ITS

Application of Cloud Computing in System Management in Order to Control the Process

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Abstract:

The implementation and maintenance of organizational resources planning systems is really costly for each business. Large business institutes can pay the costs of organizational systems but due to high costs, small to medium businesses prefer the purchase of these systems and their relevant implementation. Cloud has some advantages in comparison to traditional data centers. For example, cloud enables the supply chain in which consumer and provider organizations determine their position in supply chain. Supply chain provides services regarding accounting and bill. Various fields have conducted studies on cloud and simulation field is also emerged for web-based simulation. The present study attempts to express definite definitions of cloud and cloud computing and define the future position of cloud computing in different industries as the basis of computing. With the rapid progress of cloud computing, we can help the organizations to achieve high efficiency in proving information technology services and reduce the costs. Also, like large companies, small and medium companies can achieve high efficiency in IT by cloud computing.

1. Introduction

In the companies and organizations in which huge data volume is computed, we need high storage space with high computing speed. On the other hand, in the 21th century, with easy access to internet and light systems, users are not inclined to use the systems with high computing power and Service-Oriented applications are used increasingly.

Cloud is a type of parallel and distributed system consisting of a collection of inter-connected and virtualized computers that are dynamically provisioned and presented as one or more unified computing resource(s) based on service-level agreements (SLA) established through negotiation between the service provider and consumer [1]. Cloud computing is the most recent ambiguous term in IT industry [2]. Today, IT and internet are important elements in the life of people and by the change of life style, some requirements including information security, rapid computing, immediate access to information and above all costs saving are changed. With the development of these needs, the organizations and people have changed their needs regarding electronic services. Indeed, to remove the new problems, a technology is presented as cloud computing. In recent years, we approach the dream of McCarty who believe that computing will be applied as a public software by new computing methods and cloud computing is the biggest step to achieve this goal. According to the researchers of computer science, this technology is important and it is in the ten top technology list. It is expected that cloud computing changes the life style like internet system and even it can control the sink of kitchen.

Unfortunately, complexities of issues in this new technology have prevented the experts to have exact information of this technology. The result of an investigation by IGTS in 2014 showed that about 41% of IT experts don't know what cloud computing is!

For this reason, 2014 is called the year of cloud computing.

2. Introduction to Cloud Computing

2.1. Computing Over the Cloud

Cloud computing is a new phase of internet evolution. In cloud computing, cloud provides the tools to change the power-based computing to infrastructural computing [3]. There are various models for establishment and application of clouds and each one is used based on its application. These models include private, public, community, hybrid or special-purpose clouds as explained in details [4]:

2.2. Different Types of Cloud in Cloud Computing

a. Private cloud, b. Public cloud, c. Hybrid cloud, c. Community cloud, d. Special-purpose cloud.

The relationship between private, public and hybrid clouds is shown in Figure 1.
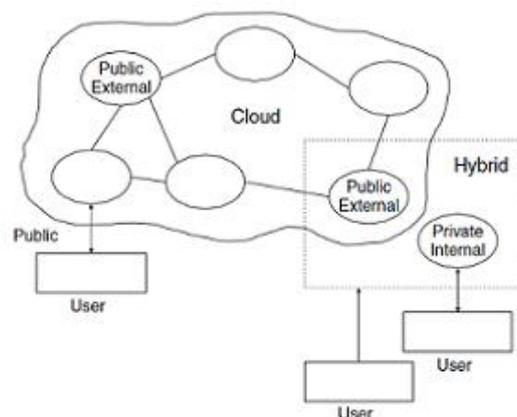
Figure 1. *The relationship between private, public and hybrid clouds [5].*

2.2.1. Private Cloud

Private cloud is a cloud computing infrastructure that is established by an organization for its internal use. Private cloud performs operation inside the firewalls of an organization and enables the organization to manage the internal IT infrastructures effectively and provides services for the local users [6]. Private clouds have maintenance problems. A middle solution to eliminate private cloud problems and use benefits is using virtual private cloud. Virtual private cloud is a part of infrastructure if a public cloud as being applied for the private use of an organization and it is available only by virtual private network. Amazon virtual private cloud is an example.

2.2.2. Public Cloud

Public cloud describes the conventional meaning of cloud computing. The services are provided dynamically via internet and as scalable form a third party provider and the provider divides up resources and sends bill based on a utility basis similar to electricity and telephone industry. Google App Engine and Amazon's Web Service are true examples.

2.2.3. Hybrid Cloud

A hybrid cloud consisting of some internal and external providers is a popular choice for most of business enterprises. By the combination of some cloud services, the users can facilitate the transfer to public cloud by elimination of some issues as consistency with standards of council of payment card data security.

2.2.4. Community Cloud

In this model, some organizations with the common requirements share their services and resources and form a community cloud [7].

2.2.5. Special Purpose Cloud

Infrastructure as a Service (IaaS) clouds present all-purpose services to be applied by a wide set of customers with different applied scenarios. There are other clouds like Platform As A Service (PaaS) with limited customers and are designed for special goals and these clouds are called special purpose clouds.

2.3. Definition of Cloud Computing

The term cloud computing means development and application of internet-based computing technology. This term is a method of computer calculations in a space in which IT-based capabilities are presented as service for the user and he can have access to technology-based services in internet without specialized information about these technologies or have the control of technology infrastructures supporting them. This term is a general concept being used for integration of new technologies including software as service, web and other new technologies presented recently and with routine issues, we can meet all user requirements in internet space. Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources that can be rapidly provisioned and released with minimal management effort or service provider interaction [8]. Figure 2 shows a structure of a cloud system.
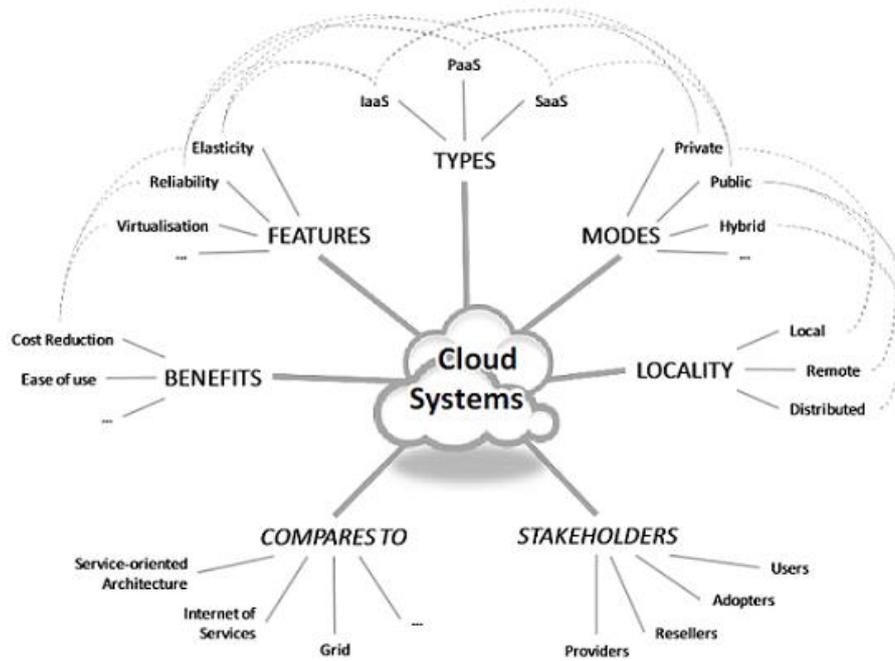
Figure 2. *The structure of a cloud system [9].*

As the cloud computation is a new concept, no exact definition is presented but some definitions are presented as:

a. According to National Institute of Standards and Technology (NIST), cloud computing is defined as:

"Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction".

b. Cloud computing can facilitate the tasks beside the solution of previous problems [10]. The term "cloud" is a metaphor referring to internet and in computer grid charts, the shape of cloud is used to show the internet grid. Internet is similar to cloud as it hides the technical details from the users like a cloud and creates an abstraction layer between the technical details and the users.

3. Cloud Topology

In a cloud computing environment, a network structure is constructed as long as nodes can connect each other via transmission media. However, the shape of connection between each node is called topology. The topology can be classified by the node shape of align, such as start, ring, and hierarchical topology [11]. Hierarchical topology is used in the relevant network applications [11,12,13,14]. In the following Figure, a three-level hierarchical topology is shown. The third level is the service node that used to execute subtask. The second level is the service manager that used to divide the task into some logical independent subtasks. The first level is the request manager that used to assign the task to a suitable service manager. The hierarchical topology levels of cloud are shown in Figure 3.
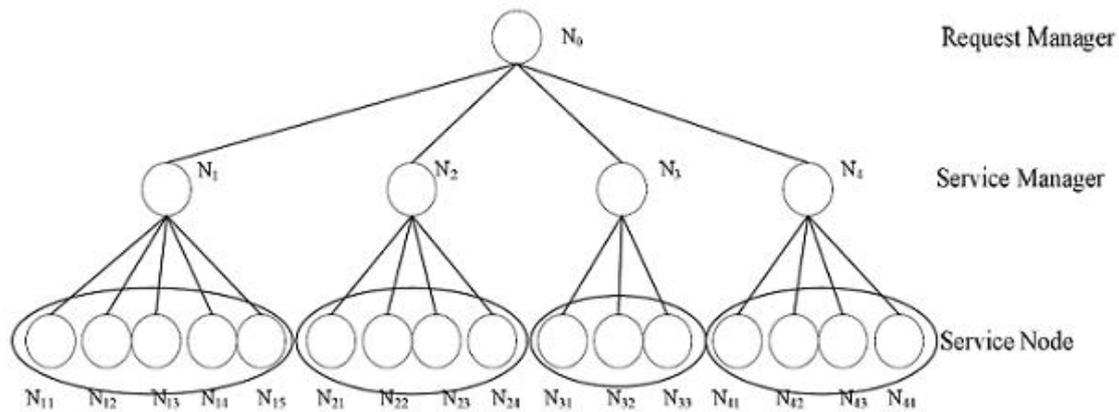
Figure 3. *Hierarchy topology levels [15].*

Cloud is not a free service. These services need a special building, hardware, etc. To determine the costs, we should measure the receive services. Cloud computing reduces considerable costs including hardware, software costs, etc.

This technology reduces the costs considerably. Cloud computing releases the customers of the costs of hardware, software, services and involvement with the installation and maintenance of applied software with local forms. Also, the costs of software development are reduced and the process is scalable. Cloud computing is mostly applied by IT managers and companies. According to the statistics, the companies using cloud computing experienced 18% reduction of costs and this figure is considerable for large companies.

Two important reasons to use cloud computing

a. Performance maximizing

b. Costs minimizing

By cloud computing, performance is maximized and costs are reduced. Also, computers of a cloud system are boot and launched rapidly as these computers have low processes.

4. Review of Literature

Taghipour et al.[16], studied Risk analysis in the management of urban construction projects from the perspective of the employer and the contractor. Imbalance between anticipated and actual progress in the development of urban construction projects suggests that there are many obstacles and risks which not only causes the urban management be unsustainable, but the reconstruction and development of urban space is also seriously threatened. the results indicated that the experts listed the most significant risks as the delays in the payment of contractors' claims and statements due to the lack of handling financial instruments, the governance of relationships rather than rules in the tenders resulting from employer actions, low commitment to the quality of work provided by their subcontractors, failure to complete the detail engineering by foreign contractors on time, weaknesses in contractors' financial resources, and offering lower prices than reasonable by contractors to win the tender. Finally, the solutions for eliminating or reducing risks in high risk areas have been offered to provide tranquility for contractors and employers.

Rezvani Befrouei MA et al.[17], discussed Identification and Management of Risks in Construction Projects. Today, risk management in construction projects is

considered to be a very important managerial process for achievement of project's objectives in terms of time, costs, quality, safety, and environmental sustainability. Instead of employing a systematic approach for identification of risks, their probability and their effects, most of the studies conducted inthis area have focused only on a few aspects of risk management in construction project. the present study aims to identify and analyze the risks associated with development of construction in the greater city of Tehran, employing a comprehensive approach that is consisted of five aspects. After the collection and observation of the data, the output was examined by Pearson correlation also, using charts and tables. The results indicated that "tight project schedule" present in all five categories- imposed the maximum risk. Also "design variations", "excessive approval procedures in administrative government departments" and "unsuitable construction program planning" were identified as next high risk factors.

Taghipour et al.[18], studied Analysing the Effects of Phisical Conditions of the Workplace on Employees Productivity. One of the issues that today will improve the productivity of any organization is attention to the human factors engineering. The aim of this study was to find the amount of employee's satisfaction from environmental and organizational factors of their jobs, thus providing guidelines for improving the identified problems which eventually will lead to increase the productivity.

Baghipour sarami et al.[19], studied Modeling of Nurses' shift Work schedules According to Ergonomics: A case study in Imam sajjad (As) Hospital of Ramsar. In this study, 35nurses working in the emergency ward of Imam Sajjad (AS) Hospital of Ramsar city, Iran, were considered. The final model was implemented with GAMS and at the end, shift working with ergonomic criteria were proposed. The results showed that the proposed working program on one hand will improve satisfaction and efficiency of nurses and on the other hand it can decrease the effects of disorders on shift work.

Taghipour et al.[20], studied Supply Chain Performance Evaluation in IN The IT Industry. The appraisal of several performance measure agendas and metrics already accessible proposes that supply chain performance measure can be detected under different categories such as cost and non-cost. In this study, developed supply chain of IT industry based on BSC from existing decision making models. Then, industrial projects performance and performance evaluation measures have been determined using a designed questionnaire.

Taghipour et al.[21], studied A Survey of BPL Technology and Feasibility of Its Application in Iran (Gilan Province).Recently Broadband over power lines (BPL) has received much attention in communication technology and this is due to economically of sending high data rate services by re-use of power line cables. As data transfer via power lines to final consumer is one of the growing technologies, this study discusses the modeling and optimization of data transfer via power transfer lines and feasibility and adaptation of using this technology in Gilan are investigated.

Khalilpour et al. [22], While explaining the concept of social responsibility, based on the conceptual framework of accounting and the reporting framework of common social responsibilities, examined the desired features and sought to provide a conceptual framework for reporting corporate social responsibility. The research results show that there are many similarities with the field of financial reporting in terms of reporting objectives, qualitative characteristics of information, responsibility

for preparing and presenting reports, accreditation, institutions that formulate corporate social responsibility standards and financing.

Taghipour et al.[23], studied the Study of the Application of Risk Management in the operation and Maintenance of Power Plant Projects. one of the methods used in good decision making, pay attention to risk management, which is known as an important part of project management and control. Risk management has evolved over time and its systematic method has provided managers with a definite path so that they reduce potential threats to a minimum and reach project goals by the least possible deviations. In this paper, subsequent to an introduction of fundamental concepts of risk, risk management, an account of risk management, methods and its techniques are presented. In the end, following a discussion on how it is practically used in projects in a real and practical sample, risk management and its application are implemented and essential investigations are undertaken into its effects.

Taghipour et al.[24], studied Identification and Modeling of Radio Wave Propagation Channel in Industrial Environments.Wireless technology in industrial environments is considered due to potential for saving in cable cost, high flexibility in factories, tracing the products and increasing optimization of process.

Mahboobi et al.[25], discussed Assessing Ergonomic Risk Factors Using Combined Data Envelopment Analysis and Conventional Methods for an Auto Parts Manufacturer. occupational injuries are currently a major contributor to job loss around the world. They are also costly for business. The absence of rational analysis is felt in this area, so mathematical analysis is needed to obtain the logical results of these injuries in order to find gaps or loss points of industry. OBJECTIVE: This paper assesses the effect of five demographic factors on ergonomic risk and occupational injuries using an integrated mathematical programming approach. The obtained results will help managers to carry out any required corrective actions or establish benchmarks.

Taghipour et al.[26], studied Assessment and Analysis of Risk Associated with the Implementation of Enterprise Resource Planning (ERP) Project Using FMEA Technique. Enterprise resource planning (ERP) is one of the latest management tools that can take advantage of information technology to comprehensively gather resources and information in all parts of the organization by an interlocking, system with fast speed and high quality and help users in all organizations and sectors by giving certain modules for managing different sectors such as projects, human resources, and services. Despite the many benefits this system can have for the organization, its implementation and deployment is very risky and costly.

Taghipour et al.[27], studied Construction projects risk management by risk allocation approach using PMBOK standard. Projects' managers in plenty of construction projects which are assumed that are under control, are facing risk as an unknown occurrences and they are attempting to control it and are suffering more costs. Though, by a comprehensible effort and applying risk management, risks are identified and controlled before happening or a plan is provided in order to deal with these occurrences and time and cost are saved. Thus, they have to be controlled and appropriately responded by risk management methods. In this regard, risk management process in PMBOK standard can be a suitable approach to solve this problem.

Taghipour et al.[28], studied The Evaluation of the Relationship between Occupational Accidents and Usage of Personal Protective Equipment in an Auto Making Unit. One of the problems that encounter each work society is occupational accidents. Today, despite the improvements of facilities and working conditions, the possibility of accident occurrence in workplaces and especially in industrial places is inevitable. Since the non-use or misuse of PPE is one of the main causes of accidents in industrial units, the aim of this study is to evaluate the association between occupational accidents and the use of PPE in the body section of a vehicle manufacturing unit. The results showed that there is a meaningful positive relationship between the factor of inadequate PPE and probable hazards of the industrial workplace.

Taghipour et al.[29], studied Necessity Analysis and Optimization of Implementing Projects with The Integration Approach of Risk Management and Value Engineering. Risk management and value engineering have appeared as modern management tools since the mid-19th century and have been used separately in different projects. Due to the ineffectiveness resulting from separate implementation of the two approaches in major projects as well as the similarity between them in terms of their goals and executive structures, this research tries to analyze the separate role of each approach in the project process and examine the possibility of integration and correlation between their different phases. This article aims at introducing and examining a tool that simultaneously has the capability of the two categories.

Taghipour et al.[30], studied Evaluating Project Planning and Control System in Multi-project Organizations under Fuzzy Data Approach Considering Resource Constraints. Projects can be repetitive tasks in specified periods of time and also it may involve some functions which are performed just once. However, in any project, managers and experts consider three basic and important goals: least time, lowest cost and best quality, so all efforts are directed toward achieving these basic goals. Statistics indicate that projects are either conducted on estimated time or delayed and rarely are delivered before due date.

Taghipour et al.[31], studied Implementation of Software-Efficient DES Algorithm. By increasing development of digital telecommunication and the increase of sending and receiving data of various network of data transfer, protection of the safety of data are the most important necessities of the current world. The increase of different bank trading, increasing use of smart cards, moving to electronic government, are the examples of significance of this issue. In this study, an efficient algorithm implementation by MATLAB and C language is presented and is compared with the latest works in this field.

Sedaghatmanesh and Taghipour [32], studied Reduction of Losses and Capacity Release of Distribution System by Distributed Production Systems of Combined Heat and Power by Graph Methods. Formulation of long term program of optimization of energy sector has positive effect on economy of country and improving the role of Iran in global energy markets. One of the results of optimization of energy supply sector is improvement of efficiency and reduction of environmental pollutants of energy generation.

Taghipour et al.[33], studied Risk assessment and analysis of the state DAM construction projects using FMEA technique. Dam construction projects are the most important projects of the country and absorb a considerable amount of the state budget on annual basis. As they take a long time to be completed, they always face risks and

many uncertainties. In this study, the researcher intends to use a highly applied qualitative-quantitative methodology (FMEA) to analyze the risks of state dam.

Taghipour et al.[34], studied the impact of ICT on knowledge sharing obstacles in knowledge management process.Today, knowledge is known as a valuable asset in any organization so management of such insensible asset is one of the factors cause success in organizations. But knowledge can be effective when it is shared across the organization. Therefore, knowledge sharing is a key element in the process of knowledge management. This study aimed to check the impact of ICT on knowledge sharing barriers in one of the mobile operator, in Tehran.

Taghipour et al.[35], studied Assessment of the Relationship Between Knowledge Managment Implementation and Managers Skills. The Purpose of this study is to consider the effects of knowledge management implementation on manager's skills of Reezmouj System Company. Results showed that there is a relation between knowledge management.

Taghipour et al.[36], studied Evaluation of the effective variables of the value engineering in services. The value engineering is a systematic method for resolving the problems, reducing the cost and improving the function and quality simultaneously and this leads to the increase of customer satisfaction by investigating and improving the value index. The results of this research which are based on the post managers and specialists responses show that applying value engineering by the post managers has significant effects on reducing the cost, saving time and customer satisfaction.

Taghipour et al.[37], studied Evaluating CCPM method versus CPM in multiple petrochemical projects. Although project management has long been under consideration and various methods have been proposed for timing projects, but they have not been completely responsive to the needs of the project for increasing productivity and customer satisfaction. As a result, increased risks and the incompatibility of the project with the initial Base line plan, necessitate using modern techniques (such as CCPM) as opposed to common methods (such as CPM).

5. The Methodology of Process

5.1. Cloud Architecture

The architecture of open cloud computing is composed of two general components:

a. Front end

b. Back end

Front end is referred to the user and user interface by which, cloud services are available. This section includes user grid, hardware and software being applied in the services. The back end is dedicated to the cloud itself in which a set of stored data in servers and service receivers can have access to them. These two components of architecture are connected via a grid namely internet. The architecture of software systems in cloud computing includes the components communicating with each other via Application Programming Interface (API) and web service [14]. It is worth to mention that the term "architecture of back end" refers to where the cloud is involved directly.

5.2. Layer Model

Generally speaking, the architecture of cloud computing environment consists of four layers:

The hardware/datacenter layer, the infrastructure layer, the platform layer and the application layer, as shown in in Figure 4.
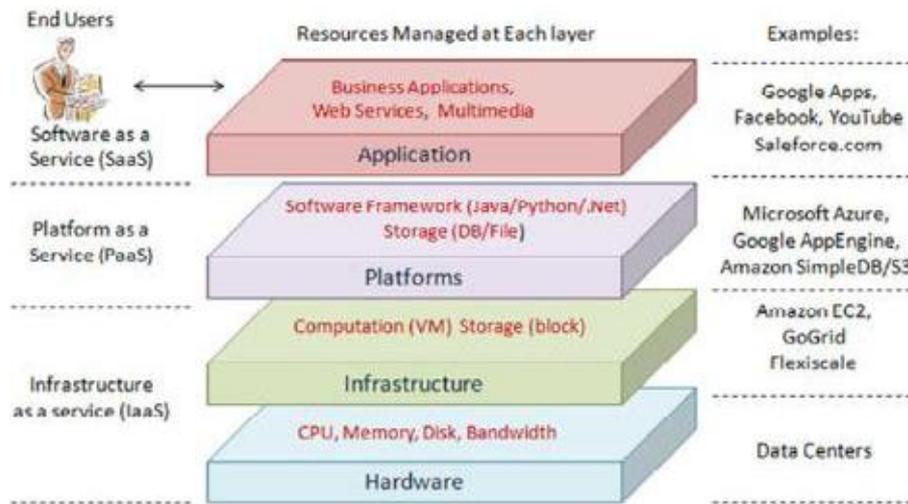
Figure 4. The layer model of architecture of cloud computing system [38].

5.2.1. Hardware Layer

This layer is responsible for managing the hardware resources of the cloud, including servers, routers and cooling systems. In practice, the hardware layer is typically implemented in data centers. A data center usually contains thousands of servers that are organized in racks and interconnected through switches, routers or other fabrics. Typical issues at hardware layer include hardware configuration, traffic management, power and cooling resource management.

5.2.2. Infrastructure Layer

This layer is also known as the virtualization layer, the infrastructure layer creates a pool of storage and computing resources by partitioning the physical resources using virtualization technologies such as Xen ,KVM and VMware. The infrastructure layer is an essential component of cloud computing, since many key features, such as dynamic resource assignment, are only made available through virtualization technologies.

5.2.3. Platform Layer

This layer is built on top of the infrastructure layer, the platform layer consists of operating systems and application frameworks. The purpose of the platform layer is to minimize the volume of deploying applications directly into virtual machine containers. For example, Google App Engine operates at the platform layer to provide Application Programming Interface (API) support for implementing database and business logic of typical web applications.

5.2.4. Application Layer

At the highest level of the hierarchy, the application layer consists of the actual cloud applications. Different from traditional applications, these applications can use the automatic-scaling feature to achieve better performance and lower operating cost.

5.3. The Cloud Computing Layers

a. Infrastructure As A Service (IaaS)

b. Platform As A Service (PaaS)

c. Software As A Service (SaaS)

d. Data As A Service (DaaS)

d. Human As A service (HaaS)

Cloud computing has high efficiency in various fields and it has crucial role in the system optimization as:

a. If the high scalability is expected and providing resources with the lowest cost in cloud computing is possible.

b. In multi-tenancy systems, many users apply a system with a code source.

c. In complex and distributed computing, various resources with low costs are required.

d. In storage of huge data as cloud computing can bring cheap and infinite memory for an organization.

The tasks of scheduling policies in a cloud environment are dependent upon the development model in the cloud. Here, a brief review of some relevant works in scheduling of a cloud is provided [39]. This algorithm has the priority to define the minimum servicers for the tasks and evaluate the tasks in two different classes. In [40], there is an optimized algorithm for task scheduling based on activity based costing that selects a set of resources to schedule the tasks as the profit is maximized. A heuristic method is shown in [41] for scheduling of a set of tasks (tasks with short execution time and no dependencies) in a cloud. Thus, the number of virtual machines to perform all tasks, in budget is minimum, in time is equal but speed is maximum. An optimal scheduling policy based on linear planning is proposed in a hybrid cloud scenario in [42] outsourcing the loading deadline of the tasks. In [43], we can use the final section of scheduling supporting the advance reserves in a tenancy form but none of the existing algorithms has considered the computing complexity of tasks for scheduling. The heuristic algorithms are used to schedule the tasks on the complexity of tasks. The heuristic algorithm for scheduling jobs on computing grids [44] provides a framework for our study. The present proposed work focuses on the scheduling tasks in a private cloud environment.

5.4. Scheduling Algorithms

A suitable scheduling algorithm should lead to better resource utilization and better system throughput. To formulate the problem, let $C_n = \{C_1, C_2, \ldots, C_n\}$ be "n" cloudlets. let $V_m = \{V_1, V_2, \ldots, V_m\}$ be "m" virtual machines and $PE_p = \}PE_1, PE_2, \ldots, PE_p\{$ Be the processing elements in all the hosts in a datacenter. Makespan is defined as the amount of time, from start to finish for completing a set of jobs. The completion time when the last cloudlet "c" finishes process is called CT_c. Our purpose is to minimize CT_c.

5.4.1. Longest Cloudlet Fastest Processing Element (LCFP)

In this algorithm, the computing complexity of the cloudlets is considered while making scheduling decisions. The longer cloudlets are mapped to processing elements (PEs) having high computation power so as to minimize the makespan. In this algorithm, the longer the jobs finishes faster when compared with the FCFS where processing requirement of jobs are not considered while making scheduling decisions.

5.4.2. Algorithm

a. Sort the cloudlets in terms of length

b. Sort the PEs across all the hosts based on processing power

c. Create virtual machines in the sorted list of PEs by packing as many virtual machines as possible in the fastest PE.

d. Map the cloudlets from the sorted list to the created virtual machines (VMs).

5.4.3. Shortest Cloudlet Fastest Processing Element (SCFP)

In this algorithm, the shorter cloudlets are mapped to PEs having high computing power as reducing sum of completion of flow time while at the same time considering that longer jobs are not starved.

### 5.5. Implementations

5.5.1. Simulation Environment

Cloudsim [45] is an organized, extensible simulation framework that enables modeling, simulation and experimentation of cloud computing infrastructures and application services. Datacenter component is the main hardware infrastructure that provides services for servicing user requests. A datacenter is composed of a set of hosts, which are responsible for managing Virtual Machine during their life cycle. Host is a component showing a physical computing node in a cloud and it is assigned a pre-configured processing capability (expressed in Millions of Instructions per Second (MIPS)), memory and storage. Virtual machine supplier component is responsible for allocation of application –specific VMS to hosts in a cloud-based data center. The default policy implemented by the VM supplier is a straightforward policy that allocates a VM to the host in First-Come-First-Serve (FCFS) basis.

In Cloudsim user jobs are named as cloudlets. Each cloudlet is assigned to an ID. It is assumed that the larger the length of cloudlets, the higher is the complexity. Cloudlets may be bound to a virtual machine as specific by user or dynamically at run-time. Cloudlet schedule is the component responsible for mapping the cloudlets to the VMs. The default scheduling policy used by cloudlet schedule is first come first served (FCFS), as each cloudlet in the queue is mapped to the list of created virtual machines on FCFS. It doesn't consider the processing requirements of a job while making the scheduling decision. Also, FCFS doesn't consider the processing requirements of user jobs. It suffers from starvation as lengthy jobs ahead in the queue delay shorter jobs with high response time and also leads into weak resource utilization.

5.5.2. Experimentation Results

The algorithms for simulation are implemented on an Intel Dual Core machine with GB HDD 320 and 2GB RAM on Cent OS 5.5. The experiments are conducted on a

simulated cloud environment provided by cloudsim. The speed of each processing element is expressed in MIPS and the length of each cloudlet is defined as the number of instructions to be performed. The simulation environment consists of one data center with two hosts having three and two processing elements, respectively. Each processing element allocates varied computing power (different MIPS). The algorithms are tested by varying the number of cloudlets from 10 to 50 and also randomly varying the length of cloudlets. The number of VMs used to execute the cloudlets is different. The makespan to execute the cloudlets is used as the measure to evaluate the performance of the proposed algorithms. It has been observed that for small number of tasks, all the three algorithms (FCFS, SCFP, LCFP) show more or less similar performance and the length of the queued cloudlets is shorter. But as shown in the Figure, the number of tasks has increased, LCFP shows better performance as compared to SCFP and FCFS since longer tasks complete faster reducing the makespan. The comparison of scheduling algorithms is shown in Figure 5.
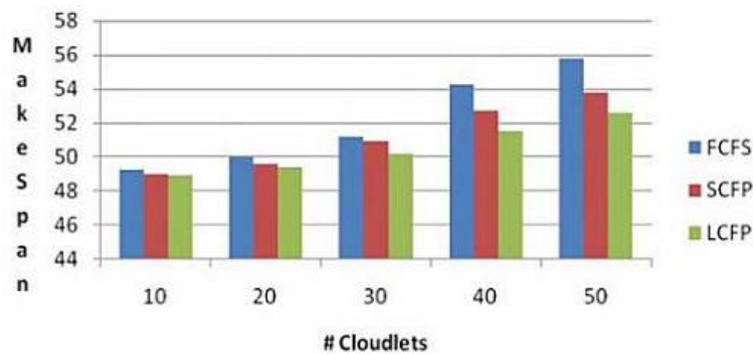
Figure 5. The comparison of scheduling algorithms.

Cloud computing is a developing research area. Scheduling of tasks to improve resource utilization and considering Quality of Services (QOS) of tasks is an improvement problem in a private cloud environment since in a private cloud, the resources are rare. Here, two scheduling algorithms are shown for tasks scheduling and the computing of a task and computational capacity of a source when scheduling decisions are taken can be considered.

6. Application of Cloud Computing

6.1. The Cloud Supply Chain

Using Supply Chain in cloud computing is an innovation to conduct a new research. Supply chain is two or some branches of goods flow, information and capital [46]. Information sharing is not the only factor leading to cost imposing on supply chain [47] and the management and renovation of services, information and financial resources are costly for optimization of this chain.

Generally, supply chain is based on two functions [48]:

a. Physical function: It is product production from raw materials or average components and transportation of all components to a proper place.

b. Market Mediation Function: It guaranties the variety of products in accordance to the taste of customers but in function-based products, physical function is dominant but in the market, mediation function is much more important than physical function in new products [46].

Generally, emerging products of ICT are classified as new products but they have special features of applied products. Cloud services should perform the basic needs of customers based on replication. They show that the features of new products as demand (On-Demand Business Model) is not predictable and based on the competitors and change of market conditions, this domain is developing gradually. Thus, cloud service is classified heuristic as a product while they are classified as functional products.

6.2. Business-driven Risk Management

Cloud computation is a model to show the innovative and promising visions regarding information and communication technology (ICT). Using cloud resources as the external assets of consumers implies risk issues that should be considered. Now, cloud computing organizes risk management approach as Business-Level objectives in the cloud. The experts propose that in risk management, Semi-quantitative BLO-driven Cloud Risk Assessment (SEBCRA) idea is used as the main process.

In addition, Cloud Service Provider (CSP) enables us to achieve Business-Level Objectives (BLO). This provider maximizes his profit by transferring the risks of private cloud to a third party providing cloud infrastructure. In this section, a new risk management method is introduced in the cloud by Organization's High-Level Interests. Indeed, the plan that is used to achieve the consequences of Cloud-Specific Risks to the business level objectives is the organized cloud. It means that the main objective is to increase the success probability and reduce the failure in achieving these objectives. Thus, the cloud is turned into Core Operations to acquire conscious policies by the existing risk planning. A general view of cloud risk management based on business level objective is shown in Figure 6.
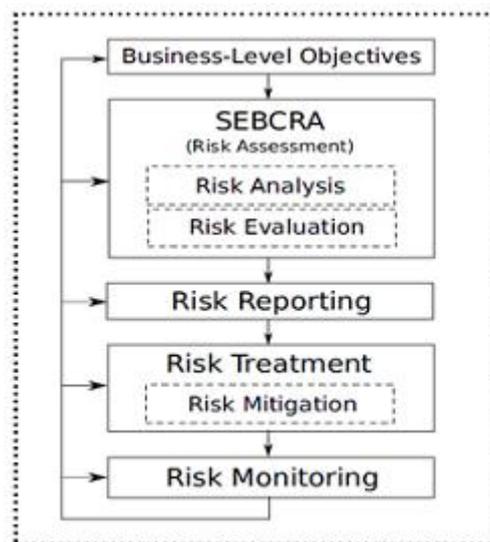
Figure 6. *Cloud risk management based on business level objective [49].*

As shown in the Figure, the proposed plan of risk management is run by business level objectives and strategic objectives [50] with the following processes:

Risk reporting and communication: It is elimination of the risks leading to the tools of implementation and selection of risk -aware policies and also it refers to the elimination of operation and controls encountered with risk in the organization. Monitoring risk should be eliminated in the organization.

6.3. SEBCRA

Risk management literature normally defines the need to rank and prioritize risks in order to identify areas for immediate improvement and, thus, focus efforts on dealing with threatening risks. To do this, new information security risk assessment model is presented as SEBCRA, with the purpose of ranking Cloud risks. Moreover, the main difference with other risk assessment models is that it evaluates the impact of Cloud-related risks on business level objectives considered, instead of considering effects on the whole Cloud organization. Indeed, it is the core process of the business level objectives -driven cloud risk management and has Risk Level Estimations (RLEs) as outputs, which are separately specified for each risk and business level objectives (Bi). Generally, the whole assessment method is subdivided into the risk analysis and its evaluation. The risk analysis is the step in which the probability of risks and the magnitude of their consequences are determined. A standard matrix is proposed to extract risk level estimation [51]. We can divide risk analysis in three stages:

Risk identification, which establishes and defines organization's potential risks; Risk description, that guarantees a comprehensive risk assessment method, and Risk estimation, which estimates the likelihood of occurrence and the estimated impact on business level objectives of each risk previously recognized. Those impacts are considered in terms of threats (downside risks) and opportunities (upside risks) and are usually evaluated using 3×3, 4×4and 5×5. We use a 10×5 matrix because we are considering five possibilities either for positive and negative impacts, while standard matrices as 5×5 only consider the negative side. The probability of occurrence of risk (PI): very unlikely - 0.1 (e.g. once in 1000 years), unlikely- 0.25 (1 in 10 years), possible - 0.5 (yearly), likely - 0.75 (monthly or weekly), and frequent - 1.0 (at any moment); the impact of risk on business level objectives, either a threat, a benefit, or both, as very high -100/100, high -75/75, medium -50/50, low -25/25 and very low - 10/10; and the Risk Level Estimation for each business level objective (Bi(RLEi) results in the following equation:

$$RLEi (Bi) = Pi \times Ii (Bi)$$

Notice that five levels of risk level estimation are defined:

critical if -100 ≤ RLEi (Bi)≤-50; unacceptable if -50 ≤ RLEi (Bi)≤-10; negligible if -10 ≤ RLEi (Bi)≤ 10; profitable if 10 ≤ RLEi (Bi)≤ 50; and high profitable if 50 ≤ RLEi (Bi)≤ 100. Thus,, we have to avoid risks with a RLE and take advantage of those that lead to an improvement in achieving the business level objectives.

6.4. Cloud Computing and Enterprise Resource Planning (ERP)

ERUP is based on a Broad-Based System by which we can integrate the software applications designed in different applied fields. These systems are at service of internal and external functions. Internal functions focus on Core Activities including Financial Management, Operations Management and human resources management. External functions include integration of organizational systems by business partners and providers [52]. This integration with external business enables tot transfer information form one company to another one in which value chain of each of companies is associated with the provider [52]. This relationship causes that the visitor is observed as a value system as this value is flowed at each point and this value can help the company to achieve competition advantages [52]. One type of cloud computing is software as services by which the users can receive software services form internet without any need of mass investment in the software or

infrastructure. They can rent web-based software from the service providers and this operation, maintenance and repair of the software are dedicated to the service provider. The recent researches show that using software as services is increased and its demand is also increasing [53]. Based on the prior studies, the predictions show that software as services is replaced with IT and based on the present economic crisis can have good performance and can improve the economy [54]. The list of software benefits as services is increasing and its progress is beyond the effective factors and costs on software delivery and enables the organization to improve business processes [55].

7. Organizational Development by Cloud

Regarding application services or software layer as a service, we don't consider at first the developers and customer relationship management (CRM), E-mail, participative solutions and other similar items come to our mind. There are two ways to know about the effect of existing services in this layer on organizational development. First, development environment should be inclined to the cloud. With the extension of development formation in the model of using software as service, the "packed computing" can take its resources from strong cloud not weak personal machines presented to the developers. In addition, the developer can dedicate the entire time, concentration and energy to the software development without having another concern.

Also, with the movement of development tools to the software model as service, the consumption services are developed in the cloud to be integrated with the method in which developers and architects design IT systems.

The services of cloud, private or public are turned into a part of general Service Oriented Architecture (SOA) of an organization and this means considering security services, requests of middle services and dominant services as applied in multiple domains. The cloud services can increase the service-oriented architecture capabilities of an organization but the development branches of the service-oriented architecture among the multiple domains and clouds should be taken into considerably rapidly by the developers and organizational architects.

8. Conclusion

Although cloud computing has responded various questions, it also has presented new questions. By selection or lack of selection of cloud computing, we make a balance between old and new questions [56]. The tendency of great companies of IT industry to present cloud computing services is unavoidable and this is good News. The main driving force of cloud computing is development of wireless and bandwidth network, reduction of storage costs, increasing improvement of internet computing software. The customers of cloud services can suggest high capacity to their system, reduce costs, experience new services and eliminate not used capacities [57]. For organizations, cloud computing is important by which with cloud-based trade systems, the relevant purposes are promoted and some benefits as reduction of costs, increase of efficiency and various choices can be considered. After the economic stagnation in the world, the great industries can use the reduction of infrastructures as it was said. For developers, in cloud computing, they improve their capabilities via platform model as a service. Thus, in cloud computing, they have much impact on various fields [56]. The chart of cloud computing progress is shown in Figure 7.
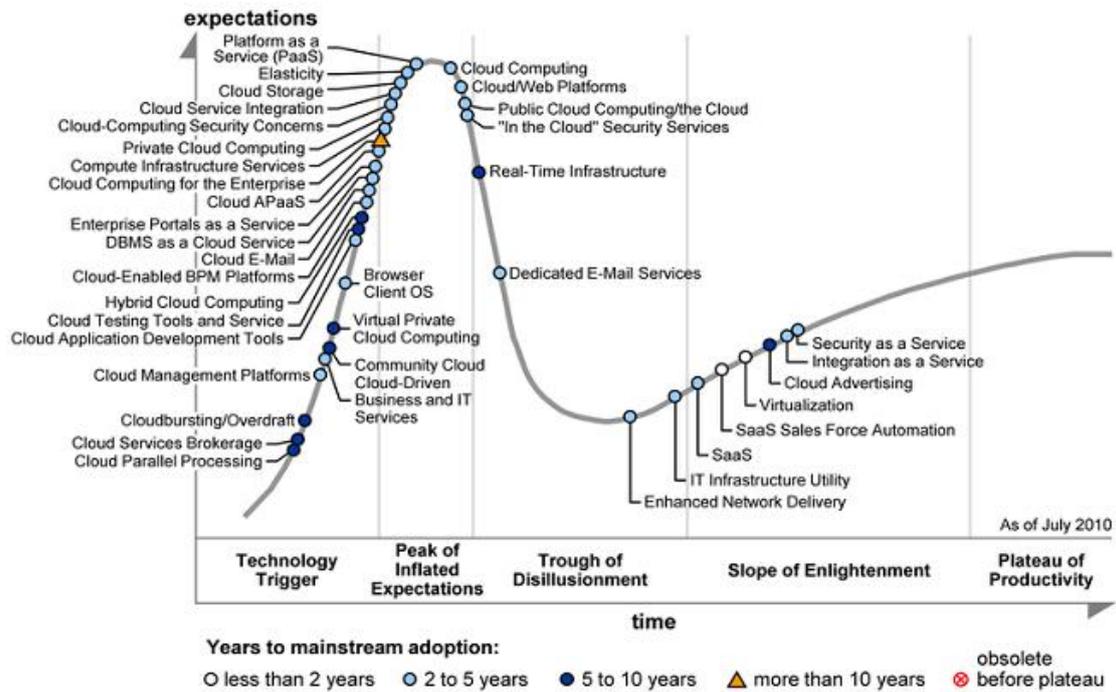
Figure 7. *The progress of cloud computing [58].*

This assumption that in 2019, we perform all our computing via lap top with price lower than 100 dollars, without any problem in security levels and services, is beyond the reality but we use the clouds in future extensively [59].Cloud computing is a new model in which computing resources including computing, memory and storage are not present physically in the user place. Instead, service provider is the owner and manager of these resources and the users have access to them via internet. For example, website services of Amazon enable the users to use a simple storage service for the storage of personal information and the computing is possible on the stored data using a flexible computing cloud [60].

The rapid development of cloud computing helps the organization s to achieve high efficiency in presenting IT services and reduce the costs and small and medium companies can achieve high efficiency of IT like large companies. Also, IT burden reduction can help the organizations to focus on their business. The process optimization based on cloud computing can be useful in renovation of this industry and can increase the standards and competition in IT domain [61]. The beneficial opportunities in organizational systems and human resources planning are the investigations of organizational system capabilities and potential benefits of using resource-based cloud and open source cloud.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

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