Cloud Computing for Businesses: Research Findings

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# Introduction

Cloud computing as a technology at this point in time is well understood and has become integral to many IT solutions. Despite this, many people still might have questions on what the potential benefits or costs are to including Cloud technologies in a system or replacing on-premise solutions with cloud. This paper will go over not only the benefits of why a company, client, or development team would want to implement cloud computing services within a solution, but also the larger ramifications that have come with a global shift to the cloud for businesses. This paper will then end with a talk about whether cloud technologies are the most optimal option for a client.

# Benefits of Cloud Technologies

To start, cloud technologies have many benefits which have been noted and could be crucial in bringing solutions, especially those that are larger-scale, to fruition.

The most important of these benefits in regards to a customer, cost, is one which can be seen through cost calculators that cloud providers give to help with cost estimations when comparing it to accumulated data for on-premise solutions. It can be estimated that on the higher end of a budget, an on-premise infrastructure can cost well more than 5,000 USD a year for maintenance depending on the number of servers which you are required to run.1 Utilizing the cost calculator for a service such as AWS it can be determined that services such as API Gateway for handling user requests, S3 for website storage, and DynamoDB for data storage put together cost on average 1,250 USD yearly.2 While it may not seem like a strict benefit in regards to price, this doesn’t consider that there are no costs to maintain the infrastructure like on-premise as these are service payments. This allows a customer to avoid costs for all of the physical requirements of the infrastructure that would have to be thought about such as electricity, cooling, “dirty” power conversion, and so forth. Most importantly though, it can remove the thought of having to manage the infrastructure from the team to the provider, ensuring that the team can focus on making an optimal product that will mitigate as many risks as possible.

This is not the only benefit however, as there is also the benefit of scalability. On-premise infrastructure will only be able to handle so much, and the expansion of the infrastructure in order to meet demands will inevitably be required. This process in turn requires large amounts of money and time in order to refactor that might not be available. Despite this, economics of scale can be vital for some companies and if they cannot keep up with the output or scale of a competitor’s application, then they can lose out on many advantages such as profit or savings they can use to further improve products. Cloud resources are built to easily scale, offering ways to just add in additional resources to a pool of resources (known as horizontal scaling) or to scale existing machines to have more powerful resources (known as vertical scaling). A lot of resources additionally have the capabilities to auto-scale as customer demands spike and put more traffic on resources. Utilizing scaling in the proper way can therefore lead to optimized costs and minimal downtime in having the appropriate resources available for any customer at any time.

Finally, one more benefit that should be mentioned from the cloud’s many benefits are the ones that come in the form of security. Many companies would cite cloud security as one of the potential reasons why they won’t use cloud technology, which logically makes sense. If a company doesn’t own the hardware that stores their critical data, then how will the company be able to ensure that it is truly secure? Although it may seem like an incredibly large risk, the cloud is good in providing the tools for a shared security model that can ensure data just as, if not more, secure than it would have been on-premise. Most providers offer some form of secrets encryption service that can be used with other services, such as with AWS System Manage Parameter Store or AWS Secrets Manager, that help to give the tools to keep data secure. But in addition to this, many also offer virtual private clouds which can create a completely isolated environment for whatever application a team is trying to run, separating the resources from the rest of the publicly available cloud.

# Global Impacts and Ramifications

With all of the potential benefits, people have rapidly shifted many technology solutions over to the cloud within the past decade. This has then resulted in several larger impacts worldwide on a variety of fronts.

Starting with some of the most direct changes, there are many changes in regards to coding and infrastructure that have come about due to the ways in which cloud services are structured. There are obviously smaller changes that can be seen, such as how cloud computing has paved the way for many applications to become more situational or adopt a “microservice” architecture, allowing for componentization and reuse in other similar situations. However, there is also an increasingly large shift to services that not only give the benefits of working in the cloud, but provide ways of doing so without having to have any form of coding knowledge whatsoever. Examples such as Force.com or Avirac showcase that in the present moment, the ability to create a simple web application is now more accessible than ever with the resources and tools that most people would need.3

Due to the infrastructure effects that cloud computing has created, the cultural impacts of it have also shifted rapidly within recent years. Of all of the factors that have been influenced culturally through cloud computing, the main underlying factor is the idea of collaboration and information sharing between people. The accessibility and benefits of cloud computing have opened up many places and people to working in a larger, more global market which results in more projects coming into fruition and more people willing to share ideas with each other. A lot of the biggest companies know this fact: GitHub provides an easy way for people to share repositories, Figma provides ways for teams to storyboard/prototype, even tools in services such as the Google Suite have drastically changed how information such as documents or presentations are shared as well.

The effects of so many people using the cloud to collaborate can then be seen in the economic ramifications the cloud made, where there have been large changes in company spending. As of 2022, the global public cloud market is expected to reach 623.3 billion USD by 20235, and with a large market comes a lot of competition. Many companies now leverage the cloud in order to gain a competitive advantage and stay on top of their competitors, seeking out talent for cloud services. This in general feeds back into a cycle of the cloud continually growing in value, with people gaining an advantage through resources in the cloud, thus influencing more people to spend in cloud technologies giving them a possible advantage over their own competitors, and so on. Many companies also utilize more than one cloud service within their solutions due to the cloud covering such a wide range of services, and ultimately all of this combined shows that the could has become integral with a large part of businesses now having a digital component.

Of course, there are also major factors outside of cloud computing itself that have drastically accelerated these effects, one of which being the COVID pandemic. Due to the large amount of different technologies that had to be shifted over to be more digital or offer digital services, more and more companies had to look into cloud computing technologies in order to handle aspects such as scalability. Many companies also found benefits in using the cloud during the time due to factors of resiliency/rollback and aspects such as having most of their workforce being remote.4 As a result, the world is now at a point where more than 90 percent of all enterprises in a survey by web tribunal say they have adopted some form of cloud technology, and more than 80 percent have put their workloads into the cloud.5 Whether this will be a larger change that stays within the working world or it was more similar to a temporary solution to get around the pandemic is unknown. Despite this many people along with businesses were exposed to working in the cloud and have had drastic shifts in how workloads are handled as a result.

# Considerations when using Cloud

With everything that has been said, it cannot be denied that cloud computing has brought many changes and benefits on a global scale. Is it necessarily the right option for a potential customer or client though to use a cloud solution? Possibly not depending on the service provided. There are several reasons as to why this could be the case, and many of them have to do with company freedom and costs.

Many companies that are hesitant on implementing cloud technologies hold out because of the fact that they feel they will be trapped in complying to the guidelines and rules of whatever cloud service provider they choose without being able to migrate. In addition, the vendor or cloud supplier might make it difficult to migrate to other environments as to preserve revenue. This is known as vendor lock-in, and while for some companies it won’t be an issue for others it can drastically affect how a business is run. While there are some ways to work around using one cloud provider, multi-cloud solutions are still relatively complex and can still involve adhering to rules in different environments. On top of this for many companies the costs of switching to another service provider might not be feasible or in budget, so if an exit plan isn’t created they will of course have to remain locked in until they are able to switch.

Another reason might be costs, which might seem to contradict previous statements but can be a large deterrent if a company does not know what they are doing in the cloud or can create a private infrastructure with their own cloud system. Optimization for cloud can be difficult for businesses, and in some cases such as with Dropbox it is just easier to manage private infrastructure or a private cloud than it would be to manage another cloud provider’s service. This applies in several different areas of optimization for a company as well, since there is of course resource optimization in how resource allocation and scaling rules, security optimization in ensuring that the company upholds their end of the shared security model, and so forth.

On top of this, a company might be worried about factors that have to be considered for a solution that relies heavily on the cloud and in turn on the internet. If a cloud service ends up going down or the internet is brought down, then that is the end of the application until the internet is brought back up again. This is a given for many resources in the online space and can be countered by some of the cloud’s own advantages in relation to fault tolerance and failback, but in can still be another concern or risk that has to be managed within the team’s risk management plans. This is also an increasingly larger concern for an area in a more remote location that doesn’t have good internet access, so it would be good to keep this in mind.

# Conclusion

Ultimately, the choice of not only whether cloud technologies are the appropriate resources to use in a solution but also whether to use a cloud-provided solution is going to be something that will have to come down to the decision-making process of the solution/development team. The benefits of the cloud, if utilized properly and matching the size and goals of the client, can be tremendous. This is especially true in regards to aspects of scaling, fault tolerance, and costs. It might even be required for their solution with how many global repercussions cloud technologies and solutions have had on companies already. Despite this, if it is not implemented with care or limits the capabilities of the team it can end up creating more costs or leaving the client unsatisfied with the cloud provider.

# Resources Used/Citations:

1. Huss, Chelsea. “Cost Breakdown of Cloud and On-Premise Software”. Centerbase, March 4, 2021
2. AWS Pricing Calculator. <https://calculator.aws/#/>. Accessed April 15, 2022.
3. Svendsen, Rene D. “Cloud Computing’s Impact on Programming Models: The Business Unit Developer”. IBM, February 25, 2014. <https://www.ibm.com/blogs/cloud-computing/2014/02/25/cloud-computings-impact-on-programming-models-the-business-unit-developer/>. Accessed April 20, 2022.
4. Aggarwal, Gaurav. “How the Pandemic has Accelerated Cloud Adoption”. Forbes, January 15, 2021. <https://www.forbes.com/sites/forbestechcouncil/2021/01/15/how-the-pandemic-has-accelerated-cloud-adoption/?sh=460577d96621>. Accessed April 18, 2022.
5. Galov, Nick. “Cloud Adoption Statistics for 2022”. Web Tribunal, April 6, 2022, <https://webtribunal.net/blog/cloud-adoption-statistics/>. Accessed April 18, 2022.