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Effects of Coronavirus Crisis in Organizations Decisions to Adopt Software as a Service

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Abstract Cloud technology has proven its value during the lockdown. Industries were heavily affected during the pandemic crisis. This paper demonstrates how the adoption of cloud in some or all business processes has become a requirement. It covers cloud basics, characteristics, and also the importance of cloud technology. It compares how organizations with on-premises and those using cloud technology had informed the constraints imposed almost overnight. Software as a Service (SaaS) was the hero of this transformation. The key benefits of SaaS do not require hardware and software installations or any complication. The Cloud Service Providers extend support for installation and customization for organizations. They create sure of maintenance and various upgrades necessary during the merchandise life cycle. These distinct advantages of cloud technology became more relevant than ever during the Pandemic situation. The cloud service providers are arising with various offerings to encourage them for cloud technology adoption. The Pandemic period also assisted CSPs to boost their services. The current crisis has opened new opportunities for cloud technology to any or all industries. The new normal has brought fewer social contacts and more usages of technology meant for daily interaction. The cloud-based workforce collaboration tools and round the clock remote accessibility mitigate the significant risks during natural disasters. it is time to adopt cloud technology.

Keywords—cloud computing, coronavirus, saas, lockdown, cloud adoption

I. INTRODUCTION

On March 11, 2020, the World Health Organization (WHO) declared the novel coronavirus (COVID-19) outbreak a worldwide pandemic [1]. That changed life as we knew—that led both organizations and individuals to be forced to adopt almost overnight. National and regional governments, local communities, health, and college systems, furthermore as businesses are being forced to form many difficult decisions. After mapped digital strategy in one- to three-year phases, companies must now change their plans during a matter of days or weeks. An outsized sector of the world's institutions has made a sudden shift to remote working to satisfy social distancing precautionary measures. Gartner CFO Survey Reveals that 74% shall Shift Some Employees to Remote Work Permanently post-COVID 19. [2].

The pandemic has raised a challenge for online applications to be more reliable, secure, and scalable as people depend upon them now over ever. At the same time, it produced an infinite new challenge to organizations that are still reluctant to use cloud computing technologies. In keeping with an independent survey of 500 IT decision-makers worldwide, 87% of IT decision-makers agree that acceleration to cloud migration will occur because of the COVID-19 pandemic. Adopting cloud technology enables employees to work from any location, giving them access via a virtual environment to the identical information that they would have access to from the office. Companies had to form sure that the platforms getting used for remote operations are secure and reliable. Millions worldwide struggle to stay productive. The deployed app or service is predicted to be up and running. It should be accessed from any device at any time from any location, and there will be no interruptions or downtime: secure connection and privacy.

II. WHAT IS CLOUD COMPUTING

A. Defining Cloud Computing

A model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., servers, storage, networks, applications, and services) may be rapidly provisioned and released with minimal management effort or service provider interaction. The National Institute of Standards and Technology (NIST) defines cloud computing [2]. A cloud may be a collection of network-accessible IT resources Consists of shared pools of hardware and software resources deployed in data centers. Cloud computing technologies ease companies to handle their computing systems as a pool of resources instead of collecting independent environments that everyone must manage.

B. Cloud Essential Characteristics

A report from the University of California Berkeley summarized the critical characteristics of cloud computing as:
"(1) the illusion of infinite computing resources; (2) the elimination of an up-front commitment by cloud users; and (3) the ability to get used. . . as needed . . ." [3].
NIST characterizes cloud computing as "a pay-per-use model for enabling available, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, services). Which can be rapidly provisioned and released with minimal management effort or service provider interaction." [2].

C. Cloud Service Models

NIST specifies three primary cloud service models. These are software as a Service (SaaS), Platform as a

Service (PaaS), and Infrastructure as a Service (IaaS). SaaS is additionally recognized for software programs on demand. Service, the related information, and its software is spread at the cloud by the provider company, and therefore, the user can get admission to and use it through any browser that works with it.

D. Cloud Deployment Models

A cloud deployment model specifies how cloud infrastructure is built, managed, and accessed. NIST defines four primary cloud deployment models: (a) Public, (b) Private, (c) Community, and (d) Hybrid.

Public cloud is when services are provided by third-party providers over a network open for public use. People who have access to it can share the same hardware, software, and network devices with others of the same provider (other companies, for example).

A private cloud runs exclusively for a single organization. It can be physically located at the company's data center or managed and hosted by a third-party provider. In a private cloud deployment, resources are not shared with other organizations, but this also means that the company is entirely in charge of its installation, maintenance, and updates. That raises a new set of challenges itself.

Hybrid Clouds has the best of both public and private cloud deployment models to provide the benefits of both infrastructures to the organization. Figure 1 shows the service and deployment models.

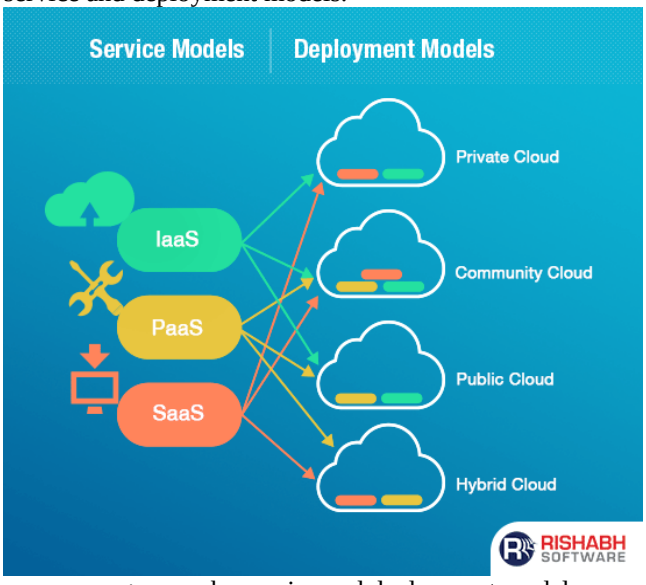

Figure 1 The service and deployment models

III. CLOUD COMPUTING OVERCOMING THE CRISIS

A. Benefits of CC Adoption Over On-Premises

Before the pandemic, some organizations were thinking of cloud technologies to accelerate the digital shift. However, they were held back by the change difficulties that will come with the transformation. The risk of doing nothing was more vital than the risk of adopting new technologies that have already existed a while back and proved efficient. Under these circumstances, organizations' ability to convert from on-premises to public cloud, scale or shrink, and test in a closed environment is valuable both from a possibility and a scaling view. On-premises is one of all the primary common, traditional methods utilized in businesses. It consists of non-public data centers that companies have in their facilities and maintain themselves. On-premises software requires a software license. The organization is answerable for the protection, availability, and overall management of on-premises software. Some businesses have legacy systems that may be holding them back. Because "why changing something that works?". On-Premise infrastructures were considered an acceptable choice before and perhaps still okay for a few cases. The lockdown during the crisis had highlighted a variety of the issues of using the quality on-premises. (a) Scalability, since all services are run, managed, and maintained from within the business on their hardware and servers. Adding and installing any hardware must be done by the organization itself. which was not available during the lockdown. (b) Cost Reduction, instead of hard currency on the most recent hardware, software, or complex enterprise licensing renewal, and support fees using the resources of a cloud service provider inundate both capital and operating costs. (c) Disaster Recovery, everything goes fine until a disaster hits the business. Therefore, having a disaster recovery and business continuity plan is also a requirement for every business. Having a foreign disaster recovery location and a complete data center is impossible for small or medium-sized companies. Cloud disaster recovery systems are going to be implemented very quickly. The key here is knowing how CC can impact organizational goals. Figure 2 represents a comparison between cloud service models and also the standard on-premises.

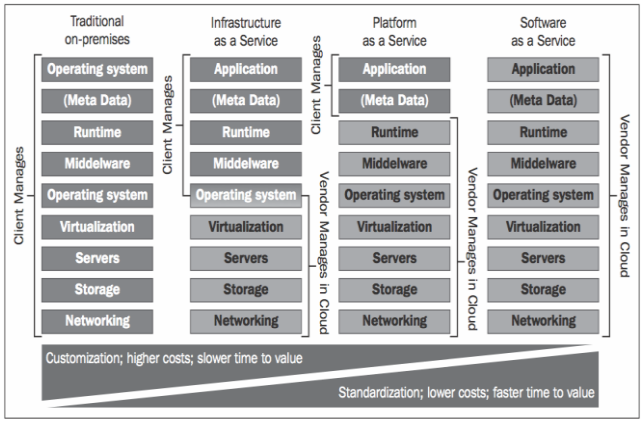

Figure 2 Cloud service models and the traditional on-premises

All fields can get satisfaction in CC. However, that does not mean that it is essential to any or all aspects. When the price of computing increases thanks to complex information architecture and infrastructure that deters organizations from employing advanced IT services, the emergence of cloud computing solves the matter by reducing the upfront expenses of computing (Marston et al., 2011) [4].

B. CC In the New Normal

With business functions not possible, organizations adapted to the new normal by moving online. During the survey, the emergence of COVID-19 prompted Flexera [5] to feature a difficulty that measures how the pandemic might affect cloud plans. Some industries are experiencing massive economic impacts as a result of the pandemic. Cloud demand will obviously shift due to these events. A subset of 187 survey respondents indicated how they expect COVID-19 to change their cloud plans (Figure 3). Over half

said cloud usage is above initially planned. The increase of the extra space needed for current cloud-based applications to satisfy increased demand as online use grows. Other organizations may accelerate migration from data centers to the cloud. Because the pandemic runs its course, some organizations may also find that public cloud providers offer a more reliable business continuity option.

The cloud lets any business accelerate. This feature has been beneficial during the pandemic. Industries have already started thinking about the future and consider clouding. For example, education startups can carry on with the demand for online learning thanks to cloud infrastructure. Within the gaming industry, the explosion of homebound users has dramatically increased broadband utilization. With immeasurable people spending significantly longer reception, an outsized proportion of them is spending even longer than usual playing online games that ride on the cloud. Furthermore, e-commerce, already a trademark of this modern era, has demonstrated pandemic-resistant economic characteristics with an unprecedented number of consumers shopping online. Currently, the cloud is helping all markets, grow and compete.

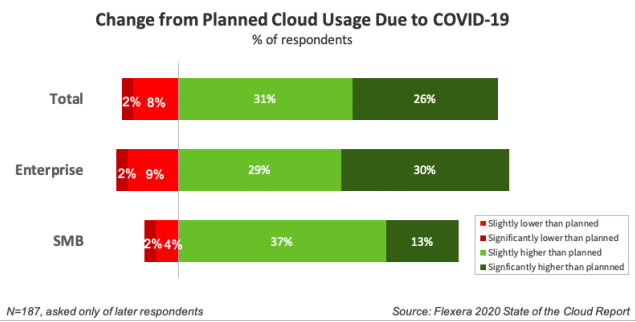

Figure 3 How COVID-19 change cloud plans.

Over one third (38%) of companies have used cloud technology to scale infrastructure to satisfy demand and control costs since the beginning of the Covid-19 pandemic, per "Aptum." In contrast, nearly half (48%) have adopted cloud solutions to produce critical services to finish customers.

Besides, 76% of participants said they need been using cloud services to facilitate remote working, while 92% expressed confidence in their business continuity thanks to managed cloud services [6].

C. SaaS In Lockdown

Being not distributed physically instead of deployed almost instantly. SaaS is sure to create a much better choice among customers who are now urgently forced to contemplate technologically evolved business solutions for their business needs and their increasingly remote work models. It is easy to work out the attraction of SaaS at the very time of COVID19. As lockdown continued and corporations evolved their remote working practices, SaaS tools' employment grew by 17% in May 2020. This growth continued into June 2020, with SaaS tool use increasing by an additional 22% and a 16% rise in SaaS spend. SaaS software trends are the fastest-growing supported traffic data analyzed by TrustRadius. The bulk is tools designed to form it more comfortable to figure from home and communicate the pandemic continues. The agile and versatile nature of the SaaS promotes more.

Even before the crisis, SaaS was more chosen because of the steady rise within the subscription-based economy. This, along with the fact that it also provides greater flexibility and security while reducing software expenses and time-to-market, implies that several software companies and their customers are transitioning to the model to understand its various potential benefits.

The Subscription-based services, being suitable, and cost-saving offers have led to increased adoption across various software services. Customers consider the flexibility to decide on annual or monthly licensing fees and simplified procurement, and a lower cost of entry highly attractive.

The evolution of the SaaS model: From a high degree of on-premises and manual efforts to install and manage applications, the SaaS model allows for software applications to be hosted in the cloud, eliminating the need for local physical storage hardware. The cost of acquisition and the burden of software management is also minimized.

Reduced software expenses: the value savings inherent within the SaaS model are significant. The lower cost of entry means customers are often ready to categorize software investments as operating expenses instead of capital expenditures. The vertical scalability offered by SaaS means licenses will be easily expanded or .reduced, supported by changing business requirements. Since most activity is driven from the information center, the customer's ability to launch and scale digital applications as a part of their digital transformation strategy is considerably enhanced.

Many organizations shifted to remote-working almost overnight. A remote-first setup allows companies to mobilize globally, gather instantly, organize a project review, and reply to customer inquiries sooner by providing everything from product information to sales and after-sales support digitally. In effect, remote ways of working have, a minimum partially, driven the faster execution drumbeat that we are all experiencing in our organizations. Moreover, this step in remote adoption is now considered important enough to reconsider current business models.

While Zoom and Microsoft Teams are gaining traction with consumers and businesses alike to stay connected during the lockdown, the reason countless people can use this tech simultaneously is thanks to cloud computing.

These benefits are well documented: cloud infrastructure enables companies to scale flexibly, so they will fit all conditions. Like what we face today, while SaaS apps mean companies do not have to worry about scaling up their hardware and bandwidth to handle enormous demands. Figure 4 shows the impact of Coronavirus on Azure Cloud Service Usage**.**

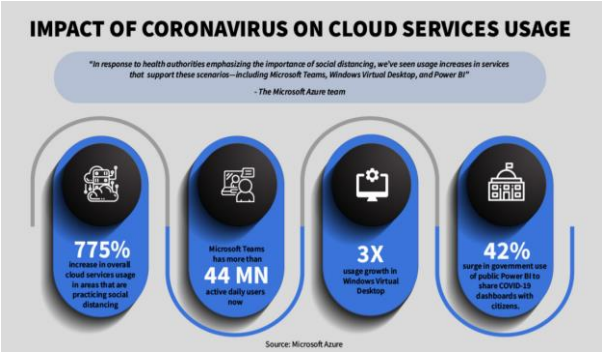

Figure 4 Impact of Coronavirus on Azure Cloud Service Usage

At the tip of March 2020, Microsoft Teams set the latest daily record of two.7 billion meeting minutes in at some point, up from 900 million minutes just a fortnight earlier. In April, that number climbed to 4.1 billion meeting minutes for one day. Suddenly, Microsoft 365's teamwork hub that permits people to satisfy, chat, call, and collaborate online saw unprecedented usage.

As of October 2020, Canalys reports that the worldwide cloud market grew 33% this quarter to $36.5 billion. AWS has 32% of the market and generated more revenue than the following three largest combined; Azure is at 19% of the market, Google Cloud at 7%, Alibaba Cloud close behind at 6%, and other clouds with 37% (figure 5) [7].

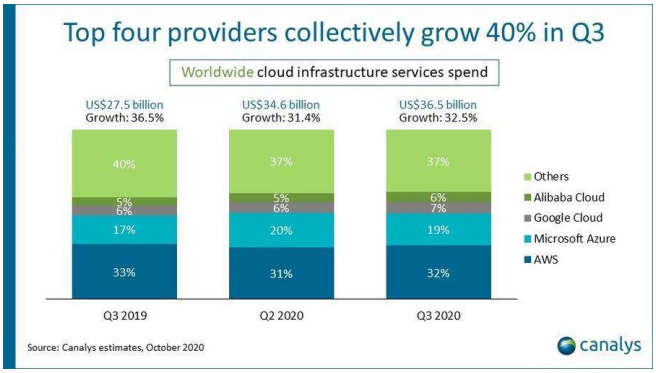

Figure 5 Cloud Market Grow

"In any down market, there are winners and losers. But the SaaS sector has done so well, and we should count our lucky stars that we work in SaaS".

-Paul French

As it became clear that COVID restrictions were not changing any time soon, many companies changed for cost-saving annual SaaS subscriptions rather than monthly subscriptions, which led to a 25% increase in SaaS spend as shown in figure 6.

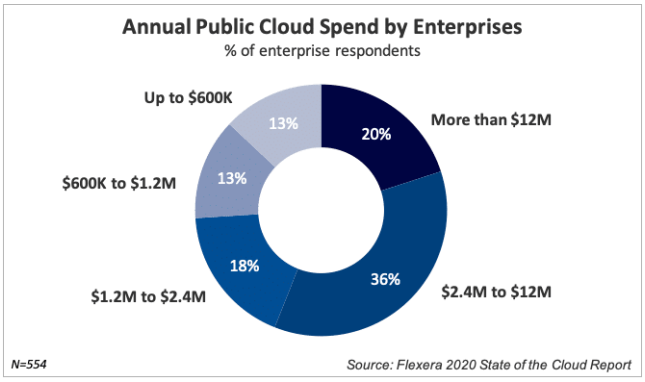

Figure 6 Annual Public Cloud Spend

IV. THE FAST ADOPTION OF CC

Companies are rapidly adopting the cloud as they realize its massive role in overcoming the crisis. Business resilience, many of the conversations about cloud computing within the past were about modern infrastructure for a quicker shift, faster time to implement, and price optimization. However, new factors prompted during the crisis like flexible power, lower cost for backup and disaster recovery, high availability, elastic core for business process and business flow, legacy skill risk, remote workforce management, safe return to the workplace, and business agility into focus to permit for resilient business functions. In line with a recent survey from Flexera, 27% of leaders mentioned a significant increase in cloud spends thanks to Covid-19. Figure 7 shows the adoption hierarchy.

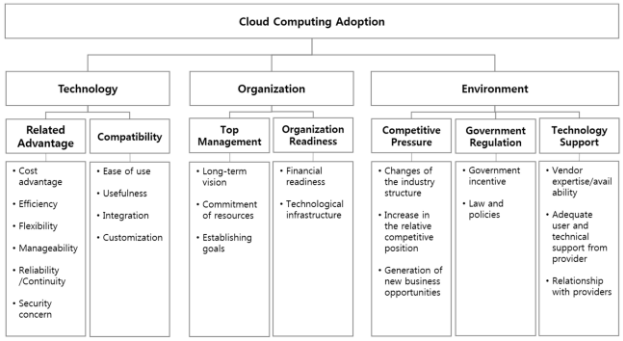

Figure 7 Cloud adoption hierarchy

Evolution of business operations In many cases, business operations have also pivoted for the socially distanced era as a result of increased demand for e-learning, telemedicine, robotics, composite computing (AI), augmented reality, and game scenarios, intelligent chatbots, digital payments, virtual retail experiences, and more. There has been an exponential escalation within the e-commerce industry. More people shifted to shopping online and in video-streaming services, with more people staying home and bereft of other entertainment options. This has led traditional retailers and brick-and-mortar stores to pivot to online ordering, curbside pickup, BOPIS (buy online, devour in-store), and residential deliveries to preserve their customer base.

Remote working the pandemic and remote working scenarios have underlined the cloud's vitality for business

continuity with remote workforces and seamless online collaboration. Healthcare investments, the pandemic, nursing, and the need to develop a vaccine as soon as possible have pushed the healthcare industry to the sting. Cloud service providers are now offering cloud offerings focused on the healthcare industry. These offerings can leverage the cloud for the precise requirements of AI-based research and development, telehealth, and crisis management while aligning with data protection standards and HIPPA compliance.

Online education with global lockdowns, many faculties and universities transitioned to online course delivery and operations quickly. The education industry adopted the cloud to conduct and process evaluations and admission examinations. Even the niche yet growing tech sector saw a surge in scale and responded with broader services and offerings.

Accelerated investments from the overall public sector are typically slow in any transformation. Government departments and other institutions are now seeing renewed interest in cloud adoption to provide citizens services within the remote-by-default and socially distanced era. This has led to an unprecedented increase in cloud adoption within the public sector, especially for government-to-citizen (G2C) services.

Renewed target environmental sustainability within the last 12 months, environmental sustainability has become a business imperative to win customers, partners, and governments' confidence. Organizations are adopting the overall public cloud to harness the benefits of carbon footprint reduction. The fourth historical period is predicted soon. More modern technologies help Small and medium-sized enterprises improve effective and efficient operations and performance, reduce risks, and achieve competitive advantages. Prominent among such advanced technologies include computing, the commercial Internet of Things, and blockchain technologies to drive business activities and enhance business process innovation [10]. Unlike the counterparts within the advanced economies, SMEs in EMDEs are yet to reap the total benefits of technological advancement thanks to several factors that tend to hinder the adoption of the available cutting-edge technologies. In an endeavor to stimulate research on the topic, we issued concern papers to measure the attention and adoption of advanced technology and identify the apparent challenges against technology implementation and deployment by small businesses in EMDEs, including small firms that operate within the informal sector. The articles included within the Special Issue examine how simple technologies, like FinTech, social media, and other technical innovations, improve small business operations and performance. However, significant challenges face the adoption of modern technologies by Small and medium-sized enterprises. Simultaneously, one in each of the papers examines the failed over-reliance on technological transfer as an impetus to revolutionizing and innovating operations and processes through foreign firms operating in EMDEs. The SMEs' inability to deploy cutting-edge technologies in EMDEs, like video games and cloud computing for remote operations and non-digitization of business activities, has negatively impacted firms operating in these countries during the continuing COVID-19 pandemic and resulting community lockdown to contain the spread of SARs-CoV-2 (Attaran and Woods 2019; Akpan and Shanker 2019). this is often in contrast with SMEs in advanced countries. The firms immediately improvised technologies and moved the public and personal sector businesses to the virtual space to keep the economies moving.

V. CHALLENGES OF CLOUD COMPUTING

Security has been a primary and concern from the beginning of cloud computing technology. It was not being able to know where location where your data is stored or being processed. This increases the cloud computing risks that may arise during the implementation or management of the cloud. Cloud computing's security risks became a reality for each organization, be it small or large. That's why it's essential to implement a secure BI cloud tool that will leverage proper security measures. Cost management and containment, cloud computing can save businesses money. A corporation can quickly increase its processing capabilities within the cloud without making large investments in new hardware. Businesses can instead access extra processing through pay-as-you-go models from cloud providers. However, cloud computing services' on-demand and scalable nature makes it sometimes difficult to define and predict quantities and costs. Luckily there are several ways to keep cloud costs in restraint, for instance, optimizing costs by conducting better financial analytics and reporting, automating policies for governance, or keeping the management reporting practice on the right track. These issues in cloud computing may be decreased.

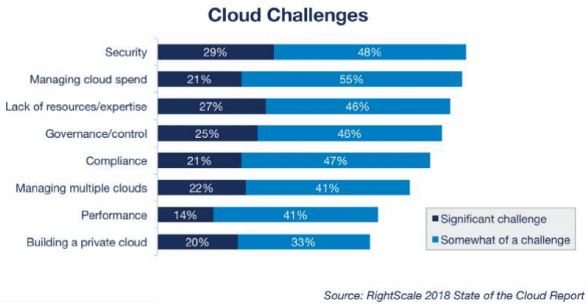

Figure 8 Cloud Computing challenges percentages

One of the challenges the cloud companies and enterprises face today is the lack of resources or expertise. Organizations are increasingly arranging more workloads in the cloud while cloud technologies continue to advance rapidly. Therefore, organizations are having a hard time keeping up with the tools. Further, the need for expertise extends. When migrating to the cloud, business becomes dependent on the service providers. The next apparent challenges of moving to cloud computing expand on this partnership.

Nevertheless, this partnership often provides businesses with innovative technologies they wouldn't otherwise be able to obtain. On the other hand, the organization's BI and other cloud-based systems' performance is also tied to the cloud provider's performance when it falters. When your provider is down, you are also down. This is common. Over

the past couple of years, all the big cloud players have experienced outages. Ensure your provider has the right processes in place and that they will alert you if there is ever an issue. Migration is the process of moving an application to a cloud. Although moving a new application is a straightforward process, many cloud challenges arise when moving an existing application to a cloud environment.

CONCLUSION

Cloud computing was the hero through this all. The pandemic confirmed what many people already knew: the elasticity cloud offers to support business transformation and adds to customer value. Rather than Businesses worrying about installing and managing their on-premises, they switched to Paas and IaaS quickly and in no time. Organizations provide their services through SaaS applications that were used widely. SaaS made people not worry about the way to continue their everyday activities. With results in hand, businesses will hasten to adopt the cloud.

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