

ADOPTION WITH SMALL AND MEDIUM ENTERPRISES

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Abstract

For this project, the student planned on having a project consisting of a questionnaire which would help a small and medium enterprise decide if they were eligible for the cloud and at what cost in some areas. This student planned on having this project reachable to a large audience where they could try out the questionnaire at a time of their choosing. As a result of this project, the student has got a website consisting of information about the cloud, information about the areas which he researched. Most importantly, it consisted of a questionnaire consisting of 4 areas which were back-up, web hosting, customer relationship management and software and development testing. After the questionnaire, the user is then aware if that by a large degree, are suitable to adopt the cloud and in some cases, how much this service will cost them. The student hopes this will benefit businesses in one way or another.

Contents

| | |
|--|-----------|
| Abstract | ii |
| 1 Introduction | 1 |
| 2 Background | 2 |
| 2.1 The Cloud | 2 |
| 2.2 Small medium enterprises | 3 |
| 2.3 Adoption | 3 |
| 2.4 Why would you adopt the cloud | 5 |
| 3 Literature Review | 8 |
| 3.1 Non-cloud | 8 |
| 3.1.1 Back-up | 8 |
| 3.1.2 Web Hosting | 9 |
| 3.1.3 Customer relationship management | 10 |
| 3.1.4 Software testing | 11 |
| 3.2 Cloud | 11 |
| 3.2.1 Back-up | 11 |
| 3.2.2 Web Hosting | 14 |
| 3.2.3 Customer relationship management | 16 |
| 3.2.4 Software testing | 17 |
| 4 Implementation | 20 |
| 5 Specification | 23 |
| 6 Data Analysis | 26 |
| 6.1 Internal Testing | 26 |
| 6.1.1 Test 1 | 27 |
| 6.1.2 Test 2 | 27 |
| 6.1.3 Test 3 | 28 |

| | | |
|----------|---------------------|-----------|
| 6.2 | External Testing | 28 |
| 6.2.1 | Test 1 | 29 |
| 6.2.2 | Test 2 | 29 |
| 6.2.3 | Test 3 | 30 |
| 6.2.4 | Test 4 | 31 |
| 6.2.5 | Test 5 | 31 |
| 6.2.6 | Test 6 | 32 |
| 6.2.7 | Test 7 | 33 |
| 6.2.8 | Test 8 | 33 |
| 6.2.9 | Test 9 | 34 |
| 6.2.10 | Test 10 | 35 |
| 6.3 | Final thoughts | 36 |
| 7 | Conclusions | 37 |
| | Bibliography | 39 |

Chapter 1

Introduction

This is a dissertation being by Masters Student Michael O Cearra from NCI who has chosen the topic 'Adoption with small and medium enterprises'. What the student hopes to achieve by the end of this, will be a well done project which main aim will be to help small and medium enterprises. That aim will be to help small and medium enterprises adopt the cloud in the areas specific to their business. These areas will be of the students choosing which he will decide after researching various areas. The student plans on having a decision tree done on all the areas to plan out the questions, the student then plans on coding out the decision tree. He will decide on the method of the code and structure of the project after some further research has been done. Overall, the student hopes to have a project consisting of a questionnaire which will help a small and medium enterprise to see if they are eligible to adopt the cloud to their own business and processes. The student plans on the questionnaire being able to tell the customer, whether they are eligible for the cloud and in some areas, what the cost of their service will be.

Chapter 2

Background

In relation to the background, the student will briefly go into detail on what the cloud is. The student will go onto explain in detail what the different areas are. Also the student will be explaining exactly happens in a cloud and all aspects of it, what a small and medium enterprise (SME) is and lastly the student will explain what it means to adopt the cloud. This will include reasons towards the why would you want to adopt and what the advantages and disadvantages are.

2.1 The Cloud

The [12] booklet explains what it believes is a cloud is 'Cloud computing is a model for enabling convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction'. It is broken up into three main areas which is PaaS (Platform as a service), SaaS (Software as a service) and IaaS (Infrastructure as a service). [1] explains it has certain characteristics such as the following on-demand self-service, resource pooling, rapid elasticity, measured Service and broad network access. It has 3 main deployment models known as private, public and hybrid clouds (mixture of public and private). It has a lesser known model known as the community model. There are known disadvantages to the cloud however, mainly according to [8], customers tend to find it very hard to back up the cloud data to their own devices but the advantages far outweigh the disadvantages

2.2 Small medium enterprises

In this section I will go on to explain what a small medium enterprise is and what it consists of. Small and medium enterprises are also known as SMB's are known as such as they fall within certain criteria such as the numbers in the company being under a certain limit. Small and medium companies are known worldwide as SME's by leading organisations such as world trade organisation and the EU. Small and medium companies are known to be the leading motivation in competition and inventing in the economy. There are three different sections which define small and medium enterprises mainly in the EU, they are:

- Companies which have up to 10 workers are known as micro-entities
- Companies which have up to 50 workers are known as small companies
- Companies which have up to 250 workers are known as medium-sized enterprises.

2.3 Adoption

It has been said that there is a number of different theories and examples of what adoption means, according to [16], by using IT and the cloud, they can provide many benefits to a business. Customers can benefit by accessing global markets with larger product availability from a variety of sellers at a reduced cost. [16] also notes that in a recent survey, more than 80 percent was reluctant to go to the cloud. It is known in the business world of cloud computing that there is not a perfect one way in which a business can approach adopting the cloud, here different approaches shall be discussed. What will be taken into account will be how a business can pick the more suitable option for the service or application to which they want to avail of. That said, adopting the cloud is not easy, [20] notes that various target cloud service models may have different requirements for migration. For example, migrating application to SaaS requires data extractions, and potentially code rewriting to support multi-tenancy model. Usually when a business is planning to adopt the cloud, they take a number of considerations into account such as if they want a new build or simply migrating over, also privacy and security is a major concern. It is noted that for the approach to be successful that everything should be considered such as the commercial, legal and marketing aspects of a business. Once an approach has been selected, it is then paired with these selected components which set the scene for a more detailed design. Some of the approaches are:

- All-in cloud

This in simpler terms is basically where the business shall use all aspects of the cloud on their business application, so that they may rely solely on it. The side of the cloud which they would use would most likely be the software as a service side.

- On-premise plus in-cloud

This is basically where businesses take into account only a part of the cloud for their application and will use their own premises for the rest of the application and service. There are a number of ways in which this could happen such as the code and logic appearing in the cloud while the database is stored on the businesses premises. This has its benefits as the more sensitive information can be stored in the comfort of your own premises.

- Data split

This is similar to 'On-premise plus in-cloud' in that the data is not in the same place but here it is strictly separated into non-critical and critical data. All the critical data is stored on the businesses premises while the non-critical data is then stored safely on the cloud. This approach is actually difficult to achieve as it would need the application or service to be able to access both areas for the data.

- Timeline splitting

The cloud has other abilities which have not been mentioned such as development or testing of an application before it is released for deployment. There are many advantages to this such as saving on costs, speed and the ability to scale up or down the environment of your testing.

- Service-oriented architecture

This is maybe one of the most used approaches where the web is used to access the services or data which a business has put onto the cloud. Using this approach makes it far easier to migrate whatever you chose to, onto the cloud. It is common when using this approach to have the business aspect of the company maintained fully.

- Business migration

This, as the name suggests has more to do with the business aspect of a company rather than the technology side. Nonetheless it has still got consequences on the impact a company may have in the cloud with regards the applications and services they are migrating. Usually in this approach, it would be more allocated to the software as a service side of the cloud. What usually happens is that the data will be put onto

an existing application which will mean the company and its users will have to be up-to-date on how that application is run.

2.4 Why would you adopt the cloud

[11] goes on to give their own ideas of the advantages of the cloud which businesses can take advantage of. Firstly though, they like so many others believe that the concept of cloud computing is not exactly new and has been around as long back as around 1965, where the idea of a company being run as an information utility as part of their strategic views. This has in turn led to this being scouted as hype rather than a promising new venture. However as will be discussed, [11] along with other sources will discuss how the cloud has so many advantages which will allow business that adopt it, to reap the huge benefit. Firstly it is noted by them that the cost of what a business would save would be substantial, there are for example computer intensive business analytics available to SME's now which were only available to larger companies not so long ago. The fact that the cloud allows for a number of computers to work together to complete a task thus allows this to happen. Companies even in poorer countries with lacking infrastructure can even take advantage of the cloud as they need not invest in anything, only pay for what they use. Secondly using the cloud allows for you to have instant access to any hardware resources without having to invest in any infrastructure or down-payment. Money which is then saved can be used to finance other IT projects which will boost productivity in the business and help improve profits. The cloud allows for as many users to join a provider as possible and it is much easier than conventional way thus meaning a company might not have to be extremely knowledgeable in coding etc, to work on the cloud. All users are separated and even if many join at once, the performance is not affected. Thirdly being on the cloud has opened many more people to having the opportunity to be innovative and start up new projects which may not have been possible before. Such reasons may be that people may not be strong in certain areas which would have put them off attempting to be innovative but now they can use the cloud to help them overcome any barriers they face. Fourthly, cloud computing allows for SME's to scale the services which they may be using. Services which they use on the cloud would be scaled up and down instantly depending on what the demands are at the time. Businesses can do these themselves through application programme interfaces which have been provided by the provider which allows them to have access to their own data and services which they are using. Lastly, as a result of the cloud, new services and applications have been created that were not possible to have been done before the cloud. [11] some examples such as mobile interactive applications which are location, environment and context-aware which are able to respond in real

time. Other examples include parallel batch processing which means that businesses can use massive amounts of processing power to analyse big data for the business in very quick sessions using services such as MapReduce. One of the last examples which will be mentioned is using the cloud to understand how customers do their business and their habits and so on from data collected.

Cloud computing itself has got many advantages to its use which is why it has taken off so quickly, goes on to explain how the main areas where there are advantages are related to the economics of the company relating to costs on software, hardware and IT support also, also noted is the immense computing power which cloud computing can provide opposed to conventional methods. HE notes how companies are not aware of not only the costs they can save but also how much they are able in which to optimise their resources in which to make the business more effective. There are companies are not aware of all the information which can be of use to them by the providers such as disaster recovery and creating platforms for business continuity. This is in part due to the fact that businesses have concerns with the privacy of the information for which they are trusting with providers and the loss of control they have over it. As a result this is one of the reasons why companies have reservations about adopting the cloud. [5] states that there are also advantages to taking a chance with cloud computing, with cost being cut, the main benefit. This is so as the cloud is used as a pay as you use it service in what you only pay for what you use which keeps costs very low and make it much easier to manage. Secondly there is far more storage open to you on the cloud than locally on the computers which you can instantly expand or give back as you chose, storage is effectively limitless to the customer. Another advantage which is found with the cloud according to [5] is the mobility and flexibility of the cloud, users of the service can access the information they own from basically anywhere they wish to. They can access this information from any device which they chose to use which makes access to the data effortless. With the cloud, you can use any language code which suits you when working with the cloud as many providers are extremely flexible which makes using the cloud easy. Lastly according to [5], the services and software which IT work with on the cloud is always up-to-date which makes it extremely easier for IT to then focus on more urgent local tasks associated with their business. There are however drawbacks to cloud computing which affect the chances that adopting the cloud may not be suitable for you. There are various areas where the cloud is not as strong in as conventional methods; one of these areas which will be discussed is the security and privacy of the cloud. This is usually a problem when talking about cloud computing as usually the customer does not fully understand the security precautions which a provider may have in place and they must put their good faith in that provider, also it is noted that they may not be willing to hand over their data onto an external provider

who they do not have much trust in initially. Secondly the problem with the cloud according to [5], the cloud cannot control large amount of data at the time of writing which would mean that transferring data through the cloud would be slow and may have unforeseen complications for the user. Thirdly, one of the disadvantages which may occur for businesses would be that the cloud is not as reliable as conventional methods, it has the potential to break down and performance issues may occur which has to be taken into account. Another downside may be the issue of control of your data and how it processed as control is taken from the user by the provider which may result in the user feeling unhappy. Businesses like to be in control of their data and usually this is the main reason as to why businesses opt to not use the cloud to better their business.

Chapter 3

Literature Review

In this section, what will be discussed is the different areas in which a business can adopt. What will be gone into detail will be four areas and looking at both how these areas compare when operating both on and off the cloud. The four different areas which we will be discussing will be back-up, web hosting, customer relationship management and software testing both on and off the cloud as previously noted. When discussing both scenarios for each use case, it will be noted what the advantages and disadvantages are for each use case, with the prime goal showing how being on the cloud will be more beneficial to the business in question.

3.1 Non-cloud

3.1.1 Back-up

To describe what a back-up which is not on the cloud is, is to say in simpler terms that it is basically the process of backing up data from a business so that you can restore it to its original state in the event of a disaster. It works by selecting the information, taking it out and preparing it before sending it to its final destination. Backup is known to have two main features, the main feature which it has is to recover data which has been deleted by accident or maliciously, the second less important feature it has is to recover data from an earlier period depending on how long the data is kept for. [4] sees the main reasons for backing up data being security precautions, security vulnerabilities and monetary issues. It has been noted that even though they are a popular way of saving data, they by themselves should not be considered to be the ultimate protection simply because backup systems are by themselves not complex

enough to mimic a computer system or database server so it is difficult to configure them correctly. Also the amount of data which has to be stored on a backup can be very extensive and expensive. On that note, also organising the storage space which is needed can be a very tough task. There are many different ways in which backups are used these days for backups to make them more useful. They are made in such ways that provide more security and portability along with making it easier to store data in multiple locations. There are a few advantages and disadvantages to local data back-up which are as follows:

- Advantages

It has been noted that possible the best advantage of data backups is the fact that you can store them anywhere as they are portable and you could easily access your information whenever it suited you. Local data backups main advantage was that it was very quick when you needed to access the data and if your system was to crash, you could easily retrieve your information and restore it back to its last backup point. This type of backup was used as external hard drives, local hard drives etc, and was used mainly by SME's.

- Disadvantages

What has been already noted is that local data backups had their advantages; they were far easier and quicker from of backup where you could retrieve your data. That said, there were also disadvantages to it. The main disadvantage was that if your main system was destroyed by a natural disaster or was damaged by unforeseen circumstances then it is likely that your local data backup would be damaged too as it would be in close proximity. Also local data backups were usually small and a business may have many of them as they were small in size and storage so the possibility of misplacing them was not unheard of.

3.1.2 Web Hosting

Web hosting is the ability of a provider to provide a business with web services and server space who are wishing to host their websites on the providers' infrastructure. The providers also have the ability to take control of the website in order to make sure it is maintained perfectly. There are a number of ways in which you can use web hosting such as follows:

- Shared Hosting

This type of web hosting is where you can put your web contents on a server provided by a provider but the drawback is you are sharing this server with a number of other businesses. The provider takes complete control over the server and has the responsibility of maintaining the server so that no problems arise.

- Dedicated Hosting

This would usually be the most widely used form of web hosting. This works just like shared hosting but you have the luxury of having your own server for your own business. You can use all the resources of the server to your own choosing meaning you can create as many websites as you please. You can have the option of owning the server and maintaining it for a period of time or giving it to the provider.

- Root server hosting

This is just like dedicated hosting which was previously mentioned, which also has the option of giving you a constant internet connection. You have the option of choosing your own hardware needs and specifications to best suit the needs of your business.

Overall it shows that dedicated hosting is the most useful type out of the rest. This is so as the web administration has full rights over the server which in turn makes it far safer than other types of web hosting such as shared hosting. There is a downside to it though as if you take control of the server then you will have to monitor, maintain, configure and upgrade the server whenever possible and when the need arises. That would then call for having IT specialised in that type of software which could be costly in terms of training them up so that they can use the server effectively.

3.1.3 Customer relationship management

When discussing the customer relationship management (CRM) it is noted that there are two different sections from where customer relationship management falls into which are strategic and operational. It is believed that the side of CRM considers only the part of strategic customers as opposed the latter. That is that it is only concerned with having a beneficial profitable and long term relationship with customers that are important to the company. That is that there is a definition which calls for customer selectivity which seems to work for all customers and business.

Having CRM in a business allows for a business to have many benefits which as follows are understanding the customer and attracting new customers and contracts at the same time, also allows for profits to be increased as in one aspect, the customer management costs are decreased.

Finally, it is usually seen that CRM is used to describe a business to customer relationship, it can and is also used to manage clients, contracts and sales to further profits. It helps you with the ability of providing services with customers which you may need, cross-sell and have the ability to retain customers that you need

3.1.4 Software testing

To put it in simpler terms, this type of process involves a number of processes related to prevention and detection strategies which are done in order to lower time, costs and risks. There are various different tests on the non-cloud such as unit testing, static code analysis, peer code reviews and traceability which all depends on how the companies ideals and expectations. The main reasons which are done for this type of testing are as follows such as quality insurance to make sure that the software being created is built to the highest quality and security which is made sure by countless development and test processes. It has been shown that implementing developing testing processes improves the quality of the testing and also the predictability of the project. It shows that development testing makes software more transparent and predictable thought the life-cycle of software development.

3.2 Cloud

3.2.1 Back-up

Back up for the cloud is also one of the main areas for which businesses look for when they try to make further profits for their business, on the cloud there are far more advantages which will be discussed now.

- Cost

Having your back up on the cloud can be one of the most beneficial benefits from being on the cloud as regards to saving money. The main benefits come from the fact that the customer does not need to buy infrastructure or install new or expensive equipment as the cloud backup takes care of it all. [6] believes is a major reduction in upfront expenses as noted already; businesses do not need to pay for any hardware or software and can use this money on other needs. Money is also saved as cloud backup providers can figure out which are the most essential files to backup and transfer over to a secure off-site data centre which in turn would result in a lower total cost ownership then if a business was to buy their own backup systems. Also most if not all backup

providers have a way of storing the latest version of backup data and deleting data which is not needed any more, this itself saves on administration and operational costs. With scalability being an advantage, then the business in question does not have to plan for more backup than is necessary in an emergency and backup itself would be automatic which would free up the IT department for other necessary jobs. If a business is allowing a provider to back-up their data then they would therefore save on energy costs as there would be no need for server rooms etc. Having a provider backup their data also means it is unnecessary for them to buy backup tapes which can be very expensive and in theory are not a good way to backup data as they can get misplaced or lost which recovering data from them is also a slow process therefore giving that responsibility to a provider can be very beneficial. Lastly backing up your data on the cloud as previously mentioned allows for a business to put the saved funds into more pressing needs like possibly new initiatives which may be beneficial to a company in the long run.

- Risk

There is a lot of risks which would be minimal as a result of going onto the cloud. This risk itself would usually be put to the provider from the business where they are more than capable of dealing with any risks which may arise. The cloud in itself offers the chance of minimising the danger of under-provisioning as unlike conventional methods, now when there is a spike in storage needs then the cloud can offer elastic resource allocation and unlimited data retention where it is very unlikely that the storage needs of a business will ever be tested or overused. There has been a lot of distrust with workers with the cloud as a result of not knowing how it operates, [15] believes that when data is given to the provider, the worker does not know where it is exactly and that draws them away from the cloud. Also which is a worry is the security of data which is used in the backup, as many businesses may be worried about giving the data of the company to a provider as trust may be a big issue but there are many benefits to having a provider take care of the security. Some of these advantages include the fact that cloud providers have very strict security audits as companies trust them with their data and they do this by having very strict security procedures which they keep up to date daily. Companies have some concerns that their data may be compromised when they adopt the cloud but one advantage the cloud has is that it can easily separate the data of different businesses so that the data integrity is not compromised. This can be done by putting the data into different environments which erases the risk of the data getting mixed up by mistake, also it is advisable to further separate the data so that possible the customers data is put into the cloud and the staff data is kept in-house. More ways in which the risk is minimised in when on the cloud, any of the files which

may have been selected would then be encrypted until they reached where they would be going to, and it is noted that these safeguards would be far more advanced to any sort of encryption which a business may have on-premise. Another advantage to take note of is that even if a business will take responsibility for their data regardless, a cloud provider can offer substantially upgraded security and ways in which to safeguard the data such as having the ability to have the data stored in multiple data centres located in various areas throughout the world. Lastly a business having its data on the cloud can ensure that it is recoverable and protected so long as that provider has done their job properly, with the way the future has progressed with the cloud, encryption and security practises have made the cloud itself very secure. Far more secure with many more advantages then conventional methods.

- Flexibility

It is well known that the cloud offers extreme flexibility and agility for businesses which wish to adopt the cloud. As the cloud as previously mentioned can scale up and down whenever needed, adds to the degree of safety which businesses can experience as regards to a business worrying about storage concerns. Adding to this advantage, as noted before, business only have to pay for what storage that they use which is a major incentive. Secondly, goes on to say how the high availability of the cloud allows for companies to be care free of their data as they will feel secure. As the information will always be on-line for them to access is also very important as a result of the high availability. Also as regard the execution, it also plays a part with the cloud as businesses can upload their data onto the cloud whenever it suits them with little or no time in which to prepare for it or plan. Providers are able to cater for these scenarios. On that note also, the recovery time once a backup is needed is near perfect. Lastly having the backup on the cloud means that it can be accessed from anywhere and from any device which allows for great flexibility. This allows for work to be executed when a need arises thus creating more profit than if it was stored locally where it would be able to be accessed there.

- Quality

As regards to quality, it is very important for the cloud so that the integrity is not compromised so therefore the cloud is very suitable. The cloud providers have invented strict procedures which help to optimise the performance so that it does not fall below standard. There is extremely up-to-date software which is used to help make sure the infrastructure is run and monitored perfectly without error. Having backup on the cloud allows for the provider to install new software which has more functionality without the user taking notice and more importantly, having to do anything about it.

Therefore the system is always up-to-date and the business availing of the service can be safe in knowing that the updates have been tested rigorously.

- Advantages

As regards to various simple but much appreciated advantages, it is easy to see that having a data backup which is in a secure location away from your business is the best advantage of these type of backup. This is solely for the reason that if your business was to be hit by an unforeseen disaster, then your data would surely be safe in the external location it is in. [2] believes that the cloud can offer services for back-up with an extremely high rate of availability.

- Disadvantages

There is one disadvantage which has not been mentioned yet and that is the speed from which you can transfer your data files. This can usually be a problem as a business may have low transfer speeds and this in turn would make transferring files, a long and tedious task. That said, not many businesses suffer this problem as they invest in a high speed connection which transmits data quickly to the provider which they are trusting it with.

3.2.2 Web Hosting

Web hosting on the cloud, also known as cloud web hosting is considered to be of a major step forward as it is believed to be a much better alternative to conventional methods of web hosting. This is as a result of its many advantages which include saving costs, being flexible and reliable but also being more practical at the same time. [18] believes that it generally offers reduced client latencies and increases a site's availability. While there may be some concerns such as security and privacy along with not trusting the new technology, the advantages far outweigh them. This in turn is proving the main reason why many businesses are turning to the cloud for the reason of web hosting.

- Scalability:

One of the main advantages which cloud computing in general has got is its ability to hold multiple terabytes of data and its ability to scale its load up and down instantly when needed. In other words, the sites which run on the cloud can handle different levels of traffic when the demand is needed and changed. This ensures that there is minimal or no chance of a site crashing if there is a sudden high demand for its services which make the cloud extremely safe and reliable. Along with the scalability, load balancing along with the use of updates and new technology help with the scalability

of a website.

- Ease of use:

In simpler terms, using the cloud is far simpler than many businesses believe for web hosting. It can be far cheaper than using conventional on-premise hosting as with the cloud, infrastructure like hardware, software and implementation are not needed. Also hosting on the cloud ensures that all the necessary requirements such as disk space etc, is met sufficiently without having to worry about it. Also the provider takes care of the need to add on more resources onto the cloud if demand calls for it. Lastly, once a business requests the web hosts services, they do not have to wait at all for it to begin as they begin almost instantaneously.

- Pay for What You Use:

Web hosting on the cloud works just like your electricity and oil bills work, which is that you only pay for what you use. There are no annual prescriptions in relation to services on the cloud, only that you will get billed for the amount of traffic you receive and what resources you use rather than a given predefined amount. As a result there is no more need to splash out on dedicated resources like server space and high bandwidth etc. Overall it is a great option for web hosting to use, businesses will save high costs from this type of hosting which is why this is possibly the biggest advantage.

- Customizable Storage and Size:

In the cloud, it is well known that there is an illusion of infinite resources on the cloud which to a degree is accurate as you will never run out of storage if the cloud is run properly. You can request as many servers as you want and would pay for which you can even control yourself through an application programming interface. The benefits from this ability to use external storage gives you the chance to reduce your burden on your services and free up internal resources which can then be put to use in a more effective way for your core jobs without the added worry of storage.

- Easy Management:

Another great advantage of cloud web hosting is the easy management of your data on the cloud. One advantage of the cloud is that it can all be managed centrally making use of the servers and network services, this in turn makes it extremely easy to use and manage while not interfering with the integrity of the data or its quality. Also, it is quite easy to customise while updates take place regularly which for the IT department leaves them to deal with other local problems which they can focus on.

- Fewer risks

One of the last advantages with web hosting is the fact that there is a reduced amount of data being lost in the cloud for a number of reasons. Firstly the cloud web hosts themselves give the option for backups and as the data is stored in a different location, there is no chance that if there was a breakdown in your company then there would be no ill effect with that data. Lastly with this type of web hosting, not only do the providers take care of everything, there is also customer support 24 hours a day 7 days a week which is for businesses that have little knowledge about technical issues which may arise which is a big plus to join the cloud.

3.2.3 Customer relationship management

As regards to customer relationship management on the cloud, there are many reasons to have it on the cloud rather than to not have it. Some of the reasons are as follows starting with rapid deployment, hosting customer relationship management tools (CRM) tools on the cloud or using their services take very little time to not using the cloud and businesses need not have to invest in hardware or software infrastructure. Another advantage is the ability to upgrade easily, CRM tools and applications would be updated and patches would be made instantaneously and without having to use the companies IT department to help in the process. Reducing the costs of the business is also a reason to adopt the cloud as companies do not need to invest or buy servers or train their IT department to help maintain these servers. Lastly, it is incentive to know that cloud vendors themselves pride themselves on the fact that their security precautions in place are ideal to deal with any unforeseen precautions, this sense of security for the companies makes it easier for them to choose the cloud. It is well known that one of the main advantages is that the cloud providers for this service charge you on what you only need according to [21]

Having the ability to use CRM tools on the cloud also allow for other such advantages for the company such as being able to have higher sales productivity, this would be from them being able to find out what new cross-selling and up-selling opportunities there are to be exploited. Having the ability to use the CRM tools will also allow for better profiling and targeting which in turn will lead to better loyalty and customer retention which will then create an increased market share thus having a higher profit annually. This lastly will allow for the company to lower their product costs which in turn will further please their customers.

As regards specifically to the customer, using CRM on the tools helps a company achieve many things. They can improve their relations with customers which lead to more improved things such as being able to figure out certain trends thus increasing sales.

It allows them to understand what it is, their customers want and their requirements. They are able to find out if there are other ways in which they can sell their products, be it with other products known as cross-selling. This can allow them then market their services better where they can zone in on what exactly it is that a customer needs' and being able to make their products more tailored to their customers' needs thus inventing newer products to attract more customers. Overall this will lead to their customers being extremely happy with their services, having the reputation of the business soar and continue to expand in the country. Overall being able to lower your costs, knowing which areas are best needed for investment and knowing your customers are happy with your services are exactly what benefits are taken from using the CRM on the cloud.

3.2.4 Software testing

To explain software development testing properly we should take note of what other people think of it, [17] believes that software testing as a service (STaaS) is defined as a model of software testing used to test an application as a service provided to customers across the internet. It enables daily operation, maintenance and testing support through web-based browsers, testing frameworks and servers, it must be noted that it uses cloud infrastructure but it is known to encounter small problems such as meeting deadlines which are unrealistic and a budget to keep within. Some other stumbling blocks which they reach may be not using the tests again and making sure that the data centre with the testing does not require a power outage. That said the advantages far outweigh the risks such as the feel of unlimited storage, the ability to upload the data onto the cloud quickly onto infrastructure made available. Lastly having the flexibility and knowledge of running a server to run the testing on reduces dramatically the costs and time it would take to test software off the cloud.

There a number of reasons why there is a need to test on the cloud, some of these include the fact that there were very high costs when testing with traditional methods, this was so as they had to show what it was like to get user activity from different regions. To be testing firewalls would mean having to spend and invest in accessories such as hardware and software. Lastly it is expected to know that the cloud is far more known in the fact that an application being tested may react unexpectedly based on the used it gets, with traditional methods, this may not have been possible to overcome without being too expensive. Now companies using the cloud can count on the cloud being able to deal with unexpected traffic.

There are a number of different tests which can be carried out such as follows:

- Stress test

This type of test is used to see how well an application can perform beyond the known limits which may cause it to break. This is because, it is expected that a product will perform as expected even under extreme circumstances which it may come across. It is usually done by simulating peak loads to test the application. That said, the cost for something like this is not on the cloud is extremely costly which is a drawback, therefore the cloud is seen as an affordable and efficient alternative.

- Load Test

This type of test will basically involve creating a lot of heavy traffic as regards the users and then measuring its response. Doing this will ensure that they have a specific estimate of how the application will handle traffic.

- Performance Test

This type of testing is done for a number of reasons, mainly it is done to see what the limitations, bottlenecks and problems of an application are. This is usually done under various specific workloads where it is possible to change the nature of user traffic whenever needed which can only be achieved on the cloud. Having this type of testing on the cloud can lower costs and time.

- Functional Testing

This is the testing of applications both from the angle of internet and non-internet. Testing on the cloud itself allows for verification on requirements which are needed for the applications.

Compatibility Testing

Using this type of testing is basically using different operating systems which can be used for compatibility testing and thus make the testing very easy.

- Latency Testing

This type of testing is basically used to see and measure the latency between when the action is first activated and the response it takes for the action to take place on the cloud.

- Advantages

There are some advantages to web hosting which outweigh the disadvantages; these are that you eliminate the hardware infrastructure as you are using a provider. You also need not worry about the maintenance as the provider will take of it. Lastly you will not have to worry about the licences which come with this type of software testing as

the cloud provider will take care of it. [14] believes there are tremendous advantages to this type of service, they believe this as in the workplace, many do not have the resources to complete long and complex jobs which cloud providers could do easily and for a fraction of the price of installing hardware and software to do it themselves.

Chapter 4

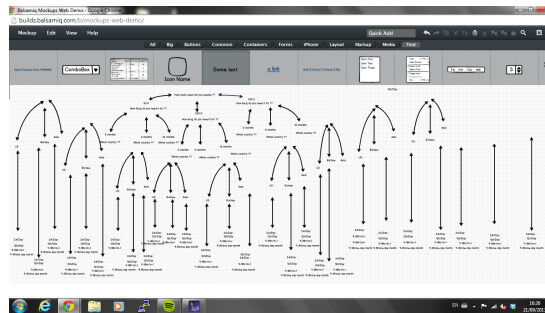
Implementation

For this there were a number of considerations in which to consider when mapping out the questions. It was first considered that using a fishbone method to dive deep into each area was considered, this was later thrown out as it was believed that it didn't necessarily get the information needed for the question, in that the majority of the information would not be used. It was therefore considered to be time wasting. It was then considered to use a decision tree in a majority of the project and this was taken into serious consideration as it would tick all the boxes in that every aspect of the questions could be answered. For that reason alone, it was decided to use that method in which to map out the questions as there were many tutorials on how to do it properly also.

It was then time to look at the different use cases from which we would be doing a decision tree out of. The student looked at various areas such as big data analysis to different CRM services. [7] suggest how to create a useful use case in terms of realising a use cases functional requirements and non-functional requirements which allowed the student to gauge more experience from what was most important. It was then agreed that the four use cases which would be focused on would be CRM, Data back-up, Software and development testing and lastly web hosting. All of these were picked for general reasons. Some of these included that it was shown that companies would benefit greatly from some of the services such as web hosting as they would not need to invest in infrastructure or need to train their staff in the maintenance of their site, Other benefits included the sheer amount of services companies could get for a fraction of the price than off the cloud, for example, you could have up to 50 works or more storing hundreds of GB's of data on a cloud server for a fraction of the price it would cost them to buy their own servers including maintaining it.

Once this step was reached, the decision tree of each use case began to take shape. As a result of some of the research done, many of the questions asked were of a simple nature but were plain yes or no answers to if the business was suitable to the area or not. Also as a result of the research completed, many other aspects were able to be exploited such as the legal side of a business such as the SLA's which are produced by providers to their customers. Some other aspects such as their need for infrastructure and their knowledge of coding were also taken into account. From there the student was able to have a decision tree which in some areas could say with a high possibility that a business could adopt that part of the cloud, to other areas which once completed were able to then inform the customer of the price of their service after selecting different option. An example would be asking to see how much data a business wanted to be stored and how long, from there, figuring out how much the average cloud provider would charge monthly and yearly was then noted.

The student then continued on with the decision tree until it was all worked out where exactly all the questions would go and make sure the questions were all of a good standard. It was from there that the student then began to code out the decision tree. Different options were looked at from which the student could try and code this project. Firstly the student looked at what type of structure cloud exist as regards to where it would be put onto be it an application etc, various different languages were looked at such as Ruby and Java as they showed promise in what was needed to be done which was specifically code decision trees. In the end, it was decided to go a different route entirely on both accounts. Firstly it was decided that the best way in which a customer/user could reach the content would be if it could be put completely on a dynamic website as it is accessible by anyone with the internet and accessible anywhere there is an internet connection. This had more positives then solely coding it as an application as it might not reach as wide an audience especially the older type managers which we are trying to attract. As regards the coding, we decided to go for PHP and Java as the languages for a number of reasons. Firstly the student completing the dissertation itself was form a business background so was unfamiliar with the strong side of coding which would be expected if coding with Java or ruby. Secondly, it was agreed these languages would be the best way forward for what was needed to done which was build a dynamic website which is easy to navigate around and does exactly what it is supposed to. It would also allow the student to build a website which could be proud of and could also have other functionality such as users being able to contact us directly from it. These and more are the sole reasons why this route was taken as it was. Here is one of the decision trees done for one of the areas :



The student then looked at different web host providers in which to store our website on-line and decided with www.ipage.com. The student decided on this web host provider as he found the process of uploading code and creating the website straight forward. Also there would be the advantage of having the website on-line 24/7 without having to worry about maintenance or other various problems with hosting a site. For a small fee, the student was given unlimited bandwidth among other bonuses, along with his own domain name on which he is able to host his website online in real time at www.cloudadopt.ipage.com.

Lastly was the issue of testing. It was agreed that the student himself would engage in internal and external testing which involved the following but will be described in more detail shortly. For internal testing, the student would test out his project and see if it operated as it should do, without any unforeseen problems. As regards the other testing, the student would gather a number of test subjects to test out his project where he would then analyse their results and make a conclusion from it all.

Chapter 5

Specification

For my dissertation the student decided that he would go and research firstly what areas there would be in the cloud for which there were the most benefits gained from adopting it. The student had decided this as there are various advantages to be gained from the cloud for different businesses but personally wanted to see what would benefit a SME the most as the dissertation is on how small and medium enterprises can adopt the cloud in various areas. Therefore the student would go onto to see which areas would suit them the best.

From there the student would then begin to fund out everything there is on these areas such as do you need to be experienced to use them, in some area how much do they cost, are business suitable for these areas based on certain criteria. The student would take into consideration that small and medium enterprises are as the name suggest, small and may not have much money to invest in the cloud services

Once the student has the areas figured out, he will begin to map out questions in relation to that area to ask the customer. Some of these questions will be from the SWIFT10 document which the student has been reading, while others will be questions which the student believes to be common sense questions based on what the student have learnt from throughout the year.

As the student is looking through the areas which he has picked, he will be looking at different areas from the SME's which may alter the outcome of the questionnaire

- Will be looking at the monetary requirements for each area.
- Will be looking at the infrastructure requirements which may show is a business can adopt or not.

- Will be looking at how a business may perceive the cloud and it's feelings towards it.
- Will be looking at how much of the service a business may need, this may change the outcome of their price range for some areas.

The reasons why the student will be looking at these factors vary. Firstly the monetary requirements is very straightforward, The student will be seeing what the usual budget of an SME is, the student will be doing this as the student will then be able to figure out what type of services they can then afford. Secondly the student will be looking at the infrastructure requirements of a business, the student will be looking at this as it will depend on a business adopting the cloud if they have this infrastructure or not. This will matter as a business which does not have the infrastructure in place for the type of service they want, such as full ownership of the servers etc, then it will not be feasible for them to adopt as it may be too costly. Thirdly the reason why the student will be looking at how a business perceives the cloud is very important, this will be because as of this moment, there is a lot of uncertainty with businesses regarding the cloud which is actually the main reason why businesses do not adopt the cloud. Some of these reasons may include concerns about the security of the cloud and privacy issues. Also another concern is mainly the fact that many businesses do not have a basic understanding of how the cloud works. This lastly is also an area the student will be looking at as regards to how much of a service, will a business be using. The student will be looking at this to figure out exactly how much would the average business be using in a service so the student can make the questionnaire as accurate as possible.

When the student is looking at the areas of the cloud itself which the student has picked to see how they may influence the questions asked and the outcome.

- Will be looking at the flexibility of the services.
- Will be looking at the price range and requirements of the services.

The student will be looking at these two areas, which are the flexibility and the price range of the businesses. The reason why the student is looking at the flexibility of the company is simply because these businesses may not cater for small businesses or their product range may be a disadvantage for many companies. By this it means that providers may only offer services which a SME would not be able to take full advantage of thus losing any advantage the cloud held. Also what is important is the second point; the student will be trying to find out if their prices are too high or if some middle ground can be found which may suit SME's. This is because some providers

only cater for personal users and big companies, SME's may find it hard in which to adopt over if they find it is not in their best interests.

The student plans on using all these areas so that the student can then achieve the aim of coming up with an accurate questionnaire which businesses will be able to depend on. The student plan on going into more detail later on but will be firstly writing out how the questions may work out and will then coding them so that they are accessible for everyone everywhere as the SWIFT10 document which is being used as a reference, while is very informative does not tell the user themselves if they need to cloud or not.

To finish up, once the coding is done and completed, the student plans on testing the application through two means which is testing it personally so that it does what it is meant to do and secondly having it tested by a number of selected test subjects who will then fill out a questionnaire from the results will be gathered. From these results, the student will be able to gauge if my project does as it is meant too and works flawlessly.

Chapter 6

Data Analysis

For this section, there were two main areas which we looked at which were the basis for our testing. The two types of testing were similar as they would both produce quantitative results to analyse but were different in that, there were different aspects being analysed and therefore they were still different tests. The first test was classed as an internal test. It is to be carried by the student himself and the main objective is to see how well the project itself is run, if there are any errors and mainly to see if the project does what its purpose entails it to do. The student completed the test on the project a total number of 3 times on different days just so he was sure of his results even if the results didn't change.

The second test was more important as it not only involved other subjects testing it out, its purpose was to gauge their response to the website as regards to if they liked it and so on. The test subjects would range from individuals with experience in the cloud, to individuals who owned a small business to lastly ordinary individuals. This was done on purpose to gauge different people with different mentalities thoughts of the project. The results as previously stated would be quantitative which would allow the student to then analyse the results and thus make a conclusion from said results. The questions would range from how easy they found it to navigate to how they perceive the questions.

6.1 Internal Testing

What will be shown now will be 3 different tests of the same kind so which was done on the project itself. What you will see will be a number of questions marked from a score of 10. The marking scheme will be as follows:

- 10 - Perfect score
- 5 - Average score
- 0 - Poor

6.1.1 Test 1

- Sex - M
- Age - 24
- Occupation - Masters Student
- What is the projects purpose - Full questionnaire for the user to use
- Mark the layout - 8
- Does the website have any spelling mistakes - 9
- Do the links on the website go to where they are meant to - 10
- Does the contact form work - 10
- Does the website cover all aspects of what it is supposed to - 8
- Does the website fulfil its purpose - 8...

6.1.2 Test 2

- Sex - M
- Age - 24
- Occupation - Masters Student
- What is the projects purpose - Full questionnaire for the user to use
- Mark the layout - 8
- Does the website have any spelling mistakes - 9
- Do the links on the website go to where they are meant to - 10
- Does the contact form work - 10
- Does the website cover all aspects of what it is supposed to - 8

- Does the website fulfil its purpose - 7

6.1.3 Test 3

- Sex - M
- Age - 24
- Occupation - Masters Student
- What is the projects purpose - Full questionnaire for the user to use
- Mark the layout - 7
- Does the website have any spelling mistakes - 10
- Do the links on the website go to where they are meant to - 10
- Does the contact form work - 10
- Does the website cover all aspects of what it is supposed to - 7
- Does the website fulfil its purpose - 9
- Mode : 5) - 8, 6) - 9, 7) - 10, 8) - 10, 9) - 8, 10) - 8.
- Mean : 5) - 8.8 , 6) - 9.3, 7) - 10, 8) - 10 , 9) - 7.3 , 10) - 8.
- Deviation : 5) - 2.5 , 6) - 1.3, 7) - 0.0, 8) - 0.0 , 9) - 2.4 , 10) - 1.5.

To put this all into context, this is a very good score. The mode is there to show which score was there the most in each section and as you can see from above, all the scores are 8 or higher. The mean shows that not only as the mode showed that the number where high, the mean also shows that the average of all the scores in each section themselves was higher than expected. The average score was between 7.3 and 10 which show for a good score. The deviation tells the same story, usually the deviation could jump as a result of a bad score but it shows that there was barely any difference in an of the scores in their respective fields.

6.2 External Testing

Next is the testing results done on the external test subjects. What follows will be the results of the test subjects and any extra comments a few may have made.

6.2.1 Test 1

- Sex : M
- Age : 23
- Occupation : Student
- What are your first impressions of the website : Looks nice, nice colors,
- Do you find it easy to navigate : Pretty much
- Could you find everything easy : Yes
- What would you rate the layout : 6
- Did you find any mistakes, 10 being none : 9
- What were your impressions of the questionnaire : 6
- Did you find what you wanted to : Yes
- Do you think the questionnaire fulfilled its purpose : Yes
- Do you think the questionnaire was informative : Very much so
- Do you think the areas covered were important : Yes
- Do you think you will be back again : Yes
- Any Comments : No

6.2.2 Test 2

- Sex : F
- Age : 22
- Occupation : Student
- What are your first impressions of the website : Nice layout, color could be brighter
- Do you find it easy to navigate : I found it very easy
- Could you find everything easy : Yes
- What would you rate the layout : 7

- Did you find any mistakes, 10 being none : 10
- What were your impressions of the questionnaire : 7
- Did you find what you wanted to : Yes
- Do you think the questionnaire fulfilled its purpose : Yes
- Do you think the questionnaire was informative : It was
- Do you think the areas covered were important : Yes
- Do you think you will be back again : Yes 15)
- Any Comments : No

6.2.3 Test 3

- Sex : M
- Age : 29
- Occupation : Student
- What are your first impressions of the website : No impression
- Do you find it easy to navigate : Yes
- Could you find everything easy : Yes
- What would you rate the layout : 8
- Did you find any mistakes, 10 being none : 10
- What were your impressions of the questionnaire : 7
- Did you find what you wanted to : No
- Do you think the questionnaire fulfilled its purpose : No
- Do you think the questionnaire was informative : Yes
- Do you think the areas covered were important : Mostly yes
- Do you think you will be back again : Yes
- Any Comments : Felt you could add more use cases

6.2.4 Test 4

- Sex : M
- Age : 18
- Occupation : Student
- What are your first impressions of the website : Looked neat and compact
- Do you find it easy to navigate : Found it easy
- Could you find everything easy : Yes
- What would you rate the layout : 7
- Did you find any mistakes, 10 being none : 9
- What were your impressions of the questionnaire : 8
- Did you find what you wanted to : Yes
- Do you think the questionnaire fulfilled its purpose : Yes
- Do you think the questionnaire was informative : Yes
- Do you think the areas covered were important : Yes
- Do you think you will be back again : Yes
- Any Comments : Enjoyed it

6.2.5 Test 5

- Sex : F
- Age : 21
- Occupation : Student
- What are your first impressions of the website : Looked ok
- Do you find it easy to navigate : Very much so
- Could you find everything easy : Yes
- What would you rate the layout : 6
- Did you find any mistakes, 10 being none : 8

- What were your impressions of the questionnaire : 9
- Did you find what you wanted to : Yes
- Do you think the questionnaire fulfilled its purpose : Yes
- Do you think the questionnaire was informative : Yes
- Do you think the areas covered were important : Mostly
- Do you think you will be back again : Yes
- Any Comments : No

6.2.6 Test 6

- Sex : M
- Age : 30
- Occupation : Worker
- What are your first impressions of the website : Looked slightly uneven
- Do you find it easy to navigate : I did
- Could you find everything easy : Yes i could
- What would you rate the layout : 6
- Did you find any mistakes, 10 being none : 10
- What were your impressions of the questionnaire : 7
- Did you find what you wanted to : Yes
- Do you think the questionnaire fulfilled its purpose : Yes
- Do you think the questionnaire was informative : Overall, yes
- Do you think the areas covered were important : Yes
- Do you think you will be back again : Yes
- Any Comments : Layout needs improvement

6.2.7 Test 7

- Sex : M
- Age : 25
- Occupation : Worker
- What are your first impressions of the website : Seemed professional
- Do you find it easy to navigate : Easy enough
- Could you find everything easy : Yes
- What would you rate the layout : 8
- Did you find any mistakes, 10 being none : 10
- What were your impressions of the questionnaire : 8
- Did you find what you wanted to : Yes
- Do you think the questionnaire fulfilled its purpose : Mostly yes
- Do you think the questionnaire was informative : Yes
- Do you think the areas covered were important : Yes
- Do you think you will be back again : Yes
- Any Comments : No

6.2.8 Test 8

- Sex : F
- Age : 25
- Occupation : Student
- What are your first impressions of the website : Looked nice
- Do you find it easy to navigate : Yes
- Could you find everything easy : Yes
- What would you rate the layout : 9
- Did you find any mistakes, 10 being none : 10

- What were your impressions of the questionnaire : 7
- Did you find what you wanted to : Sort of
- Do you think the questionnaire fulfilled its purpose : Yes
- Do you think the questionnaire was informative : Yes
- Do you think the areas covered were important : I think so
- Do you think you will be back again : Yes
- Any Comments : Questions could have been more deep

6.2.9 Test 9

- Sex : F
- Age : 26
- Occupation : Student
- What are your first impressions of the website : Had a professional look
- Do you find it easy to navigate : Yes very
- Could you find everything easy : Yes
- What would you rate the layout : 8
- Did you find any mistakes, 10 being none : 10
- What were your impressions of the questionnaire : 7
- Did you find what you wanted to : Yes
- Do you think the questionnaire fulfilled its purpose : Kind of
- Do you think the questionnaire was informative : Yes
- Do you think the areas covered were important : Mostly
- Do you think you will be back again : Yes
- Any Comments : No

6.2.10 Test 10

- Sex : M
- Age : 22
- Occupation : Student
- What are your first impressions of the website : Good
- Do you find it easy to navigate : Yes
- Could you find everything easy : Yes
- What would you rate the layout : 8
- Did you find any mistakes, 10 being none : 10
- What were your impressions of the questionnaire : 8
- Did you find what you wanted to : Yes
- Do you think the questionnaire fulfilled its purpose : Yes
- Do you think the questionnaire was informative : Yes
- Do you think the areas covered were important : Yes
- Do you think you will be back again : Yes
- Any Comments : No
- Mode : 7) - 8, 8) - 10, 9) - 7.
- Mean : 7) - 7.1, 8) - 9.6, 9) - 7.4.
- Deviation : 7) -4.5 , 8) - 2.7, 9) - 1.8.

The results of this was slightly poor then was hoped. Overall people were happy with the project but there seems that there are improvements to be made. Some were very happy with the layout while others were not satisfied and felt a change of colour could work. Some were in favour of the questionnaire but some were still not happy with it as they felt it could have had more depth in it, some felt that the more use cases should be explored which will be noted. That said, that was a portion of the subjects, the others were impressed for various reasons. The mean test shows that overall, again the test scored highly in terms of the layout, errors in the site and their impression of the questionnaire. The mean showed us that the layout on average scored just above average, there were barely any errors and lastly, the score for the questionnaire was

also above average. Deviation was also interesting as it showed the score didn't deviate much with regarding the errors and the questionnaire but was bit more unpredictable.

6.3 Final thoughts

After looking through these results and analysing them, it is fair to say that more use cases have to be looked at and explored as these results were slightly below expected, at best. Most had a very good score but now and again, the scores in the deviation and the mean made the cause to pause and think what can improve the project. In future, the student hopes to keep at the site, to add more use cases to it and have make it as much as an industry standard as is possible.

Chapter 7

Conclusions

From what has been read it is clear that a few things have been said and stated. Firstly as regards the question, it can be shown that the documents shown have in their own way been related back to the document by showing the different advantages there are in the different areas of adoption which have been explained. All the documents shown show that they have a general understanding of ways in which adopting the cloud in the areas described such as data back up and web hosting which have shown a positive result in terms of profits which can be made.. In relation to all the documents, they have all shown a joint understanding in the importance of the cloud and for the need for SME's in the right position to adopt. Where they tend to disagree or merely not be agreeing on is how much should a business adopt the cloud into its business. Some of the authors such as would agree on adopting the whole business over to the cloud as they see no disadvantage to it, while others take the more conservative approach by stating that a business should only adopt the cloud into areas that it is needed which many feel is the right and safe option. They all would also though agree as one as stated before that adopting the cloud is essential as it is very beneficial to a business if, importantly, used in the right way. The benefits for using this technology correct range greatly from improving profits, to making the IT work more efficiently, to freeing up resources which may have been used on the task locally to work on other important jobs in the business which overall in them proves that this is the way to go.

Lastly there of course so many other common ways in which to find out if you are suitable for the cloud. One of the best and most straight forward ways is to simply contact a provider or cloud broker who will then guide you in the right way to gain the most benefits for your company. On that note, not everyone is suitable for the cloud, this may be for various reason which include, the company is strong in all areas, they are too small to adopt the cloud or simply it is too costly as the beginning for them to

adopt the cloud. That said, many can adopt it and reap the benefits

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