Cloud Computing and Its Impact on E-Commerce

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Abstract- *Cloud computing is one of the most evolving technologies in the information technology sector. Since its introduction by Google in 2007, cloud computing has become from a theoretical concept into a real time technology in different industries such as telecommunication and healthcare. Cloud Computing uses Internet and remote servers to maintain user's data and applications. It provides the necessary platform to customers and businesses to use applications without installation and access their personal files, data and information at any corner of the world with the help of internet. E-Commerce is one of the major services of cloud computing. E-commerce in Small and medium businesses is needed to provide better services to satisfy them. In this paper, we discuss how E-Commerce business is affected by cloud computing.*

I. INTRODUCTION

What is cloud computing?

Google believes that the cloud computing should provide consumers data storage and computing services in a secure, fast and the most convenient possible way [4]. According to Mell and Grance [5], the cloud computing allows users to customize network related resources, applications, and services based on the demand. Another definition of the cloud computing is a dynamic computing environment which allows scalability and provides virtualized resources as service through the Internet [6].

Omni-Channel

Based on Marketo, one of the leading Automation Providers, the marketers must provide a seamless experience, regardless of channel or device. The consumers have many ways in which they can communicate with the company (i.e., physical store, online website/catalog, mobile app, social media). The consumers can again use various electronic devices such as desktop or laptop computers, smart phones, tablets, iPads, and so on. And, the aim is that the consumers' experience should be consistent regardless of the type of communication and the type of device they use for their transactions [7]. There are several benefits of omni-channel to the businesses and their customers [8]:

- **Cross-sell and up-sell:** the sales at physical stores can improve when the sale person can provide real-time information to the customers
- **Operating costs:** can be decreased when sales channels and inventories can be accessed through an integrated platform
- **Customer satisfaction:** can increase when the consumers' experience has consistency among all the channels
- **Sales:** can be increased by providing customers alternative ways to purchase goods such as online or by sales person finding out the available inventory in real-time
- **Order and fulfillment costs:** can decrease when all the processes such as merchandising, inventory, and shipping are consistent among all the channels
- **Decision-making:** can be improved since the businesses will be able to more precise forecasting, in return more accurate decisions on merchandising and replenishing the stocks
- **Efficiency and confidence:** can increase when all the stakeholders such as decision-makers and departments collaborate efficiently and work within an integrated platform

What is E-commerce?

E-commerce came into being since late 1970s. Many advantages of online shops encourage consumers to adopt, like lower costs, better prices than traditional retailers, and ability of consumers to compare prices from different retailers (Chaparro-Peláez et al., 2016, Chang et al., 2010). The Electronic Commerce Association introduced a general definition of E-commerce: "electronic commerce covers any form of business or administrative transaction or information exchange that is executed using any ICT (Information and Communications Technology)". Raymond (2001) defined E-commerce as "The functions of information are exchange and commercial transaction support that operate on telecommunications networks linking business partners (typically customers and suppliers)". Turban et al. (2002) defined it as "An emerging concept that describes the process of buying, selling, or exchanging services and information via computer networks".

In general E-commerce can be categorized as:

1. Consumer to Consumer E-commerce (C2C E-commerce): The E-transactions between consumers themselves
2. Business to Consumer E-commerce (B2C E-commerce): Enterprises can sell to the consumers directly
3. Business to Business E-commerce (B2B E-commerce): The E-transactions between Enterprises.
4. Consumer to Business E-commerce (C2B E-commerce): Consumers can sell products to the Enterprises.

II. RELATED WORK

The paper concentrates on how cloud computing environments impacts on E-Commerce, the main background of the influences of cloud computing has to be established. The impact of cloud environment has been discussed by different literatures. Firstly, Kasherfi, F., Et al. consider the impacts of cloud environment on the processes and present a new method of cloud computing. The paper discuss the positive impacts of cloud environment on e-commerce small and big companies and organizations such as yahoo, Google, etc. In this, authors highlight the technical influence of cloud computing rather than its business impacts. Lai, S. examine the influence of cloud computing on traditional software project. Mainly, it processes the security strategies, migration and the corresponding tools. Li J. and Liu J. examine that the lack of teaching resources which are averting the educational in rural China. According to the authors, cloud computing help to solve the problems. However, all these possible benefits of cloud computing environment are only discussed. Zhang, H. point out that cloud technology will become the best choice of the virtual operation process due to its features such as security and reliability and cloud computing can be applied in different levels in management process. As a result, the development of e-commerce businesses and industry will be significantly impacted. Finally, few researches give the case analysis to make the points more persuasive. By virtue of describing the changes of E-commerce in the cloud era, the paper analyzes the impacts of cloud computing on E-commerce enterprises and industry chain in detail.

III. THE APPROACH OF CLOUD COMPUTING

Today, there are many detonations of cloud computing. As according to Wikipedia, Cloud computing includes deploying groups of multiple remote servers and software networks that permit different kinds of data sources which can be uploaded for real time processing for the generation of results without the need to store (processed) data on the cloud. In short, it uses the public for calculation or other way to shared information and resources.

IV. DEPLOYMENT MODEL OF CLOUD COMPUTING

It is most primary to decide which type of cloud model is selected for secure cloud services. There are basically three types of deployment model in cloud computing.

4.1 Public Cloud

A cloud is called a "public cloud" when the cloud computing service are given over a network that is open only for publicly use. This model is based on pay-per-use method, same as prepaid electric meter technology. It is ideal for businesses seeking less complex Information technology hosting. Public cloud allows user's access to the cloud via interfaces using mainstream web browser. Applications run on it have either seasoned demand or unforeseeable traffic. It is less secure cloud models

4.2 Private Cloud

Private cloud model is designed with organization's internal enterprise data center. Here scalable resources and virtual services are provided by the cloud vendors are combine together and available for cloud users to share and use Only the organization people and designated stakeholders may have use to operate on a specific private cloud. Thus, private cloud model is much more secure than public cloud model. Just like Intranet, all the resources and applications are managed by organization itself.

4.3 Hybrid Cloud

Hybrid cloud is a combination of both public cloud model and private cloud model which is centrally circumscribed and managed by a secure network. It gives more secure control of the data and applications and provides various parties to access data and information over the Internet.

V. CLOUD COMPUTING DELIVERY MODEL

After cloud deployment models, there are three types of cloud delivery models. Delivery models are as follows
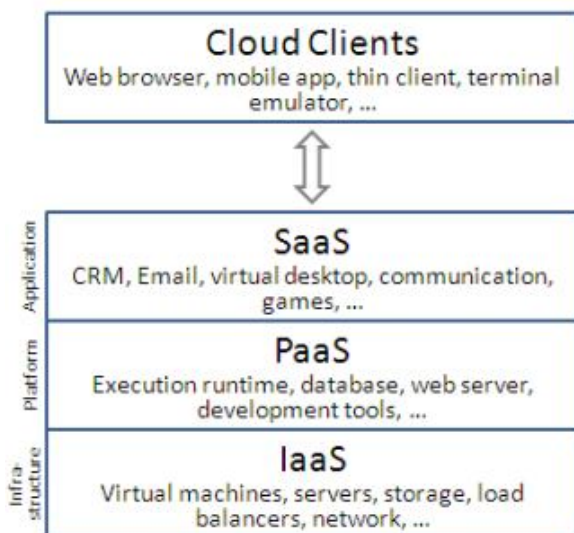
5.1 Infrastructure as a Service (Iaas)

IaaS is a single layer cloud model where cloud computing vendor's dedicated resources are only shared with contracted users at pay-per-use service. This model is also provides different degrees of financial and functional pliability which is not found in inside data servers or with co-location services, because computing resources can be added or released much more quickly and cost-effectively than in an internal data servers As a initial investment cost of computer servers, results, networking devices, processing power etc. are minimized.

5.2 Software as a Service (Saas)

SaaS is based on pay-per-use basis costing model where software applications are leased out to contracted organizations by specialized SaaS sellers. SaaS giver may host the software either in their own data network center. Initially software has limited functionality, it can be easily customized based on demand which is billed accordingly softwares are accessed using secured web browser over the Internet. Web services (WS) security, XML encryption, Secure Socket Layer (SSL) etc is used in enforcing data protection transmitted over the Internet.

5.3 Platform as a Service (Paas)

PaaS cloud model layer is similar to IaaS model with additional "rented" features. Virtual machines are secured against unauthorized attacks such as cloud malware and hackers. PaaS model services are expensive than IaaS and SaaS. Cloud sellers and users need to maintain cloud computing network security at all interfaces.

VI. E-COMMERCE AND ITS MODELS

Electronic commerce is one of the main criteria of revolution of Information Technology and communication in the field of economy. The Current edge for business today is Electronic Commerce, it refer to electronic transaction such as buying, selling, information flow and fund transfer over the internet. E-commerce broadly encompasses all business activities taking place over internet. E-commerce has the following Models:

o   **Business-to-Business (B2B):** the transaction between business enterprises.
o   **Consumer-to-Business (C2B):** the customers selling products and services to the Business Enterprises.
o   **Business-to-Consumer (B2C):** the transaction among Business Enterprises and customers. 44**Consumer-to-Consumer (C2C):** the business transaction among users or consumers.

VII. INFLUENCES ON E-COMMERCE TECHNICAL ARCHITECTURE

E-commerce is the exchange of products and services via Internet. From the perspective of system, it is composed of two layers: one layer is the technical architecture made up of hardware and software; the other layer is the business transactions based on the technical architecture. According to Laudon, the technical architecture is the base of E-commerce. And only on the base of the technical architecture, can the E-commerce business modes and marketing strategies be realized. In addition, the security and stability of technical architecture are the premise of online products and services exchange. Cloud computing is not a brand new computing mode. It is the evolution and extension of the traditional distributed computing and grid computing. For instance, Weiss defines cloud computing as the natural evolution and integration of effective computing, distributed and grid computing. Mell and Grance defines cloud computing as a model which is able to visit the configurable resources such as network, server, memory, applications and services based on the demand. Therefore, the influences of cloud computing on Ecommerce technical architecture are demonstrated by the building, implementing and maintaining of the technical layer.
 Firstly, cloud computing enables E-commerce enterprises to rent rather than purchase hardware and software, which help them to decrease the cost of system building. Traditionally, E-commerce enterprises have to purchase all the needed hardware and software, which accounts for a high percentage of E-commerce operation expenses, especially for the medium and small businesses. By virtue of the cloud computing platform, an E-commerce enterprise can choose and rent the

IT products and services based on its demand so as to establish the technical architecture. Especially, the charging mode of "pay-as-service" is very flexible, which helps an E-commerce company to pay for the resources based on the demand. EC2 (Elastic Compute Cloud), a cloud system offered by Amazon, which allows the users to rent the applications in the cloud is a good example. Many businesses have benefited from EC2.

Secondly, cloud computing solved the problem of resources utilization efficiency. For an E-commerce company, it is necessary to invest on the software and hardware to maintain the operation. With the company's growth, the investment will be increased. However, the utilization efficiency of the invested infrastructure is low due to the sales season and the change consumers' behavior. According to Robert L., the average utilization efficiency is no more than 10%, which causes the IT resources waste. Cloud computing enables the businesses to integrate the idle IT resources (e.g. server) on the far end platform and rent them to the customers. This mode on the one hand reduces the operation cost of an E-commerce company and prioritizes resources allocation on the other hand. Although, customers' privacy may become an obstacle for the cloud applications of E-commerce.

VIII. INFLUENCES ON E-COMMERCE BACKEND SERVICE MODE

The new service mode offered by cloud computing differentiates it from the traditional IT services. Firstly, all the IT resources such as hardware, software, data and infrastructure are offered to the E-commerce enterprises as service by virtue of the cloud platform]. Secondly, just like the utility services (e.g. electricity), an E-commerce company is allowed to access to the IT resources on the cloud platform and pay for them as services. It does not require the high expenses on devices purchase and each firm is able to choose the appropriate IT resources through renting. In another word, the emergence of cloud computing brings the new service philosophy and mode which enables the lower cost and changes the traditional IT licensing mode. As the outsourcing service provider, a cloud computing business establishes the standardized and uniform service platform which integrates the infrastructure, application software and developing environment and customize them based on customers' demand. As the customer, an E-commerce enterprise searches the needed services and pays for it based on the demand. Essentially, it is a kind of outsourcing, that is, the E-commerce company delivers the backend processes that it had to complete before to the cloud computing provider through contracting.

The backend service mode based on cloud computing changes the close-end service that the service provider has to

send the IT personnel to conduct local technical support and is called as "outsourcing 2.0". The primary objective of outsourcing is to reduce cost, improve efficiency as well as service quality and improve the core competencies of an organization. The evolution of E-commerce indicates that the core competency of an E-commerce firm is not the pure technology any longer but the business or service mode. Cloud computing sets the E-commerce enterprises free from the complicated technical architecture planning, designing and maintaining and enables them to focus on the core businesses. Virtual business is the typical example of the new outsourcing based on cloud computing. It refers to that an E-commerce firm fulfills most of its functionalities through "cloud-outsourcing" .

The advantages of virtual business lie in

1) The charging mode of "pay-as-service" enables the cost saving;
2) The expenses of devices upgrading can be decreased;
3) The "cloud-outsourcing" mode enables the higher visiting of E-commerce website.

IX. INFLUENCES ON E-COMMERCE BUSINESS STRATEGIES

Since the emergence of cloud computing, a lot of Ecommerce firms begin to expand their business to cloud computing. Several driving forces lead to the migration of cloud computing into E-commerce strategies: 1) *Demand*. With the rapid development of information technology, E-commerce services are improving—the services with higher efficiency, lower cost, more flexibility and diversity are needed; 2) *Efficiency*. The efficiency advantages of cloud computing lies in two aspects: on the one hand, the huge data storage is becoming a problem with the growth of E-commerce firms. Establishing the data center is unaffordable for medium and small E-commerce enterprises. Cloud computing enables the outsourcing of the backend infrastructure building and application software services; 3) *Policy*. Government's policy is another driving force which spurs the E-commerce enterprises to involve cloud computing into their business strategies. In 2009, Obama —president of U.S.A announced a long-term cloud computing plan so as to reduce government's expenses by virtualization technology. In the same year, Apps.gov—a cloud services website was established. This online store enables all the federal institutions to browse and purchase IT services based on cloud computing. These policies and measures indicate that cloud services will help E-commerce enterprises to gain more opportunities and resources; 4) *Quality*. Customers' higher requirement on the quality of E-commerce products and

services is another driving force which makes the E-commerce enterprises implement their cloud strategies. For example, Baidu, the largest Chinese searching engine, in 2011, announced opening its cloud platform which supports 6 billion searching from the 138 countries. Cloud computing enables Baidu the functionalities through the ability of huge data storing and processing, real-time computing and high quality service architecture. As a result, Baidu stands out among the information searching platforms due to its ability of quick response and high reliability of 99.999%.

X. BENEFITS OF CLOUD COMPUTING FOR E-COMMERCE

The cloud computing and e-commerce highly benefit from the Internet. Cloud computing allows consumers and clients to use services, computational resources and storage in a transparent way. E-commerce on the other hand, allows consumers to buy services or products from just about anywhere in the globe and anytime. The cloud computing for e-commerce has several benefits [15]. The cost can be calculated based on the need of each company. According to Amazon, cloud computing helps businesses to significantly reduce the costs on several places such as hardware procurement, security, privacy, energy, and maintenance.

Trust and Security of cloud computing:

The security of data stored in the cloud is an important concern by everyone [16]. The concept of trust is not easy to define; however, many cloud computing users agree that transparency is important when it comes to trust issues in cloud computing. The businesses must clearly see that the service providers indeed adhere to security standards and best practices. Storing data in the cloud for e-commerce applications is generally considered the best choice.

Investments tailored to the needs of e-commerce:

It appears that the cloud computing allows e-commerce companies to save costs up to 80% which is a significant amount. Given this savings, there is a continuous need to maintain and even enhance IT infrastructure for the future development of e-commerce industry. The scalability and flexibility are two important benefits of cloud computing as applied to e-commerce.

Cloud computing scalability:

One of the most essential benefits of cloud computing is its ability to scale based on the demand of the cloud clients or businesses. Many of the operations such as

activation of the server, increasing the computation power, to reallocating the loads due to changing demands on the cloud can take place relatively quickly (in the order of minutes). These operations basically define the scalability of the cloud and the flexibility to allocate more resources when requested and disposing of them when they are no longer needed by the cloud users.

Mobility:

E-commerce benefits from cloud computing by allowing its customers access products and services from anywhere and anytime through mobile devices. If the users travel all around the globe, they can still have access the goods through their smartphones.

Global expansion:

Cloud computing can be considered while developing strategies for current and future global expansion of e-commerce industry. The e-commerce product contents could be readily available to customers in the world through the use of cloud computing. Cloud computing can also assist to handle numerous e-commerce businesses specific to customers within many different countries.

Cost of construction and operation:

As the e-commerce industry grows with the increased data growth, the need for the computer hardware and software resources increase. As a result, costs associated with maintenance of equipment and operations will need to be taken into consideration.

Quality of e-commerce:

In order to sustain the quality of e-commerce, the computing services must be scalable, reliable and provide flexibility of access to products and services from anywhere and anytime in the world. Many of the large cloud service providers such as Google, Amazon, IBM, and Microsoft have their data centers spread across the globe in order to guarantee reliability in accessing the cloud applications in cases of failures.

XI. CONCLUSION

In this research we believe that, we can create an E-Commerce service model based on cloud computing by means of cloud computing services such as mass data storage, high-speed computing capabilities, as well as its perfect allocation and the sharing of resources. The new emerging technology of cloud computing is creating a new ecosystem service which

will combine all the E-commerce services and facilitate the new service modes. Cloud computing help companies to attain more efficient use of their Information Technology hardware and software investments and give a means to speed up the acceptance of innovations. Cloud computing service has enabled teams and organizations to streamline lengthy acquisition processes. Cloud computing is still a very new technology and we still having more room for improve the service of cloud computing. In the traditional E-commerce enterprises, an proper strategy of implement in the cloud computing era is to cuddle cloud computing rather than avoiding on it. Only when the E-commerce model includes cloud computing in the business strategy and establish the core competencies, can they realize the sustainable development.

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