

"A COMPARISON OF CLOUD APPLICATIONS FOR ISPSC"

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Chapter I

INTRODUCTION

Project Context

One of the best challenging part of a person who uses gadgets is to know what are the latest technologies in our industry. Information technology is pervasive in society today. It supports and enables many aspects of life and has become the single most important technology in use worldwide. Information technology has revolutionized how business is conducted in all areas except health care, including public health, where adoption and use of health information technology has been slow and information sharing sporadic and often manual. Information technology is a technical discipline that solves real-world problems using a variety of computing resources. IT professionals help meet people's needs within an organizational and societal context through the selection, creation, application, integration and administration of computing technologies. (CapstoneDestination)

When individuals store their photos online instead of on their home computer, or use webmail or a social networking site, they are using a "cloud computing" service. If they are an organization, and they want to use, for example, an online invoicing service instead of updating the in-house one they have been using for many years, that online invoicing service is a "cloud computing" service.



Cloud computing is the delivery of computing services over the Internet. Cloud services allow individuals and businesses to use software and hardware that are managed by third parties at remote locations. Examples include online file storage, social networking sites, webmail, and online business applications. The cloud computing model allows access to information and computer resources from anywhere if a network connection is available. Cloud computing provides a shared pool of resources, including data storage space, networks, computer processing power, and specialized corporate and user applications.

Cloud services are popular because people can access their e-mail, social networking site or photo service from anywhere in the world, at any time, at minimal or no charge. Some cloud providers may, however, use the personal information of users for advertising purposes or to learn more about the users for other reasons. Individuals should pay careful attention to whether and how the cloud company protects their personal information. Users should also protect their own personal information by using any privacy settings that the service may offer. (Introduction to Cloud Computing)

Everyone has an opinion on what is cloud computing. It can be the ability to rent a server or a thousand servers and run a geophysical modeling application on the most powerful systems available anywhere. It can be the ability to rent a virtual server, load software on it, turn it on and



off at will, or clone it ten times to meet a sudden workload demand. It can be storing and securing immense amounts of data that is accessible only by authorized applications and users. It can be the ability to use applications on the Internet that store and protect data while providing a service — anything including email, sales force automation and tax preparation. It can be a storage cloud to hold application, business, and personal data. And it can be the ability to use a handful of Web services to integrate photos, maps, and GPS information to create a mash up in customer Web browsers.

(SunMicrosystem. 2009, June)

The current system or ways of the students in ISPSC on saving or storing a file is by the use of a flash drive or external drive. Student's used a flash drive or an external drive to save their files, photos, videos and other documents. But what if they left it or worst misplaced it? How can they recover it? In cloud computing even if they have no flash drive or an external drive they can store and save their files, photos, videos and other important documents on the cloud. Also, when student are on out of town they can easily send or retrieved a file or data on the cloud at any time and it is very affordable because if they have an android phone or a laptop they can access it easily.

Purpose and Description

The following significances were brought to focus in the conduct of this study:



Administrators. Through this study they will be able to determine the most feasible cloud application that can be implemented in the college.

Students. They are the primary person who will be benefited in the study if it will be implemented. They will be able to store their files even if they are not in the school premise.

Researchers. The proponents applied their knowledge in comparing cloud application and gained more knowledge about the different cloud applications.

Future Researcher's. This study would serve as research guide for students who will be having the same interest with the similar project manuscript.

Statement of Objectives

The proposed capstone project aims to determine a good cloud application among the ten cloud applications used by ISPSC, Sta. Maria.

Specifically, this study focuses to:

1. To determine the current process of storing and sharing data/info at ISPSC;
2. To compare the different cloud applications for ISPSC in terms of;
 - a) relative cost advantage
 - b) application complexity



- c) application strategic importance
- d) resource utilization
- e) application outcome measurability
- f) vendor behavior observability
- g) learning capabilities

3. To determine the most feasible cloud application technology that can be adopted for ISPSC.

Scope and Limitation

The study aimed to determine the most feasible application of cloud by comparing different cloud applications. The cloud applications will be compared by its features through the following factor: a) relative cost advantage; b) application complexity; c) application strategic importance; d) resource utilization; e) application outcome measurability; f) vendor behavior observability; g) learning capabilities. The study only focuses on how to store and share files by the means of the cloud applications. The cloud applications that needed to be purchased cannot be tested. Only those applications that are free were tested by the researchers.



Chapter II

REVIEW OF LITERATURE

Cloud Computing

According to Rajkumar Buyya, et al. (2013) Cloud Computing is a technological advancement that focuses on the way people design computing systems, develop applications, and leverage existing services for building software. It is based on the concept of dynamic provisioning, which is applied not only to services but also to compute capability, storage, networking, and information technology (IT) infrastructure in general. Resources are made available through the Internet and offered on a pay-per-use basis from cloud computing vendors. Today, anyone with a credit card can subscribe to cloud services and deploy and configure servers for an application in hours, growing and shrinking the infrastructure serving its application according to the demand, and paying only for the time these resources have been used.

Cloud computing allows anyone with a credit card to provision virtual hardware, runtime environments, and services. These are used for as long as needed, with no up-front commitments required. The entire stack of a computing system is transformed into a collection of utilities, which can be provisioned and composed together to deploy systems in hours rather than days and with virtually no maintenance costs. The demand has fast-tracked technical development and enriched the set of services offered, which have also become more sophisticated and cheaper.



The word cloud is used to describe this kind of computing because of the metaphor used for describe networks, a cloud that underlie all the technology that is above and the user do not know it exists and don't need to know it. There's not an official definition about what is cloud computing. For answering this question we will make reference to some different definitions offered by important organizations.

“A general term for anything that involves delivering hosted services over the Internet.”... “A cloud service has three distinct characteristics that differentiate it from traditional hosting. It is sold on demand, typically by the minute or the hour; it is elastic -- a user can have as much or as little of a service as they want at any given time; and the service is fully managed by the provider (the consumer needs nothing but a personal computer and Internet access).”(IT encyclopedia whatis.com (2011))

Cloud services are popular because they can reduce the cost and complexity of owning and operating computers and networks. Since cloud users do not have to invest in information technology infrastructure, purchase hardware, or buy software licenses, the benefits are low up-front costs, rapid return on investment, rapid deployment, customization, flexible use, and solutions that can make use of new innovations. In addition, cloud providers that have specialized in a particular area (such as e-mail) can bring advanced services that a single company might not be able to afford or develop. (Introduction to Cloud Computing)



Deployment of Cloud Services

According to the Office of the Privacy Commissioner of Canada Cloud, services are typically made available via a private cloud, community cloud, public cloud or hybrid cloud.

Generally speaking, services provided by a public cloud are offered over the Internet and are owned and operated by a cloud provider. Some examples include services aimed at the general public, such as online photo storage services, e-mail services, or social networking sites. However, services for enterprises can also be offered in a public cloud.

In a private cloud, the cloud infrastructure is operated solely for a specific organization, and is managed by the organization or a third party. Typically designed and managed by an IT department within an organization. A private cloud is usually built specifically to provide services internally to an organization. Private clouds may be in a collocated facility or in an existing data center. This model gives a high level of control over the cloud services and the cloud infrastructure.

In a community cloud, the service is shared by several organizations and made available only to those groups. The infrastructure may be owned and operated by the organizations or by a cloud service provider. Is a “stand-alone,” or proprietary, clouds mostly off-premise, run by third party companies such as Google, Amazon, Microsoft, and others. Public clouds are hosted off customer premises and usually mix applications (transparently) from different consumers on shared infrastructure.



A hybrid cloud is a combination of different methods of resource pooling (for example, combining public and community clouds).
(Introduction to Cloud Computing)

Cloud Computing Models

According to Harris T. (2009) Cloud Providers offer services that can be grouped into three categories.

First, Software as a Service (SaaS): In this model, a complete application is offered to the customer, as a service on demand. A single instance of the service runs on the cloud & multiple end users are serviced. On the customers side, there is no need for upfront investment in servers or software licenses, while for the provider, the costs are lowered, since only a single application needs to be hosted & maintained. Today SaaS is offered by companies such as Google, Salesforce, Microsoft, Zoho, etc.

Second computing model is Platform as a Service (PaaS): Here, a layer of software, or development environment is encapsulated & offered as a service, upon which other higher levels of service can be built. The customer has the freedom to build his own applications, which run on the provider's infrastructure. To meet manageability and scalability requirements of the applications, PaaS providers offer a predefined combination of OS and application servers, such as LAMP platform (Linux, Apache, MySql and PHP), restricted J2EE, Ruby etc. Google's App Engine, Force.com, etc are some of the popular PaaS examples.



And lastly is Infrastructure as a Service (IaaS): IaaS provides basic storage and computing capabilities as standardized services over the network. Servers, storage systems, networking equipment, data centre space etc. are pooled and made available to handle workloads. The customer would typically deploy his own software on the infrastructure. Some common examples are Amazon.

According to Saleem, R. the summary of the features of Cloud Computing are described as follows:

1. Cloud Computing is a new computing paradigm.
2. Infrastructure resources (hardware, storage and system software) and the applications are provided in X-as-a-Service manner. When these services are offered by an independent provider or to external customers, Cloud Computing is based on pay per-use business models.
3. Main features of Clouds are virtualization and dynamic scalability on demand.
4. Utility computing and SaaS are provided in an integrated manner, even though utility computing might be consumed separately.
5. Cloud services are consumed either via Web browser or via a defined API. (Saleem, R. 2011)

According to Reese (2011), we can define three criteria to discriminate whether a service is delivered in the cloud computing style: (1) the service is



accessible via a Web browser (nonproprietary) or a Web services application programming interface (API); (2) zero capital expenditure is necessary to get started; and lastly (3) you pay only for what you use as you use it.

Cloud Computing Technology

Virtual Private Network (VPN)

Cloud technology organization a virtual private network (VPN) extends a private network across a public network, such as the Internet. It enables a computer or network-enabled device to send and receive data across shared or public networks as if it were directly connected to the private network, while benefiting from the functionality, security and management policies of the private network. A VPN is created by establishing a virtual point-to-point connection through the use of dedicated connections, virtual tunneling protocols, or traffic encryptions. Major implementations of VPNs include OpenVPN and IPsec. (Virtual Private Network. Wikipedia January 10, 2015)

Virtualization

According to Rajkumar Buyya, et al (2013) Virtualization is essentially a technology that allows creation of different computing environments. These environments are called virtual because they simulate the interface that is expected by a guest. The most common example of virtualization is hardware virtualization. This technology allows simulating the hardware interface expected by an operating system. Hardware virtualization allows the coexistence of different software stacks on top of the same hardware.



These stacks are contained inside virtual machine instances, which operate in complete isolation from each other. High-performance servers can host several virtual machine instances, thus creating the opportunity to have a customized software stack on demand. This is the base technology that enables cloud computing solutions to deliver virtual servers on demand, such as Amazon EC2, Right Scale, VMware, vCloud, and others. Together with hardware virtualization, storage and network virtualization complete the range of technologies for the emulation of IT infrastructure. Virtualization technologies are also used to replicate run time environments for programs. Applications in the case of process virtual machines (which include the foundation of technologies such as Java or .NET), instead of being executed by the operating system, are run by a specific program called a virtual machine. This technique allows isolating the execution of applications and providing a finer control on their source they access. Process virtual machines offer a higher level of abstraction with respect to hardware virtualization, since the guest is only constituted by an application rather than a complete software stack. This approach is used in cloud computing to provide a platform for scaling applications on demand, such as Google App Engine and Windows Azure. (Rajkumar Buyya, et. Al. 2013)

Four of cloud computing defining characteristics are particularly important to legal analysis: (1) on-demand self-service; (2) rapid elasticity; (3) location independence; and (4) data replication. First, within the limits



defined by the cloud provider, the customer has complete control over the provisioning and de-provisioning of cloud resources, which they can do quickly and on-demand. Second, because of this ease and elasticity, customers can cause evidence to appear and disappear at a moment's notice. Third, like other resources on the Internet, the cloud resources physical location has no bearing on the use or provisioning of those resources, which could exist in one or more data centers around the world. Finally, to provide data reliability and fault-tolerance, cloud providers routinely replicate data on several computers in multiple physical locations. Further, cloud environments typically store data in a distributed file system, breaking single files into pieces that can be stored on multiple independent storage devices, such as hard drives.

Some other benefits to users include scalability, reliability, and efficiency. Scalability means that cloud computing offers unlimited processing and storage capacity. The cloud is reliable in that it enables access to applications and documents anywhere in the world via the Internet. Cloud computing is often considered efficient because it allows organizations to free up resources to focus on innovation and product development.

Another potential benefit is that personal information may be better protected in the cloud. Specifically, cloud computing may improve efforts to build privacy protection into technology from the start and the use of better security mechanisms. Cloud computing will enable more flexible IT



acquisition and improvements, which may permit adjustments to procedures based on the sensitivity of the data. Widespread use of the cloud may also encourage open standards for cloud computing that will establish baseline data security features common across different services and providers. Cloud computing may also allow for better audit trails. In addition, information in the cloud is not as easily lost (when compared to the paper documents or hard drives, for example).

While there are benefits, there are privacy and security concerns too. Data is travelling over the Internet and is stored in remote locations. In addition, cloud providers often serve multiple customers simultaneously. All of this may raise the scale of exposure to possible breaches, both accidental and deliberate.

Concerns have been raised by many that cloud computing may lead to “function creep”—uses of data by cloud providers that were not anticipated when the information was originally collected and for which consent has typically not been obtained. Given how inexpensive it is to keep data, there is little incentive to remove the information from the cloud and more reasons to find other things to do with it.

Security issues, the need to segregate data when dealing with providers that serve multiple customers, potential secondary uses of the data—these are areas that organizations should keep in mind when considering a cloud provider and when negotiating contracts or reviewing terms of service with a cloud provider. Given that the organization



transferring this information to the provider is ultimately accountable for its protection, it needs to ensure that the personal information is appropriately handled. (Introduction to Cloud Computing)

Conjoint Analysis Approach

Relative cost advantage in the context of this research is defined as the expected overall cost savings from migrating an application to cloud computing instead of pursuing it internally. The extent to which managers perceive high relative cost advantage from using cloud computing will therefore increase the likelihood that they will choose to use it. Task, transactional, or project complexity is another important variable in transaction cost economics. Project complexity is defined as the complexity of a project due to its size, scope, or technical novelty. In Application Complexity the proponents determine the size or storage of a cloud and also if it is available in any hardware application like android, IOS, or a Desktop computers. They also identify here the third parties of each cloud wherein the more third parties the more that cloud application is useful to the user. They also identify if the application can able to edit a document or data. The strategic importance of transactions is likely to influence the decision to migrate to cloud computing because it may impose significant transaction costs in the long term. How important is the application to the organization and is there risk if something goes wrong. The extent to which resources (both personnel and IT) are efficiently and effectively utilized. In the case of



cloud computing, resource utilization is lower when a smaller number of users access the application, and resource utilization is higher when a larger number of users access the application. Application outcome measurability is the ability to measure the cost, schedules, risks and performance metrics of a given application .Establishing performance metrics at the outset of a project allows a client firm to tie incentives and penalties with vendor performance. Vendor Behavior Observability occurs when the vendor/employee behavior and relationship with the governmental client can be effectively monitored during and after the migration of an application to cloud computing. Learning capabilities are defined as the acquiring, assimilating, and developing of new knowledge needed to revamp operational capabilities. Learning relates to knowledge creation and development processes, knowledge sharing and integrating processes as well as procedures of experience-based learning. Knowledge development comes from in-house learning and on the job training. Effectiveness in learning was reflected by the absorptive capacity.

The three elements that comprise a conjoint research design are 1) the attributes, 2) conjoint profiles, and, 3) part-worth and overall utilities. The attribute refers to a decision criterion that respondents might use to evaluate the dependent variables: -What is the likelihood of application migration to cloud computing? And, how attractive would it be for your government organization to migrate an application to cloud computing? In



layman's terms, conjoint analysis 1) identifies the attributes important in a choice decision, 2) identifies the way the attributes are combined to make the decision, and, 3) determines the utility value for each of the levels of each of the attributes considered in the decision. (Barry C. West, 2014)

Learning Objectives:

1. Explain what is meant by conjoint analysis.
2. Explain how conjoint analysis can be used to determine the relative importance of different attributes in a choice decision.
3. Explain how conjoint analysis can be used to determine the utility value for each of the levels of each of the attributes considered in the decision.



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