BEGINNERS GUIDE TO CLOUD COMPUTING

A SMALL BUSINESS OWNERS HANDBOOK

DAVID SHAW

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CHAPTER 1 - WHAT EXACTLY IS CLOUD COMPUTING

Let me start by explaining what cloud computing is not; it's not in the sky and has nothing to do with actual clouds. It's also not affected by adverse weather conditions.

You may think it's unnecessary to point this out, however these are theories that have

been suggested to me. In the most basic sentence, cloud computing is simply accessing computing resource that are based somewhere other than where you are.

Most of the world's most popular websites are a form of cloud computing. Facebook, Gmail and Twitter for example are all effectively applications you are interacting with without ever installing anything. All the actual 'work' or processing, is done at the other end, not on your device. When I say device I mean PC, laptop, tablet or even a smart phone. As long as it's connected to an internet connection you can interact with these cloud services. That internet connection is now often a mobile internet connection like 3G or 4G.

Cloud computing is mostly a marketing term. We have been accessing computing resources remotely for years. However, in terms of potential we are at the very start of what is possible.

So why all the hype?

Technology has evolved so that cloud computing is now so cost effective that it can be made available in minutes to anyone with a credit card. Also, Web browsers have got better, faster more sophisticated and

connectivity (internet connection) has also got faster and cheaper.

There is also a generational part to this. Generation Y or millennials (those born between 1980 and early 2000s) are completely used to being able to access applications and data over the internet. In fact, they know no different. However, this is not what previous generations experienced. The previous generations were very much reliant on an IT department or even a friend who works in IT to help them install a new application. And over time the PC would get slower and the application would get more demanding. This cycle continued for a good few decades. "My PC is slow" was a common complaint in schools, homes and businesses worldwide.

What has happened is generation 'C' for connected (coined by Brian Solis). No matter how old or young we are, smart phones have worked their way into the pockets of us all. Having this kind of computing power and more importantly an internet connection has changed the way we live and do business forever. Look around you next time you are on the train or the bus or and you will find

people glued to a screen of some kind, interacting with the World Wide Web.

Even watching TV, which was historically considered a passive pastime, has become an interactive activity in some homes with people using related apps or social media to interact with the TV program or advert. Or maybe you are watching on demand TV which again, is a cloud based service.

So, as you can see, cloud computing is all around us and will continue to impact our lives forever more.

CHAPTER 2 - THE HISTORY OF CLOUD COMPUTING

The first concept of cloud computing has been attributed to computer scientist, John McCarthy, who proposed the idea of computation being delivered as a public utility, which dates back to the sixties. Accessing computing resource remotely is nothing new, data centres have been around since the 1960s. In fact, in the early 1970s businesses were implementing formal disaster recovery plans to off-site locations

so that if there was a disaster such as a fire it would rarely affected business operations.

That's about as far as centralised computing went because in the early eighties the launch of IBM's Personal Computer changed how IT was to be delivered for the next few decades.

Personal computers (PCs) had processing power in the actual device and could also store data on the device too. Computers were no longer just dumb terminals connected to the mainframe which had all of the processing power. PCs and local servers dominated the IT industry. Companies started deploying more and more servers and the data centre was born.

A data centre is nothing more than a purpose built or utilized room where servers live and are run from. Data centres mainly resided within the company walls and consumed huge amounts of energy to run and to keep cool. In the nineties purpose built data centres started being built however it was after the dot-com bubble in March 2000 that data centres really started to appear. Internet speeds had improved from the traditional 14.4k to the 56k modem to now seeing speeds of 512k with the first

house in the UK to receive broadband was actually in Gillingham, Kent. As for data centres, with companies needing access to secure computing resource, prices were at a premium. The bubble burst in March 2000 and with it millions of pounds in revenue from all the companies that been created and the investors that poured money into them.

So, as you can see, accessing computing resource remotely is not really new, so where and how did the cloud come into this? During the following decade internet speeds got quicker and computer speeds got faster. Data centres were growing rapidly in size and with an increase in size comes an increase in energy requirements. However, companies continued to house hundreds of servers in these data centres as they still offered many benefits such as physical security, guaranteed power and connectivity.

In 2006 Amazon, which had survived the dot-com crash, launched Amazon web services (AWS).

What AWS brought to the market was 'elastic compute cloud' which basically was the ability to rent computing resource from the Amazon data centres or “cloud” and

scale this up or down in terms of power and storage and only pay for what you use. The problem with all of these data centres was the amount of energy being consumed by keeping tens of thousands of servers running, and also, cool. Servers were typically only being utilized at around 15-35% of their capacity leaving huge amounts of computing resource under used and yet still being powered.

In 2001, an up and coming company from Palo Alto, California, called VMware slowly began gaining traction with its range of products, but in particular, one called ESX which is what is known as a "hypervisor." This was to change computing forever. VMware decided to tackle the problem of grossly underutilized servers. The solution was the hypervisor (ESX). This allowed multiple instances of servers known as virtual machines to run on the same physical server. Each virtual machine is controlled by the hypervisor which distributes the computing power of the physical server to the various virtual machines. Each virtual machine acted in exactly the same was as it did before, it could see the computing

resource that the hypervisor was giving it and had no idea it was virtual and that other virtual machines existed on the same physical server. This technology is known as virtualization.

Virtualization meant that instead of having 10 separate servers using 10% of their capacity and capability you could have 1 server with all 10 running on it. This was a game changer.

As a result of virtualization, computing resource suddenly became more affordable.

Amazon was offering access to computing resource to anyone with a credit card and would bill them by the minute. Amazon could only do this because creating a server (computing resource) with smaller amounts of resource, and running it for small to medium periods of time, no longer meant investing in an entire physical server. Creating software had always been a very expensive process and without investment was almost impossible. However, with the birth of the cloud, developers now had access to everything they needed to create. Historically if you were a developer with an idea you either pitched to an investor or self-funded and hoped that the idea would take

off. Alternatively, you worked for an existing software developer and they took on the risk and the profits. Obviously this stifled innovation and kept end users with limited choices.

However once the cloud was available all that changed. Now developers can have access to as much or as little computing resource as they want and pay accordingly. This means ideas can be tested and software can be deployed far quicker than ever before. In fact, cloud computing cost has reduced by an average of 15% over the last 5 years alone and predicted to continue to reduce by 3-5% each year. As a result, this has also opened markets up and made the business world a truly global marketplace. Data flows faster than before and more of it.

At this point it's worth pointing out that there has been an awful lot of confusion about what cloud computing is and is not. The term itself is fairly new and most consumers now associate cloud computing with Apple and their iCloud product. This is a form of cloud computing; in essence it's cloud based storage. This has helped some people's understanding as they know their data is backed up elsewhere. It's the

elsewhere part that's important and as soon as people understand that part it all starts to make more sense. It could be storage it could be processing it could be all of it.

Part of the confusion is that IT is now starting to become part of everybody's life and work. It is no longer something you use at work only and is, in fact, part of our lives more than ever. Even the definition of the word 'work' has changed. Work used to be somewhere you went. Work is now more clearly defined as something you do. What this has meant is that we have all had to become IT savvy very quickly. Most people had a basic understanding of how their computer worked however with this development everything has changed once again. Cloud computing changes the old rules completely. No more disks or CDs; all you need is an internet connection and a device. It was hard enough for people to understand the old ways IT worked but then they didn't need to know.

This is no longer true today. Smart phones are more powerful than computers were ten years ago and they live in our pocket and are normally the last thing people put down at night and the first thing they grab in the

morning. The fact is, nearly all of the apps and services running on your smartphone are probably using the internet to work and therefore can be considered to be using cloud computing services. So with computing power in our pockets getting faster every day and internet speeds becoming faster and available in more places every day this really is only the very beginning of the cloud computing journey. Our lives are undoubtedly going to change as we are connected 24/7. Household items are getting internet connections such as our TVs and fridges. Where it will take us is anyone's guess but it's here to stay so it's best we understand how it works.

CHAPTER 3 - DIFFERENT TYPES OF CLOUD

As the cloud developed the obvious questions of security arose. People were naturally concerned about putting corporate

and sensitive data into servers that they could not see or control.

The solution was for corporates with these natural concerns to build their own "private cloud".

As a result, there are three different categories of clouds:

- Public
- Private
- Hybrid

Public Cloud

A public cloud is a service operated by a company such as Amazon or Rackspace and they offer computing resource on a pay as you use basis as we discussed earlier.

The advantages of a public cloud are:

- Pay as you go
- Elastic (increase and decrease resources i.e. speed, storage with a direct effect on cost)
- No ownership of hardware
- The service is 100% outsourced
- Low entry level costs

The disadvantages of a public cloud are:

- Shared hardware (in most cases but not all)
- Blackouts (if the service is unavailable)
- Potential privacy and data laws may prevent use of certain public clouds in certain geographical areas
- Perceived as less secure
- Can be costly over long periods of time

Private Cloud

A private cloud is very simply the same as a public cloud however all of the physical servers are owned by the same company. Where they reside is not important it may be a purpose built data centre or even a data centre in their own building.

Often companies will decide to own their own servers and then house them in a purpose built data centre. This is called co-location. This option gives the company the best of both worlds. They own and manage the hardware but get the advantage of the physical security and guarantee of power and connectivity (internet).

Companies such as Amazon and Rackspace also offer a private cloud solution

which is identical to the public cloud setup however the physical servers are completely dedicated to one company.

Advantage of a private cloud are:

- Dedicated or owned hardware
- Control of the service
- Perceived increase in security
- Easy to scale

Disadvantages of a private cloud are:

- High cost of ownership
- Ongoing cost
- Potential underutilized hardware if not used
- In house skills required to operate and maintain

Hybrid Cloud

A hybrid cloud is exactly as it sounds a hybrid of both a private and public cloud. These are often used when a company's own private cloud is nearing capacity and require additional resources, a hybrid cloud

provides the ability to burst into a public cloud so any services running is not affected.

Another example is where critical workloads are run on the private cloud and less critical loads are run in a public cloud.

Advantages of a Hybrid Cloud:

- Low cost of entry for existing private cloud owners to expand to hybrid.
- Scalable (quick and easy to expand into a public cloud)
- Security (keep the critical and sensitive data in private)
- Pay as you expand only

Disadvantages of a Hybrid Cloud:

- Complex service level agreements
- Difficult vendor alignment (compatibility with both clouds)
- Elements that run in public cloud are considered less safe.

Other cloud platforms

So there are the three different types of cloud however there are three more terms that are worth understanding when entering the world of cloud computing; they are as follows:

- Infrastructure as a service (IaaS)
- Platform as a service (PaaS)
- Software as a service (SaaS)

These are all services offered under the private cloud banner from cloud providers such as Amazon or Rackspace. Let's go through each one to explain.

Infrastructure as a service (IaaS)
This is most often referred to by its acronym IaaS and is simply where a company outsources their requirement to have hardware such as servers, storage, and associated networking to a third party who runs and maintains this service for a monthly fee. This is hosted in the third parties' data centre and it is the responsibility of the third party provider to keep the lights on (keep the system up and running). This is a popular choice with companies that want to control the whole environment and typically run services such as email or a line of business application. There are two mainstream choices of software that enable IaaS these are called Openstack and Cloudstack. Openstack is an

open source product which means its free and is continually developed by more than 150 companies.

Cloudstack is again an open source product and in 2011 was purchased by software giant Citrix.

Platform as a service (PaaS)
Again referred to by its acronym PaaS, this service also provides the underlying hardware i.e. servers, storage and networking but this time the service also provides a software layer to enable the consumer to build an application. There are various different options which the consumer can choose before deployment.

The main reason why PaaS is a popular offering is for application developers to quickly deploy servers and then upload their applications for testing purposes. They often run a series of tests then take the server down. They would then make changes and repeat the process.

Historically this would be an expensive process and the servers would have need to

have been purchased and configured for different environments for testing purposes. However, in a PaaS environment this is quick and easy to deploy and the developer is only billed for the time they use the system.

Software as a service (SaaS)

This is by far the most recognizable of the services and is often an end product of both IaaS and PaaS. Software as a service is any application that is delivered over the internet so for example Hotmail (Outlook.com) from Microsoft or Salesforce the online CRM platform.

This way of delivering applications has revolutionized the software industry. There are tens of thousands of SaaS applications available today stretching across every business sector you can imagine. Installing applications onto local PCs via CD Rom or DVD is a thing of the past.

Over the last few years the user interface (UI) has dramatically improved and this has proved a real game changer once again.

Software as a Service is generally the end product a consumer will interact with. The opportunities in this space are endless and everyday more and more services are being released. This has really opened the floodgates for new companies to be formed and for many personal and business challenges to be solved. There are new ways people are trying to monetise Software as a Service with the most popular method being the pay per month subscription model.

Equally there are tens of thousands of services that are free up to a point or even completely free. The free ones will make money by advertising or even just to raise their brand profile so you buy other products or services.

Some of the larger brands are using Software as a Service to provide utility apps at a very low or free price to improve their customers experience of their brands. Online banking apps on our smart phones are a great example of this. They are free and give us access to key information in seconds. These are free apps that the company has paid to develop in order to make the banking

experience simpler and easier for us the consumer. This is a trend we are going to see more and more of.

CHAPTER 4 - EXAMPLES OF CLOUD SERVICES

Salesforce.com

The first great example of cloud services would have to be the software service company that really changed the way we think, buy and develop software; namely Salesforce.com.

Salesforce were the first real mainstream SaaS company. By offering 'pay per user per month' it very quickly gained huge traction. This option was a no brainer for companies both small and large. There were no upfront costs, no hardware requirements, no upgrades and was simple to use. Salesforce is an online CRM (customer relationship management) application that completely changed how salespeople operated. Traditional CRM systems would involve a

local server with the central database and then the individual salespeople with laptops with a local copy of the database stored on their laptop. While the salesperson was out and about they had access to all of their client database and associated files. Any changes that were made to the database would then be synchronized back with the main database once they had connectivity. This is not as simple as it sounds and issues with what synchronized was a huge problem. However, with Salesforce, there is only ever one copy of the database, and the salesperson just needs a browser and an internet connection to have access to the entire system.

Hotmail

Hotmail now known as Outlook.com was one the world's first free email services. It was developed and launched in 1996 and was quickly acquired by Microsoft a year later. Millions of people signed up to get their free email account and many still use them today.

Outlook.com now offers unlimited email storage on its account and is completely free. Email was originally something you only

used for work and only at work. The concept of everyone having access to free email was really a huge milestone in bringing the internet to the average user. It slowly replaced fax sending and telegrams, although traditional mail still has its place in certain areas but the volumes are reducing considerably year on year.

Google Docs

Microsoft have been dominating office productivity tools with their office suite for the last few decades. There have been free alternatives before in Openoffice however it never really made a dent in the market. That is not the case with Google Docs. The simple user interface and its natural extension to its hugely popular email service Gmail was a winner with companies immediately. Google Docs is another free product and although it may not offer some of the advanced options that Microsoft office has it certainly has enough for some people.

Dropbox

Another example of cloud services that have changed both the consumer and

business landscape is Dropbox. This is a cloud based storage repository. Dropbox allows its customers to store any kind of data online and then it's made available on pretty much any device with an internet connection. Files are synced across your devices so you only ever have one version of any file. Dropbox again has a free account giving you 2GB of data to start with and extra storage can be earned in various ways. There are various different types of account you can use depending on your security requirements and storage requirements. If companies are considering using this service, there are paid for team accounts which meet the needs of most small businesses.

Facebook

This list would not be complete with a social media service. There are some other huge services such as Twitter but picking one, Facebook is the obvious choice. The service has grown to over a billion users worldwide and is one of the largest disruptors to our everyday lives in history.

Facebook is now one of the world's largest companies and continues to innovate and

shows no sign of stopping. Facebook is a huge platform that even has other applications that run from within the service. Facebook has changed the way people connect and communicate completely.

The average person has around 200 connections and even brands are getting in on the act and trying to engage in conversation with us in the same mix as past school friends and family. A huge amount of Facebook's traffic comes from mobile as people are posting pictures and updates from their mobile devices.

Amazon.com

I have mentioned Amazon a few times as a cloud provider, however it is also one of the largest online retailers on the planet. Shipping millions of items every day all over the globe. This could just as easily have been eBay on this list but I feel Amazon is continuing to make huge strides into disrupting the retail industry and has changed the way we shop forever.

Google

One of the biggest disruptor's in history is Google, searching was not new when Google

first started out but they knew that they could do it better and they saw the future. AltaVista and Yahoo were the big players at the start and they really could have done so much more. However, the guys at Google created something so simple, clean and easy to use that even today the Google home page with widgets is still a blank page with a text box. What goes on in the background is mind boggling and clever but it gives us what we want. Search has changed the way we live. I know that's a bold statement but it has changed every single industry and the way we live more than any other company. Information on any subject matter is available in seconds from our mobile phone. They have a mobile phone manufacturer in Motorola and their own mobile and tablet operating system in Android. Google are now moving into other spaces with Google glasses and other wearable technology.

CHAPTER 5- HOW CLOUD COMPUTING HAS CHANGED THE WAY WE LIVE AND WORK

As you can see from these few examples cloud computing is very much part of our lives personally and professionally already. For companies considering if the cloud is right for them, they will probably find that they are already using some form of cloud services. Going forward the idea of owning and running an IT infrastructure in-house is no longer necessary particularly in the SME sector. Cloud services offer far more flexibility and with the rate that technology is evolving investing into equipment may not be the best idea.
The new devices we use now are all designed for cloud services. Although you can install applications onto tablets they mostly interact with the internet in order to function. Tablets and smartphones are simple to use and offer hundreds of thousands of applications that can be downloaded in minutes.

This gives us three types of applications,

- cloud based applications that are accessed via a web browser,

- mobile applications that are installed on mobile devices and often use the internet to function,
- traditional applications that are installed on traditional PCs or Apple Macs.

The traditional applications are very much ingrained in some established companies; however, they are a dying kind of application.

Cloud based applications (SaaS) and mobile applications have taken over the market completely. With such a wealth of choice, and often free of charge, or with free trials, the barrier to entry is very low and the risk is also very low and therefore attractive.

There is pretty much an application for almost anything you can think of. This has also changed the way we do business. It is no longer only the big wealthy companies that have access to the latest and greatest. Small and even micro businesses have access to exactly the same technology and services. What the abundant choice has done is completely change the way we all access IT.

Traditionally IT departments had the control and dictated what applications the staff would use. However, with such an abundance of cloud and mobile applications available, the average user is far more tech savvy than ever before. If they know a better tool to do the job more often than not they will use it, with or without permission.

This is called the consumerisation of IT. This concept also extends to the device. For many years Microsoft Windows was the dominant player in the business world. This was only accessed via a PC or laptop and was completely under corporate control. In general, it was the office where people had access to the latest and greatest IT equipment, however this is no longer the case and it is often the case now that staff have a better smart phone than the corporate issued device. What happened as a result was personal devices accessing corporate data and services because the user preferred to use their own device. This gave birth to "Bring your own device" or BYOD. Those companies who were forward thinking enough that had the right technology in place, were able to allow their employees to

bring their own devices to work. As with most cloud services the data resides in the data centre and never leaves the data centre so there was no data on the device. So if the device was lost, stolen or broken no corporate data was ever lost. The employee simply would use another device and carry on working.

Today as more and more companies are using cloud based services that are not device dependant it has added fuel to the existing fire that was tablet sales. With or without cloud computing services, tablet sales have rocketed and PC sales are on the sharpest decline in history. People like the simple interface, the lightweight structure and self-service of the tablets on sale today. They are perfect for today's consumers both personally and professionally. Cloud computing complements todays devices perfectly and this is only the very start.

CHAPTER 6 - THE FUTURE OF CLOUD COMPUTING

Cloud computing is not new but it's now starting to impact everyone's life. The PC era is over for sure and those who do not embrace the cloud era may find themselves out of date very soon if not already.

Technology has without a doubt changed the business landscape forever. We are in a new era now and with both fast internet connected smart phones and tablets able to access these services wherever we are, the cloud has given us a truly mobile first future.

The future? Being internet connected has become a way of life and for many a basic human right. More and more of our everyday life is going to include something that is internet connected and interacting with some form of cloud computing. We are leaving data trails of our lives all over the web and more companies are finding new ways to use this data and the fact that we are connected to find new ways to save us time and provide more utility.

Even today we can set the oven on, turn the heating on and run a bath over voice command whilst on our way home from work in a self-driving car. It may not be something everyone is doing yet but just you

wait. It will start off small, using your phone to put the kettle on while you lay in bed.

We are in a mass era of change and technology is driving this change and the internet and cloud computing are at the very heart of this change. The cloud may have started out as a marketing term but it is now changing how we live.

I hope this guide has given you a useful insight into what cloud computing is, how it is used and how it already is playing a huge part of our lives.

The services available now as a result of cloud technologies are not only changing entire industries but creating new ones. The cloud is just a fad eh! I'm not so sure.