An analysis of cloud computing for the homeworking environment, via case study of an international institute and a commercial organization.

A dissertation submitted in partial fulfillment of the requirements for the degree of Bachelor of Science.

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Declaration

I hereby declare that this dissertation entitled ‘An analysis of cloud computing for the homeworking environment, via case study of an international institute and a commercial organization’ is entirely my own work, and it has never been submitted nor is it currently being submitted for any other degree.

Ethics approval identification number: 201312016

Supervisor’s name: Dr Tom Crick

Candidate signature

Date
Abstract

Cloud computing has become a high profile technology, effecting change in both academic and industry by underpinning new research areas and innovation in practice as it provides a glimpse into the future architecture of IT. Homeworking is a growing trend in many organizations, being able to link these two can be extremely effective for organizations, although studies show that organizations are still foreign to the capabilities of cloud computing in the homeworking environment. This research explores the advantages and disadvantages of the use of cloud computing in the homeworking environment via case study of an international institute and a commercial organization.

This study will interview participants from 2 organizations that utilize cloud computing for the homeworking environment to gain an understanding from experienced individuals of a fairly new concept. This will allow for a strong analysis of cloud computing in the homeworking environment.

The aim is to establish the advantages and disadvantages of the use of cloud computing in the homeworking environment. The objectives set out are; To explore and analyze cloud computing in both the academia and business perspectives; To critically assess all the ways that this technology affects the business and academia sectors; To investigate the amount of research and development put in to cloud computing; To explore the homeworking environment and analyze the link with cloud computing. These objectives will require a mixture of qualitative and quantitative methods of research such as interviews, literature review, questionnaires and online research. A critical analysis of the findings will allow for a conclusion in order satisfy the research question. The initial expectations of this research would be that there is a future for cloud computing in the homeworking environment with a strong developed basis.
Acknowledgments

This dissertation would not have been possible without the guidance and support of Dr Tom Crick. I would also like to thank my mother and father for being patient with me and supportive of me during my early years. Finally I would like to dedicate this dissertation to my wife Saphia, she has been by my side throughout all the hard times.
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Chapter 1: Introduction

This chapter will set the scene for this research study, introducing the research aims and objectives, as well as an overview of cloud computing and homeworking. Finally, the dissertation structure will be presented, providing a brief description of each chapter.

1.0 Research Motivation

Cloud computing has become a high profile technology, effecting change in both academic and industry by underpinning new research areas and innovation in practice as it provides a glimpse into the future architecture of IT (Vaquero et al., 2009). Homeworking is a growing trend in many organizations (Walshe 2009); being able to link these two can be extremely effective for organizations, although studies show that organizations are still foreign to the capabilities of cloud computing in the homeworking environment (Connelly 2013, Miller 2008, Gray 2013). Therefore, an investigation that can shed light upon this area could prove valuable for organizations across a wide range of industry sectors to be better informed with regards to their future developments.

1.1 Cloud computing background

Cloud computing is not an actual physical technology, but in fact a model of provision and marketing IT services that meet certain characteristics. This is, in part, where cloud computing is misunderstood (Cueli 2010). Palmer 2013 also suggests that the cloud can be seen as a “trendy” buzzword, and in fact should be replaced by “somebody else’s computer” in order for staff to fully understand the implications (especially with respect to data security) of cloud computing.

Cloud computing characteristics are as follows

- **Shared infrastructure.** This is a combination of interlinked services. This therefore enables rapid service employment through self-service interfaces, therefore eliminating the need to wait for the equipment to be delivered before the services can be constructed (Wang et al., 2011). As described by Rouse 2010, shared infrastructure, also known as Infrastructure as a Service (IaaS) also sometimes referred to as Hardware as a Service (HaaS), this is a provision model in which an organization outsources the equipment used to support operations, including storage, hardware, servers and networking components. The service provider owns the equipment and is responsible for housing, running and maintaining it. Another form of shared infrastructure, in particular the more self-service interfaces for construction section of shared infrastructure is also known as Platform as a Service (PaaS). This provides an environment for developing and running applications. Authentication and authorization, session management and metadata are also part of this service (Roebuck 2011).

- **Accessibility and software use.** The private and public sectors of cloud computing is an example of accessibility and software use. The public cloud offers services to any customers over the Internet, whereas the private cloud offers services to a predefined group of customers (Smoot et al., 2012). The services offered are known as Software as a Service (SaaS). This is the most
advanced and complex characteristic of the cloud. The software services
provide functionalities that solve user problems, whether it is an
individual or an employee of a company (Jamsa 2013). Business
intelligence, web conference, e-mail, office automation suites such
as office 365 and sales force automation are all examples of SaaS
(Hatch 2008).

- **Scalable services.** The scalability refers to the services being
  offered in an organization can be anything, there is no restriction
  depending on the number of users or amount of data (Gillam al
  2010). This characteristic entitles a business to easily upscale or
downscaled their IT requirements as and when required (Van der
Molen 2010). An example is Amazon Web Services1 (such
as their Amazon Elastic Compute Cloud "EC2"), allowing it to be able
to scale its services dependent on the demand. In specific cloud
computing allows for quick and easy allocation of resources in a
monitored environment where overloading is never a concern as long
as the system is managed properly (Hill 2011). This leads on to the
flexibility that is incorporated with cloud computing. The ability to
simultaneously share documents and other files over the Internet,
many organizations are now implementing a “bring your own
device” (BYOD) policy, this way employees can access company
information using their mobile device, allowing them to be more
flexible and responsive to their work (Keyes 2013).

- **Cost.** Instead of paying the fixed costs of a service to handle
  peak usage, the cost is variable as a per unit consumption basis
  that is measured in time periods that can vary, such as hour or
  month (Sosinsky 2010). This is a very important characteristic
especially for organizations as it eliminates opportunities for
overspending or wastage, as all that will need to be paid is
what is used by the organization, an example of this is the company
Intercontinental, that introduced cloud computing during 2010 in order
to link all of its hotels around the world on to one system, therefore
meaning one cost for everything (Smith 2014).

1.2 Homeworking Background

Homeworkers are defined by the International Labor Organization as “people
working from their homes or from other premises of their choosing other than the
workplace, for payment, which results of a product or service specified by the
employer.” (Rossi al. 2009). Since 2007 the homeworking theme has grown
with increased communication technology, as well as changes in supply chains
(Huws 2009). Homeworkers differ from entrepreneurs, or self employed or family
business, in that they are hired by companies for specific activities or services to be done
from their homes (Jewson 2002). Homeworkers do not own or operate the business they
work for (Wright 2008). It has been noted that there is a significant body of highly
skilled homeworkers, particularly in IT and related sectors (Warman 2012).

1 http://aws.amazon.com/
2 http://aws.amazon.com/ec2/
1.3 Research Aim and objectives

1.3.0 Research aim

- To establish the advantages and disadvantages of cloud computing for the homeworking environment.

1.3.1 Research objectives

1. To explore and analyze cloud computing in both the academia and business perspectives.

2. To critically assess all the ways that this technology affects the business and academia sectors.

3. To investigate the amount of research and development put in to cloud computing

4. To explore the homeworking environment and analyze the link with cloud computing.

1.3.2 Research Question

- An analysis of cloud computing for the homeworking environment, via case study of an international institute and a commercial organization.

1.4 Dissertation structure

In order to be able to answer the research question mentioned, six main chapters have been developed. Below is a brief description of the contents of each chapter.

Chapter 1: Introduction

This chapter provides a brief introduction to the research topic and presents a background on cloud computing and the homeworking environment. This chapter also presents the research question, aim and objectives as well as the structure in order to achieve them.

Chapter 2: Literature review

This chapter critically discusses the essential theory applied throughout this work. The two main topics are discussed: Cloud computing and homeworking environment. A summary is then provided in order to gain the critical analysis of the theory.

Chapter 3: Methodology

This chapter discusses the used methodology, the research hypothesis and the data collection process.
Chapter 4: Findings

This chapter presents the findings from the primary research using the questionnaires and interview methods.

Chapter 5: Discussion

This chapter discusses the data analysis of the main findings (primary research) against the literature review (secondary research) in order to satisfy the objectives.

Chapter 6: Conclusion

This is the last chapter and it presents an overall conclusion of this study and how the aim and objectives were achieved. Furthermore the studies limitations and future research ideas are presented.
Chapter 2: Literature Review

2.0 Introduction

This chapter will provide an overview of the secondary research. This consists of researching and summarizing the key domain knowledge, concerning cloud computing and homeworking, to give context to the chosen research topic. Finally the literature review will also include a summary of the research on this particular topic that has been published.

2.1 Cloud computing

Cloud computing has been defined as a model of provision and marketing IT services that meet certain characteristics (Cueli 2010) in the introduction. Furthermore the basics of cloud computing is computing that involves a large number of computers connected through a network, distributing the ability to run a program or application on many connected computers at the same time (Youssef et al. 2008). It has been noted that the term “the cloud” is a metaphor for the Internet (Shelton 2013), the literature review found that the majority of the definitions for cloud computing had mentioned the parallel use of the Internet (Buyya et al. 2008, Youssef et al. 2008, Shelton 2013).

There is a significant body of research focusing on the services and characteristics of cloud computing (Buyya et al. 2008), (Wang et al 2011). (Wang et al 2011) indicates that there is a growing dependency for cloud computing, as they go further addressing the technical aspects of using cloud computing, exploring the cultural and social challenges, showing that all people are depending on the cloud computing services more and more in one way or another, be it at work or socializing or even using for services. (Youssef et al. 2008) focus on the services and characteristics and how they can be developed to benefit the future of IT as a whole. (Jamsa 2013) presents real world examples in order to show how cloud computing is being used to make lives easier. An example given is of the fact that there are features such as automatic backup and being able to access information at all times no matter where you are, providing a better understanding of the advantages. The practices for developing and implementing cloud computing has also been covered by (Beard 2008), he provides examples and models in order to understand the development and implementation stages of cloud computing. It is noted that security is a major challenge in the development and implementation stages. (Tsai et al. 2010) focuses on the cloud computing architecture that gives volume to the research on a technical basis. There are also many research papers on business models associated with cloud computing such as (Weinhardt et al. 2009, Shelton 2013, Weinman 2012). The results of the business models shows rapid growth when cloud computing is implemented. This is relevant to the research as it proves that cloud computing is advantageous in a business sense when providing a consideration for organizations.

BYOD has been introduced in Chapter 1. BYOD refers to the policy of permitting employees to bring personally owned mobile devices to their workplace, and to use the device to access privileged company information and applications. This also extends to students using personally owned devices accessing privileged university information and applications. In (Hayes 2013) recent trend report he states the general consensus is that BYOD is coming, so it’s inevitable that all companies will have to
establish a BYOD program. For this to be stated in a trend report, it goes to show that BYOD is performing well with the users both employers and employees.

2.1.0 Security

While privacy and security of cloud computing was not a research objective, it is clearly a vital factor when considering cloud computing. Morgens et al. 2008 raised questions about the privacy and security of cloud computing that organizations are oblivious to. Lekkas et al. 2012, Shaikh et al. 2011 highlighted security threats and addressing the cloud computing security issues, these references show that organizations are oblivious to security and privacy challenges that come with cloud computing. Jensen et al. 2009 provides a more technical perspective going in to depth as far as including algorithms and coding about the security and privacy options cloud computing has. This is important as it allows the organizations to gain a technical understanding of how these challenges can be tackled. Catteddu et al. 2010 put forward a risk assessment and make some recommendations for cloud computing. They highlight that the information security risk is a key issue and propose that this is the biggest challenge facing cloud computing. In terms of focus on uses of cloud computing in the academia side, Sultan 2010 stated, “cloud computing for education is a new dawn.” His paper goes on to explain that in result of the recent global financial crisis, educational establishments are going to be effected financially, the paper argues that cloud computing is likely to be sought after by “cash-strapped” educational establishments, and it could prove to be of immense benefit due to the flexibility and pay per unit consumption system.

Microsoft’s Azure platform is an operating system for cloud computing is a good example that is being used by educational establishments (Jennings 2010). Azure was designed to facilitate the management of scalable web applications over the Internet. The hosting and management environment is maintained at Microsoft data centers therefore, the educational establishments pay a single monthly charge of using the service (Rouse 2009).

2.2 Homeworking

There are approximately 300 million homeworkers across the world (Powell 2009). This was stated 5 years ago, however it has been noted that the number of people working from home has increased by 13% in the last five years (Flaxton 2013). This however can not be completely verified as there are many instances where homeworkers purposefully do not register themselves as doing so in order to avoid charges such as tax, other reasons are that some positions don’t classify themselves as homeworkers however they do work from home (Eyck 2013), an example of this would be academics, who in cases do not necessarily need to be at the university in order to complete their tasks (Vassie 2004). (Boris et al 2006) suggest that convenience is a key factor why people choose to work from home. Whether the employee is unable to commute due to a disability or distance from work, or whether the employee has dependents that having that choice of working from home gives them the flexibility to work as well as take care of their dependents (Jewson 2002). (Read 2004) states that UK workers waste over 4.5 million hours per day in commuting, this shows that an employee could be a lot more efficient with time if the provision to work at home is available. Read had stated this in 2004, 10 years later.

3 https://www.windowsazure.com/
this may have changed, regarding the commuting procedures, faster transport facilities, however the key factor is that there is time being wasted for the fact that employees travel to work.

(Felstead et al. 2010) suggests that working at home is the future of work for many people in the UK; their paper examines this claim by analyzing data from the labour force survey as well as taking in to account the extent and growth of the communication technology that has become more and more vital for homeworking. An important sector that must be noted in this research is the health and safety assessment for homeworking, (Vassie 2003) agrees with this factor. (Vassie 2003) took data gathered from a wide variety of companies that use homeworking and analyzed it, in order to understand whether health and safety provisions are kept to a high standard with homeworkers. Her findings showed that in most cases health and safety was of a high standard however in cases of self-employed status or grey areas where the employees role is not clearly defined as homeworking, health and safety provisions are non existent. (Wolkowitz 2007) suggests that the barriers to increased homeworking are cultural and not to do with lack of technology. (Powell 2009) states that it appears that senior managers haven’t yet bought into the idea that work is a thing that you do, not a place that you go to. However there is a counter argument from (Verlag 2011) that concludes strong evidence that work satisfaction, efficiency and social interaction are considerably higher working at the company rather than working from home.

2.3 Literature summary:

The literature review has found that many authors have discussed cloud computing services and characteristics, there was strong focus on the demand for cloud computing in general as well as the general speculation for what the future brings for cloud computing. What have been explored in more depth are the security risks and challenges that are facing cloud computing. In the literature there is some consensus emphasizing the potential for cloud computing, especially because organizations are seeking to cut costs due to the financial crisis (Nicoletti 2013, Chorafas 2011). (Sultan 2010) states cloud computing is very cost effective. Homeworking is perceived by some who view that work as a place “to go to” and not “a thing to do” (Beaurefard et al. 2013). Literature evidences significant research that examines the feasibility and risk assessment regarding homeworking environment. However, there is some opinion that homeworking is still evolving as some organizations have yet to embrace this idea despite the perception that it can be cost effective and more efficient for them (Chorafas 2011). It is important to keep in mind two key factors: firstly, the security and privacy challenges facing cloud computing, these are very important factors for the future of cloud computing. Secondly the health and safety issues regarding homeworking, which has not been implemented in certain circumstances. These two factors will be kept in mind when carrying out the interviews and questionnaires, in order to verify whether these factors are being taken seriously and what provisions are set in place in order to ensure this. It is noted however from this literature review is that there a lack of research that examines both cloud computing and homeworking. Research on homeworking acknowledges that homeworking in general requires strong communication technology and, on the other hand authors researching cloud computing also acknowledge that the one big advantage for this is that it allows staff members to be more flexible with their location and can work from anywhere in the world in order to complete their task. In the context of the merging of both homeworking and cloud computing there is not a significant amount of research
published. Consequently the aim of this study is to focus on discuss cloud computing specifically relevant to homeworking. For example, in the homeworking environment, this in turn will allow organizations and the general public to gain a more tangible understanding of cloud computing and therefore be able to embrace it or may learn to understand that it is not the way forward, but at least be able to make a more informed analysis as they will have more specific studies to work with.
Chapter 3: Methodology

3.0 Introduction

This chapter is a guide to the research procedure used to collect the data, in turn fulfilling the objectives set out. As (Marais 2006) defines methodology, to be a study of the research process in all its breadth and complexity. My research will involve a mixture of quantitative and qualitative methods. (Mujis 2011) defines quantitative research as ‘Explaining phenomena by collecting numerical data that are analyzed using mathematically based methods (statistics)’. Adding Qualitative research which is ‘multi method in focus, involving an interpretive, naturalistic approach to its subject matter. Qualitative research involves the studied use and collection of a variety of empirical materials – case study, personal experience, introspective, life story, interview, observational, historical, interactional and visual texts- that describes routine and problematic moments and meaning in individuals lives’ (Neergaard et al. 2007).

3.1.0 Research question

An analysis of cloud computing for the homeworking environment, via case study of an international institute and a commercial organization. The research question is based upon the use of Cloud computing in the homeworking environment.

3.1.1 Research approach

The research approach is a mixture of qualitative and quantitative methods. The quantitative research will allow for a general understanding and may also highlight key factors to understand further. The qualitative research will take the results from the quantitative and investigate further to gain a full understanding. (Mujis 2011) defines quantitative research as ‘Explaining phenomena by collecting numerical data that are analyzed using mathematically based methods (statistics)’, this includes questionnaires used to obtain primary data at a foundation level, this is key to understand what software is used within the environments and how useful it is in order to do the job. The qualitative approach, which is ‘multi method in focus, involving an interpretive and naturalistic approach to its subject matter’ (Neergaard et al. 2007). This involves the studied use and collection of a variety of empirical materials – case study, personal experience, introspective, life story, interview, and observational, historical, interactional and visual texts. This is used to open avenues for further investigations as well as highlight the advantages or disadvantages of using this technology.

3.1.2 Research type

The type of research intended is a mixture. Descriptive research allows for an understanding of cloud computing in a more in depth manner. Comparative research, will be applied to identify the differences and similarities between the homeworking environment and the in office working environment, this will help in developing an understanding of the advantages and disadvantages of cloud computing in the homeworking environment. Finally an evaluative type of research will take the information gathered from the previous types of research and examine it in order to reach an evaluation, this will allow for an appropriate analysis of cloud computing in the homeworking environment. This final type of research works best when it is highly structured so that judgment can be precise and clear.
The research strategy takes the main data collection sources (interviews, diary, questionnaires and case studies) to prove or disprove the theory and explain the outcome. If for example the theory suggests that homeworkers use cloud computing as a backbone to their environment, questionnaires and interviews would be used to conclude this theory as well as state ‘why’. An example of the questionnaire and interview can be found in appendix 1 and 2.

3.1.3 Time horizon

Time horizon focuses on the technology in present, however there will be an investigation as to the history of this technology as it will allow for a comparison to be drawn up to be able to emphasise either the advantages or disadvantages of this technology in the homeworking environment. In addition the research could lead to looking into the future of the homeworking environment as well.

3.2 Data collection methodology

Data collection involves interviews, diaries, case studies and questionnaires. The questionnaires would give the basic level evaluation of cloud computing’s use in homeworking, however the interview gives a further in depth understanding of the data from the questionnaires, therefore coupling these two methods. Research data is collected from a wide scope of viewpoints within the organization and institute, all of whom are involved with the use of cloud computing. A consideration will have to be taken due to the variety of uses for the individuals for both the organization and institute. As a previous employee of both the organization and institute, there is access to many personal contacts however in order to avoid bias, questionnaires and interviews will be taken by members who are not on a personal contact level.

The data collection is carried out on four levels; each level goes in to more detail. The starting point would be to identify the basic pattern and then the levels progress to give an explanation to the identification of the pattern. This allows for the research to be thorough, this it will allow for a strong analysis.

The research levels are the following:

1. Study of literature
   This is used to set the foundation in which more specific research could be used for the investigation.
2. Questionnaires
   Using the findings in level 1 to shape the direction of the questions to pursue certain aspects discovered from level 1.
3. Interviews
   Taking levels 1 and 2 further in gaining more in depth answers to the questions.
4. Diary Entry
   Combining all previous levels allowing an opportunity to further investigate any patterns and themes that could have emerged through the progression of the research.
3.3.0 Sampling strategy

The target audience will need to be considered initially, the general employees who use cloud computing for their work and the technicians and engineers who implement and maintain the technology are the target audience. As theory suggests the most valuable data is with the more senior employees and users due to the many years of experience shared (Gunson 2010). Questionnaires are more suited to the employees who generally use the technology for their work, whereas the interviews are more suitable for the technicians and engineers behind the technology in the organization and institute. This is based upon the assumption that technicians and engineers will be able to give a more in depth detailed answer to my questions, as well as be able to answer the more technical questions.

3.3.1 Questionnaire sampling strategy

The questionnaires sampling strategy was non-probability, cluster random and snowball, this is because it would be most useful to gain a range of views from those of different backgrounds to fully understand cloud computing in the homeworking environment and all the aspects around this topic. The procedure consisted of being on site at the organization as well as the institute and kindly asking people to fill in the questionnaire. Questionnaires will also be sent to homeworkers as well as their friend and family to get a wide scope of the technologies impact.

3.3.2 Interview sampling strategy

The interviews sampling strategy is purposive and self-selection, this is because the interviews are more specific questions, therefore the interviewees have to be from this specific sector in order to gain an in depth analysis and understanding from their experience. Structured interviews will be conducted with two of self-selected members of the ICT departments of each the institute and the organization. Another two members of employees who had filled out the questionnaires will also be invited to an interview in order to get a more detailed understanding. It is very important to be aware of the impact of different research procedures on the result. Interviews are more likely to open avenues for additional information and produce more detailed responses than basic questionnaires.

3.3.3 Research participants

All research subject samples are either from the UK working for Tesco or members of the European University Institute. The key factor for having an international institute allows exploration to the nature of international use of this technology, examining how teams work with it and just how vital it is in order to complete tasks for the organization.

3.4 Data analysis procedure

As the research consisted of qualitative and quantitative methods, the questionnaire and interview answers will be categorized in to themes and sub themes then organized into mind maps. The maps would then provide a clear way of viewing the data, which

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4 EU funded institute located in Florence Italy, Diverse post graduate students, home to many high profile conferences.
will then allow for the highlighting the need for any further research. Categorization will occur when patterns emerge from the data. Recognizing the patterns and explanations for them allows a valid conclusion to be drawn.

3.5 Budgetary constraints

As an individual, of who has a limited budget, is conducting the research data collection procedures and data analysis won’t be done in a perfect manner (Bryman 2007). Data collection and analysis might be inferior to professional market standards but the researcher will ensure that the quality of the research is as high as possible, given the resources available.

3.6 Legal and ethical constraints

Due to the nature of the research, information will need to be collected from people currently actively involved with the organization. Some questions may be sensitive to particular individuals and therefore an ethical approach will need to be used (Saunders et al. 2010). Ethics is defined as “manners and customs, which form the laws of human action and give a character to human life” (John Clark Murray 1891). As a result information should be confidential as per the ethics procedure. An ethics form has been submitted (Appendix 4) to the committee who has given approval for the research to be implemented. The ethics procedure states that there is a manner and custom in going about the research as well as how data will be obtained. These factors may have an effect on the amount of data collected, as some participants will not be willing to give in depth information.

3.7 Time constraints

Time is limited; therefore data collection will be conducted during a set period for time. As a result, some interviewees may be unable to communicate data when convenient for the researcher and therefore the number of people able to contribute is limited. Due to the limited time frame, the data collection and analysis process is restricted, increasing the risk of human error (Saunders et al. 2010).

3.8 Chapter summary

The methodology has discussed the research strategy. Questionnaires and interviews have been identified to be the methods of primary research, the sampling strategies have been acknowledged. The data analysis strategy and constraints have also been discussed in this chapter. In Chapter 4, we will present the findings from the primary research designed in the methodology.
Chapter 4: Findings

4.0 Introduction

This chapter aims to present the results and findings from the research provided for the case study. The questionnaire results will be presented; thereafter the interview results will be presented. As discussed in Chapter 3, two primary research approaches were used to collect data for this case study: a questionnaire and interviews (see Appendix 1 and 2). This chapter will allow for a good understanding of the primary research in order to lead on to the next chapter for discussion.

4.0.1 Questionnaire

The number of respondents to the questionnaire was 69, from Italy and the UK, all from organizations that use cloud computing. The intended role of the questionnaires was to lay the groundwork for the interviews. The interviews are the main source to ensure the objectives are covered well in order to get a full understanding from the interviewees in order to be able to discuss the findings with the literature reviewed and finally provide a consideration for the future use of cloud computing for the homeworking environment.

4.0.2 Interviews

Interviews were conducted to achieve a more in depth investigation in to the logistics and the uses of cloud computing within organizations. In total, four semi-structured interviews were conducted, with two interviewees from a commercial organization and two interviewees from an international academic institute in Italy. Two interviews were face to face, one interview online via Skype and one telephone interview. The interviews were not recorded because it has been noted in the literature review (section 2.3) that by recording interviews, some interviewees may be nervous of being recorded, which may spoil their performance in the interview. Notes were taken during the interviews.

The first Interviewee (I1) is a customer service manager from Tesco stores limited. The second Interviewee (I2) is an IT manager in the same commercial organization. The third interviewee (I3) is a professor/tutor at the European university institute. The fourth interviewee (I4) is the IT operations manager at the European university institute. All interviewees work with cloud computing, and have experience in the homeworking environment. For example working in the homeworking environment, or experience behind the logistical setup for an organization, such as establishing a homeworking environment.

Respondents and interviewees contributed answers and substantial information that helped draw a reliable and valid conclusion. This collated information corresponds to the topics mentioned within the literature review. The information and results of each the questionnaires and interviews were conducted with the aim of ascertaining benefits and drawbacks of cloud computing for the homeworking environment in order to provide an informed consideration for the future use.
4.1 Questionnaire results:

Q1. What is the size of your organization?

![Size of participant's organizations](image)

*Figure 1: Size of participant’s organizations*

The figure above shows the size of the participated organizations. The figure shows that 45% of the participating organizations are in the over 200 employees range.

Q2. Which of the following describes the industry of your organization?

![Number of employees in industry](image)

*Figure 2: Number of employees in industry*

The offered statistics establish that most participants were from an IT or Educational organization.
Q3. Do you work from home? If so choose from the following reasons as to why.

33% (23) of the participants work from home. The majority of the participants do not work from home. It is however important to note at this point that some of the participants may not be clear as to whether their position is classed as a homeworker or not, this is because a participant in the industry of education has not classed themselves as a homeworker when they are officially classed as a homeworker. The second part of the question has been presented in figure 5 below.

![Figure 3: Participants reason for working from home](image)

The data clearly shows that the convenience reason is the main decider for employees to opt for the homeworking environment.

Q4. Is cloud computing user friendly in your organization?

48% (33) of the participants agree that cloud computing is user friendly in their organization. A slight majority however is not finding the cloud computing services in their organization as user-friendly. This is not what was expected, and will be noted and flagged up when conducting the interviews in order to further grasp this.

Q5. Do you find you are more flexible with cloud computing?

It was found that 75% (52) of participants find that they are more flexible with cloud computing. This is an important question as the purpose was to understand whether the advantage of flexibility that was stated in much of the literature review was true.

Q6. Do you experience any technical issues with cloud computing? If so briefly explain.

It was discovered that 94% (65) of the participants had experienced technical issues whilst using cloud computing. This will also be noted for a follow up in the interview section, in order to gain a further understanding of why there was a large common response with regards to technical issues from all participants.

The second part of the question asking the participants to briefly explain the nature of the technical issues has highlighted a certain trend, showing that the technical issues
are very similar across the board. The main response that over 90% of the participants who answered “yes” had given regards to the explanation was that the systems would have a major “lag”, and in many occasions freezes up and will need a complete system restart. Other commonly used words in order to explain the technical issues were the frequent loss of data when logging in to the cloud computing systems from the homeworking environment. There was also recording that it would be common for frequent loss of connection to the server when using the cloud computing systems. The participants described these technical issues as a major inconvenience to their workflow. Many of the participants used words such as “frustrating”, “challenging” and “unsatisfying” when it came to explaining the technical issues. This shows that the employee satisfaction would be reduced because of the technical issues that occur from the cloud computing systems. In the case of two of the participants it has driven them to question whether they would go back to working in the office in order to avoid using the cloud computing systems altogether.

Figure 4: Comparison of user-friendly and technical issues.

Figure 5 shows the results from Question 4 (green) regarding the user friendliness of cloud computing and Question 6 (blue) regarding the technical issues. Participants had suggested that the reason why participants answered “no” regarding the user-friendliness of cloud computing in their organization is because of the frequency of the technical issues. The purpose for presenting both results on a chart allows for the researcher to see the correlation between the two more clearly, in order to verify the participant’s suggestions. The comparison does show that there is a correlation as more participants had answered no to whether cloud computing is user-friendly as well as more participants answered regarding there being technical issues related to cloud computing.

Q7. Do you feel you have an advantage over other organizations that do not have cloud computing?

The results demonstrate that 87% (60) of participants feel they have an advantage over organizations that do not have cloud-computing systems. The purpose of this question is verify a theory that was presented in the literature review that the idea of organization having cloud computing systems for an employee is appealing as it
shows the organization is up to date, as well as allowing its employees more flexibility to do their job well.

**Q8. Do you prefer having a BYOD policy in your organization?**

The results show that 77% (53) of participants prefer having a BYOD policy in their organization. The purpose of this question is to gather a further understanding of whether employees want BYOD or not.

**4.2 Interview Results:**

**Q1 Have there been any obvious differences in the past before cloud computing was introduced to the organization?**

All four acknowledged that there were major differences. I1 and I2 both come from a commercial organization, they have both been working for more than ten years in the organization. I3 and I4 both come from an international academic institute, they both have been with the institute at least fifteen years.

I2 stated:

“There have been major differences, before cloud computing, staff members were not able to take work with them to business trips. Communication between offices around the world was very difficult as files too big for email had to be sent via courier so, they would not get them quick enough. Cloud computing has allowed eliminated all these issues.”

I1 explained that, there were no positions for homeworking before cloud computing was introduced. I1 went on to explain that without cloud computing it was difficult to communicate with staff members who were not in the office over time sensitive tasks. However, now that cloud computing is available, they are able to locate and communicate with a staff member at any time whether it is their day off or not. Contacting staff outside their working hours, although an interesting issue, is not within the scope of this study. This participant further explained that this allows staff members to be more flexible and actually be able to take their entitled time off without the worry of having to fill their position with a temporary staff member as if it is an emergency that staff member is still contactable with the cloud computing systems.

I2 also explained that before cloud computing was introduced to the organization, there was a cap on how many employees could be working at one time due to the amount of space and equipment available. Now that cloud computing has been introduced, the amount of employees working at one time is limitless, as there can be employees working away from the office. This eliminates barriers such as space and limited equipment. I2 does state that there has been a substantial demand on the IT services ever since the cloud computing systems were introduced, especially from employees who needed to learn on how to use it and be efficient with it. I2 goes on to explain that there is not enough training given to the users of the system for them to be able to achieve a grasp on the systems.

I3 has also noted a clear difference since cloud computing has been implemented in the organization. I3 explains that his job role requires him to travel around the world frequently. Thus he requires constant access to his systems and documents that are in
his office. Cloud computing has allowed him to only need to travel with his laptop as opposed to needing a suitcase full of documents and books. Therefore I3 has experienced the full advantage of the convenience cloud computing has given him for his job role. I4 has also expressed the same points as I2 but went further to explain that it has been a challenge to keep up with the demand required by the users after knowing what they can do with the cloud computing systems. This fact certainly shows the demand from the employees to use the cloud computing systems to make their job roles easier in the academia field.

Q2 If you were present when the cloud computing was being introduced to the organization, what were the logistics, did the users welcome it? Explain.

This question is targeted at I2 and I4 due to their position in the organization however I1 and I3 did state that the users did not welcome the change, as they were “afraid of the unknown” and could not imagine what this would contribute to their day to day working lives. They did also state that on the logistical side there was not much training provided in the early stages, so most of the employees had to learn through “trial and error”.

I4 stated:

“Cloud computing was unknown when introduced, therefore many people were not happy with it. What made it worse was the fact that there were many ‘teething’ problems in the first couple of years, users lost trust in cloud computing. However now this has changed, users cant function without it.”

I2 and I4 had advised that the logistics of setting the cloud computing systems up were very unstructured, I2 states “it was a new thing for all of us” and therefore they did not have any policies or process in hand on how to tackle setting the systems up. The major work on creating the systems and setting them up in the case of both organizations was outsourced to other companies; the IT departments only received the new systems and the user manuals. The commercial business outsourced to Cisco and BT in order to set up their cloud computing systems and in the case of the international academic institute they had outsourced this task to Cisco. When the outsourced companies created the systems, a team of representatives from the outsourced companies had accompanied the new systems in order to help implement them and train the IT departments in the organizations. I2 and I4 also acknowledged the resistance by the users to the introduction of the cloud computing systems.

Q3 and Q4. What are the main advantages and disadvantages of this technology being introduced to the organization? Explain.

All interviewees have noted how cloud computing systems has allowed the organization to be that much more flexible. I2 has gone further to explain that with the cloud computing systems, the organization is able to recruit staff members for a short period of time in order to prepare for the peak times such as Christmas and summer holidays with out the worry of physically expanding the floor space. This is mainly because certain staff members can work from home using cloud-computing systems through the BYOD policy, which in turn makes space at the offices. I1 has also acknowledged this but has included that this procedure is beneficial for both the organization and the employee in question, as they are able to stay at home with their dependents during the peak times such as school holidays. I3 has also expressed how
flexible the cloud computing systems allows him to be as an employee. He provided an example: as he travels regularly to other countries as part of his research, having a system such as cloud computing allows him to be utilizing the travel time to be able to ensure he is in contact with the institute, marking work and updating documents that can be published instantly, without the need for anyone to wait until he gets back. This allows him to stay away from the institute building for as long as six months at a time without being out of touch. He has stated that on many occasions this has saved the institute a lot of money as they do not need to keep spending on tickets for travel and instead he goes from one place to another without the need to return first.

The IT specialists I2 and I4 have both indicated the advantage of the cost aspect.

I4 states:

“The setup costs have not been relatively high in comparison to the setup cost of producing the bespoke software, purchasing licenses for each machine and installing them. There are also costs for maintenance on both the software and hardware. However, now maintenance costs have been eliminated because we are using cloud computing systems and therefore we pay a yearly rate that includes all maintenance and updating”.

I2 has highlighted the BYOD policy implemented in his organization, advising how useful it has been to the organization and also more specifically to the IT department. This is because users now use their own devices to access the cloud systems, and therefore will not need training, maintenance or updating on the organization systems. The only thing that has been noticed by I2 is that users are continuously accessing insecure files and sites with their own devices that could threaten the security of the organizations private information.

However I2 states

“Security of the cloud systems is something we are investing both time and money in to heavily with our cloud computing service provider in order to tackle it”

I1 has mentioned the user friendliness of the cloud computing systems, stating, “It is easy to get the hang of it all, fairly quickly”. After this point was made, the results of question 4 were highlighted to the interviewee stating that over 50% of the participants believed that the cloud computing systems were not user-friendly. I1 went on to explain that the majority of the users are fairly new to cloud computing and therefore would feel that the systems are not user-friendly, however the truth behind this feeling is the fact that they “don’t know” how to use the systems. Both IT specialists I2 and I4 have also expressed how user friendly the systems are in comparison to what was available before in their organization. However they did add that there still needed to be more training in understanding how cloud computing works for the staff members in order for them to get a good grasp over the concept.

All four interviewees agreed to the same disadvantages. The system being very slow was one that was noticed by all participants, as well as the unreliability. I1 has noted that on one occasion when he had a customer on the telephone, checking their account for them on the system, the system decided to restart and close down the account. This prompted I1 to have to request I1s details again in order to access the account again.
I1 stated:

“This is not good customer service, keeping the customer waiting on the phone while restarting the system and having to go through the process of bringing up the account again, in cases like these we are not able to do our job to the highest quality.”

The IT specialists have also noticed the increase in frustration by staff members due to the “technical glitches” that happen on a regular basis. This has prompted many of the users to complain to the IT department advising the lack of reliability of the system in order for them to complete their job. The IT specialists both blame the fact that cloud computing systems are in their early stage of development, therefore these “technical glitches” will be ironed out over the time these systems get developed. Question nine goes further in asking what the consequences from the technical issues are, I2 and I4 both have advised that the repairs are from the third party companies as it is part of their contract to keep the systems maintained and updated, therefore there are no costs incurred on behalf of the organizations however they have highlighted the fact that there is a considerable financial loss, as when systems are down, staff members are still being paid for effectively not working. Additionally there is also a loss of customers with regards to the commercial organization as customers feel they are not getting a “reliable” service, therefore lose trust in the organization.

Q5. If the cloud computing were not introduced to the organization would you be able to grow as much as you have with it? Explain.

I2 clearly expressed that this would not be possible, as physically it would be costly in order to expand the floor space to house all new staff members.

I2 stated:

“Many organizations are beginning to implement cloud computing in some way or another. Therefore if we as an organization didn’t implement it, by now we would have lost our competitive edge, would not be able to expand as much as we have and finally it would be very difficult to reach out to international communities as we have.”

I4 also expressed the same opinions about the institute, he adds that the institute would not be able to expand to other countries, allowing representatives of the institute to work in other countries so easily without the cloud computing systems, and therefore it has in fact opened up many doors for the organization as a whole allowing it to branch out in to things that it otherwise would not have found feasible.

Q6. Do you have any security issues regarding the use of cloud computing in the organization? Explain.

This is a topic that was not intentionally set out to research from the beginning however after conducting the literature review, it has prompted for further investigation.
I1 said:

“It is difficult to ensure complete security of customer details as homeworkers have access to the details in their home environment. Thus could potentially write something down on a piece of paper that could end up in the wrong hands”.

I2 added:

“There are many scenarios that could happen when the user has the equipment at home that make it a huge challenge to know how to develop security.”

Q7. What recommendations would you give to an organization that is considering implementing cloud computing.

The IT specialists (I2 and I4) focused on the fact that security is a significant topic for debating the future of cloud computing as

I4 said:

“The organizations information has become its most valuable commodity, therefore I would recommend that the organization ensures to select a company that is focused and developed with regards to the security of the cloud computing systems”.

The second priority was the training side of the implementation. All interviewees believed that there needed to be stronger training provisions made for the staff members with regards to cloud computing in order for them to grasp the idea.

Q8. What do you believe a homeworker is? Who is classed as a homeworker in your organization? Explain.

The purpose of this question is to supplement the outcome from question three of the questionnaire, it was noted that participants might not believe they are homeworkers due to the nature of their job. I1 agreed that many of his colleagues did not class themselves as homeworkers as they do “from time to time pop in and out of the office”. However technically according to the international labor organization they are classed as homeworkers. I2 has also provided accounts were staff members are querying why they are classed as a homeworker even though they believed they were not.

I2 stated:

“This confusion must be highlighted in order to develop a system that benefits both parties, the organization and the employee.”

I3 also acknowledged the fact that only recently he realized that he was classed as a homeworker, this demonstrates that it is easy to make the mistake.

I4 concludes that the reason why it is vital to personify the difference between a homeworker and a general employee is that there are different rules for the two, with regards to the employee welfare and the monitoring systems in place. Therefore it is vital for an employee and employer to know whether the staff member is a
homeworker. This is beneficial to both the organization and the employee in the long term as it means they will ensure their rights are being attained.

4.3 Chapter summary

This chapter has presented the findings from the primary research. The primary research consisted of a questionnaire and interviewing employees from two organizations that utilize cloud computing. The findings have highlighted key factors that need to be discussed in the next chapter. The users have suggested that cloud computing is very efficient and effective, however they seem to experience major technical issues. These findings will now be discussed in the next chapter. The discussion is a platform that will allow for the primary research to be compared with the secondary research in order to gain a better understanding and fulfill the research objectives.
Chapter 5: Discussion

5.0 Introduction

In order to provide a rich consideration of cloud computing for the home working environment, the literature review was carried out to provide a foundation of the underpinning subject knowledge and domain research. The interviews and questionnaires were implemented to part satisfy the primary data research objectives. The discussion provides an opportunity to assess the findings in the light of the different perspectives from the literature reviewed (Saunders et al 2010), in turn fulfilling the objectives set out in section 1.3.1. The security factor will then be discussed further and finally a summary will be provided.

5.1 Objective 1: To explore and analyze cloud computing from both the academic and business perspectives

The literature review has provided a solid understanding of cloud computing and the main domain research; (Cueli 2010) has defined cloud computing not as an actual physical technology but in fact a model of provision and marketing IT services that meet certain characteristics. The four characteristics are outlined as, Shared infrastructure, accessibility and software use, scalable services, cost (Wang et al 2011, Rouse 2010, Hill 2011, Keyes 2013). The misunderstanding and lack of knowledge is a key factor to getting to know cloud computing, the primary research has proved this as quoted by I2 “the lack of knowledge of cloud computing has driven users to dislike it”, as many of the participants see cloud computing as a new physical technology. Participants of the questionnaire also highlighted that there is a profound lack of knowledge and training for cloud computing in the organizations used for the case study.

5.1.0 Objective 2: To critically assess all the ways that this technology affects the business and academia sectors

This research study examined the advantages of cloud computing for organizations. Flexibility is a key element for cloud computing (Sosinsky 2010), the primary research has suggested from the questionnaires that users believe they are much more flexible and efficient while utilizing the cloud computing systems. It has also been considered that the business organization utilizes cloud computing in order to be able to adjust the work output for short periods of time.

I2 states:

“During peak periods we are able to utilize cloud computing by moving willing staff members (such as parents during Christmas holidays) to homeworking. This frees up more office space for temporary staff members, which ultimately increased the work output needed for peak periods.”

This example shows the effectiveness of cloud computing regarding the logistics of the organization. The primary research has found to be consistent with the literature review. (Keyes 2013) considers this factor, highlighting it as a cost effective move for organizations, as they are paying as a “per unit consumption basis” eliminating overspending or wastage (Rouse 2010). Furthermore this advantage is also referred to
as scalable services in the literature review, entitling business to easily upscale or downscale the IT requirements as and when required (Jamsa 2013).

(Rouse 2009, Jennings 2010, Shelton 2013) illustrates the logistics of cloud computing for an organization, which in turn demonstrates the cost effectiveness. This study shows that the majority of organizations outsource the setting up of cloud computing for the organization, that includes complete maintenance as well. The IT specialists interviewed (I2 and I4) from both organizations have provided a logistical explanation that compliments the literature review. They further explain that because this task was outsourced, they were able to implement it in a much quicker time as the outsourced companies already have servers setup, therefore all that was needed was programming and training.

A BYOD policy has been implemented in many organizations. Using BYOD Employees can only access documents and systems within the organization through cloud computing systems (Keyes 2013). The literature review identified that implementing BYOD is a successful way of keeping employees more flexible, which is advantageous to both, employee and employer (Keyes 2013, Hill 2011, Van der molen 2010 Gillam 2010). The findings from participants for the questionnaire demonstrated that there is a considerably high demand for BYOD. Questionnaire participants have mentioned they feel considerably more flexible and efficient with the BYOD policy implemented. The other consideration for BYOD is that organizations are eliminating the purchase, upgrade and maintenance costs for owned devices as this will be the employee’s responsibility (Keyes 2013). It is interesting to note that previous unpublished research (by the researcher) has shown that security is become a significant challenge for organization when implementing a BYOD policy (Appendix 3).

5.1.1 Objective 3: To investigate the amount of research and development put in to cloud computing

The literature review presented in Chapter 2 suggests that there is a substantial amount of research and development committed to cloud computing (Morgans et al. 2008, Shelton 2013). There are billions of dollars being spent on security development projects for cloud computing worldwide (Catteddu et al 2010). However the primary research contradicts this showing that there is a lack of research and development in specific to cloud computing in the homeworking environment. The participants of the questionnaire and interviews have indicated that there are many technical issues experienced, resulting in a lack of reliability for the organizations. The IT specialists (I2 and I4) have blamed these factors on the shortage of research and development. I4 explains that cloud computing has been implemented since 2007 however there has not been an increase in development in comparison to the increase in demand.

The analysis explored cloud computing and highlighted the key factors for its use with both business and academic organizations. The research has also provided an assessment of the ways cloud computing affects organizations. A majority of both questionnaire and interview participants have advised and agreed that cloud computing has allowed the organizations to be able to grow as well as be more flexible and more appealing to the employees. It was found that there are major advantages to cloud computing (Lekkas et al. 2012), however the primary research
suggests that there are issues that need to be addressed regarding the development and implementation of cloud computing for the homeworking environment

5.1.2 Objective 4: To explore the homeworking environment and analyze the link with cloud computing

This has been investigated through literature review (section 2.2), concluding that the demand for homeworking is increasing (Verlag 2011). An additional finding is that a major factor for selecting homeworking as an employee is its convenience (Boris et al 2006). Participants in the questionnaires and interviews who express these ideas further support this. I1 has stated that homeworking positions only came available after cloud computing has been implemented. This shows the direct link and need for cloud computing for the homeworking environment. Although Secondary research does not have a specific example however it does demonstrate that communication services and equipment is vital for homeworking (Powell 2009). Both primary and secondary research has suggested that cloud computing is an important factor for organizations to implement the homeworking option (Felstead et al. 2010, Beaurefard et al. 2013).

5.2 Security:

It has been noted that the findings have emphasized the importance of security for cloud computing regarding the consideration for the homeworking environment. Therefore additional research was conducted in to security in the literature review (section 2.1.0), (Morgens et al. 2008, Lekkas et al. 2012, sheikh et al. 2011) to illustrate the significance of security for cloud computing. The interviews support this analysis, with participants going as far as recommending security to be considered a vital factor.

I4 said:

“The organizations information has become its most valuable commodity, therefore I would recommend that the organization ensures to select a company that is focused and developed with regards to the security of the cloud computing systems”.

5.3 Chapter summary:

This chapter has provided a discussion platform in order to discuss all research against the objectives set out in Chapter 1. This has allowed for the research data to be developed in to vital information. The key factors developed are that there is a consensus that cloud computing is valuable to any organization however the security and privacy as the reliability need to be further addressed. The next chapter being the conclusion will allow for a further understanding how these points can be achieved leading to a consideration for the future of cloud computing being produced.
Chapter 6: Conclusion

6.0 Introduction

This chapter establishes the aim set out in Chapter 1, it then provides the contributions that this research has provided regarding this topic. It further presents the limitations this research study has been faced with. Finally, recommendations are proposed, as well as the identification of areas for future research.

6.1 Fulfillment of the aim:

The aim for this research presented in Chapter 1 was to establish the main advantages and disadvantages of cloud computing for the homeworking environment. This research has discovered four significant points to consider when accomplishing the aim two advantages and two disadvantages.

1. **Flexibility.** This is one of the main advantages for both the employees and the organizations. The literature review has acknowledged this advantage. The primary research has been able to provide ‘real life’ examples in order to gain an understanding of the significance of this advantage.

2. **Reducing Costs.** This is also a significant advantage; the literature review has established that organizations are looking to reduce costs as they are recovering from a national financial crisis (Sosinsky 2010). Interviewing the two IT specialists in the organizations has provided a further understanding of exactly how the costs will be saved, for example through ‘pay per unit’ methods therefore eliminating wastage.

3. **Research and Development.** A lack of research and development has been discovered to be a significant disadvantage. The literature review suggests that there is a lot of research and development invested in cloud computing (Keyes 2013, Smoot et al 2012, Warman 2012). However the questionnaire participants have indicated there is a lot of technical issues, this shows a conflict between primary and secondary data. When investigating further with the interviews (Section 4.2, Q3 and Q4), the results have suggested that the research and development with regards to the homeworking environment still needs a long way to go in order to "iron out the creases".

4. **Security** has been found to be a challenge. Both the literature review and the primary research suggest that this disadvantage has a direct relation to the research and development factor (Jensen et al. 2009, Sheikh et al 2011). The literature review has identified that the security for cloud computing has to be developed in order for organizations to view this as a reliable system to use (Lekkas et al. 2012). Furthermore, I4 has also proposed for organizations that are planning to implement cloud computing, to ensure they select a company that is focused on the security element as well as its development in order to keep it up to date.
6.2 Contributions

The objectives have been individually discussed in Chapter 5. There is a significant body of research on cloud computing, however the niche that this paper has been able to investigate further is the use of cloud computing in the homeworking environment.

1. The representatives of the organizations mentioned in this research have both stated that homeworking positions have only become available after cloud computing was implemented. This shows there is a direct correlation between the two topics. This factor is important as it allows for a better understanding as to how vital cloud computing is to the homeworking environment.

2. The research has identified that there is a growing demand from organizations in implementing a cloud computing system in order to produce homeworking opportunities for employees, the key factors behind this is that employees feel ‘flexible’ and ‘efficient’ with cloud computing, therefore providing a stronger output.

3. Objective 4 (Section 5.1) has allowed for a further understanding as to why there is an increase in demand to implement homeworking. (Boris et al. 2006) has stated that ‘convenience’ is a major factor for homeworking, households are more and more looking for convenient work that fits around their lifestyle.

4. The research has also identified that the cloud computing systems have not been appreciated by organizations, the reason behind this has been discovered to be the lack of reliability regarding the security as well as the frequency of system issues. The results for Objective 3, investigating the amount of research and development put in to cloud computing, shows that there is a strong need for development with regards to the systems in order to gain reliability.

6.3 Limitations

The limitations for this research study were time constraints, limited access to data within the organizations due to privacy policies and finally the limited resources due to the minimal budget set aside for this research study. However the researcher ensured to gain as much data from current literature as well as participants that effectively informed the findings of this research study. There were also limitations to the scope of the research, limited to key points, rather than being able to research further in other issues, such as cloud security. There were also limitations regarding the data collection, the researcher was only able to use organizations that were available and familiar, allowing the staff members to participate within the time given. Finally, as the data collection from the questionnaires was ‘self-reported’, there could therefore potentially be a mismatch between perceptions and actual level, and furthermore participants could misunderstand the questions.
6.4 Recommendations for future research

Throughout the process of this study, additional topics arose that need further study; examples of these topics include the following:

- Security for the use of cloud computing specific to the homeworking environment. It has been highlighted by the literature review and the interview results that security is a major challenge for cloud computing, therefore it is important to research this topic to further understand it and be able to develop it.

- Furthermore there should be an in depth study of data location issues as well as national and international data protection laws with regards to cloud computing specific to the homeworking environment. As cloud computing grows, so will the demand for regulating it and therefore research in to the data protection laws will be useful.

- Future studies should highlight ethical issues that may arise regarding the homeworking environment, as this study has identified potential ethical risks through the interview results. Researching the ethical issues is useful to employers in order to ensure they are fulfilling their workers welfare rights.

- An in depth study regarding the research and development of cloud computing specific to the homeworking environment. This is in order to further understand where exactly the research and development is lacking, in order to develop it further.

6.5 Chapter summary

This chapter has satisfied the aim presented in section 1.3.0, identifying two key advantages and two key disadvantages for homeworking and cloud computing. The contributions made by this research have then been presented; stating that the research has shown there is a direct correlation between homeworking and cloud computing; there is a growing demand in cloud computing in order to implement homeworking; and finally the research has identified that there is a lack of research and development regarding cloud computing in the homeworking environment. The limitations for this research have also been stated and finally the recommendations for future research have been provided.
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Appendix

Appendix 1
Questionnaire

The purpose of this research project is be able to provide a clear explanation of Cloud computing Technology in order to establish the advantages of cloud computing for the homeworking environment. Your participation will enable the collection of data, which will form part of a study being undertaken at Cardiff Metropolitan University.

Please answer all questions accurately:

1. What is the size of your organisation?
   - 0-50
   - 50-100
   - 100-200
   - 200+

2. Which of the following describes the industry of your organisation?
   - IT
   - Financial Services
   - Healthcare
   - Education
   - Manufacturing

3. Do you work from home? If so choose from the following reasons as to why.
   - Convenience
   - Dependents
   - Tired of Commuting
   - Relaxed/quiet environment
   - Other

4. Do you get any technical issues with cloud computing? If so briefly explain.

5. Do you feel you have an advantage over other organisations with cloud computing?

6. Is cloud computing user friendly in your organisation?

7. Do you find you are more flexible with cloud computing?

8. Do you prefer having a BYOD policy in your organization?

Thank you for taking your time to fill this out accurately.

Appendix 2

Interview questions:
The purpose of this research project is be able to provide a clear explanation of Cloud computing Technology in order to establish the advantages of cloud computing for the homeworking environment. Your participation will enable the collection of data, which will form part of a study being undertaken at Cardiff Metropolitan university.

1. Please state your position in the organisation.

2. Please state the length of time you have been working within this organisation.

3. Have there been any obvious differences in the past before cloud computing was introduced to the organisation?

4. If you were present when the technology was being introduced to the organisation, what were the logistics, did the users welcome it? explain

5. What do you feel are the main benefits of this technology being introduced to the organisation? explain

6. What do you feel are the main disadvantages of this technology being introduced to the organisation? explain

7. Please state the importance of this technology now within the organisation and explain

8. If the technology were not introduced to the business would you be able to grow as an organisation as you have with it? explain

9. There have been many claims that technical issues are very frequent. What are the main technical issues you receive with this new technology is it costly to repair and does the organisation lose out financially when these issues occur? explain

10. Has the technology become used more in the industry your organisation is in, does this improve your position competitively in the industry? explain

11. Do you have any security issues with this technology? explain

12. If you were present when the technology was being introduced to the organisation, what processes and factors did you consider at that time which leads to the contract you chose? explain

13. Is this technology the way forward in your opinion? explain

14. What recommendations would you give to an organisation that is considering introducing this technology? explain

Appendix 3
A report from Eddy, N (2014) states that one of the major challenges in the BYOD is the need for enhanced mobile communication security. With the number of Wi-Fi hotspots increasing, this exposes mobile devices to hackers who monitor traffic on open networks. Furthermore there is the issue of regulating this policy. Some organizations must deal with regulatory mandates that require very strict security measures. Therefore how shall this sort of security be architected when BYOD is in place.

5.1 Significance:

The aim of this report is to evaluate the current trend of BYOD, taking in to account the current blackberry developments. In doing the research, there has been 3 significant factors; Setting up the BYOD policy in order to implement this trend, Data security and the devices “multipurpose” factor.

Setting up the BYOD policy refers to the rules that the organization should implement, this is important as proved in section 2.3 (BYOD in practice). Companies that have invested in setting up a policy phase allows them to create an app for example that will make sure users do not access insecure sections, which in turn may result in loss of very sensitive data. IBM implemented a BYOD policy however did not invest in the policy phase that resulted in a significant challenge for the security department within the organization as stated by the chief information officer Jeanette Horan.

This leads on to the security factor, BYOD mixes business with pleasure, and therefore it is vital to ensure there is a strong security system in order to ensure things do not overlap, which may lead to data loss. The way to do this is to ensure there is a strong security structure within the organization as well as ensuring there are strong security features within the device being used, be it hardware and software. The loss of the device all together is another challenge that needs to be taken in to consideration, as stated in section 2.2 (Disadvantages) $7 million worth of devices are lost around the world daily, this can also lead to compromise of the sensitive data that the business may hold if device falls in to the wrong hands.

Appendix 4
When undertaking a research or enterprise project, Cardiff Met staff and students are obliged to complete this form in order that the ethics implications of that project may be considered.

If the project requires ethics approval from an external agency such as the NHS or MoD, you will not need to seek additional ethics approval from Cardiff Met. You should however complete Part One of this form and attach a copy of your NHS application in order that your School is aware of the project. The document Guidelines for obtaining ethics approval will help you complete this form. It is available from the Cardiff Met website. Once you have completed the form, sign the declaration and forward to your School Research Ethics Committee.

PLEASE NOTE:
Participant recruitment or data collection must not commence until ethics approval has been obtained.

PART ONE

<table>
<thead>
<tr>
<th>Name of applicant:</th>
<th>Tanim Rashed</th>
</tr>
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<tbody>
<tr>
<td>Supervisor (if student project):</td>
<td>Tom Crick</td>
</tr>
<tr>
<td>School:</td>
<td>Cardiff School Of Management</td>
</tr>
<tr>
<td>Student number (if applicable):</td>
<td>09003788</td>
</tr>
<tr>
<td>Programme enrolled on (if applicable):</td>
<td>Business Information Systems and Technology.</td>
</tr>
<tr>
<td>Project Title:</td>
<td>A consideration Of cloud computing for the home working environment, via case study of an international institute and a commercial organisation.</td>
</tr>
<tr>
<td>Expected Start Date:</td>
<td>26/12/2013</td>
</tr>
<tr>
<td>Approximate Duration:</td>
<td>1 Month</td>
</tr>
<tr>
<td>Funding Body (if applicable):</td>
<td>N/A</td>
</tr>
<tr>
<td>Other researcher(s) working on the project:</td>
<td>N/A</td>
</tr>
<tr>
<td>Will the study involve NHS patients or staff?</td>
<td>No</td>
</tr>
<tr>
<td>Will the study involve taking samples of human origin from participants?</td>
<td>No</td>
</tr>
</tbody>
</table>

In no more than 150 words, give a non technical summary of the project

This project aims to research on the home working environment and the use of the technology to make it possible to do so. The research discusses the advantages and disadvantages of the cloud computing software. There will also be a case study in the use of the cloud computing software to enable a homeworking environment. The case study takes an institute as well as a commercial business in order to grasp the full picture of demands on this technology. This case study will allow for a better understanding of the use of cloud computing for the homeworking environment.

Does your project fall entirely within one of the following categories:

Paper based, involving only documents in | NO
the public domain
Laboratory based, not involving human participants or human tissue samples NO
Practice based not involving human participants (eg curatorial, practice audit) NO
Compulsory projects in professional practice (eg Initial Teacher Education) NO

If you have answered YES to any of these questions, no further information regarding your project is required.
If you have answered NO to all of these questions, you must complete Part 2 of this form

DECLARATION:
I confirm that this project conforms with the Cardiff Met Research Governance Framework
Signature of the applicant: Date: 08/01/2014

FOR STUDENT PROJECTS ONLY
Name of supervisor: Date: 08/01/2014
Tom Crick
Signature of supervisor: Tom Crick

Research Ethics Committee use only
Decision reached: Project approved
Project approved in principle
Decision deferred
Project not approved
Project rejected

Project reference number: Click here to enter text.
Name: Click here to enter text. Date: Click here to enter a date.
Signature:

Details of any conditions upon which approval is dependant: Click here to enter text.

PART TWO
A RESEARCH DESIGN
A1 Will you be using an approved protocol in your project? No
**A2 If yes, please state the name and code of the approved protocol to be used:**

N/A

**A3 Describe the research design to be used in your project**

Saunders (2007) Research Process Onion with the 5 layers is the intended method. Research questions, research approach, research strategy, time horizon and data collection. There will be a mixture of qualitative and quantitative research methods used. So the primary research will include the Main Method of interview. 2 participants from an organization in the UK, Tesco, and 2 participants will be interviewed from an institute, the European University Institute. The interviews sampling strategy is purposive and self-selection. The interview will be semi-structured, the questions will be asked to establish the uses of cloud computing (SAAS) as well as the advantages and disadvantages of the uses to the specific users. The set up logistics and costs will also be investigated in order to further determine the feasibility for the homeworking environment. The users within the 2 organizations will be provided with a questionnaire in order to gain more of a perspective of the use of cloud computing. The questionnaire answers will be analyzed and presented using STATA and Excel software. The sampling is split in to two groups, the general employees who use the technology for their work and the technicians and engineers who implement and maintain the technology. The questionnaires sampling strategy was non-probability, purposive, self-selection and snowball. The procedure will consist of being on site at the organization as well as the institute and kindly asking people to fill in the questionnaire. All research subject samples are either from the UK working for Tesco or members of the European University Institute located in Florence Italy. Secondary research will include Literature review, online research, journals and articles in order to establish a good background for the cloud computing technology. All data gathered will be confidential and participants will be anonymised.

**A4 Will the project involve deceptive or covert research?**

NO

**A5 If yes, give a rationale for the use of deceptive or covert research**

N/A

**B PREVIOUS EXPERIENCE**

**B1 What previous experience of research involving human participants relevant to this project do you have?**

None

**B2 Student project only**

- What previous experience of research involving human participants relevant to this project does your supervisor have?

Over 10 years of Supervisory experience as well as completion of a PHD

**C POTENTIAL RISKS**

**C1 What potential risks do you foresee?**

The project will not be completed in time is the key risk I foresee. Other possible risks that must be considered are:

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5 An Approved Protocol is one which has been approved by Cardiff Met to be used under supervision of designated members of staff; a list of approved protocols can be found on the Cardiff Met website here
• physical threat or abuse;
• psychological trauma, as a result of actual or threatened violence or the nature of what is disclosed during the interaction (e.g. during interviews);
• being in a compromising situation, in which there might be accusations of improper behaviour;
• increased exposure to risks of everyday life and social interaction, such as road accidents and infectious illness; and/or

causing psychological or physical harm to others.

C.2 How will you deal with the potential risks?

Ensure to have strong time management by setting out many objectives throughout the project in order to ensure there is consistent progression. The proposed solutions would be, to ensure safe travel to and from project sites. To ensure to have a local contact person at the project site. To ensure to have a background of the area in order to be sure it is a safe situation. Not to be exposed to known dangers that can be avoided.

When submitting your application you **MUST** attach a copy of the following:
• All information sheets
• Consent/assent form(s)

Refer to the document *Guidelines for obtaining ethics approval* for further details on what format these documents should take.

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**Bibliography**

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