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Does Cloud Computing Add Business Agility to Big Data Analytics

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Abstract:-Cloud computing and big data are two IT initiatives currently concerning worldwide business companies. The first offers the promise of generating rich information sources of competitive advantage, innovations, and raising revenue. Cloud computing, if implemented correctly, can improve process agility and productivity while drastically reducing time and costs. Cloud computing continues to evolve, more and more companies are creating efficient and agile cloud environments, while providers are expanding their service offerings. Emphasizing on Software as a Service (SaaS) as a fundamental cloud prototype, a comprehensive literature review was conducted to procure a theoretical model illustrating impact of the adaptable SaaS-based procedure on operational agility. These procedures comprise of Decision Support Services, Planning Services of Enterprise Resources, and Work Support Services. Theoretical Studies of this research declare that SaaS-based processespositively influence on enterprise operational agility. Therefore, SaaS architecture has become the extensively used framework that encompasses implementation of several services like pricing models, consumption, and delivery. The paradigm of SaaS-based cloud computing has significantly simplified the application development, design, enhancement, management, and assembly, along with notable contributions. This significant research will develop an understanding on whether "cloud computing add business agility to big data analytics." Consequently, it will benefit market competitors, to refine their business models, policies, marketing, operations, security of data storage through an apprehension of cloud computing, business agility and its correlation with big data analytics. As continuously altering business situations demand companies remain stable, to reconstruct and modify their policies quickly or in other terms to be agile.

Keywords:- Cloud Computing, Business Agility, Big Data, IaaS, PaaS, SOA, Business Models

I. INTRODUCTION

Management of business processes in diverse applications and industrial areas is an unconventional affair of responsibility. Because of the development of Cloud computing, the hypothetically tremendous assets can be utilized for the establishment of business forms. These Cloud assets render a few difficulties for Business Process Management Systems to guarantee a predefined Quality of Service level amid Cloud-based process authorization. Hence, new answers for process booking and asset allotment are required to handle these difficulties [9].

In spite of being the moderatelynew paradigm of Computing, it has demonstrated its capability to change the manner in which power of computation is devoured and offered. With the entrance of significant market players such as Google or Amazon, this shift is, as of now, truly progressed. Nowadays, the global market of Public cloud resources has a financial value of 131 billion US dollars, with an expected composite yearly development rate of around 17% since theperiod of last six years (2011-2017). Although, the effect on managing Business Process (BPM) by cloud computing is negligible by yet, in a perspective of offered solutions for concerned areas of research, software and business industry which has done in this field. Process enactment is one of those special features where Business Process Management (BPM) is benefited in various manners by cloud computing., i.e., the endorsement of business procedures. Process scenes are consistently changing as far as the figure of arriving process demands. Hence, the computational assets expected to order process occurrences that fluctuate over time[10].

In an era of big data, operational instability can originate from an alternate viewpoint. To start with, the estimation of data resources is exceptionally precarious, and some canassess it by utilizing the risky manners in danger type measures yet not all. Actual operational price is affected by the integrated price of big data. According to Tallan, a lot of unnecessary data will be kept without any security planning if industriesstart believing that charges of data retaining are almost zero. Therefore, this results in making decisions on deficiently driven information in an actual operation. Furthermore, the actual estimated cost is quite than zero figure due to other software and influential maintenance tariff. Finally, e-commerce is very famous in a present time of internet thing, so it aids in collecting business analytics big data of all types [6].

If the predetermined sum of computational assets is given, the altering workloads can head the demands of utilization pauses and peak resources. The probability of peril always remains in both cases of over-provisioning and under-provisioning of computational resources if the ground requirement procedure is not furnished by available resources

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and if the utilization is however not done more often despite the availability of resources, prompting to needless cost issues. Renting and discharging of Cloud-based assets is an undeniable contrasting option to the provisioning of a fixed measure of computational assets. By using cloud resources to implement business procedures are otherwise called "elastic processes"[9].

Elastic procedures depict three noteworthy advantages of Cloud computing

- The rapid versatility of single procedures and the landscaping procedures areestablished on computational resourceslegitimate demand.
- Renting and discharging the required computational assets in an on-request, consumption-based trends, and
- Pay/utilization of these computational resources is made through metered services.

Conventionally, theconcept of service composition is related to theelasticprocess that is a key formula for business process endorsement. In order to acknowledge elastic process, the Business Process Management system needs to be developed not only along with management of lifecycle procedure as well as to operate as the controller of the cloud. i.e., to have the capacity to rent and discharge Cloud resources. Implementation of services and bringing forward service examples that follow the schedule of the process [9].

A. Research Background

a). Cloud Computing

Cloud computing has become a significant topic of research with the upheaval of computing resources and its ubiquitous supply. In perspective of some authors and technologists, cloud computing is an emerging paradigm that proffers IT services and resources over the internet. It has been found innovative in various manners. In a technological outlook, it's the growth of computing industry that has emerged from large machines and complex architectures to tablets, PC's and is available globally. A heap of research was only done on the technical side of cloud computing whereas its IT provisioning in new business strategies and approaches remain neglected. Hence, in this concern cloud computing can revolutionize the means of application deployment and computing resources and establish new models for business [1]. Today's cloud computing market holds many big providers like Google, Amazon, Salesforce, Microsoft, IBM, etc., that serves both as a positioned infrastructure supplier and platform. Apart from these international market players, many new service and infrastructure providers have emerged who offer their own consulting and application services [8].

The advent of Cloud computing has brought unique opportunities to establish new processes for large-scale business and to design applications for a workflow that bridge to different domains of the organization through its infrastructure and web technologies. The infrastructure of cloud computing, as shown in Figure 1, significantly address the interoperability challenges related to platform and technology [2].

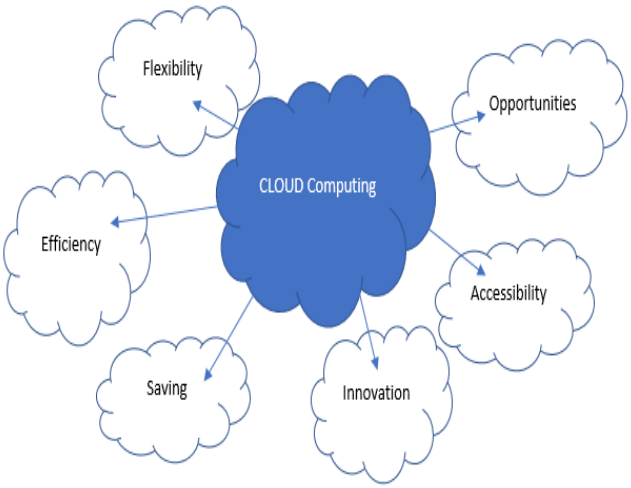

Figure 1: Cloud Computing Infrastructure

Computational strategies are dire need of present era, in order to gain business advantages and to establish a competitive position. Therefore, industry competitors launch an Internet-based service known as "cloud computing." There is no specific definition of cloud computing, but according to IBM, it simply refers to it as "the cloud" that is considered to provide computing services on demand and these tasks are performed over the internet, more precisely to manage, process and store data online. Applications that are cloud-based and offer services over the web are classified into three layers, i.e., software as a service (SaaS), platform as a service (PaaS), Infrastructure as a service (IaaS), moreover, Public cloud, Private Cloud, and Hybrid cloud [3].

- **SaaS:** provides application services to its customers through the internet or the web. Cloud hosts the application or software services and delivers to its users through browsers once they subscribe. This attribute has swept out the need to install an application, run and to maintain on personal computers. SaaS comprises of multi-occupied architecture by which the same code provided by the supplier is used by all users. Whereas, the user data is kept separate by using security policies of authorization and authentication. Such sharing process of SaaS has enabled its price and cost to remain competitive as compared to the conventional bespoke and off-the-shelf software. It will not only reduce the maintenance burden but will also alleviate purchasing cost of software from the user. You just need to sign up and begin using these unprecedented business apps which provide: easily accessible from any server, data is not lost as it is present in the cloud, and service is scalable according to users need [3].
- **PaaS:**Platform as a service lies one step ahead of IaaS because it provides execution and programming environment to its subscribers. Products of PaaS operate as deploying platforms, integrated designs, testing and developing. By using PaaS, the users can develop their own applications by using programming languages and place these applications directly on supplier's infrastructure cloud by doing few click. Users of PaaS

have complete control over the configurations of hosting environment of applications and probably the deployed applications. However, the fundamental infrastructure of cloud-servers, storage, network, etc.are not managed by users. These characteristics diminish the burden of system administration. Traditionally, PaaS furnish entire tools of development to process logic, to integrate and interface designing. Some other impressive features of PaaS make use of applications for collaborations of the online community, solving problems and billing purposes. Its benefits involve creating applications and becoming a market competitor, placing new apps to the cloud, and most importantly it lowers the complexity issues [3].

- **IaaS:** provides basic cloud computing services over the internet or the web like storage and processing, bottom level hardware, and network resources online. IaaS is different from conventional services of hosting as they rent physical servers on a quarter or annual basis. Whereas, computer systems are rented in cloud infrastructure on perusing premise, and is scaled dynamically in and out according to the needs of customers. Contemporary progress in network management and virtualization has enabled this scalability of on-demand. Users of IaaS can control the storage, operating system, and application deployment, but can not control or manage the fundamental infrastructure of the cloud. Users also have limited access to select and control networking elements like firewall hosting etc. IaaS provides innovative, flexible, on-demand services with no investment charges on personal hardware, and great workload support [3].
- **Public Cloud:** Public cloud is operated and owned by individual companies and provides access to computing resources for the general public. By using the public cloud, the subscriber does not need to buy assisting infrastructure, hardware, and software [4].
- **Private Cloud:** Private cloud is operated and managed by single entity or organization, either the internal users of cloud technologies or some third party. The private cloud has advanced security, automatic resource management system, and control designs according to the needs of any company [4].
- **Hybrid Cloud:** hybrid cloud is the combination of public and private cloud, where an organization bridges its private cloud infrastructure with any publically operated cloud in order to meet business requirements through proprietary and standardized technology. That's why it is called a hybrid cloud. It facilitates the easy transfer of services, data,apps, and business model deployment, etc.[4].

These computing services are available on request and have become a "fifth" necessity of human life like water, electricity, etc. Subscribers can access the services according to their need without concern ofthe place of hosting services provided. Many IT purveyor has promised to proffer hosting and computation application services, coverage across a number of continents and storage facilities. Hence it provides SaaS, PaaS, and IaaS to its customers and cost of these service providers depend upon the quality of service and time[5].

But there has been observed significant obstacle in the extensive deployment of these computing services due to the absence of trust between the service provider and user. Storage of data on cloud gives rise to these suspicious concerns by customers about data assessment, copyright issue and who can control their data. However, a mechanism of trust can be established to counter these problems, and existing models of trust that are used nowadays are not suitable for the environment of cloud computing. Significant reasons behind this issue are user amalgam, access, processing and location of data, and a number of subscribers [3].

b). BIG Data Analytics

Big data has drawn the attention of numerous practitioners and researchers of cybernetics and system engineers within the industry. Multiple organization will be benefited with the crucial knowledge of big data analytics. Data analytics have largely benefited the business community. Now multi-national companies can scrutinize their activities like marketing, sales, risk and fraud management, innovative optimization, to maintain customer support for improving tactical and strategic business ruling. Although research of big data is in its beginning years, IT has produced many exceptional boosting opportunities and appliances that were formerly impractical.For example, business market has gained an advantage to improve its operation from data mining and business intelligence techniques. Here we can consider the service of the cloud as a warehouse of data that supplies fount of rich data. Communication across the internet has provided a facility to collect a heap of data on the platform. It has made easier to gather data earlier than this [6].

Therefore, big data can be defined as to supply actionable and significant information about how things work by making use of substantial sources of data sets. For technology retailers, big data is the necessity of technology to operate significant datasets. Big data is a scrutiny process used to reveal the trends of market, preferences of customers, unseen patterns, and undefined correlation. The foremost objective of data analytics is enabling multi-national business companies to take more accurate decisions by benefiting them with services of predictive modelers, professionals, and data scientists to examine the bulk of data transaction [7].

Significant intuitions of generating massive revenues and competitiveness are provided by big data analytics. Generally, cloud computing reduces pricing factors, enhances efficiencies and productivity, offers storage, and serves groups and many networking facilities. Furthermore, it allows big data to process velocity, different big data formats, and voluminous [8]. The significance of big data can be demonstrated by the following five terms:

- **Variety:** comprised of diverse data like video, audio, transaction, and Emails.

- **Velocity:** fast data processing and production to fulfill users demands.
- **Variability:** exceedingly inconsistent flow of data during peak cycles.
- **Complexity:** complexity is an important affair while dealing big data analytics as numerous resources send data. Hence, before data processing, it must be cleansed, formatted, transformed, and linked to the desired format. Transactions of Banks through credit cards are the most common example of actual time big data. Also, the social interaction developed by users of Facebook and Twitter, etc.
- **Volume:** increased volume because of transaction data storage capacity that is collected from live streaming and sensor data.

Big Data analytics is the class of contemporary technologies that are designed to operate with bulks of diverse data and is analyzed when its exact value is produced. In order to examine data, exploring patterns and their inter-relationship, new quantitative procedures like machine learning, robotics, artificial intelligence, and computational mathematics are used. Cloud infrastructure utilized by organizations for supplying SaaS have various alternatives due to analyzing components of security, data, and cost compatibility and workloads. Risk factors can be mitigated by using private cloud to preserve control. Consequently, the infrastructure of public cloud platforms is best for scalability enhancement.

c). Applications of Big Data

Applications of big data cover two specific areas that are Bioinformatics and Manufacturing. Controller data and distinct type of sensory data like voltage, pressure, current, and vibration are obtained through data procurement, whereas historical and sensory data construct together big data mass-produce. Input tools of preventive and predictive strategy are big data, e.g., health and prognostic management. Many industries face a challenge through the combination of predictive analytics with big data [8]. The following benefits can be obtained from this combination:

- High-profile cases of risk calculation
- Financial fraud calculation by prevention, audit, and detection.
- To execute market-based campaigns

d). Business Agility

Business agility can be characterized by the capacity of a business to adjust cost systematicallyand quickly according to the changes in the business domain. Business agility is kept sustained by keeping up and adjusting products and ventures to meet client requests, acclimating to the adjustments happened in a business industry and keep gaining benefit from HR (human resources)[11].Advancement in Service-Oriented Architecture (SOA) has conveyed us closer to the formerly nonexistent innovation for virtual business maintenance and establishment, a kind of business where almost all of tasks of its business capacities are contracted with online service providers.

Distributed computing offers an acknowledgment of SOA in which IT assets are preffered as services which are reasonable, adaptable and appealing to business industry. A detailed study was conducted to analyze the improvements drawn in cloud computing and its advantages of using services for trading-off and businesses. Although, many political and cultural threats of regional and global level emerge from these kinds of operations, and a lengthy discussion has visualized about the ethical and legal right of companies to hold customers information regarding IP addresses for an unlimited duration. Furthermore, by the recent agreements on big data, various legal regulations and affairs have putforward for monitoring big data usage in business processes [6].Advancement in the IT sector influence directly the affordability and agility of business. Thus, innovation, transformation, and disruption have introduced the initiating key concepts of cloud infrastructure and highlight the prodigious incorporation to enable the smarter enterprises to sustain and register themselves. The IT industry authorizing analytics, innovation, sensing, minimization, virtualization, federation, and integration are establishing too quickly. The ensuing solutions and systems will fade in backstage, and stable, expendable, inexpensive, acquainted with surroundings and people-centric will remain [12]. Hence, we can say the agility has emerged as competency key currently because a volatile and uncertain environment is usually faced by the business community. Agile procedures are needed by large organizations that constantly operate in changing, extreme circumstances. The infrastructure of comprehensive systems and information technology comprises of the regime of the business company along with their organizational incorporation attribute of achievement has an extreme lead trial for agility process. Despite leverage of cost problems in business [13].

Rejecting previous definitions of agility, Dove describes it as the capacity of significantly applying managing knowledge so that a firm has the strength to progress in consistently unpredictable and altering environment of business. In comparison, agility is defined by Garter as the organizational potential to detect the changes of environment and to act in response to that change effectively and efficiently. The commencement of proactive alteration is categorized as the fundamental prerequisite of business agility achievement. Countless comprehensive elements that confer business agility includes financial policies, structure of organization, IT and business infrastructure alignment, academia and vocational skills, and controlling the influence of information and people. Therefore, to attain business agility via registration of agility demands of business is one of the vast advantages of establishing SOA formula [11].

B. Identifying Problem Area

A substantial set of complex data is most widely used in large business organizationsfor analyzing purposes, so it needs to be stored safely as well, and to share and manage. Nonetheless,Cloud mayface a clear challenge to data security because the owner of data might not have authority to know where this data is located. On the other side, big data analytics furnish the significant comprehension for generating revenues and establishing competitiveness [8].So we can say

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cloud computing append business agility to big data analytics in many perspectives. Analyzing this area of research will have significant effects on business management, marketing, and humans as well. Business processing and outsourcing will be improved, and people can take advantage of this technological advancement. This research and its outcomes will help in developing an understanding of the combined effect of both big data analytics and cloud computing. Moreover, it will provide substantial advantages to market competitors, to refine their business models, policies, marketing, operations, security of data storage through an apprehension of cloud computing, business agility and its correlation with big data analytics.

C. Objective

This research paper will address the understanding of " does cloud computing appends business agility to big data analytics." Demonstration of the research objectives are:

- Reviewing the former researches done on big data analytics and cloud computing
- Developing an understanding of, " Does cloud computing appends business agility to Big Data analytics?"

II. METHODOLOGY

A. Hypothesis

Any enterprise is categorized to be smarter and more efficient in its output and outlook if it controls essential resources of IT and infrastructure of Business data. Business firms are striving hard to compete for their contemporary market partners globally by means of entrepreneurs, executive members, and stakeholders who formulate innovative, and pragmatic strategies in order to sustain the strong market position that is gained through solution and services of IT and business process. Leveraging Information Technology progress to refine the business optimization, transformation and automation are a time-consuming and monotonous duty that demands planning, strategizing, brainstorming through smart motivation schemes [12].The popularizing models of cloud delineate the collection of scalability of many enterprises, their critical missions, avant-garde technologies that includes services of software, visualization, utility, autonomic, SOA, demand base requirements and grid or cluster computing patterns. Conceptually, the idea of thecloud is not unique; its smooth synchronization accompanied the manychanges during optimization of information technology infrastructure. Applications created for IT by cloud havestarted influencing the enterprises for their business matters [12].

Cloud computing has grown to be a critical component in determining an organization's competitiveness given the benefits it brings in terms of cost-effectiveness and agility. It has significantly added to the analytical capabilities of Big data, increasing the efficiencies while reducing the costs. This study hypothesizes that cloud computing adds business agility to Big Data Analytics. The study will provide relevant knowledge of cloud computing and big data analytics and does it add business agility to take advantage of marketing for businesses. Given the scope of the topic and the limitations of this study, this paper will primarily focus on Software as a Service (SaaS). The research will utilize both secondary and primary data sources to answer the following research questions:

(1) Which sorts of business forms are affected by the use of SaaS?

(2) How do these SaaS-based business procedures append the operational agility of an enterprise?

B. Justification of Research Approach

In technical terms, Cloud computing is a theoretical notion that represents an organization's access to services and information, that are present on a remote server. More simply, cloud computing is an outsourcing of a company's servers and some or all of the related services to another company [14]. Customarily, companies use their own digital infrastructure for hosting the services. Therefore, the practices these days are more aimed at acquiring the servers (where they become the company's property). Third party companies are then hired to develop and maintain the servers and systems that are necessary to ensure sustained operations [3].

The question that concerns the organizations nowadays is of deciding what data will be placed in the cloud, at a location that is not known to the concerned client. Typically, the clients are only concerned with the applicative component of such data, and the rest is delegated to its service provider. It is also considered one of the most beneficial uses of outsourcing of skills for a company. Since the service provider mostly gains from constructing vast economies of scale, it is in a strong negotiable position to provide similar service for a, particularly advantageous fee. They also have the resources required to guarantee the creation and maintenance of the company's servers. In light of these arguments, cloud computing, ultimately, maximizes the company's productivity and reduces the costs, thereby increasing its efficiency and performance [14].

The service supplier of thecloudisreal competitors in investigating the growing assembly of technical and business services that are entertained in their cloud for global consumers and customers. Professional and personal services are extensively locating again to platforms of thecloud as its space is consolidated. Therefore, we can say that mobile, embedded, social and richer content, and many other executions will be available in thecloud. Information systems of thevarious famous business firm are already gaining success from thecloud-like management of human resources, management of customer relationship, and management solutions for supply-chain [12].

Foremost characteristic of cloud computing helped in better understanding are listed below:

- SOA and theoretical computing of information technology services.
- Gignatic, altering, scalbale and virtual infrastructure.

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- Provide easy accessibility from anywhere through any device.
- Less management required platforms
- Using patterns that are based on individual requirements and capacity
- Pricing is done on amount of service consumption

A study revealed that about 70% of business organizations had opted cloud computing as apractical technological choice. And they have believed it will increase the flexibility of their business. In comparison, about 62% think it will increase the market-basedresponse, and about 65% took it as concentrating on the core strategies of business and that it would help them in their focus on market requirements. Recently, hardly any organization is taking advantage of cloud computing because of their little knowledge and understandingof its infrastructure, pricing models and altering thesituation in business. Solutions based on cloud computing were designed to entertain small, medium-sized business firms to enable them being agile at lower rates. However, now a significant increase in the firms using cloud computing infrastructure has been observed. Figure 2. is the graphical representation of a survey conducted by World Economic Forum that depicts theimpact of cloud computing on different Business companies.

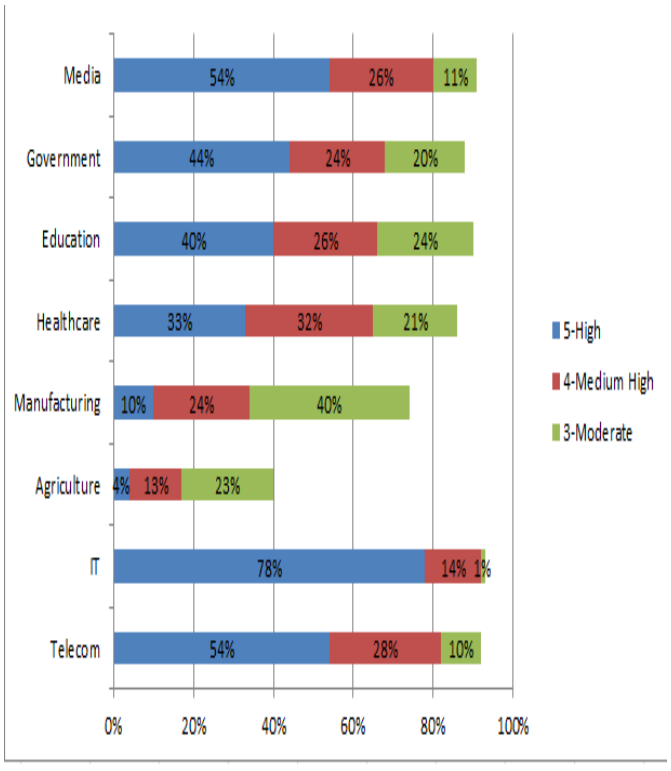

Figure 2. World Economic Forum survey

The main purpose of this research scrutiny is to make an analysis impacts of implementing enterprise system on theagility of business procedures in perspective of theorganization. Excellent practices, orientation procedures, standardization, and integration, are abasic feature of any enabled enterprise system environment. Now, agility in any business procedure is marked significant. This terminology is considered for bringing refinement in the capacity of any organization to introduce new chances for competitive and innovative actions. However, we have studied that enterprise system has already benefited the firms capacity to sustain aposition in altering thebusinessenvironment and be agile. Nonetheless, prerequisite agility is found to be amongst one of best practices as updated on aregularbasis that in technologies and practices, latest progress and its collaboration is ensured. It will help in suggesting the impact of standardization and integration on the capacity of the firm, and to establish agility in business procedures and operations. Although the information technology infrastructure requiresbeing firmly incorporated for the purposes of visibility and control along with their firm system, concurrently firms are searching to provide agility witha loose couple of technologies and systems [13].

There are three core elements of Cloud Computing.The first one is IaaS, which stands for “Infrastructure as a service.” The service provided is virtualized hardware. It includes offers such as server space, network connections, bandwidth, and IP addresses. These hardware resources come from a multitude of servers and networks generally distributed across many data centers, which the cloud service provider has a responsibility to maintain. The PaaS for “Platform as a service.” It's a bit like the intermediate brick between the IaaS and the SaaS. The Paas allows outsourcing the hardware infrastructure but also the middleware applications: databases, integration layers, application development environments, and storage. While the IaaS puts the cloud computing platform at the disposal of professionals able to build their own platform, the PaaS offers a Cloud platform already configured. Companies can, therefore, focus on application development and production. SaaS for “Software as a Service.” The company here rents an application, a service (such as a mail server) installed on remote servers rather than on the user's machine [11].

There are a number of benefits of Cloud computing that provide huge strategic advantages to the company. However, given the very nature of cloud computing, its benefits also remain theoretical. Through cloud integration, organizations gain the capacity to employ and sustain major process and work environments updates in short spans of time. As these application updates are, in nature, systematic, and the company is released from any maintenance responsibility on account of its supplier, it provides the company a unique advantage of simplicity which also saves the company any additional resource deployments [7]. Further, the data stored in the cloud can be easily made accessible to multiple users, the creation of a collaborative platform is also made possible in a short time [8].

It also provides a free of charge and easy access to the clients, so that they can set up their connections on the go and access their data without having to install a VPN (virtual private network in the workplace [16]. The company can ensure continuous monitoring and assessment of its computing space and its development while enjoying complete operational freedom since there are no long term commitments between the company and its service provider. Cloud services generally either are charged on a monthly subscription, or they are billed on demand. It is therefore quite easy for the

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company to terminate this service at any point in time, if it does not need it anymore, or if it simply wishes to change supplier [16].

The major controversies and debate in this matter lie on the issue of security and privacy of the data which forms the main limitation of cloud integration. As the data is hosted by the supplier outside the company, the risk of the company's sensitive information ending up in the event of misuse or theft or misuse is, therefore, a vivid possibility. The company's part at this point will be to make sure that its supplier provides sufficient data security and offers them a privacy policy that incorporates all of its data [15]. It depends on the vendor it chooses that the flexibility may be restricted to the nature of the offer.

Figure 3 shows the consequences of Cloud service supplier.

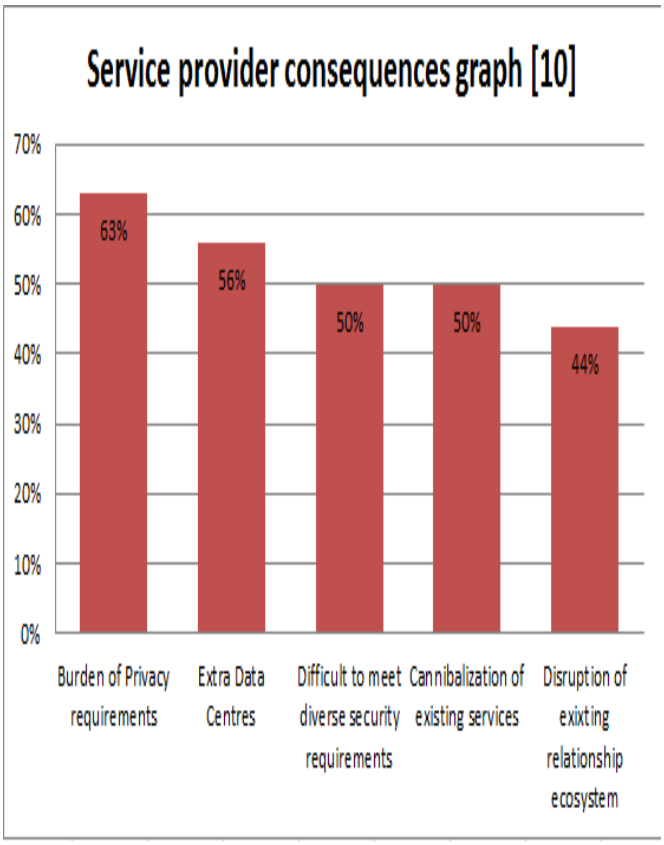

Figure 3. Cloud Service supplier Consequences

The decision of or not to use cloud computing information systems is based on the analysis of the risks inherent in this use. A company that wants to use cloud computing services needs to consider whether cloud computing is a contract between itself and its supplier (B2B) or whether it also shares this risk its external customers (B2C). When cloud computing concerns only the company's internal operations, it can determine to what extent it is willing to share risks with its supplier in order to gain from the leverage effect of the integrating cloud computing in its operations [17].

Cloud computing by industrializing the processes of creating, testing, putting into production and maintenance of software tools, is an effective response to managing program's life cycles. Developers capable of making upgrades in a matter of hours and complex prototyping in just a few days are all obstacles to change. Thus, the SaaS is a way to accompany the digital transformation of companies and the implementation of more agile methods [10].

With business benefits of agility that are already well identified, namely: a better rise of needs with fast iterations on the service and more efficient loop feedback; a continuous adaptation to the demands and specificities of its market, and users; a release first then iterate approach often reduces the time to market of the applications, thus favoring the business of the companies [2].

C. Big Data and Cloud Computing

The volume of data available to companies explodes with Big Data and the Internet of Things. Cloud Computing, with its storage volume and unmatched computing power, is the solution to this challenge. PaaS platforms allow you to "start small and grow" [6]. By relieving IT administration constraints, PaaS offers the opportunity for start-up companies to work in lean mode, and thus promotes their economic viability. More time to work and iterate on the applications, it is also more means left to the innovative exploitation of this data [11].

The practices and tools associated with Big Data, and of which Cloud Computing is a part, make it possible to measure, process, and thus evaluate the data. For example, when considering supply chains, the use of Big Data and its applications allows for optimization of profitability through fine analysis of data from production capacities, stocks, transport times, and of real consumption. Another scenario is the analysis of the performance of the equipment in real time which anticipates the risks of breakdowns and opens the door to predictive maintenance software [12].

The two IT initiatives of Big Data analysis and Cloud Computing currently concern companies worldwide. The first offers the promise of generating rich information sources of competitive advantage, innovations, and raising revenue. As a distribution model for IT services, cloud computing, if implemented correctly, can improve process agility and productivity while drastically reducing time and costs. Professionals are now attempting to analyze Big data in a relevant way to meet real business needs. As Cloud computing continues to evolve, more and more companies are creating efficient and agile cloud environments, while providers are expanding their service offerings [6], [18], [19], [20].

Semantics Literature review is a type of research methodology that will be used for this research. This examination report will provide a discussion about "Does cloud computing appends business agility to big data analytics?" for all researchers in business technology. A conceptual model will be drawn from the literature and amended from in-depth interviews with field experts to identify which business processes, SaaS-enabled, impact on agility on Big Data analytics and a company's operations. Suggestions of the different researchers and policymakers

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will be utilized for writing and organizing the research [18], [19].

The crux subject of big data analytics concerning risk management and business operations the research has made in three core areas, specifically:

a. Data mining and Business Intelligence (BI)

b. Security and reliability of Industrial systems

c. ORM (operational risk management) in business

The research in these core areas will cover previously done research in this aspect, challenges and solutions, and future recommendations. This research will addressthe issues of business management in operations, risk reduction approaches and trigger efficiency in the system. Fgure 4 shoes the business mapping process.

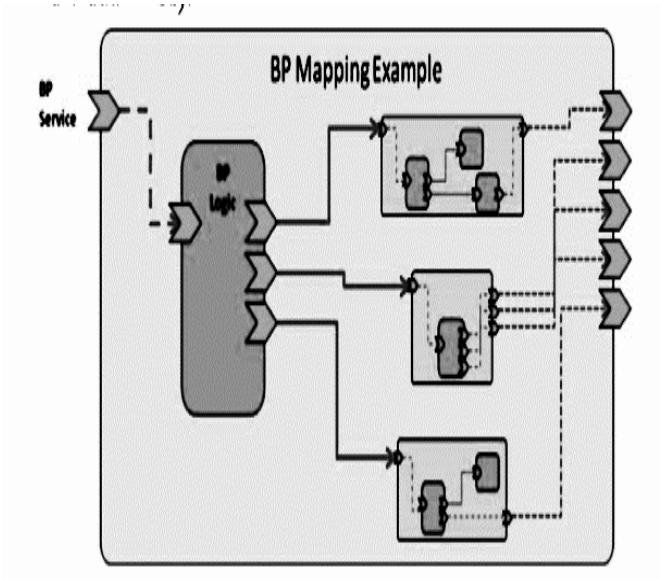

Figure 4. Example of Business Process

a). Business Intelligence (BI) andData Mining

➢ *BI:*

Since very long Business Intelligence phrase has been in use. In its older studies, the description is given of "an automatic system of processing and retrieving data," that aid in developing intelligence-based decisions on many sources of data. A more simplified definition was presented by Wixom and Waston: to acquire data in and out. During the 1970's, these intelligence systems were particularly in connection to the afterward development of DSSs (decision support systems). Hence, business companies can deploy these systems to make wise operational decisions. Figure 5 clearly, depict the business intelligence system[12].

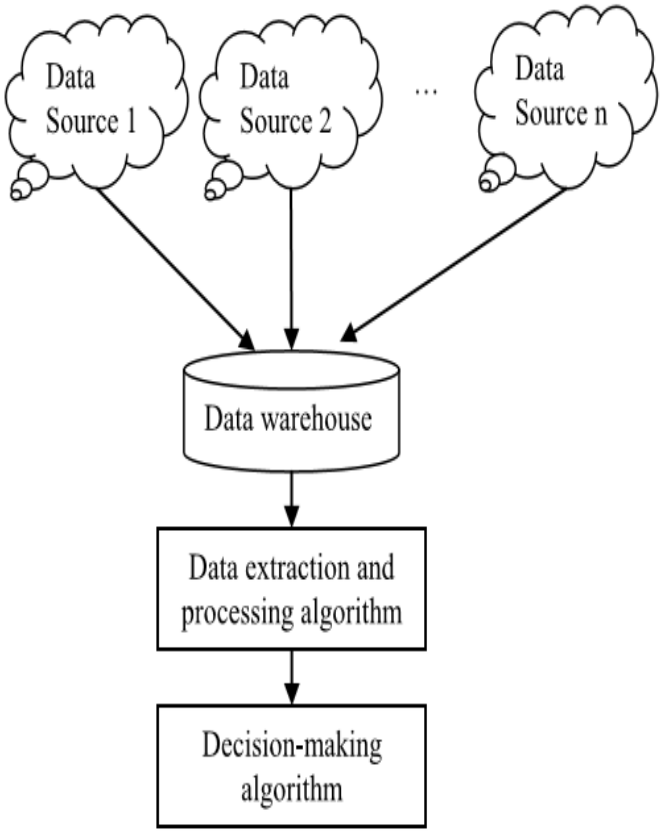

Figure 5. Business Intelligence system

Prominent applications of business intelligence in theindustrial sector are:

- Management of revenue in Airline industry
- Standardization of industrial operations in automobiles that result in cost efficiency.
- In transportation systems the routing complications
- In supply chain systems decrease the influence of unreliability

Assuming the accessibility of data onreal-time basis the above application was a technological issue for system designing of business intelligence (BI).However, this constraint of gathering data in real-time has been developed by IT advancements, especially RFID (radio frequency identification) that is a wireless sensor technology. This technology has changed conventional Business Intelligence systems to move to ubiquitous systems of BI. For the industrial sector, RFID has been found for establishing excellent coordination mechanism at i-level particularly. Hence, characteristics of operations like management of inventory and assessment of risk are prospectively enhanced sections along with data collection. [12], [18], [19].

Current progress of the Internet of Things (IoT) has made the supervision of massive datasets of real-time easier. By usingsoftware (middleware) that acts as a bridge between applications and databases or operations, the attached gadget

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with RFID instrument can be contemplated as the Internet of Things (IoT).The crucial difference between conventional sensor networks and IoT is their attribute of Internet empowerment which describes the alignment of an object in the domain of the Internet.The reality of it as an emerging technology has proven from the practical applications discovered already in transportation, supply chains of the food industry, management of inventory and monitoring of the business domain as discussed previously. However, for industrial applications, through a genuine design of the system, BI (Business intelligence) can be incorporated to IoT. The simultaneous emergence of cloud computing and big data analytics is not a matter of coexistence, as both possess similar attributes. A mechanism of massive dataset processing and storage is provided by cloud services that are formulated from many places. After this data analytics for example clustering, data mining, etc., will occur at some other location without any corporal interconnection with data gathering locations. Computational effects can be reduced by the platform provided by cloud services as for the above issue of data analytics to the infrastructure of the cloud. At this point, it iscritical to note that cloud can enhance the business agility through the architecture of Hadoop rather than acting only as a warehouse of data. As an example, the smart grid system and telecommunication sector are found to be the most successful implementation of technology. In figure 6, the impact of cloud computing in various domains is apparent [18], [19], [20], [25].Figure 6. Shows the Impact of cloud computing in different domains

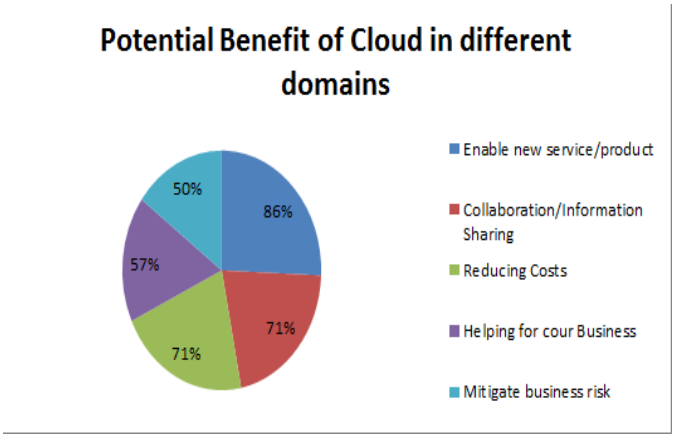

Figure 6. Impact of Cloud Computing in Different Domains

Evident advantages of Internet-enabled Business Intelligence systems are

- Cost efficient
- Less time required for data collection
- Individual data gathering platform
- Achievable expert database

Nonetheless, security matters are of concern on the addition of these services. Though no virtual technology or information systems are exempted from these vulnerabilities and risks, and the most significant issue if the vulnerability of cloud that is yet to be specifically managed. Moreover, an expert piece of data has its confrontations. It is to say that concerns should be made while scheming internet-enables systems of business intelligence. Table 1 shows the BI enable technologies [12].

Technologies	Web-Based	Intelligence	Ubiquitous
Cloud Service	✓	×	✓
Internet-Enabled BI	✓	✓	×
DSS	×	✓	×
IoT	✓	×	✓
RFID	×	×	✓

Table 1: Synopsis of Various Bi-Based Technologies

[If standalone, Supported = ✓, Not Supported = ×]

Furthermore, for top-level system sketch, the progress is a constraint that is actually not a limitation in the real sense but the depiction of immense outlying application of BI in real life even not indicating if it's successful gaining is possible or not[6].

➢ *Data Mining*

Algorithm for data processing and extractionwhich afterward result in progress of an important method of machine learning known as “data mining.” A procedure that is utilized to locate or determine expert patterns, correlation, identical items and components in the dataset. Conventional application area of data mining includes risk and insurance related assessment and analysis. The most significant example of data mining is in the field of medical research to recognize thedominant disease. These mining procedures are made easier through OLAP (online analytical processing) which is the underpinning key of various applications of business in Business Intelligence. In the 1970’s, it was first introduced along with the development of DSSs. Countless studies of data mining are associated with OLAP by yet[6], [18], [19].

Data mining and business intelligence systems work simultaneously. In the era of big data, data mining specifically is not of much concern, but the questions appear when processes of data collections are associated with scrutiny. The situation becomes alarming when dataset comprises of information about public sector especially large data of executive level. The off-the-shelf result is impossible to find because of customized application of data mining for different purposes. Risk factors can be minimized through the data mining process, but its establishment can generate another kind of risk. However, regardless of these issues, through the appropriate deployment of data mining applications supplementary practicality of business can be created significantly[6].

b). Reliability of Industrial System and Security

- *Reliability of System*

An important constituent of almost every system is its reliability. It is the possibility of a system completing its functions in a time frame under specific conditions. A system is reliable if it functions constantly and safely. Research studies regarding reliability comprise various areas. These is dissemination evaluation and data reliability, data transmission, product lifecycle management (PLM), and efficient exchange. For reliable manufacturing in industrial systems, data is extensively applied in PLM. To prevent any faults and interruptions that impinge on completeness and precision of enterprise applications, particularly in the PLM that is closed-loop in which numerous partners and establishments are participating, an efficient technique for tracking and following the product lifecycle information is crucial[6], [18], [19].A complete structure for this technique is established in the closed-loop PLM. To handle large event data of product embedded information devices, it comprises of a schema and a processing mechanism that produces relevant information from a large set of data. Mathematical models were suggested by Gupta and Ondemir that use remaining life estimations and product life-cycle data for the purpose of fulfilling the need of old products as well as components with a limited remaining life. The data produced by EOLP is a record of every end-of-life products with corresponding numbers. These corresponding numbers are used for identification purposes which may be used during distribution between partners of manufacturing organizations [6].

Evaluation of dissemination and data reliability application is necessary to power systems, aeronautical engineering, traffic field and much more. Innovative middleware architecture was proposed by Woochul named the real-time data distribution service (RDDS) and validated its viability by applying a model of it. This demonstrated that RDDS, in comparison to baseline methods, attains robustness against random workloads and greatly reliable and efficient dissemination of sensor data. For evaluation of the performance of data delivery in a virtual environment, Shah presented a distributed control algorithm. It was shown that the structure could attain the necessary quality of service. The notion of implementing Bayesian methods was introduced by Li and Meeker for the analysis of the reliability of data, and they used four basic types of the reliability of data to demonstrate the methods. Data in real-time is the main aspect of reliable power delivery from the units generating power to the end-users. Natural emergency, capacity constraints, and equipment failures influences can be mainly averted by online power system condition protection, diagnostics, and monitoring. Exploring the know-how of a guaranteed reliable data transmission and exchange in various real-time studies are present. For example, a survey was organized by Gungor et al. on requirements for communication and potential uses of the smart grid. It showed that communication and information technologies are a critical component in smart grids performance and growth. In lieu of a connection between the vast sum of distributed elements, for example, generators, storage systems, and users, a fast, dependable and advanced infrastructure is a must. [6] They are able to improve reliability and effectiveness of the smart grid elements. Dietrich, they presented that for a home energy management system the crucial functional areas are data measurement, transmission, and energy effectiveness. Real-time data measured form appliances is transmitted to a data concentrator. Consumers can be updated on the trend of their consumptionby showing statistical analysis based on collected data on displays. Thus in the era of big data, real-time data about system reliability can be gathered from multiple sources, and there is also stronger computational ability so that greater bulk of this data can be processed. In this region, the construction of systems for evaluation index constructed from reliability data and formation of a mechanism for anticipating and warning are the key challenges [6], [20].

- *Data-Driven Based Reliability of System*

In order for the systems to be stable and reliable processing plants in the industry require an enormous amount of sensors for reporting data for control and observing the process. An innovative “Web” made of a network of wireless sensors can be implemented. In various operations of the industry soft sensors can be used. For example, an ensemble method based on multilayer perceptrons was presented by Gabrys and Kadlec for development of soft sensors. Using this ensemble method, they solved the complexity selection problem of optimal networks. The soft sensors were implemented in a drier process. Detection of fault in a process and monitoring of process is another use. To detect and isolate faults of a process Kämpjärvi provided multiple soft sensors that can be advanced into an ethylene cracking process. They indicated by taking in calculated variables (produced using knowledge of the process) system accuracy enhanced. This method uses rules established from knowledge of human experience to evaluate monitored data [18], [19]. This way, human intellect for supervision is automated. For the problems of classification, knowledge was obtained by means of data summarization, a method proposed by Rongsheng et al. In manufacture, this approach is implemented in the diagnosis of welding fault. Every time new sets of data are acquired, knowledge can swiftly be brought up-to-date. In supply chain management, data-driven methods are generally used, and there are many problems. One is that reacting to demands of the market and conditions presented by the supplier, the arrangement of supply chain time may not operate satisfactorily in real time. These problems can possibly be resolved by using extensive data acquired using equipment and sensors. For the purpose of being used for the management of supply chain, RFID (Radio-Frequency Identification) tags and sensors have already been incorporated. This leads to the notion of combined knowledgeable products and also facilitates to storing data about products that dynamic and static, thus in EOLP management this shows the way to new prospects [6]. A new improvement of supporting systems is MapReduce. In this context, implementing the distributed approach, big data is divided into smaller sets and dealt with side by side. A system called starfish was presented by Herodotou et al. that is self-tuning for analytics that is economical, reliable and

well-timed. Cohen examined the evolving exercise of active, deep information investigation as the first exit from outdated warehousing. The data-driven systems in the industry can be expansively monitored, and their operations can be controlled by using big data methods. It is evident that many big data challenges will present themselves for the reliability of industrial systems that are data-driven in their analysis, warning, and assessment [6].

- *Security Breaches*

Several applications related to big data have been developed to work out difficulties involved in security breaches. In industrial systems, for example, security evaluation is carried out, and security problems are resolved using these applications. They are useful in the public sector as well. A method for data mining was applied by Xu for rapid security that illustrated the improvement of efficiency and precision of transient stability. In order to reduce the consequence of unforeseen variations in the production operation, global operations method that is data-based was presented by Ding to assure safety in the functioning of a plant for mineral processing. An important feature of the smart grid is demand response. For security and stability of power system, a structure of defense architecture was proposed by Yong that contains the control system stability and security assurance system[6] [18] [19].He discovered that power system security was assured using this method. To improve power system efficiency and safety, Wang et al. presented an emergency demand response system that is event-driven. The security of buildings and physical infrastructure can also be guaranteed using big data and as well as the monitoring in industrial regions and safeguarding delicate infrastructures. To reinforce the security of surveillance-broadcast systems that are automatic, Samuelson et al. presented a coding algorithm with message verification that contains an encryption scheme to secure the message material and its verification. It is extensively applied in control system of air traffic. The two characteristics of big data-driven security standards are 1) cutting-edge monitoring systems that constantly analyze systems and resources 2) incorporation of tools for the management of safety and risk to assist comprehensive examinations of possible complications. An efficient sampling scheme was proposed by Krishnan, in which data content of the database was maximized whereas computing requirements were minimized. To allow multiple multimedia applications in IoTs, Chao and Zhou devised a security framework that is media-aware. To handle the heterogeneity of varied applications, they introduced an innovative method for traffic inquiry and classification. In order to accomplish a healthy balance between flexibility and efficiency of the system, they presented a strategy and design rule. By incorporating features of IoTs, multimedia traffic, and security service their study constructs a data-aware security architecture. Our perception of safety violations in industrial system is improved by big data technology. Some challenges in research are to 1) construct a better security assessment system; 2) establish further sensible analysis rules for security invasions 3) ensure legal actions and effective actions are taken to handle security breaches [6].

c). Operational Risk Management (ORM) in Business

There are various operations and procedures, in theindustry regardless of what type of business it is. There is a plethora of dangers and risks due to improbability in the real world. Beroggi and Wallace, in their significant study, described Operational Risk Management (ORM) as recognition of an unanticipated occurrence, evaluation of its effects and deciding what to modify in a strategic procedure. According to this definition and theory, for best decision making a real-time focused paradigm and algorithm was presented by them, with an outlook of attaining ORM that is efficient and implementable. They used to real-time cases from industry to explain their motivation. One of them being the routing of transportation and the other one is the management of emergencies. Now further advancing the ORM framework of a single decision maker, they also investigated the circumstance where the number of decision-makers in the procedure is significant. For first and ordinal preference evaluations they established two dynamic preference accumulation models to be used. Fiel's data was used by them to authenticate their planned prototypes. In order to show the strength of their models, they carried out a sensitivity analysis. Brenden, from the point of view of the person that is implementing, scrutinized the worth that can be achieved for the company using appropriate ORM [6], [18], [19]. The meaning is extremely similar, the operational risk was described by Breden, as the possibility of loss consequential of insufficient or unsuccessful internal procedures, method, and people or originating some outside occurrence. He stated that in the business operational risks arise with the passage of time when there are fluctuations. In the regulatory structure, he inspected the part of ORM and indicates that regulation can be considered an important part mechanism that makes business decisions. To make certain that there are vigorous and robust operating procedures for assessing and handling operational risk, he presented the ORM structure. Prime allocation problem of resource was examined by Minciardi et al. with the administration of combined preoperational and operational structure for natural dangers. In the light of a deterministic setting, they comprehensively investigated the substitutes of modeling the resources. A scientific process-level prototype was established by Mendonca and Wallace in extemporization. This model was applied to them in the area of emergency management which verified that the corresponding ORM could be effectively improved by their model. In recent time, in order to study the problems relating to production capacity planning, Chronopoulos et al. implemented the real options method. Essential elements such as the aversion of risk and the possible flexibility in operation were combined in the model. They concluded that investment could be improved if the amount of aversion to risk is amplified by lowering the best capacity. At first sight, it is very astounding to know that in IEEE TRADE risk in operations in the finance area is not well issued, but it is realistic as keeping in mind that in financial engineering there is no specified IEEE TRADE [6].

- *Management of risk in Operations*

Operational risk arises from various outlooks during big data epoch. Firstly, information resources worth are very

challenging and can only be assessed by performing measures of value-at-risk type. Secondly, the actual operating cost is affected by the cost integrated with big data. Thirdly, e-commerce has become very famous due to the presence of internet that actually help in collecting data. Some calculations can be done to obtain ORM based big data. According to researchers' analysis, big data analytics are implemented by business firms from a risk point of view and suggested a model based on the theory of planned behavior for assistance. Methods to gain cost efficiency and worth of information resources was proposed nonetheless. Therefore, financial estimations of expenditures for storage of big data was found to be identical to any calculations made for insurance. Methods of storage tiers were suggested to regulate price risks by which top technology for data storage is deployed for processing most significant data. Moreover, specific recommendations for setting tolerance level relevant to the critical risk elements and should be added to ORM strategy by business companies. Additionally,operational risk management should base on both internal and external affairs of operational issues and market environment. Meanwhile, an advance ORM model has been developed that will facilitate future grid processes. Its silent features comprise of a durable system capable of reliable operation, a commitment procedure that is scenario-based and dispatches operations for network economics along with corrective calculations. ORM was also explored in the health department. Hence, DSSs was developed to integrate the accessible data and previous knowledge to build risk profile clinic patients, and it will aid diagnosis process[6].

Table 2 represents significant frameworks of ORM along with weakness and strength of proposed models [6].

ORM Prototype	Efficacy	Deficiencies	Observations
W & B	Mechanism of decision-making at real-time	Useful for individual decision-makers but not a group	The only initiative study was done on ORM
Tallon	Provide information resources estimation and contemplate cost, value and risk of operations in big data.	Not logical	State that a tolerance level must be created between value and risk by companies and more research should be done.
Breden	Comprises of ORM integration	Not logical	Need further researches to be conducted in this perspective.
B & F	Contemplate data protection, risk and standard in big data.	Not logical	Fact-finding model. However, need further scientific analysis.
C & E	Deploy a model based on the theory of proposed behavior to establishing of ORM based on big data.	The result was drawn from small size sample.	A fact-finding model. Factual observations need to be verified through scientific studies.
R & Z	Control the evaluation challenge of distribution framework for uncoupled arrangements	Unconnected analytical consequences	Intensify algorithm efficiency
L & Z	Flexible & robust	Complex for utilization purpose	Model supposed to be used for upcoming grid functioning.
W & M	Development of technical, cognitive model for emergency management issues,	Incorporation issue with other models and absence of time and risk limitation factors.	Introduce the concept of ERP systems for linkage enhancement.
B & C	Introduced advanced system based on knowledge domain and data of individual patient aiding assessment of risk	Heterogenous system from other clinical systems	Should be incorporated into other routine systems present in clinic

S, D & C	Deployment of real concepts to find worth of capability size in perspective of risk disinclinatio n	Model presumed to have never-ending lifespan	A model with enhanced utility attributes for any business company

Table 2: Comparison of Various ORM Models

Data mining is used to create business intelligence in a recent span of big data. A heap of research was conducted and analyzed to address the operational risk issues. Moreover, financial warnings can be generated through data mining to detect danger in the systems. Further research studies analyzed the presented four techniques performance of data mining used for risk evaluation of personal balance. The four techniques were: a regression of logistics, supporting vector mechanism, neural system, and decision tree. Data mining procedures based on regression and supporting vector mechanism are found best for gaining accuracy of classification, and also it provides durability. More specifically, data mining applications were deployed to analyze the fraud management of collected data gathered from big enterprises of big data. An argument was made that data mining is an appealing and competitive appliance for operational risk management. Although using data mining in healthcare is a timely subject to analyze risk[6], [21], [22], [23].

Hence it can be said that operational risk management (ORM) frameworks mainly comprises of conventional operations stressing on analysis of risk. On the other side, auditing, and quality of data are major concerns. Consequently, ORM architecture developed for new significant data span should be thoroughly analyzed and explored. The existing mechanism can be supported through hypothetical examination and can attain optimal solution for entire organization globally[6].

D. SaaS (Software as a Service)

Service Paradigm of Cloud Computing: It has become essential for major companies like Google, IBM and Amazon to keep transforming themselves and understand more about the customer satisfaction and demand, which is why previously in 2007 Cloud Computing and SAS came into being which was started to provide with the help of internet as the medium in order to give enhancements to the overall computing power and the storage devices [26], [29]. Computing has been defined by many writers and authors, Mell and Grance define Cloud Computing as, “an innovative form of computing in which huge IT-related skills are provided to the customers as “Services” using Internet technologies to cater the needs of clients. As far as the benefits are concerned, it allows the users to have access to the following things like, (storage, server, and applications) with a minimum effort which is not independent of the variables like time and quantity. Furthermore, cloud computing is categorized into different models which are as followed. The first one is known as Infrastructure as a Service (IAAS), this is the form of service which provides hardware resources which includes basic software which is usually referred to as the operating system which aims to maintain the overall infrastructure [26],[29]. The second service is known as Platform as Services, (PAAS), the main function of this service is to maintain and make sure about the development and testing of new applications. Lastly, Software as a Service(SAAS) is another form of service which helps customers to access software applications through a pay-per-use model.

a). Operational Agility

The Operational Agility concept came into being during 1980’s from the manufacturing industry.In comparison with other ideas like flexibility, business agility determines the capacity of a firm to adopt the continuously changing environment rapidly [29],[24]. Business agility can further be described as the form which can sense the change, threats or pressures occurring within the organization or firm and demands to get adaptive according to the situation and time. That is the reason why Agility is essential for organizations today as it helps them to continue in all kind of circumstances. It goes without saying; IT plays a significant role for companies, it helps to detect technological threats and failures and react to them in order to make changes accordingly. One of the most important thing that IT contributes to carrying out is related to the enhancement of resources and building a broad network to improve the richness in overall quality. Furthermore, **Sambamurthy**shed light on different dimensions of agility, which has been further categorized in the following: customer agility, partnering agility and operational agility [24], [26], [29]. Customer Agility outlines the importance of clients in regards to the information that is gathered and transferred to themthat being said it gives leverage to the customers to have access to knowledge, assets, and resources in a partnership network. Figure 7. Shows the SaaS effect on operational Agility.

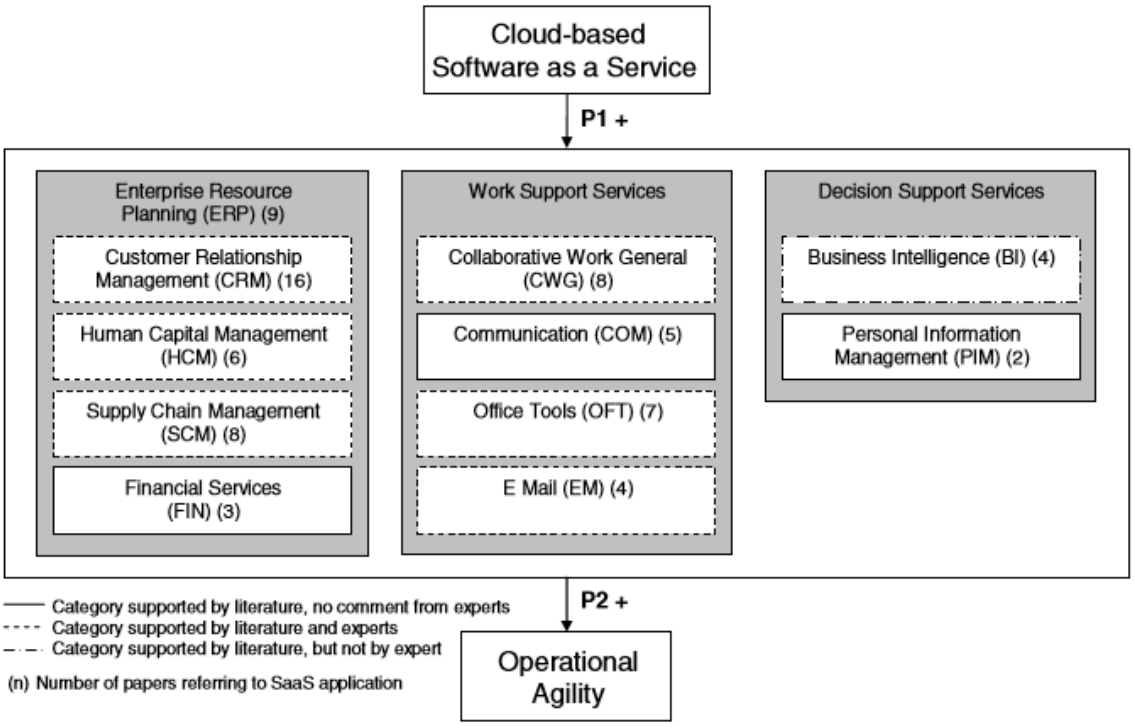

Figure 7. SaaS Effect on Operational Agility

b). Research Method

In order to understand and identify which SaaS-enabled process is more efficient, and has had an impact on operational agility, we createdavalid explanation that was extracted from the literature review and the interviews conducted by the experts. This will enable us to understand more about the concept that revolves aroundagility. As faras the reasonable approach is concerned, we were helped by Hirschheim who proposed that there are three important conceptual elements that are needed in research which is as follows: statements, certifications, and surroundings[29].Hence, we have tried to draw some reasonable (cases), and, e. g., this has demonstrated about the research questions that were carried out in addition to the conclusions and recommendations made based on the model . In order to make verifications about the statements, we made certain classifications and recommendations from surviving Cloud Computing writing concentrating on SaaS[18], [24], [29].

c). Literature Review

In orderto know more about this particular section, conclusions that were drawn from Webster and Watson work were used, in addition, an understanding about cloud-based SAAS was developed by analyzing data from the AIS.Keeping in mind the end goal of gathering procedures, we picked the four most imperative IS meetings for America and Europe. As specified above, Cloud Computing and henceforth SaaS, developed without precedent for 2007. Therefore, the point of focus for our research was based upon journals, resulting in 214 papers of possible use. This amount had to be minimized, as the time frame of our research was within January 2007 to December 2011.Of the papers considered192 were published in journals [26], [29]. Table 3 demonstrates and reflects the gist of the main literature review, which was followed by journals and meetings , resulting in the number results for every year. Findings were analyzed in order to understand the conceptual model and presentation that was drawn out.

Source	2007	2008	2009	2010	2011	Total
AMCIS	3	3	23	30	31	90
ECIS	1	3	10	12	21	47
HICSS	-	-	1	1	6	8
ICIS	1	6	10	19	11	47
JIS	-	-	-	-	1	1
EJIS	1	1	-	5	3	10
ISR	-	-	-	-	-	0
JAIS	-	-	-	-	-	0
JIT	-	-	-	-	-	0
JMIS	1	-	-	3	2	6
MISQ	-	-	-	-	-	0
JSIS				2	3	5
Total	7	13	44	73	71	214

Table 3. Literature Search Results

A short time later, to avoid unessential papers, the papers were bunched by their real point of investigation and prohibited if not qualified for our examination. 15 papers which were based on the identification of serious themes related to security were chosen. Different papers explored Cloud administration themes, for example, asset portion (10

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articles) or concentrated on Web 2.0 innovations, for example, wikis, online journals, and group sourcing (10 articles)[29]. There was an additional reduction of approximately 42 papers since on a fragile area and were not identified with the forms of business. Almost 7 articles were rejected, referring to some major applications which fall under the umbrella of SaaS. Furthermore, if we see the use of SaaS at the business platform, this investigation of the papers brought about 28 distributions measured as applicable for our motivation[18],[24]. For instance, we divided some critical applications like Google Docs and Microsoft office into Office Tools which can be classified as a subcategory. The main goal was to identify the importance of Customer Relationship, Supply Chain, and ERP which is also known to be three major classes that were searched for similitudes. The classes and sub-classifications have been talked about among the creators to locate a typical concession to the order.[29]

d). Conceptual Model

To create a greater understanding of research question, which analyzes the importance of business processes and the association with the use of Saas, we utilized various research methods. Speaking about the research approach that was followed by it consisted of literature review and expert interviews, which gave us the result of the findings in a way that it has been divided into three main categories and 10 main subcategories of the business process which has been eligible for Saas usage. While one unique form of categorization , ERP, was rationally specified in the examined writing of SaaS and Cloud Computing, which turned out to be a more informative update of the papers which uncovered the proposed order into the classifications which covered the details of Work Support Services and Decisions support services [29]. Figure 8 shows the Cloud Business Model.

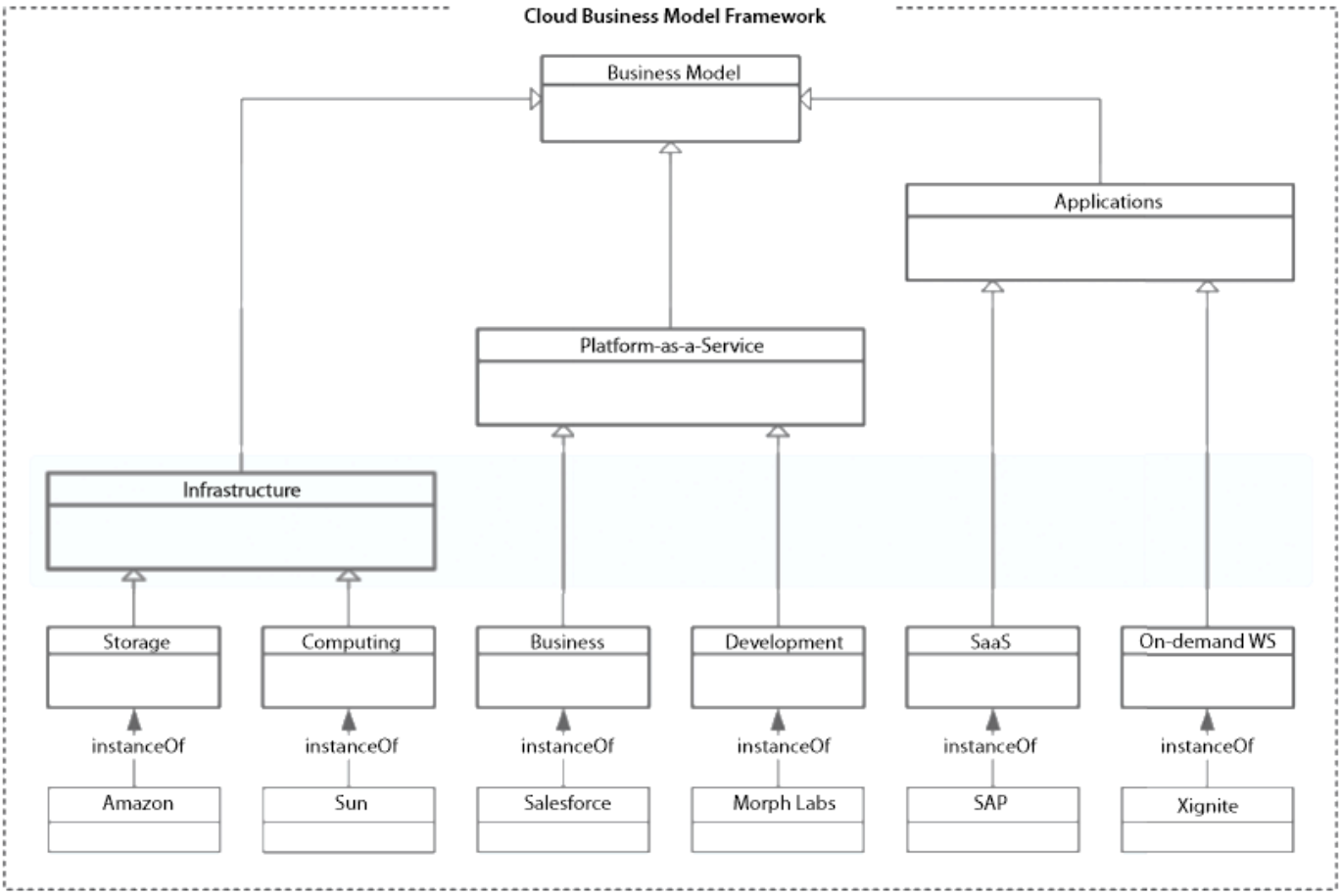

Figure 8. Cloud Business Model

Furthermore, outskirts of the subdivisions which have been demonstrated in the above model, which illustrates either the arrangement were taken exclusively from literature review which was not remarked by the interviewee and was substantiated by the interviewees or if the classification was adulterated by the people who took the interviews [29]. The accompanying segments delineate in greater detail how we determined the classes appeared in Figure. In order to understand more about the concept revolvingaround SaaS and Cloud Computing Literature, Table 3 gives an outline on the surviving which rose up out of our writing survey and shows the arrangement of the papers.Also, it has been demonstrated

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in Table 3 that answer the first section of research questions by illustrating the business procedures primarily examined in the research study [29].

Thereof, we determined that those business forms are not valuable cases for examining. Since a few productions concentrated on SaaS for their situation study or execution explore, we feel sure to presume how it is evident that, SaaS-based procedures are additionally the ones which are often as possible utilized as a part of business process. While answering the second portion of questions and know about the things in detail, we explored the arranged papers[24],[26],[29].

e). Enterprise Resource Planning Service Category

ERP framework has become essential in the cooperate world, which is why the context of ERP is being followed and practiced in different capacities like CRM, HCM, and FIN. Therefore, it has been explained by famous researchers Blau and Kosalgewhere they have stated how all these capabilities helped in the overall administration esteem to improve and make it better.. Because of the modularization, services being carried in the organization acts as substitutes which helps the organization to adapt themselves according to the change that is occurring within the organization and the external and internal environment that the people are working in. There are some major benefits inclined because of incorporation of Web2.0 which includes online websites, groups, etc. Two of those advantages likewise influence the utilization of CRM SaaS by altering business forms from a single viewpoint and obtaining clients yet again. Thus, the two papers show that particularly any change that is happening within can be adapted by using methods like CRM and Saas which also enhances the operational skills[24],[26],[29].

f). Work Support Services Category

As far as the work support service is concerned, it follows the categorization which covers devices that help to support the shared work as a rule or correspondence regarding video conferencing and texting. Word processors or spreadsheet applications fall down under the same umbrella of this category[29]. These applications hold important utilization and are confirmed by one of the interviewees, "As the market today offers me institutionalized administrations which helps me to do things more easily, and more efficiently, I can execute everything: from E-Mails to any type of Office work ." The focus of research so far has been shifted toward SaaS which boosts the administrations from various headings however there was no any focus on the important ones which could help to understand the connection of cloud computing with the work which has been further explained in table 3.In addition, Kosalge and Tole foresee that in order to expand the business it is important to create online cooperation will help the business to grow and develop [18] [26] [29]. Consequently, it is expected that the witnessed change will create an impact on the overall operational agility.Figure 9 is the graphical representation of theimpact of cloud computing transformation on thejob market.

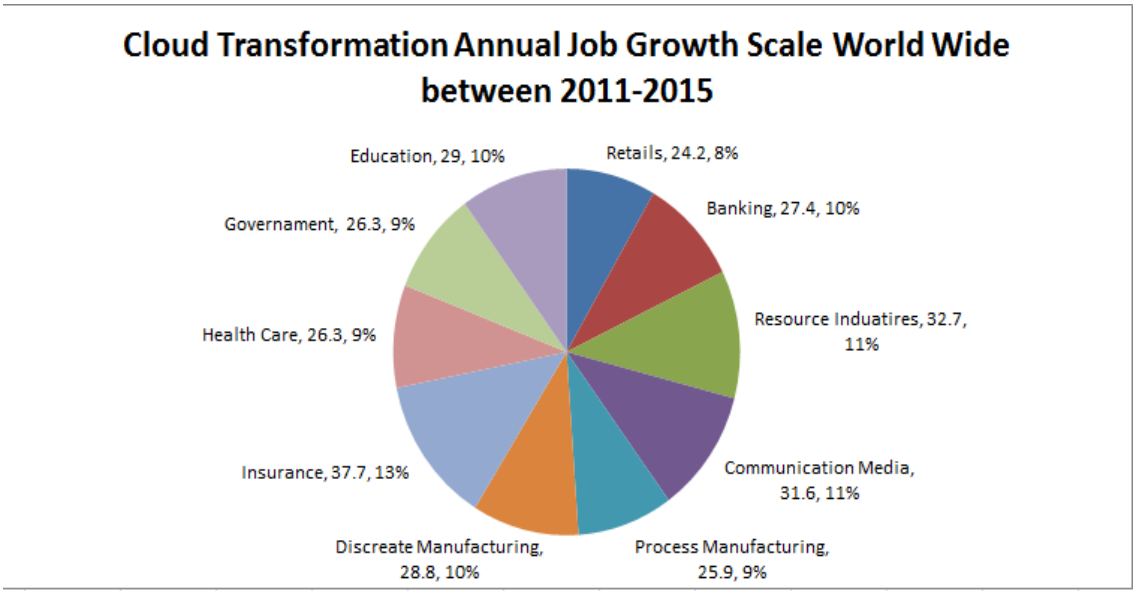

Figure 9. Impact of cloud Transformation Globally

g). Decision Support Services Category

This remains as one of the most important categories that is followed by the organization, that being said decision support services help to provide leverage and a certain ground of authority in order to make decisions which are significant for the company. Furthermore, **Baars and Kemper** state the importance of Business Intelligence in the company where it was explicitly mentioned that how effective Business Intelligence can act in order to improve the overall agility of the system[29]. It has been referred to in the literature review how Business Information and Saas will create a positive impact on the environment of the company which would help the decision-making process. As one of the expertSusrala stated, “Innovative concepts related to Business Intelligence must be made, it will be highly ineffective of the business

like car manufacturing to run without putting Business Intelligence into consideration, the need of Business Intelligence is way more than ERP itself." As long as the implantation of Business Intelligence in the cloud system, it requires intensive customization to adapt to the particular changes, in addition to that the customization needs to be more flexible and placed in order[26] [29].

h). Deployment of Theoretical Prototype

As discussed in the subsequent section, utilization of Software as a Service (SaaS) emphatically influence three classifications of business procedures that were significantly obtained from deep interviews of experts and literature. A model is conceptualized to envisage reliance between using SaaS, consequences on business agility and improvement of business processes. However, confirmation of various kinds of foremost applications of SaaS was also found in the literature. SaaS has a significant influence on business agility and also enhance the flexibility of operation. Although, researchers have found the average potential among the business agility of enterprises and information technology flexibility supplied by SaaS[18],[24],[26],[29].Consequently, a direct impact of flexibility is not proposed to operational agility yet though ERP employment, decision support services, and services of work support give a moderate effect. Here a few propositions are listed as follows:

- P1 = Pliability of business procedures is positively influenced by using cloud computing SaaS (software as a service)

- P2 = adaptable, business processes that are SaaS-based effect agility of business operations.

Therefore, it can be concluded that business enterprises can be benefited from SaaS-based models, due to its flexibility according to altering the business environment and facilitating with in-house services, especially the attribute of scalability in accordance with up and down financial situations. Pinsonneault and Tallon, both researchers, have also corroborated this model and confirmed that flexibility of information technology comprises of both adaptability and scalability [18], So both attributes are a basic characteristic of SaaS and cloud computing according to the prior definition. Later on, from many researchers work it can be stated that flexibility of IT influences agility in both operational and strategical business. According to the operational agility description, the flexibility in business processes generated through SaaS is a requirement of firms to enable them in reshaping their business procedures. This potential permits business firms to proceed immediately to altering the environment and as a result, obtain operational ability to think and understand fastly[24].

III. DISCUSSION

In order to analyze the business model changer through the influence of Cloud Computing, SaaS cloud-based framework is emphasized to examine. To address the answer to our hypothesis questions, we inquired: (1) Which sorts of business forms are affected by the use of SaaS (2) How do these SaaS-based business procedures append the operational agility of an enterprise? A critical reassessment of literature and comprehensive interviews of experts were conducted. To address the very first question of the hypothesis, concerned with the conceptual findings of researchers, three classifications of business procedures based on SaaS were derived which include ERP employment, decision support services, and services of work support. Moreover, the calculation also discloses that flexibility is induced to business procedures by SaaS that further appends business agility[18],[19],[20].

Upcoming research domain is identified through the support of theoretical model to conduct a comprehensive investigation of the cloud-based model and its influence on processes of the business. To conclude a decision about which process of marketing the software-as-a-service will be deployed in future as an underpinning theoretical model by practitioners. Therefore, the paper also declares a clear approach to business managers for encouraging the benefits of cloud computing both in the business sector and information technology (IT) domain as well[20].

In the given situation, the SaaS-process CRM is frequently referred as a framework that can be considered worthy for relocating SaaS as an initial pace. Finally, it is important to note that business firms take into account the influence of workers thrusting Service-As-A-Service (SaaS) from the private sector to information technology of any organization. The demonstrated research within this paper has some restraints. First of all, a theoretical model based on SaaS of cloud computing has derived leaving behind PaaS and IaaS. Second SaaS and also cloud computing are the innovation in a technological sector that is the base for carrying out this research and diminish the generalization requirement[19].And the third constraint is examining the influence on operational agility by eliminating dimensions of partnering and customer agility from agility of business. Examining the interconnectivity among SaaS, cloud computing and agility of operations, the assembly should be operationalized so that model can be promoted in future researchers with the help of extra data. Subsequently, the intuitions should be able to test the model empirically being a segment of any quantitative study amid SaaS corporate subscriber. Desktop virtualization is another significant research area needs to be addressed in upcoming time. Nonetheless, the literature reassessment doesn't give recognition to this section in this paper. But, it will append workplace flexibility and will enable business firms to "cloudify" while interpreting their issues [29].

Forwith, the emphasizing problems like work adaptivity, work collaboration and flexible work demands in-depth scrutiny in perspective of business influence on device and location independence in order to approach information [18], [19],[29].

It is apparent;cloud infrastructure has brought strategic innovation and transformation on how businesses can work. Business intelligence is real-time system generated efficiently from the prime resources of business data. That ultimately

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help decision-maker to planappropriatelyfor risk situations [12], [19].

IT and cloud have ensured the initiative and informative interfaces to streamline and simplify the procedures for utilizing functionalities of business, discovering and assessing and furthermore to facilitate the clients and customers globally. Establishment of small and smart enterprises has been solidified by the exposure of IoT (Internet of Thing)discipline.Now through networks, general things are getting digitized and incorporate other parameters in remotely and locally hosted applications of the cloud.Hence, extreme enablement of service and connectivity will generate comprehensions that will trigger the enterprise system. Mostbusiness are facing the actual and real transformation through systematic and smarter evolving ideas of architecture, SaaS, and IT advancement[12], [18], [19]. Figure 10 shows Comparison of Conventional IT sector with Cloud

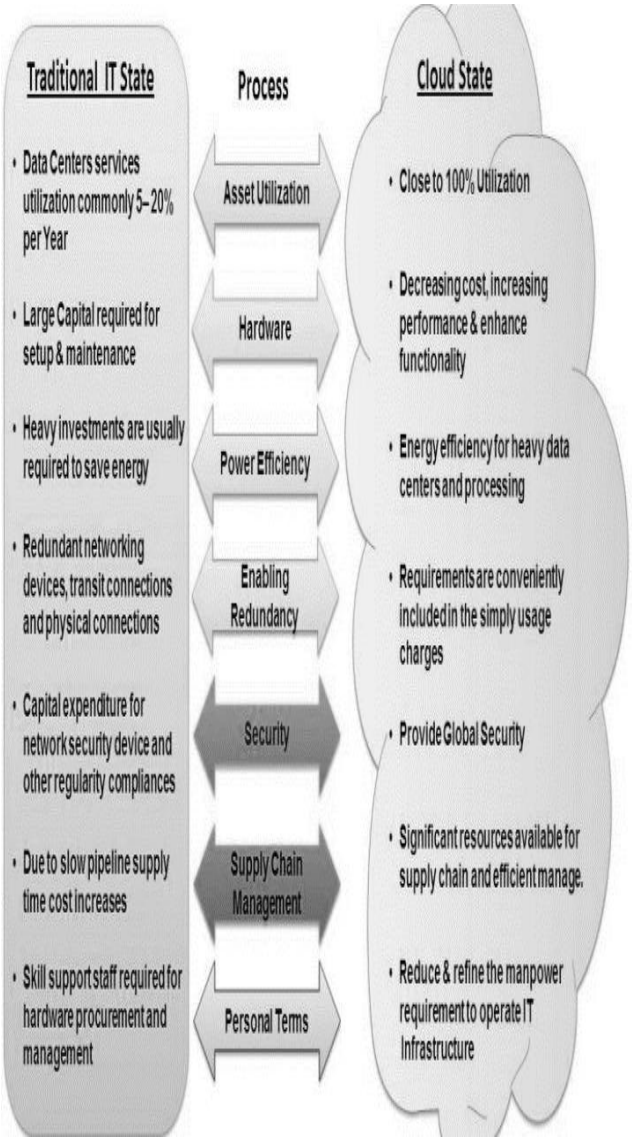

Figure 10. Comparison of Conventional IT sector with Cloud

IV. FUTURE RECOMMENDATION

Security and privacy in perspective of data applicability are a matter of concern, and it is found that despite mobility it is more secure in a staticenvironment. This issue has been highlighted from the world economic surveys that security is the substantial concern for the clients and service suppliers of the cloud to adopt these transformational technologies. Future recommendations for big data analytics are made in perspective of carrying out further deep scientific research in future[6], [21], [22], [23].

- *Business Intelligence and Advancement of Technology:* conducting severalindependent research studies so that various methodologies can be deployed to analyze the knowledge for "Big Data" scrutiny. This can be achieved through implementing real-time data, systematic patterns of optimization, models based on thetheory of behavioral decision-making to facilitate the decisions of managerial level in business. Moreover, despite analyzing algorithms in big data, ontologies mining should also be investigated[21], [23].
- *Reliability and Security of Systems:* investigating the security and reliability of supply chain of ICT systems, significantly in perspective of the whole system. To develop theories on thereliability of industrial systems of big data-driven that underpinned the recent research explanations. In order to improve security and reliability of the industrial system, a warning and evaluation index system should be developed. Introducing the security measures that can cope any uncertain situation of security breaches. For example, multi-layer security frameworks are implemented by different business companies to secure their systems. Moreover, organized and standardized business operations should be utilized to keep significant workflow and avoid breaches of security[27], [28].
- *ORM (Risk Management of Business Operations):* searching for the measures and research conclusions that can trigger the big data quality and these actions could be formulated with scientifically proven factual verification. Establish a systematic framework for risk management of thebusiness operation, significantly integrated with big data that stress on gaining optimality of system. Furthermore, the unexplored sector must also be analyzed especially in risk management besides business firms but also for non-profit organizations as well[27], [28].

Here a few recommendations are given regarding role of Cloud, software, and services in future [6], [12], [18],[19], [29].

- In service and software industry, the cloud will be responsible for substantial gains in productivity and innovation. As it generally encourages all kinds of innovative features.
- SaaS (software as a service) is the most dominant future innovative sector of Cloud computing.
- The futuresoftwareis most likely to be based on cloud infrastructure that will be distinctively operated in design in the cloud.

Below are listed critical issues faced during research workwhich should be kept in mind before conduction any sort of research work in near future.

- *Cost & Business Models*

Nonetheless, cloud computing opens the door of developing new frameworks and models for business applications pernew time requirements, but it also creates problems of practicality and applicability of proposed models[29].

- *Handling and Management of Data*

Although, enough research and practical work have been done in distributed networks of databases.The problem asked over concerns with clouds distribution, loyalty, dynamicity and simultaneous assess have hardly been addressed. Consumption and production of data areconstantly growing, but the hardware and software environment is not ready to tackle this situation encoding application doesn't perform their function properly and exploiting the Cloud services [29].

- *Programmability*

The program should be structured properly and utilize the attributes of dynamic, distributed environment in order to provide cloud services like management of data, awareness of resources, performance and other related applications. Therefore, efficient programming models utilized to address the issue of parallelization, replication, and distribution [29], [30].

- *Management of Networks*

Management of networks in IT, Cloud and other networks are not adequately addressed and covered up till now. Resource management, continuous and smooth provisioning of Cloud is required at all levels. So, that in perspective of availability the core attributes of Cloud can be fulfilled. To deploy appropriate management of networks service quality and capabilities are themain target of improvement. Nevertheless, a poorly managed network will create immense problem and risk for any business firm[29], [30].

V. CONCLUSION

The aim of conducting this in-depth research was to address the impact of cloud computing in business companies and whether it appends business agility to Big Data analytics. Cloud has brought a revolution in general IT sector through its computing resources and services. As majority business firms suffer from high operational costs, theabsence of infrastructure and finite resources. Both SaaS and cloud computing have increased the computational power and storage facility. Thus,Big data analytic has significantscope in cloud computing. Although, manufacturing intelligence systems and sensors operate on real-time data and are sensitive. Therefore, it is of critical importance to keep data safe from malicious actions. Security breaches need to be investigated further in future research. More research studies and theoretical models are needed to deploy agile procedures, to enhance business process efficiencies and fewer security problems.

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