigm organizations deal only with the software and does not have to bother about the hardware at all; unless the organization becomes a data centre service providers.

Empowered with cloud computing libraries can gaze a progressive future. We must get out of the business of buying, configuring, installing, and maintaining servers unless we absolutely must do so. We should be simpler and easily requisitioning services from the cloud, and immediately and effectively putting them into service.

6. Ubiquitous electronic libraries in cloud

In cloud library a user will connect through the library cloud. Through library cloud users will get access to the software, applications and platforms provided on a pay per use by the service providers.

6.1 Classes of cloud computing solutions
Three ranges of services are available in the cloud by the cloud providers:
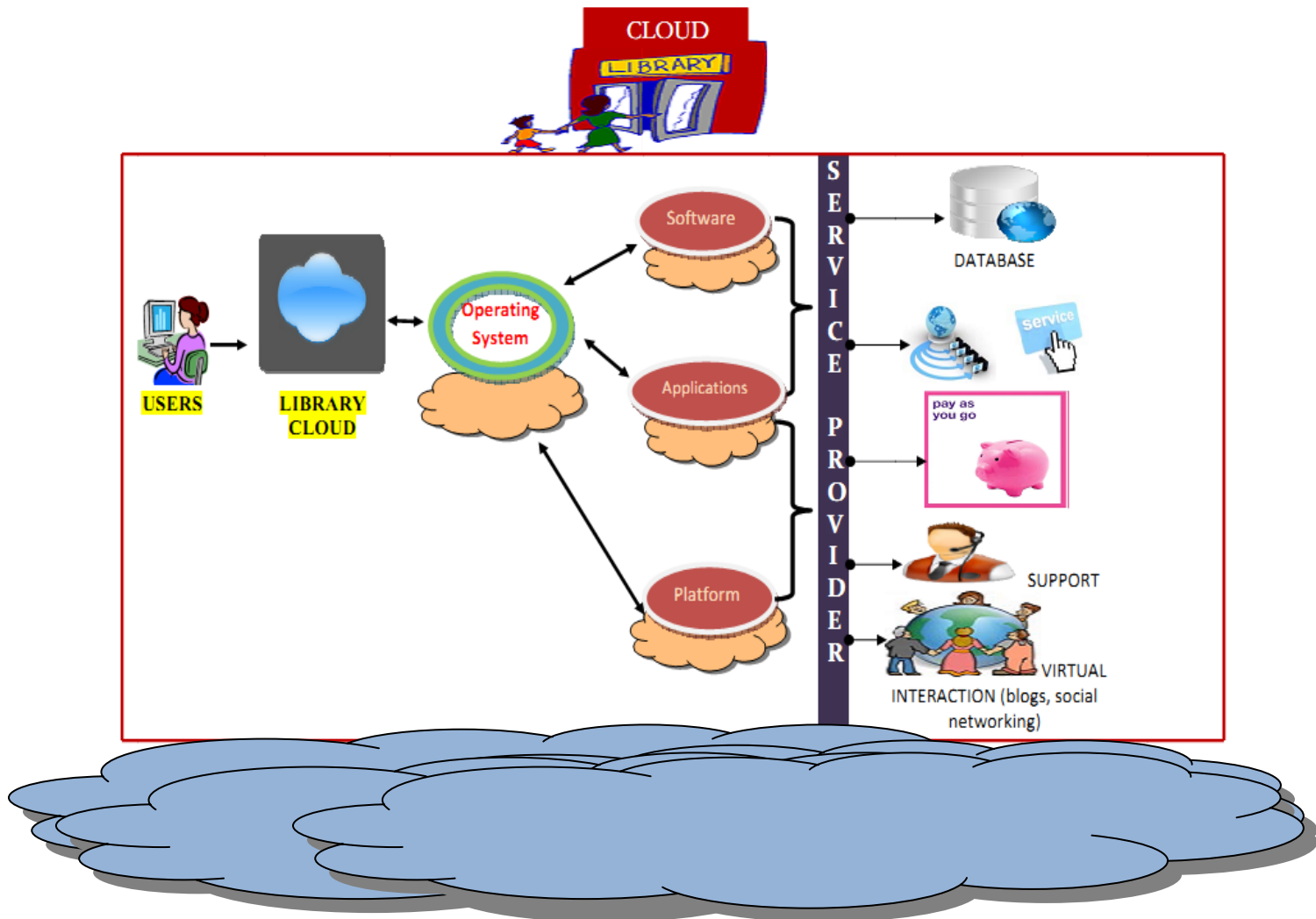
1) Software as a Service (SaaS)

In SaaS model, the end user purchases the ability to access and use an application or service that is hosted in the cloud. For example email and few other services offered by Google, Hotmail, Yahoo, Sify, Skype etc. Cloud computing offers the ability of libraries to use online software to handle a task like video chat through Gmail video chat or through Skype. (Goodman, 2011). Both of these are free services though there is little customization or control available with these applications. (Kroski, 2009). Since the services and application interfaces are often familiar with users, it will decrease the learning curve for library staff and users. (Goodman, 2011)

2) Platform as a Service (PaaS)

In PaaS model, the end user purchases access to the platforms, enabling them to deploy their own software and applications in the cloud. Operating systems and network access are not managed by the consumer. A special platform or application infrastructure is also being provided to the clients. Moreover, the client does not require knowing programming language, database management systems, etc. to run applications. Windows Azure, Google App Engine and Force.com are the finest examples of PaaS. Libraries can create applications in an online environment where they

can build, test, and deploy Web-based applications. (Kroski, 2009). PaaS gives the library the freedom to explore development options

without having to purchase and maintain the required infrastructure. (Goodman, 2011)

3) Infrastructure as a Service (IaaS)

In IaaS model, consumers control and manage the systems in terms of the operating systems, applications, storage, and network connectivity, but do not themselves control the cloud infrastructure. In IaaS, clients are being offered with storage, networking and processing of data. Amazon's Elastic Compute Cloud (EC2) or Simple Storage Service (S3), VMWare vCloud are some of its examples. By using IaaS, a library can purchase server space and computing power. (Goodman, 2011). A library does not need to purchase a server which is underutilized but costs the same to purchase and maintain as if it were using all of its resources at all times. By using an IaaS, a library gains the benefit of only paying for the resources you actually use (Peters, 2010).

Any organizations can deploy applications on Public, Private, Hybrid and Community Clouds

(Craggs, 2009) has put forth the main categories of cloud computing:

- *The public cloud* – IT resources and services are owned by a third party, located off-premise and made available to anyone on a commercial basis as metered services.
- *The community cloud* – IT resources and services are owned and operated on behalf of a community of organizations.
- *The private cloud* – IT resources and services are owned/leased by a single company for its own use.

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o   *The internal cloud* – A private cloud where all resources remain on-premise.

▪   **The hybrid cloud** – A combination of two or more cloud models.

7. Key service providers of cloud computing

Over a period of time various companies have come to light that attempt to harness the competencies of cloud and apply the same in various services sectors. Some of the dominant ones in the computing world are: (Geelan, 2009, 2010)

♦   **Google:** Google is the pioneers of cloud landscape which have developed useful utility tools based on Software as a Service (SaaS) and Platform as a Service (PaaS) model to be used in various environments. Varied facets of applications as ad-ins or plug-inns are on offer through google webstores.

♦   **3 *Leaf System:*** It is being considered as the next generation server solutions for implementing cloud computing. It offers a terabyte of DRAM at a nominal cost leading to a virtualized CPU and memory

♦   **3 *PAR:*** It provides infrastructure for storage in the cloud.

♦   **3 *Tera:*** It provides the necessary provisions for the deployment of scalable clustered applications from anywhere in the world. It is successfully working in seven countries (United States, Japan, Singapore, Argentina, United Kingdom, Netherlands and Serbia) and four continents (North America, South America, Asia and Europe).

♦   **10 *Gen:*** It is a commercial entity offering innovative platforms for data storage on the web and other applications fast and easy.

♦   **Adaptivity:** It offers integrated solutions that automate IT delivery optimization across enterprise computing environments. Rapid adoption of cloud computing renders a broader perspective. Emphasis is laid on the IaaS type resources managed externally from the enterprise who deliver and consume IT resources.

♦   **Agathon group:** It is a dedicated grid computing environment offering scalability and a charitable character.

♦   **Akamai:** It is dedicated to the cause of building a global cloud computing platform making the cherished goal a reality. The cloud optimization services are now a vital part of the company`s total offerings. It offers content delivery network (CDN) cache-based technologies. It marks the transition of Akami from CDN to full-fledged cloud computing player.

♦   **Amazon EC2:** Introduction of Amazon Elastic Compute Cloud (EC 2) single-handedly brought virtual computing environment or cloud computing to the very forefront of public awareness by using web services. It runs on Amazon`s network infrastructure and allows customers to pay only for what they use.

♦   **Appirio:** It acts as catalyst to accelerate the adoption of on-demand cloud computing solutions by offering products and services.

♦   **Appistry:** It offers a grid-based application platform that makes it easy to scale-out CPU and data-intensive applications across a virtualized grid of commodity servers.

♦   **Aptana:** It has released its beta version AptanaCloud architected to complement cloud infrastructure providers like Amazon, Google and Microsoft.

♦   **Arjuna:** It is positioned to help IT towards a world in which internal IT infrastructure can over time be increasingly subsumed into the cloud.

♦   **Asankya:** It specializes itself in the high speed delivery of Internet-based applications. It provides an Application Delivery Network (ADN) service for leading SaaS companies, cloud storage providers, internal enterprise cloud users and key government entities.

♦   **AT&T:** Launched in 2008 it offers next-generation utility computing service with managed networking, security and storage.

♦   **Bluewolf:** It is a leading provider of on-demand software deployment services. It offers remote database management and cloud storage infrastructure. It allows users to economically store a virtually unlimited number of files of all sizes through the Salesforce interface.

♦   **Boomi:** It is an integrated SaaS platform that does not require software or appliances.

- ♦ **Callidus Software:** It is a scalable, secure, subscriber-based model that does not require additional IT resources.
- ♦ *Cisco:* They are firmly into the Cloud Crowd with the acquisition of WebEx and PostPath.
- ♦ **Citrix:** They are offering an integrated portfolio of Citrix delivery infrastructure products packaged and marketed to the cloud service provider market.
- ♦ *CloudBerry Lab:* These organizations are dedicated to the cause of adopting cloud computing technologies by closing the gap between Cloud vendor's propositions and consumer needs through development of innovative low cost solutions.
- ♦ *Microsoft:* One of the leading giants of cloud computing has put forth varied segments of offerings like, online storage (Microsoft skydrive)
- ♦ *Open Nebulla:* It is used as a reservoir in cloud projects. It is open-source tool for efficient, scalable and dynamic management.
- ♦ *Rackspace:* It delivers computing power-as-a-service, combining best technologies into a flexible service offering, making computing more affordable and reliable.
- ♦ *HyperOffice:* It is the first company to offer software-as-service.
- ♦ *Jamcracker:* It empowers service providers, cloud providers and IT organizations to unify cloud management and delivery of services for their users and staffs.

8. Properties of Ubiquitous electronic libraries in cloud

- User-centric

Through cloud a user is empowered to access the resources anytime, anywhere. Users can also share their ideas and resources stored with others.

- Task-centric

Small programs and applications are available in cloud by means of which a user can accomplish his task instead of installing and configuring software on their system.

- Powerful

Cloud provides substantial computing power on demand. It is based on the notion of virtualized hardware and software providing a painless IT practice and greener computing.

- Economic

Cloud eradicates the risky capital investment and the lengthier implementation process. It counters the "*do it yourself approach"* and provides virtualized and highly secure computing power at low costs.

- Programmable

The added feature of the clouds is the flexibility offered by it where users can deploy requisite applications and software and redesign it as needed.

9. Conclusion

In a nutshell, Cloud computing is all about virtualized web based services providing a painless and economic computing's solution. It is still evolving and in a state of flux. Although new players are joining the cloud race and everyone is using some form of cloud yet people do not feel confident. We are moving towards a semantic, personal, intelligent, collaborative and ubiquitous Web. With the technological changes and the shift from library mission and services by being involved in IT there is urgency to leverage library services on cloud platforms. Cloud has an essence of the future and by 2020 everything will be in the cloud. So we have to nurture a library structure in cloud landscape.

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