

# Cloud Computing for Retailing Industry: An Overview

Mohammed Maqsood Ali<sup>1</sup>,

Mohammad Haseebuddin<sup>2</sup>

<sup>1</sup>Department of Marketing, Community College, Jazan University, Jazan, Kingdom of Saudi Arabia

<sup>2</sup>Department of Computer Science, College of Computer Science, Jazan University, Jazan, Kingdom of Saudi Arabia

**Abstract:** Cloud computing is a novel approach which is practicing by many industries in the world, specifically the small and medium scale industries. It has become a talk of the town in computing industry and in business. Its gaining popularity can provide a lot of opportunities for the retailing industry to improve their business. This paper discusses the concept of cloud computing and its importance in retailing industry. Application of cloud computing in retail sector and comparison between traditional retailing and cloud computing retailing are also discussed. Both small and large retailers may be benefited by using cloud computing in cutting costs, segmenting, targeting and positioning the products in the market, and build and maintain relationships with customers in lesser time.

**Keywords:** Cloud Computing, Service Model, Deployment Model, Retailing Industry, Cloud Computing process

## I. Introduction

Cloud computing is an emerging technology and a buzz word in the distributed computing world which allows using the software and hardware on demand over the Internet. Cloud computing is based on “pay per use” billing model i.e., the consumer companies access the cloud computing services and infrastructure on need and pay per use much like as we pay and use services like water, electricity etc. on need. Cloud computing is a method for facilitating suitable permission to use collective group of organized computing assets like networks, servers, storage, applications and services which can be quickly reserved and freed up as and when required by user and without spending too much time or working hard for it. Cloud computing technology focuses on an idea more specific to use of computing capabilities without any other investment in infrastructure, trained staff or licenses (Robu, 2011).

## II. Cloud Computing: Definitions

What is Cloud computing? Many research scholars have defined the cloud computing in different ways. Ian Foster et al. (2008) defines the cloud computing as “a large-scale distributed computing paradigm that is driven by economies of scale, in which a pool of abstracted, virtualized, dynamically-scalable, managed computing power, storage, platforms, and services are delivered on demand to external customers over the Internet”. It is the

delivery of computing as a service rather than a product, whereby shared resources, software, and information are provided to computing devices as a rented service over the Internet (Shufeng Gao, Ai Xu, 2012). Furthermore, Buyya et al. (2008) defined as “a cloud is a type of parallel and distributed system consisting of a collection of interconnected and virtualized computers that are dynamically provisioned and presented as one or more unified computing resources based on service-level agreements established through negotiation between the service provider and consumers”. Their definition of Cloud Computing overlaps with many existing technologies, such as Grid Computing, Utility Computing, Services Computing, and distributed computing in general. Cloud computing can be defined as a mechanism for providing a bunch of shared computing resources like dynamic networked servers, storage, software and services on lease over the Internet.

## III. Characteristics of Cloud Computing

The NIST (The National Institute of Standards and Technology) definition of cloud computing [4] includes the five essential characteristics of cloud computing: on demand self-service, broad network access, resource pooling, rapid elasticity and measured service.

**On-Demand Self-Service:** Using a simple computing internet connected device and with a web browser installed, customers can access the additional computing resources anytime and from anywhere at their own convenience without any human interaction with the cloud provider.

**Broad Network Access:** Customers have broader capabilities over the network and can be accessed using heterogeneous thick and thin multiple platforms. (e.g., Mobile phones, laptops, and workstations).

**Resource Pooling:** Using multi-tenanted computing model, the cloud computing service provider’s resources are pooled to serve the multiple customers, which can be dynamically allocated and reallocated according to the customer demand. This makes the computing resources invisible to customers, who have no idea of location and originality of the resources (storage, processing etc.). For

example, consumers are not able to tell where their data is going to be stored in the cloud.

**Rapid Elasticity:** Cloud computing enables computing resources or user accounts to be rapidly and elastically provisioned or released so that customers can scale their systems (and costs) up and down at any time according to their changing requirements.

**Measured Service:** Cloud computing providers automatically monitor and optimize the resources by leveraging a metering capability (typically done on a pay per-use) at some level of abstraction appropriate to the types of services.

#### **IV. Cloud Computing Service Delivery Models**

The cloud computing service models represents the different ways of providing various resources like software, infrastructure, and storage on the Internet. The cloud service providers that offer services are categorized into service delivery models: Software as a Service (SaaS), Platform as a Service (PaaS) and Infrastructure as a Service (IaaS).

**Software as a Service (SaaS):** This service model refers to the software application services required by the customer are delivered by the cloud computing provider on demand. This is one of the most popular and widely used cloud computing services like Gmail, Google Docs etc. SaaS is the ability provided to the customer to run its software applications on vendor's infrastructure provided on the cloud (Williams, 2012). These software applications can be accessed from various client devices either through a simple web browser or a program interface. The customer is free from managing the underlying cloud infrastructure including the network, servers, operating system, storage or even the individual computing capabilities.

SaaS provides cloud based services such as customer resources management and enterprise management services. For example, Microsoft provides the services of Microsoft Office suite on the cloud for a fee. Another successful SaaS provider is Customer relationship management (CRM) specific Salesforce.com followed by Force.com that gives organizations the tools to integrate enterprise systems with Salesforce.com to produce seamless interaction and enhance productivity.

**Platform as a Service (PaaS):** Platform as a Service provides consumers with a stable online environment

where they can quickly create, test and deploy web applications using browser-based software development tools (Williams, 2010). PaaS is the ability provided to customers to develop and deploy the software applications created using the programming languages, libraries, services, and tools supported by the provider. The consumer does not manage the underlying cloud infrastructure but has control over the deployed applications. It enables independent software vendors (ISVs) to develop, deploy, and manage applications without incurring upfront cost for buying the platform hardware or software (Jain & Gupta, 2012).

**Infrastructure as a Service (IaaS):** This service model is the delivery of hardware for storage and processing including the operating systems required to build the software applications. IaaS can almost be seen as the inverse of SaaS (Williams, 2012). It is the ability provided to the consumer to provision hardware (processing, storage and networks), and other core computing resources. It can include the operating systems and applications where the customer can deploy and run arbitrary software. The customer does not manage the underlying cloud infrastructure but has control over operating systems, storage and deployed applications.

#### **V. Cloud Computing Deployment Models**

The cloud computing environment is categorized into four common deployment models: private cloud, community cloud, public cloud and hybrid cloud.

**Private Cloud:** In this model the cloud infrastructure is provided to a single organization or a third party, or both exclusively and it may exist on premises (local) or off premises (remote). The main advantage of private cloud is that it is easier to manage security, maintenance and upgrades and also provides more control over the deployment and use (Jadeja and Modi, 2012).

**Community Cloud:** The cloud infrastructure is provided to a group of organizations that have shared concerns (e.g., mission, security requirements, policy, and compliance considerations) for exclusive use. It may be operated by one or more of the organizations in the community, a third party and it may exist on or off premises.

**Public Cloud:** The cloud infrastructure is provided to the general public. It may be owned, managed, and operated by the cloud provider and it exists on the premises

of the cloud provider. It helps in cutting costs and is less secure compared to other cloud models as all the applications and data on the public cloud are more prone to malicious attacks (Jadeja and Modi, 2012).

**Hybrid Cloud:** The cloud infrastructure is a composition of two or more distinct cloud infrastructures (private, community, or public) that remain unique entities, but are bound together by standardized or proprietary technology that enables data and application portability (e.g., cloud bursting for load balancing between clouds).

**VI. Pros and Cons of Cloud Computing**

After the global financial crisis in 2010, business organizations everywhere are looking for strategies to cut costs. At these critical times, cloud computing played an important role for the businesses in cutting costs. Retailing industry can also benefit from cloud computing in cutting costs. According to Vaidya & Gaur (2013), a shift towards cloud computing can provide a lot of benefits to retailers and would take the retailers to a higher and better level. In addition, retailers should evaluate cloud computing as a viable solution for reducing operating costs, simplifying business processes and collaborating more easily with partners and suppliers. Azam et al. (2013) have identified that cloud computing is beneficial to midsize and large size companies but not for smaller businesses. Table 1 presents the advantages and disadvantages of cloud computing.

**Table 1**  
**Advantages and Disadvantages**

Advantages	Disadvantages
<ul style="list-style-type: none"> <li>• Cutting costs</li> <li>• Dynamic Scalability</li> <li>• Reliability</li> <li>• Maintenance</li> <li>• Minimize licensing new software</li> <li>• Innovation</li> <li>• Multiple Users at same time</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of Control</li> <li>• Dependency</li> <li>• Security Risk</li> <li>• Internet connection needed</li> <li>• Migration Issue</li> <li>• Lack of Standards</li> <li>• Continuously Evolving</li> </ul>

Many small and medium scale industries shift towards cloud computing IT solutions so as to cut costs related to IT services especially the investment and maintenance costs and get a better on-demand, flexible quality of services from cloud computing providers at anytime from anywhere.

Williams (2010) have classified the benefits of cloud computing into financial benefits, technological benefits, operational benefits and environmental benefits. Financial benefits include pay-per-use IT, operational expenditure and reduced IT management costs. Technological benefits include rapidly scalable computing on demand, access anywhere and future proofing. Operational benefits include fewer IT administration tasks, remote access, online collaboration and faster software development and deployment. Environmental benefits include shared resources and reduced travel.

Despite the security risks, cloud computing continues to grow faster in providing services to multiple businesses including the retail sector. The main advantage of adopting cloud computing is cost reduction by avoiding the headache of high end infrastructure maintenance and trained manpower.

**VII. Retailing Industry**

Retailing industry is where the products are sold to the ultimate consumer who buys them for personal use but not for making profits. They buy wholesale products in bulk from wholesalers including suppliers and distributors, and add their margin before selling it to consumers. They have good product knowledge and provide advice and customer service to consumers. Moreover, they target the consumers based on their age, location and requirement and update the products supply according to the consumers’ interest.

Retailers can be categorized by the size of their business and the way they in which they sell their products. Department store offers a wide range of products at various pricing levels to the customers. They are managed by one organization. Supermarkets either small or large offer range of foods, beverages, vegetables, fruits, clothing, electronics and bakery products at lower prices. Warehouse retailers’ stock, display and retail a large variety of good at very competitive prices. Specialty retailers offer wide range of specific products at higher prices to the customers. They add value by offering accessories and related products. Convenience retailers offer limited range of products and usually located in residential areas. They offer products at premium prices. E-tailers offer products online. Customers can buy online at anytime from anywhere at competitive prices.

### **VIII. Adoption of Cloud Computing in Retailing Industry**

The cloud computing industry has gained much popularity in every other business but in the retailing industry is still stagnant in adopting cloud computing. Retailing industry is slowly adopting the cloud computing technology which can provide the major benefits including the reduced costs, scalability, lesser time and flexibility. On the other hand, according to a Microsoft-commissioned survey of about 3,000 business decision-makers across the US, nearly half of the respondents from the retail industry said that their companies have already adopted cloud computing and one third of the respondents said that their companies are ready to adopt cloud computing.

Gong (2011) has suggested five simple guidelines for the organizations who are adopting cloud computing to help stay firm. 1. Design IT as a supply chain 2. Use a portfolio approach for deciding what to move to the cloud. 3. Make service costing a core competency 4. Treat security as a service and 5. Start with an exit strategy. Moreover, Mankotia (2011) recommended five tips for organizations getting on the cloud. Firstly choose the appropriate complete business case, then plan for the possible cloud computing services crash. Read and fully understand the SLA's coverage with their service providers, track your users and their usage and finally know where your data is stored.

Motta et al. (2012) captured the business and economical perspective of cloud computing using the Systematic Literature Review (SLR) method. They classified the cloud computing issues into service level agreement-performance, security issues business issues-cost and legal issues. In addition, they identified that some authors have considered benefits and challenges of cloud computing from a broad perspective, thus showing economic benefits for providers and end users. On the other hand, cloud computing might imply key ethical and legal issues that may delay or even prevent a mass adoption.

Accenture (2014) research says that the competition with online pure-plays such as Amazon and ASOS and customer demand for a seamless experience will trigger fast adoption rates for cloud in global retail sector. According to Accenture analysis report (2014), widespread adoption of cloud computing in retail is expected with the industry's cloud market tripling from \$4.2 billion in 2011 to an estimated \$15.1 billion in 2015.

In traditional computing model, the retailers in order to expand the relationship with the customers maintain the customer's information, reviews and their feedbacks. The retailers have to build up their own hardware infrastructure including servers and storage devices and also purchase the expensive software applications. In addition, they have to hire people to maintain the hardware and software infrastructure. But in cloud computing, the hardware equipment and software applications are located on servers in large data centers making the retailers hassle free.

In the context of retailing industry, Arun (2010) identified cloud computing as an efficient in collection and analyses of huge volumes of sales data and in real time inventory management. In retailing, everyday large amounts of data is generated through POS (Point of Sale) systems. Low and medium size retailers do not have enough resources to store and maintain these large amounts of data generated through POS. The retail clouds provider provide the storage service and collects the data from advanced servers connected to the supply chain to independent cash points at small stores and store it for the retailer. The retailer in turn can access the stored data from anywhere and anytime. (See figure 1).

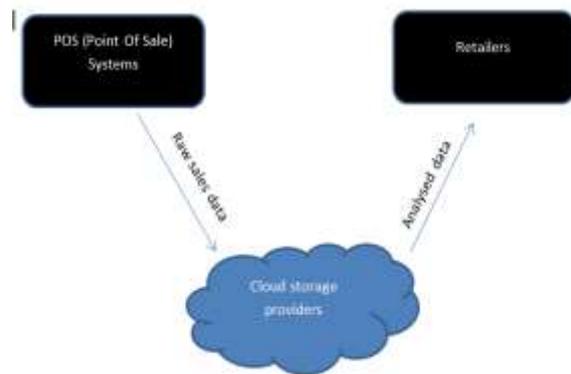


Fig. 1 Process of flow of sales data originating from POS systems and reaching to the retailers via cloud

The retailers collect large amount of data from consumers to connect and improve relationships with customers. The cloud then provides the retailers data analysis and easy, secure and accessible data storage.

A cloud computing provider can track performance of products in comparison to previous time periods. The cloud provider can identify the trend and seasonality component of each product, brand or category and identify and monitor the performance. Then, it can provide analytical results to the retailers. The provider of the service can serve many

retailers at the same time, without making each retailer do it individually for themselves. A good cloud provider can easily help the retailer in understanding patterns and trends within large databases. Thus retailers can increase their ability to forecast their customer's behavior and plan accordingly. Table 2 presents the cloud computing providers and their specific products providing key services to the retailing sector.

**Table 2**  
**Cloud computing providers and their specific products and services**

Company	Product	Product Description
Oracle	Oracle Retail	With Oracle Retail, retailers can align corporate objectives with deployment strategies to deliver superior customer experiences and drive profitable growth. (Mankotia, 2011)
NetSuite	NetSuite for Retail	NetSuite for Retail is the only cloud business software solution that brings together every step of a multi-channel, multi-location retail business— POS, ecommerce, CRM, marketing, merchandising, inventory and order management and financials.
Salesforce.com	Sales Cloud and Salesforce for CRM	Salesforce Retail Clienteling takes the “Little Black Book” of retail and blends the best of physical retail — great stores, inspiring product, responsive sales associates — with the #1 CRM platform of Salesforce. The boundaries between physical and digital retailing have disappeared. With Retail Clienteling, retailers can bring a whole new level of personalization to the shopping journey.

Accenture [2014] believes that retailers can leverage from the cloud to improve business outcomes in four key areas - Channel Operations, Merchandising and Marketing, Supply-Chain Management, Sales, Service and Support.

Han (2011) has conducted a comparative analysis on a leading cloud computing providers’ storage service

Amazon Web Services against the traditional local managed storage and servers. The TCO (Total Cost of Ownership) for Amazon Web Server and local managed storage server were calculated and the comparison shows that cloud computing model has a significant fifty percent cost saving.

**IX. Conclusion**

Instead of investing in hardware and software, retailers can use cloud computing services from clouds service providers. They can access large amount of stored data from anywhere and anytime, forecast demand for the products or services, segment the market, improve and maintain relationships with customers, track the current trends of customers’ behavior, and purchasing patterns towards various brands. Moreover, retailers can reduce costs and target the right customers in lesser time. Clouds service providers can provide secure data of customers and analytical results to the retailers. Thus, adoption of cloud computing in retailing industry is the need of the hour.

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