

Leveraging Cloud Computing To Enhance Global Quality of Life

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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Introduction

Cloud computing has become ubiquitous in modern business, with approximately 94% of enterprises utilizing the cloud. Furthermore, experts predict that by 2030, the total spending on cloud computing in the United States will reach an astounding \$1 trillion annually (Flynn, 2022). These staggering figures attest to the immense impact that cloud computing will continue to have on the world. Despite significant advancements in technology over the past few decades, there remains a large disparity between developed and developing nations in terms of access to innovative technologies. It is crucial to explore ways to bridge this gap and make groundbreaking innovations widely accessible, so that quality of life is improved worldwide.

In this paper I will focus on the current state of cloud computing globally, considering both developed and developing nations, and its multi-sectoral benefits. The goal is to explore how cloud computing can be utilized to enhance quality of life, particularly in developing nations. I will then discuss how, in order to achieve this result, both governmental and technological efforts will need to be made. The central motivation behind this paper is the belief that as a society that has experienced significant advancements, it is the responsibility of the United States to ensure that these benefits are widely available. The primary methods used in this research paper are literature review and document analysis; I discuss a plethora of both primary and secondary sources in order to provide a comprehensive understanding of the topic.

State of Cloud Computing Today

The Cloud In Developed Nations

In plain terms, cloud computing refers to the technology that allows individuals, businesses, and institutions to perform computer-related tasks without owning and maintaining

the actual computers. Cloud providers offer these services over the Internet, and can be services as simple as Gmail or as complicated as massive data centers running complex algorithms nonstop. These services are nonetheless pervasive in everyday life. In developed nations, cloud computing has experienced particularly tremendous growth and innovation, with widespread adoption and continued popularity. The industry has become an integral part of many sectors, including finance, healthcare, retail, and education. One of the key drivers of cloud computing's growth in the developed world is its ability to provide cost savings, scalability, and increased efficiency compared to traditional IT infrastructure. This has led many organizations to adopt cloud computing as a key part of their IT strategy. The major cloud service providers, including Amazon Web Services (AWS), Microsoft Azure, and Google Cloud, have established themselves as market leaders by offering a wide range of services. These providers allow customers to choose the combination of services that best meets their specific needs and take advantage of the strengths of different cloud providers (Dignan, 2021). For instance, AWS may be especially adept at providing reliable storage for a company's massive amount of data, while Azure can be integrated in the firm's cloud infrastructure for a different cloud service such as providing machine learning models for the firm's data.

In the developed world, there is a growing emphasis on data privacy and security, particularly in response to recent high-profile data breaches. To name a notable few, Yahoo was breached in 2013 where over 3 billion user accounts were exposed, 150 million people had their data leaked from Equifax in 2017, and 700 million user profiles from LinkedIn were leaked in 2021 (Hill and Swinhoe, 2022). As a result, cloud service providers are increasingly investing in new technologies and services to enhance the security of their offerings, which, done sooner, could very well have prevented or at least mitigated the dozens of massive leaks that took place

in the past decade alone. For instance, many cloud service providers now provide encryption services, as well as services to assist customers in complying with any data privacy regulations.

Overall, cloud computing in developed nations is highly advanced, with broad acceptance across multiple industries and a growing number of companies taking advantage of its benefits. Cloud computing is constantly evolving and expanding, with emerging technologies and services catering to the growing needs of clients, and the trend towards multi-cloud strategies and edge computing predicted to continue. With continued innovation and investment, cloud computing has the potential to offer even greater benefits to businesses and organizations in the developed world, allowing them to remain competitive in an ever-changing global business environment. The post-pandemic era in particular has shown just how rapidly the context and arena in which firms compete can change, with consumers now increasingly relying on digital tools for productivity and e-commerce more than ever before, requiring firms to adapt quickly and effectively if they expect to remain profitable. Cloud computing provides a solution to this challenge and I suspect that the firms which best take advantage of it will thrive.

The Cloud In Developing Nations

In developing nations, cloud computing is currently in a state of rapid growth and evolution, with massive amounts of adoption and investment. Developing nations are seeing significant benefits from cloud computing that can be used to drive economic and social progress, but there are undoubtedly some challenges being dealt with. The following sections discuss the nature of these challenges.

The adoption of cloud computing in developing nations is hindered by several challenges, including the lack of reliable and affordable internet connectivity, which limits the ability of organizations and individuals to access cloud services and hampers wider adoption (Utoikamanu,

2018). Nevertheless, the proliferation of mobile and wireless networks, as well as the deployment of new satellite and fiber-optic connectivity, is transforming this scenario, enabling more people in developing nations to connect to the internet. In addition, developing nations face a shortage of investment in IT infrastructure, such as the hardware and software required to support cloud computing. Yet another issue faced by developing countries is the lack of stable governments (Ahmad, 2017). These include governments that are at risk of overthrow, corrupt, and insufficiently involved in actually managing a country's affairs. Without stable governments, the citizens of these nations will be unable to benefit from cloud computing, as implementing any type of cloud computing infrastructure will be extremely challenging. Governments need to be able to invest in the cloud and have strong legal and economic systems in place to support their growth. Without this basic structure, any cloud implementation, no matter how intricately planned or costly, is certain to fail.

Despite the challenges, cloud computing has made impressive strides in developing nations. Businesses and organizations in many countries are leveraging cloud services to boost efficiency, lower costs, and enhance customer engagement. In particular, cloud computing is driving financial inclusion, expanding access to banking and financial services for people regardless of their location or financial status. The African region has experienced an explosion in financial services apps that rely on cloud computing (Slaheddine, 2021). Cloud computing is improving education in developing nations. Cloud-based learning management systems are delivering online education to students in remote or rural areas, providing them with high-quality education opportunities regardless of their location, all while facilitating storage and management of educational resources, such as course materials and student records (Chen, 2020). This makes it easier for educators to access and utilize these resources, and for students to

access their own records. In turn, data analytics on student learning outcomes are becoming widely available, creating a more bespoke educational environment for students which should enhance their progress and development in school.

In the healthcare sector, cloud computing is revolutionizing patient care by enabling the storage and management of patient health records, allowing healthcare providers to access this information remotely and collaborate with other providers for improved care delivery. For example, Tufts University is using AWS to create a resilient IT infrastructure to help streamline their operations and ultimately improve patient outcomes (Daigle-Alexander, 2022).

Additionally, cloud-based telemedicine services are being leveraged to provide medical care to patients in remote or rural areas, reducing travel distance and improving access to care (Onibalusi, 2016). In the field of government and public administration, cloud computing is being utilized to enhance transparency and improve public services. Similarly, e-government services such as online tax filing and passport renewal are being delivered via the cloud, facilitating easier citizen-government interactions and access to public services (Gartner, 2020). This has great potential to delegate responsibility away from government-managed IT centers and towards on-the-go cloud services, reducing costs and streamlining many services.

The growth of cloud computing in developing nations is also driving innovation and entrepreneurship. For example, cloud computing is being used to develop and launch new businesses, including online marketplaces, fintech companies, and digital health startups. These businesses are leveraging the scalability and cost-effectiveness of cloud computing to reach new customers and create new economic opportunities. Netflix, Coca-Cola, Kroger, and more are some examples of multi-billion dollar companies that have enabled their growth with cloud technologies offered by firms such as AWS (Synenka, 2021).

Overall, the current state of cloud computing in developing nations is one of growth and evolution. Despite some challenges, including limited internet connectivity and a lack of IT infrastructure, developing nations are taking advantage of the benefits of cloud computing, and using it to drive economic and social progress. With continued investment and innovation, cloud computing has the potential to provide even greater benefits to developing nations, and to help bridge the digital divide between developed and developing nations.

Discussion of Benefits of Cloud Computing

On the Economy

Cloud computing offers various economic benefits that will ultimately elevate the standard of living. Firstly, cloud computing provides worldwide access to information and services, which is particularly significant in developing nations where internet access and technology infrastructure are inadequate. By offering a diverse range of services online, including healthcare (such as telehealth and remote monitoring), financial services (like robo advisors and fraud detection), and entrepreneurship support (such as website builders and IT management), cloud computing effectively addresses these challenges.

Moreover, the ability to collaborate and communicate with others from anywhere in the world is another vital aspect of cloud computing in developing nations. Teams can use cloud-based collaboration and communication tools to work together on projects, share information and files, and communicate in real-time, irrespective of their location. This can significantly improve the quality of life for individuals and organizations by facilitating cooperation and helping them achieve their shared objectives.

Cloud computing also has the potential to transform the way data is stored and secured. Instead of relying on physical storage devices like hard drives and USB drives, individuals and

organizations can store their data on remote servers using cloud-based data storage services. This approach not only saves space but also ensures the safety and security of data, even in the event of a natural disaster or other unforeseen circumstances. Additionally, cloud-based data backup services automate data backup and make data recovery easier in case of data loss, reducing the negative impact of data loss and eliminating the need for manual backups. This should ultimately lead to notable cost savings and create an easier, simpler user experience.

Cloud computing has unbound potential to be a cost-reducing solution for individuals and organizations in developing nations (Ki-moon, 2013). Traditional IT solutions require significant upfront investment in expensive hardware and software, which can be a challenge for small businesses and individuals with limited financial resources. In contrast, cloud-based services are provided by third-party service providers, eliminating the need for upfront investment. Cloud services are sold on a subscription basis, allowing businesses and individuals to pay only for the services needed. This approach has democratized access to high-quality IT services and applications, enabling small businesses to compete with larger organizations and promoting job growth in developing nations. In fact, it is estimated that 80% of jobs expected to be present starting as soon as 2025 are non-existent today, and cloud computing will play a significant role in creating those new jobs (Elmes, 2017).

Overall, cloud computing can significantly improve economic growth prospects globally and make economic opportunity more equitable. By providing readily access to key data and services, supporting collaboration tools, storing data safely and securely, bringing cost savings to enterprises, and more, it is easy to see that the cloud is a fundamentally important aspect of global technology infrastructure. Taking steps today to implement cloud computing solutions into every possible aspect of society will have substantial payoffs in the future.

On Education

Cloud computing has the potential to transform the education sector in various ways, altogether making it a more accessible, efficient, and effective system. Firstly, the cloud can improve access to educational resources by providing students with greater access to e-books, videos, and digital textbooks, regardless of their location. This is particularly important for students in developing countries who may lack access to physical libraries or costly textbooks. Cloud computing has effectively eliminated these barriers to education, creating a more equitable outcome by providing students with high-quality learning materials. Secondly, the cloud enables real-time collaboration, communication, and information sharing between students and teachers in a virtual platform. The pandemic has demonstrated that remote learning, though not ideal, is a practical option for promoting learning. Thirdly, the cloud offers increased storage and computing power, which eliminates the need for schools to invest in extremely expensive hardware and software. By using cloud-based solutions to store and process large amounts of data, educators can access more powerful resources and tools to improve the learning experience, and all for a lower price. Take two examples: Oregon's Department of Education, which estimates they will save \$1.5 million annually thanks to their integration of Google Apps for Education, and NYC Intermediate School, which has seen math proficiency more than double after using Google Apps for Education (Chen, 2020).

Fourthly, the cloud enhances data management and analytics. Cloud-based data storage allows for the centralized storage and analysis of data, giving educators greater insight into student performance and enabling informed decision-making. For instance, teachers can use cloud-based analytics tools to track student progress and adjust their teaching strategies accordingly. Fifthly, cloud-based tools streamline classroom management, including assignment

submissions, grading, and attendance tracking, allowing teachers to provide personalized feedback to students. Sixthly, cloud computing is scalable and cost-effective, enabling schools to subscribe to cloud-based services on a pay-as-you-go basis. Finally, the cloud enhances cybersecurity, providing advanced security measures such as encryption and multi-factor authentication to protect sensitive data from cyber threats. (Sether, 2016).

Overall, cloud computing has the potential to greatly enhance the education experience for students and teachers, by providing access to a wider range of resources, improving collaboration and communication, and streamlining the management of educational activities. The benefits of cloud computing are clear, and it is essential that its use in education continues to grow in the future. Teachers will especially benefit by being able to focus on tasks that are more important, outsourcing any tedious data-related tasks to the cloud. With its ability to provide cost-effective, scalable, and secure solutions, cloud computing has the potential to help address the digital separation present and provide students with access to high-quality education, regardless of their location or financial circumstances.

Cloud Computing Implementation Methods

Government Responsibility to Act

Governments can play a significant role in creating an environment that fosters innovation, investment, and adoption – one that is crucial for the growth of cloud computing. To this end, there are several key actions that governments can take. Firstly, governments can invest in the development of the necessary infrastructure, such as high-speed internet connectivity, which is essential for the growth of cloud computing. This is particularly important in developing countries, where limited access to reliable and affordable internet connectivity remains a significant barrier to cloud adoption (Ki-moon, 2013). Secondly, governments can

encourage innovation in cloud computing by providing funding and support for research and development. By creating an environment that fosters entrepreneurship and start-up development, governments can encourage the growth of the cloud computing industry. This can include initiatives such as tax incentives, grants, and incubation programs for startups. Thirdly, governments can encourage the adoption of cloud computing by providing training and support for organizations and individuals. This can include training programs and educational resources that help people understand the benefits and limitations of cloud computing, as well as best practices for its use. By taking these actions, governments can help to support the growth of cloud computing and enable organizations and individuals to reap its many benefits.

In addition, governments have the responsibility to regulate the cloud computing industry to ensure the safety and security of users' data, as well as their privacy. This can be achieved through the development of laws and regulations that establish standards for data protection, security, and privacy, and by enforcing these regulations (Gellman, 2009). The government should further ensure that cloud computing is free of bias: full transparency and a system of accountability will be necessary to guarantee fairness (Niezen & Steijn, 2015). International cooperation is also important for promoting the growth of cloud computing in developing countries. Governments can collaborate on international agreements and standards and share best practices and experiences to improve implementation outcomes markedly.

Moreover, governments can promote the adoption of cloud computing in the public sector by mandating its use for certain functions and applications. This can help to demonstrate the benefits of cloud computing and encourage its adoption in both the public and private sectors. Key sectors, such as healthcare, education, and government, can be targeted by the government

for funding and support for the development and deployment of cloud-based solutions. This can improve the delivery of services in these sectors, and drive economic and social progress.

Overall, governments have a key role to play in supporting the growth of cloud computing. By taking the actions that were outlined above, governments can create an environment that fosters innovation, investment, and adoption, and that enables cloud computing to drive economic and social progress in developing nations.

Measuring Success of Implementation

When rolling out a cloud computing program (or any new program), it is crucial to be able to measure your success. Since the overall goal is to improve the quality of life as much as possible, I would choose to focus on ways of measuring quality of life. At present, the primary method is to use real GDP per capita, which essentially measures the dollar value of a country's total economic output per person each year, adjusted for inflation (Carr, 2017). I find this measure to be limited in that it merely captures the size of the economy per person – and nothing about how that economic output is distributed or any of the dozens of other components that drastically impact quality of life. So, I challenge this measure and introduce some alternate ways of measuring quality of life that I view as being more fitting.

To begin with, a more equal distribution of income within a population is crucial for a higher quality of life for a larger percentage of the population. Additionally, education levels are significant indicators of employment opportunities, which have long-term effects on the quality of life. Moreover, a low unemployment rate reflects a healthy economy, leading to a higher quality of life for people who can find jobs. Cloud computing has the potential to enhance all of these factors by creating job opportunities and expanding educational opportunities.

Apart from these factors, healthcare quality is also an essential consideration for improving the overall quality of life. Cloud computing can provide benefits such as expanding telehealth services, which can directly increase the quality of life. Therefore, it is essential to ensure that any cloud computing implementation program promotes high-quality healthcare. Additionally, the quality of the environment, including access to clean water, air quality, and progress towards climate change, should be taken into account while assessing the quality of life. However, as cloud computing can be an energy-intensive activity, it should be implemented with a focus on environmental considerations. In fact, just one data center can require as much electricity as 50,000 homes (Monserrate, 2022). The massive cooling requirements of these centers mean that large cloud computing providers jeopardize the water availability of many regions nationwide. Noise pollution is yet another real concern with cloud computing, with elevated stress levels due to constant noise being a very real phenomenon. It is imperative that these environmental harms are limited, and limited through more than just corporate pledges.

Overall, real GDP per capita is just one of several indicators that can be used to measure the quality of life in a population. To get a more complete picture, it is important to consider a range of different indicators that reflect different aspects of well-being, such as health, education, and the environment. Every action taken in a program that launches a large cloud computing effort needs to keep these measurements in mind, and the program should be periodically evaluated against this criteria to ensure we are on track to meeting these objectives.

Conclusion

To conclude, cloud computing presents enormous potential for improving the quality of life on a global scale. Currently, developed nations heavily rely on the cloud to support business growth and development, while also utilizing it to improve access to education, finance, and

healthcare resources. Conversely, developing nations are quickly catching up in terms of cloud adoption, with a massive potential for further expansion. The cloud has the potential to significantly enhance quality of life in developed nations by increasing access to healthcare, finance, and education resources. However, to achieve this, governments must collaborate, promote investment in the cloud, and develop a comprehensive plan of action. It is important to define success holistically, considering factors such as income distribution, environment, and overall well-being as equally important metrics of quality of life. With concerted global effort towards widespread cloud implementation, the potential benefits could be phenomenal and long-lasting; I firmly believe that cloud computing marks a massive turning point in technological history and has unbound potential for creating quality of life improvements.

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