

Investigation of Cardiff Metropolitan University Wi-Fi's performance from a student perspective

A dissertation submitted in partial fulfilment of the requirements for the degree of Bachelor of Science (Honours) in *Business Information Systems or Computing*



Cardiff | Prifysgol
Metropolitan | Metropolitan
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DECLARATION

I hereby declare that this dissertation entitled *Investigation of Cardiff Metropolitan University Wi-Fi's performance from a student perspective* is entirely my own work, and it has never been submitted nor is it currently being submitted for any other degree.

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ABSTRACT

This thesis sets out to investigate the Wi-Fi performance of Cardiff Metropolitan University. The aim is to evaluate and gather student's views and opinions about the current Wi-Fi performance in order to give out recommendations for improvement if any. There has been a lot of reading to try and highlight the different areas which contribute to the overall Wi-Fi performance at Cardiff Met. The areas will then be discussed and then compared to the primary results. The methodology approach to this thesis was a Pragmatism approach where by it's open to exploring the different kinds of methods of research out there. This led to conducting questionnaires and interviews to students. From the primary research, there was a wealth of data which was fascinating. There was a discussion to find out if the primary and secondary data found helped to conquer the research aims and objectives set out. Finally, there were a series of recommendations presented.

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I would like to thank my friends and family for their support throughout this dissertation; I couldn't have done it without them. I would also like to thank Dr Hilary Berger for all her help with this dissertation; her guidance has been impeccable. Lastly, I'd would like to dedicate this dissertation to my mother Sandra Brown who died of cancer earlier on in this academic year. She was my best friend, and I know she would have been supporting me throughout this dissertation.

TABLE OF CONTENTS	Page No
DECLARATION	i
ABSTRACT	ii
ACKNOWLEDGEMENTS	ii
TABLE OF CONTENTS	iii
TABLE OF FIGURES	vi
TABLE OF TABLES	vi
ABBREVIATIONS	vi
CHAPTER ONE – INTRODUCTION	
1.0 Background	1
1.1 Aims and Objectives	2
1.2 Project Overview	2
CHAPTER TWO – LITERATURE REVIEW	
2.0 Introduction	4
2.1 BYOD (Bring Your Own Device) in Education	4
2.2 Use of Wi-Fi in Education	5
2.3 Wi-Fi performance across Educational Sector	6
2.4 Performance Issues	6
2.5 Public Wi-Fi and Cardiff Met’s Wi-Fi provision (Eduroam)	7
2.6 Security	8
2.7 Conclusion	8
CHAPTER THREE – METHODOLOGY (MIXED)	
3.0. Introduction	9
3.1. Research Design	9
3.1.1. Secondary Research	10
3.1.2. Primary Research	10
3.2. Research Approach	11

3.3. Research Method (Mixed)	11
3.3.1. Quantitative	12
3.3.1.1. Questionnaires	12
3.3.1.2. Open and Closed-ended questions	13
3.3.2. Qualitative	13
3.3.2.1. Interviews	13
3.4. Research Sample	14
3.5. Ethical Considerations	15
CHAPTER 4 – FINDINGS	
4.0. Introduction	16
4.1. Student Questionnaire	17
4.1.1 Question 1	17
4.1.2 Question 2	17
4.1.3 Question 3 & 4	18
4.1.4 Question 5	18
4.1.5 Question 6	19
4.1.6 Question 7	20
4.1.7 Question 8	21
4.1.8 Question 9	24
4.1.9 Question 10	24
4.1.1.0 Question 11	25
4.1.1.1 Question 12 & 13	26
4.1.1.2 Question 14 & 15	27
4.1.1.3 Question 16	28
4.1.1.4 Question 17	29
4.1.1.5 Question 18 & 19	29
4.2 Student Interviews	30
4.2.1 Question 1	30

4.2.2 Question 2	31
4.2.3 Question 3	31
4.2.4 Question 4	33
4.2.5 Question 5	33
4.2.6 Question 6	33
4.2.7 Question 7	34
4.2.8 Question 8	34
CHAPTER FIVE – DISCUSSION	
5.0 Introduction	34
5.1 Research Objective 1	35
5.2 Research Objective 2	35
5.3 Conclusion	36
CHAPTER SIX – CONCLUSION	
6.0 Introduction	39
6.1 Research Aim	40
6.1.1 Objective One	40
6.1.2 Objective Two	40
6.2 Recommendations	41
6.3 Limitations	41
6.4 Validity and Reliability of the Research	42
6.5 Further Work	43
REFERENCES	43
APPENDICES	45
Appendix A	48
Appendix B	51
Appendix C	52
Appendix D	53
Appendix E & F	55

TABLE OF FIGURES

Figure 1 – What age group do you fall within

Figure 2 – Which year of your degree are you currently studying

Figure 3 – Do you use the Wi-Fi provision at Cardiff Met

Figure 4 – What do you use Cardiff Met's Wi-Fi for

Figure 5 – What devices you have connected to Cardiff Met's Wi-Fi

Figure 6 – Rate the security of Cardiff Met's Wi-Fi

Figure 7 – Issues experienced when using Cardiff Met's Wi-Fi

Figure 8 – Do you think overall performance of Cardiff Met's Wi-Fi could be improved

Figure 9 – Do you have access to Wi-Fi at home

Figure 10 – Do you use public Wi-Fi

Figure 11 – What do you use public Wi-Fi for

TABLE OF TABLES

Table 1 – Course studied and quantity

Table 2 – Download Speed

Table 3 – Upload Speed

Table 4 – Volume/Media

Table 5 – Availability

Table 6 – Home Wi-Fi Comparison to Cardiff Met Wi-Fi

Table 7 – Results of public Wi-Fi comparison

ABBREVIATIONS

BYOD – Bring Your Own Device

Cardiff Met – Cardiff Metropolitan University

CHAPTER ONE – INTRODUCTION

1.0 Background

Wireless Networking Technologies or as it's better known (Wi-Fi) allows computers and other different devices to communicate over a wireless signal. There are three different parts to a typical Wi-Fi network which includes: a wired connection, an access point, and a computer that's wired and has wireless connections. It offers different speeds and operates Scientific, Industrial, and Medical. The communication between the nodes is done via the access points. The access point plays the role of the wireless Ethernet adapter. Wi-Fi has grown in popularity due to how simple and effective the installation is and the increased number of Wi-Fi equipped laptops.

There are currently lots and lots of business such as airports, restaurants, cafes and shopping areas that offer people the option to connect to their wireless internet service. There has been a demand for wireless technologies over the years and have gained an importance within everyday life. Wi-Fi networks have easy deployment in places such as offices, airports and other locations which provide advantages such as flexibility, ease of use and the all important low cost. Companies who desire to enter this market need the intelligence in the areas to make the correct business decisions based on the present and future technologies. Knowledge of technologies in terms of performance, security issues and installation are important too.

This research study will attempt to find out the issues surrounding Wi-Fi performance at Cardiff Metropolitan University. The study will get retrieve in the information from students at Cardiff Met. The aim to is to achieve a level of knowledge so that the research carried out can be used again for another thesis or for the staff at Cardiff Met to acknowledge the issues and try to address them. Before this research, there could be nothing found in relation to Wi-Fi performance situated in Cardiff Met.

1.1 Aims and Objectives

The aim of this dissertation research is to investigate the Wi-Fi performance at Cardiff Metropolitan University from a student's perspective.

The specific research objectives of this project are:

Objective One: To investigate how students of Cardiff Metropolitan utilise the Wi-Fi provision on campus.

Objective Two: Examine the Wi-Fi performance at Cardiff Metropolitan

1.2 Project Overview

Chapter 1:

The introduction into this chapter will define and list the project research questions, the aims and objectives, the background to Wi-Fi, and given new readers an indication that they need to understand the current situation of this research dissertation.

Chapter 2:

Chapter 2 entails of a literature review which will look at the current literature which is surrounding the topic of Wi-Fi performance across higher education, as well as other relevant topics to add on. The literature review is known as the underlying base for where primary research can be conducted and focused on. The literature seeks on investigating similar studies which have been conducted by other researchers in that area; this can then be used to meeting the aims and objectives which have been set out. Common themes will be quickly identified within the literature review to then compare with the two objectives in the process.

Chapter 3:

The methodology part of this research will assess the option for conveying the primary research elements for this thesis. A discussion will then be made illustrating how the research will meet its targets and discuss what techniques are used in order to achieve each of the objectives which have been set out. This section will include the lists the specific outcomes for the questionnaire and the interview process.

Chapter 4:

This chapter sets out to show all of the research findings for this thesis. The purpose of this chapter is to gather and present the data which was collected in order to complete the research objectives. The findings will show the reader all the important facts and opinions students have said during their online questionnaire and interview process. All findings will be presented in the form of text, graphs and tables.

Chapter 5:

This chapter sets out to look at the primary data gathered and assess its wealth and relevance towards the objectives. The primary data will then be related back to the literature review again to see if there are any links in the results.

Chapter 6:

This chapter will set out to bring things to a conclusion. The chapter will look to find any useful meaning from the results of the study. The chapter will look to focus on giving an answer to whether the research objectives were met, and if not why wasn't they met. Further, into the chapter, there will be a discussion about whether there are any validity and reliability for the research. Meaning, does the research think there could have been some miscommunication during interview stages or a misled question on the questionnaire. In return, giving out any invalid data to the overall outcome of the results. The discussion will also discuss what information can be used from this study and could it be used as future work to be carried on, or as part of another project entirely.

CHAPTER TWO – LITERATURE REVIEW

2.0 Introduction

This chapter reviews secondary research resources relative to investigating the Wi-Fi performance at Cardiff Metropolitan University and will form the basis for the primary research activities (see Chapter 3). The extant literature reviewed and organised into sub-sections which are BYOD in Education, Use of Wi-Fi in Education, Wi-Fi Performance across Education, Performance issues and the difference between public Wi-Fi and Cardiff Met's Wi-Fi. These areas all contribute to the research objectives set out for this thesis.

Although there is a wealth of data regarding the use of Wi-Fi in educational settings, there is relatively limited published literature related to its performance across the educational sector. The majority of secondary literature was found in a paper released by CDW-G (2012). The article provides a lot of information which contributes to the research of the thesis for this project.

2.1 BYOD (Bring Your Own Device) in Education

It has been reported that students see technology as a must to help out their education. It has also stated that a total of 92% of American school students have said that technology will be a critical factor when they are in the process of choosing a university to study at (CSW Group, 2012). This type of stat shows that if universities are not willing to adopt and adapt to new technologies such as BYOD, they may face themselves to be at risk of losing their appeal of attraction to prospective students. (Walling, 2012). It has also been pointed out that the use of Bring Your Own Device (BYOD) devices are a huge part of students' lives in today's current climate (Walling, 2012). (Clifford, 2012). Further, into the report carried out by CSW Group it has shown that students are now increasingly seeing that connecting to a wireless access is a right and not a privilege to have. Students are also expected to have the best of services available to them. Students will have a zero tolerance for a slow and unreliable network during peak times (CSW Group, 2012).

Studies have shown the use of BYOD in Education has been known to increase student's engagement, students who bring their own personal devices are more likely to engage in the classroom and engage with other students and staff (CSW Group, 2012). Roles of teachers within education is changing due to the adoption of BYOD in educational institutions. Teachers can now manage their students learning instead of being the direct source of information (Hamza & Noordin, 2013).

2.2 Use of Wi-Fi in Education

In a study reported by CSW Group in (2012), they took out at the University of Tennessee in Knoxville; it was found that 9,700 staff and 27,500 students had a total amount of 75,000 registered devices on the university's wireless network. This stat averages out to 2.1 devices per user at the University of Tennessee. This study shows this ratio has got the potential to increase further in time, so it's essential that educational institutions accommodate for the increase in bandwidth.

Students expect to be able to access a course management system on their laptop one minute and their mobile devices the next without any problems. Universities need to be able to accommodate for these facilities. It has been discovered that campuses are moving forward but progress is very slow (CSW Group, 2012), and 38% hasn't made much progress (Dobbin et al., 2011).

Taken from an article written by Kim Reddy for Purdicom. She has stated that "*Wi-Fi isn't just about information, it's also about communication*". Having the ability and freedom to use Wi-Fi in a school opens up new communications barriers in many different ways. Students will have the ability to communicate with one another, with their teachers and any other member of staff. It also gives teachers and other members of staff to become more creative in the way they deliver their teaching or providing an assistant to the resources which are available to them. (Purdicom, 2017).

2.3 Wi-Fi Performance across Educational Sector

As Higher Educational institutions start to embark and embrace the current trend of Bring-Your-Own-Device [BYOD] and try to revolutionise the different ways students can learn, they have found they are not quite ready to fully embrace the opportunity. From a study in 2012 on the CDW-G report, it states that *“87% of IT professionals say they need to upgrade their district/institution’s infrastructure to incorporate more technology in the classroom.”* Including wireless networks, to incorporate more technology. (CDW-G Learn Now, 2012).

The large amount users, devices and applications all being connected to the learning environment network, it creates obstacles that weren't around years ago. Higher educational institutes will need to try to ensure there is adequate bandwidth to accommodate the growth of devices on the WIFI network. (CDW-G Learn Now, 2012).

A report has found that 88% of academic institutions who had been surveyed had an acceptable outdoor covered on campus with this then reducing to 78% for indoor coverage. The differencing between these figures could be affected due to buildings interfering with the radio signals given out (Dahlstrom et al., 2013). Even so, students do often expect network coverage campus. This can sometimes be difficult to achieve as cellular coverage is determined and controlled by network operators (Dahlstrom et al., 2013).

2.4 Performance issues

From a survey conducted by Education Dive has a shown that 38.2% of its respondents reported that an inadequate network infrastructure is one of the greatest challenges to providing access to education technology for students. Technology initiatives are focused on giving teachers, and students access to education resources available on the network or from the internet. Whether it be online streaming content from a school's network device or directly from the internet, the network has to be fast in order to deliver, reliable connectivity to support high bandwidth. Issues surrounding this such as buffering videos or the incapability not to

be able to retrieve any online content and have an impact upon the impact of a classroom lesson. (Education Dive, 2015)

As an increasing amount of devices connect to the limited amount of bandwidth available, the network tends to suffer, which in return impacts the operation of classroom activities in a negative manner. Applications such as streaming, cloud-based applications and interactive classroom tools become slow or in-active. (Education Dive, 2015) According to SecurEdge Networks, most Wi-Fi performance issues seem to always come down to the poor wireless design which has been put in place. A poor design can come down to the way of the building has been laid out, it may have a significant effect in the way the wireless designs has to be set up. (SecurEdge, 2017)

2.5 Public Wi-Fi, Home Wi-Fi and Cardiff Met's Wi-Fi provision (Eduroam)

When associating public Wi-Fi, home Wi-Fi and Cardiff Met's Wi-Fi, it's important to state these are very different types of network infrastructures. Both are intended to allow its users to connect to the internet, but they may be for entirely different purposes. Public Wi-Fi tends to be a free service which is available to the general public to use when they are connected. Public Wi-Fi hotspots are generally found in places such as airports, shopping centres, restaurants, and hotels. – Public Wi-Fi can literally be anywhere. (Norton, 2016) Although the thought of public Wi-Fi is brilliant, it's the least safe way in order to connect to the internet. The main issue with public Wi-Fi is being unable to determine if the network is 100% safe. (Norton, 2016)

Home Wi-Fi is a way of connected to the internet at home for personal use. There aren't any restrictions, unlike public Wi-Fi and Cardiff Met Wi-Fi. Home Wi-Fi generally seems to be a safer option of browsing the internet as attackers mainly target areas where there's lots of data to steal or tamper with.

On the other hand, Cardiff Met's Wi-Fi is a private and more secure way of connecting to the internet. In order to connect to the Wi-Fi at Cardiff Met, you need to be either a student or a member of staff which requires a unique login. Cardiff Met uses a network infrastructure called Eduroam.

Eduroam states that “eduroam (education roaming) is the secure, world-wide roaming access service developed for the international research and education community. Eduroam allows students, researchers and staff from participating institutions to obtain Internet connectivity across campus and when visiting other participating institutions by simply opening their laptop.” (Eduroam, 2017).

2.6 Security

In a research which was conducted at the University of Liverpool has shown that Wi-Fi networks can easily be infected by a virus that moves through highly populated areas. The computer virus has been said to spread like the movement of a common cold through a crowd of people (Curtis, 2014). As well as tackling the possibility of viruses it's important to take into account cyber crime. “*Higher education provides a treasure chest of high-value information for cyber-attackers*” (Tenable, 2016).

With such information such as Social Security details, medical records, financial data and intellectual property all located within a single institution, it's important that institutions lay down a security protocol to protect themselves from attacks.

According to some estimates, higher education sectors equals to 17% of all data breaches where personal information has been stolen. Higher Educational databases contain some highly sensitive data such as medical details, financial details and social security numbers. (Tenable, 2016)

2.7 Conclusion

This chapter has looked on researching appropriate and available literature surrounding Wi-Fi Performance across Higher/Further education. The secondary literature found was an in-depth review which will be used to contribute to the rest of this thesis. However, when looking to find secondary research for this literature review, there has been a lot of difficulties finding researching involving Wi-Fi performance within higher/further education. This chapter has now given a platform to work upon to achieve the primary research objectives set out.

CHAPTER 3 - METHODOLOGY (MIXED)

3.0. Introduction

This chapter is set out to show all the relevant methods and methodologies within the use of primary and secondary research for this thesis. This chapter will give suitable reasoning as to how the methods and methodologies, as well as primary research outcomes, will contribute towards the accomplishment of the research aims and objectives set out.

3.1. Research Design

"The road map that you decide to follow during your research journey to find answers to your research questions" (Kumar, 2011, p.g.120). This was said by Kumar who was given an explanation of what Research Design is. It's said by authors Cooper & Schindler & Kumar that choosing a research design that is relevant to the aims and objectives of the research can be a hard task to achieve (Cooper & Schindler, 2010 (Kumar, 2011).

The methods and methodologies of the research are often decided upon before research starts taking place, this will ensure a successful result for the project taken place.

A methodology is defined as an explanation of all methods used within a study, stating how they will help contribute towards a researcher to achieve the aim and objectives. The methods are the techniques used to begin the research, gather and analysis data, whether it be by the form of qualitative or quantitative. All of the different methods used are compiled to form the methodology of the research (Cottrell, 2008).

The Primary and Secondary research was used in order to gather sufficient data that is relevant to the research objects set out.

3.1.1. Secondary Research

The secondary research was completed via a literature review, and this was to gather thoughts, reports and studies that have been published before. The literature review focused on gathering information by various types of different authors and sources in regards to Wi-Fi performance within Higher/Further Education. The sections laid-out within the literature review were set out to gather the sufficient amount of sources surrounding how and what students use Wi-Fi for, what issues do educational institutions face with their Wi-Fi infrastructure. As stated previously, there's a limited amount of secondary research available in regards to Wi-Fi performance within Higher/Further Education. But in addition, it was initial to use relevant and up-to-date sources such as reports and articles (Fisher, 2007).

The literature helps to towards achieving the research objectives set out. The literature review forms a base where relevant knowledge is compared against results from the primary research. However, there was a great number of blogs and reports were used in order to gather sufficient secondary data and again, there were very limited sources out there to use. Books we're not able to offer any information in regards to the use of Wi-Fi or performance of Wi-Fi. Although, there were other sources available such as reports and blogs which could be used in order to gain information. It's important to state that relating to this thesis, it's extremely difficult to find the appropriate literature in order to achieve research aims and objectives. Even though there's a wealth of data about the Wi-Fi in the educational sector, there isn't a published resources out there in relation to Wi-Fi performance in educational institutions.

3.1.2. Primary Research

Primary research is the structure which is built upon by secondary research. The primary research is generally more specific to gain the perspective from students at Cardiff Met.

For the primary research, there were two approaches used which were an online questionnaire for students to fill in, and a series of interviews for students to gain information from a more personal environment. The aim is to gain relevant data

which can help towards achieving the research aims and objectives of this thesis. Each method conducted have both different techniques in order to collect the information for the appropriate research objectives. The online questionnaire was used to attempt to gather information in regards to a research objective carried out which were to see how students utilise the Wi-Fi provision at Cardiff Met. The interview technique by asking students a series of questions attempts to provide suitable data in order to achieve the objective set out which is to identify any key issues with the Wi-Fi performance at Cardiff Met.

Both primary and secondary types of research are used in order to achieve the overall research aim, which is to investigate Cardiff Metropolitan University Wi-Fi from a student's perspective.

3.2. Research Approach

The research philosophy for the thesis which was used was Pragmatism.

Pragmatism is a way of being open to exploring the different kinds of methods of research (Saunders et al., 2012; Hookway, 2008). However, the research did go down the path of using the qualitative and quantitative route.

There are two different research approaches that can be used by a researcher and they are 'inductive' and 'deductive'. A deductive research approach evolves existing hypothesis, and inductive research looks to create a conclusion to researcher's findings. (Saunders et al., 2009). The deductive approach has a very strict methodology, and research aims to test existing theories, leaving it all very limiting to what you can do (Saunders et al., 2012). The research approach chosen for this thesis was an inductive approach, as it allows the research to have an input on his own theories of the information which has been collected. Also gives a possibility to expand upon in future work (Yin, 2003)

3.3 Research Method (Mixed)

There are two different types of research methods used by researchers which are Quantitative and qualitative. Quantitative research tends to be more scientific based

which looks at the more measurable results which are related to existing theories, and the data which has been collected from participants. Qualitative research looks to carry out collecting data from it's participant's personal opinions on a particular topic set out (Veal, 2005). The mixture of the two research methods can lead to higher quality research outcomes (Creswell & Plano Clark, 2011). Creswell and Plano (2011, p.12) also said: "*the combination of strengths of one approach makes up for the weaknesses of the other approach*". For this thesis, the decision was to use a mixed method approach in order to gather primary research. Interviews (qualitative) and online questionnaires (quantitative).

3.3.1. Quantitative

For the thesis of this project, quantitative research method was used in order to collect data surrounding the thoughts and opinions of students regarding the Wi-Fi performance at Cardiff Met. Finding patterns in the data gathered will help towards creating an overall perception of Cardiff Mets Wi-Fi performance.

3.3.1.1. Questionnaires

The online questionnaire was created using an online survey service called Qualtrics. The online questionnaire consisted of a consent form which gave participants the relevant information about the questionnaire and they had to agree to the terms and conditions before being allowed any further into the questionnaire. The questionnaire had a total amount of forty respondents, but only a total twenty-seven completed the whole questionnaire.

The questionnaire was spread via social media and emails targeting the wealth of Cardiff Met students. The questionnaire consisted of eighteen questions which consisted of open and closed questions, but most questions were closed. Questions started very simply slowly turning more complex which was in place to gather participant's opinions to help towards the research aims. The research questions were edited through the primary research in order to allow knowledge gained from the literature review and increased the understanding of issues (Blaikie, 2009)

3.3.1.2. Open and Closed-ended questions

Open and closed-end questions were used in order to gain the specific views from participants from the online questionnaire. There were only five comments were used as it takes a rather long amount of time to gather all the data and analyse it. Participants generally tend not to like to put down their views or opinions as it's a time constraint for them. Closed-ended questions guarantee a much great response rate in comparison to open-ended questions (Veal, 2005). The attractive point of closed-ended questions they tend to be easy to analyse, presented and compared to other closed-ended questions. While, open-ended require a lot of time for processing in order to understand what has been put down. (Silverman, 2010). The positive side to open-ended questions is that they allow the participants to express their view towards a particular area. (Bryman, 2012). Both open and closed questions within a questionnaire allow for a much greater feedback.

3.3.2. Qualitative

Qualitative research is found to generalise the analysis and the findings of gathered data found. It's vital that instead of generalising the sample population, the theory in place is put in connections with the qualitative outcomes. This will ensure no primary data is overlooked (Bryman, 2012) (Saunders et al., 2012). Qualitative research gives the research an understanding of the topic. As part of the qualitative research for this topic, the method will gather the thoughts of the student's views to whether there are any key issues with Cardiff Met's Wi-Fi performance. This will be conducted in the form of interviews.

3.3.2.1. Interviews

The interviews were used in order to get the opinions from students at Cardiff Met in a personal environment. The idea was to ask students their personal experiences from using the Wi-Fi provision at Cardiff Met, and it return gather sufficient data to achieve the research method carried out. For the interview a semi-structured approach which meant there was a set of questions already in place prior to the interviews. A total of three students were interviewed and were conducted the same set of questions in each interview. The interviews which were held all had the same

purpose, and that was to achieve the person's experience, and as Silverman (2010) suggested, using open-ended questions provides the "greatest effectiveness" to do so. All interviews can be found in the appendix section titled Appendix D

3.4. Research Sample

The research objectives are conducted within the confinement of Cardiff Metropolitan University. This is because of the ease to obtain research from students that attend a single university in comparison to gaining information from other university students. With the research being within the domain of Cardiff Met the results found could be utilised by the university for other their own research purposes. As Wi-Fi performance is a such an important area for the university, they could use the results in order to help them make changes to the performance at Cardiff Met.

For a researcher, it's important to show and define the sample population in which they plan to investigate (Morris, 2009). Within this study, there was a total of thirty students, with three students being part of the interview process. A total of thirty participants involved gives a good overall contribution to the project, resulting in a lot of opinions being taken and put forward against the research aim carried out. One part of the student sample population is identified by the online questionnaire they participated in. Students are very accessible to use as research as the research project is being held within a university and the facilities are there in order to get in contact with other students. The sampling method Nonprobability was used in order to achieve the sample group of students needed in order to complete the online questionnaire. (Explorable, 2016)

A technique called Snowball sampling was used to obtain the number of participants needed for the online questionnaire. The online questionnaire was spread around using social media websites and also using the email facility the university provides. As the questionnaire was put onto social media, the questionnaire was seen by a various amount of people who then passed on the questionnaire to other people producing the "Snowball" effect. The initial plan was to achieve thirty participants for the questionnaire but the research only achieved twenty-seven, this was one limitation when trying to find students to complete the questionnaire. Snowball

sampling does have problems with hierarchy as social connections may have a positive or negative responses to the completion of the questionnaires. Even so, the method was still chosen because it offers quick distribution and gathering of data (Berg, 2006)

3.5. Ethical Considerations

Within this thesis, there are many ethical considerations to consider, especially when conducting primary research. Many authors, Silverman (2010), Bryman & Bell (2011), Saunders et al., (2012) and Veal (2015) have all given their opinions suggesting that if research has an ethical impact to any primary research, it should be investigated immediately. There are four main categories which related to an ethical concern which is: Intrusion of privacy, harm to involved, Absence of informed consent, and deception of participants (Bryman, 2012). To avoid an ethical breach, it's important that researcher and institution set down a foundation of guidelines to hand out to participants, so they are aware of procedure (Bryman, 2012).

Before there any primary research is taken out it's of great importance that the ethical approval was granted. Approval was obtained from the research committee at Cardiff School of Management at Cardiff Metropolitan University. A copy of the ethics form that was submitted to the committee and granted approval can be found in Appendix A, B, C & D of this document.

Prior to this, it was important that participants for the research fully understood the study they were being part of and knew exactly what was going to happen with their information. A participant sheet was given as a hard copy to the student who was interviewed, and a brief explanation was given during the questionnaire alongside the research objectives for the thesis. Participants were given the right to leave from the study if they felt uncomfortable at any time. Participants were ensured that all data would be kept safe and secure.

3.6 Conclusion

This chapter has looked at the different types of method approaches are out there for researchers and how they are implemented into their research. This chapter has also shown what approach methods are to be used for this thesis and how the primary data is going to be collected.

CHAPTER 4 – FINDINGS

4.0. Introduction

The purpose of this chapter within this thesis is to collate and present the gathered findings of primary data in order to fulfil the research objectives set out. This section will present the findings from the primary research, which includes student questionnaires given out and interviews with Cardiff Metropolitan University students.

4.1. Student Questionnaire

An anonymous online questionnaire was created in order to collect the opinions of students studying at Cardiff Metropolitan's University. Twenty-seven questionnaires were completed by Cardiff Metropolitan students, across the whole of the University campus. This comes in relation to the second question that was asked which was checking that participants who filled in the questionnaires were, in fact, Cardiff Met students. This question did have relevance to the study due to primary research set out what was to be retrieved from students at Cardiff Metropolitan. A full record of the anonymised responses to the questionnaires can be found in Appendix ().

4.1.1 Question 1

From the twenty-seven students questioned, fifteen of them (55.56%) fell within the 18-21 age bracket, whereas nine students (33.33%) fell in the 22-25 bracket and three students (11.11) fell in the 25+ age group. This question was created to see if the age groups of the students asked would have any effect on the primary research carried out. Figure 1 below shows the responses to what age group the student falls within.

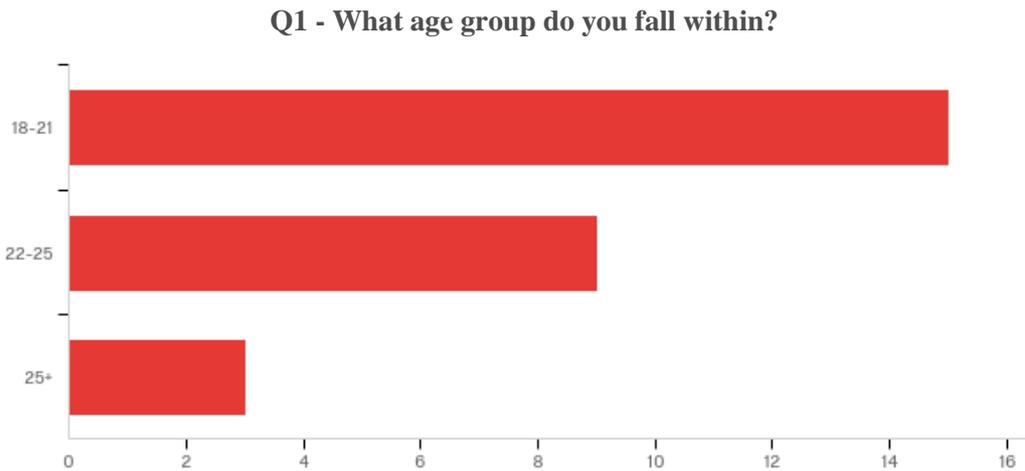


Figure 1 – What age group do you fall within

4.1.2 Question 2

Question 2 was explained during the student questionnaire chapter (see chapter 4, 4.1).

4.1.3 Question 3 & 4

For questions 3 & 4 students were asked to write down the course, they are studying at university, and what current year they are studying on. Question 3 doesn't have a real significant relevance to the thesis set out, but it does help with identifying where the information was given has come from. Results for question 3 can be found in Table 1.

Name of course	Quantity of students
Business Information Systems	11
Computer Science	2
Computing	3
Software Engineering	9
Product Design	1

Table 1 – Course studied and quantity

Twenty-seven students were asked to put what year of their degree they are currently studying. The results show that sixteen students (59.26%) were currently

engaging in their third-year studies, five students (18.52%) are first-year students, four students (14.81%) are currently second-year students, and lastly, two students (7.41%) are fourth-year students. Question 4 doesn't have any significant effect on the thesis set out but is useful for the sample population.

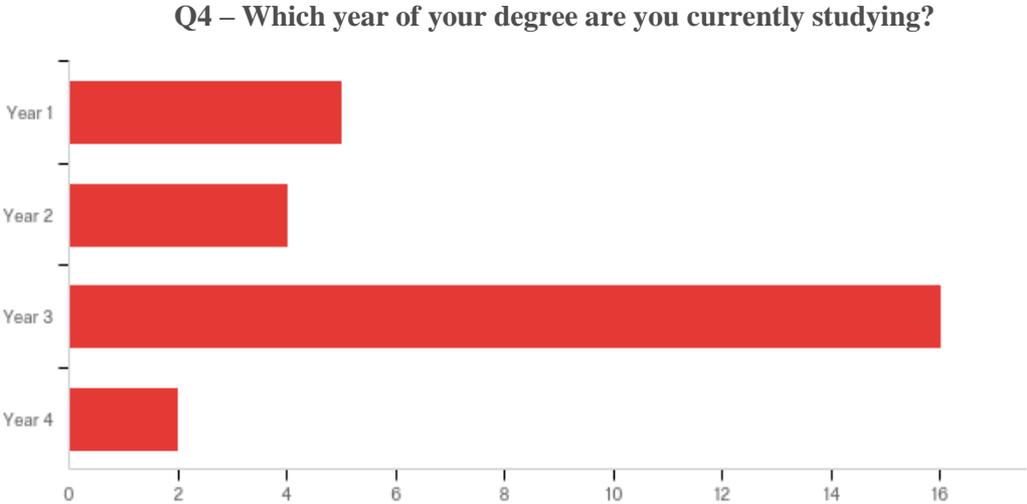


Figure 2 – Which year of your degree are you currently studying

4.1.4 Question 5

Students were asked if they use the Wi-Fi Provision at Cardiff Metropolitan University. There were twenty-seven respondents, and twenty-six of those respondents said they do use Cardiff Metropolitans Wi-Fi and one student responded with zero. This does have an impact on the thesis as primary research carried out needs to take note of the opinions of students. As there was only one respondent who doesn't claim to use the Wi-Fi provision, the study isn't really affected by it.

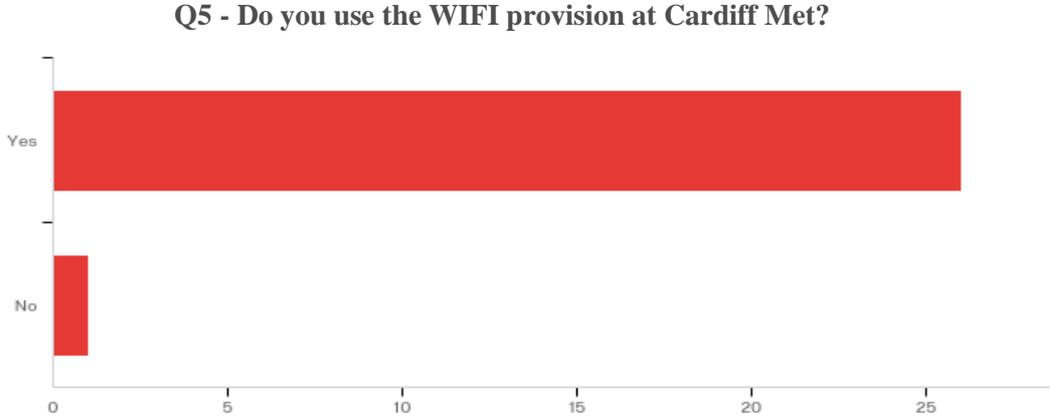


Figure 3 – Do you use the Wi-Fi provision at Cardiff Met

4.1.5 Question 6

Question 6 involved asking students what their purpose of using Cardiff Metropolitan University’s Wi-Fi is for. Students were to choose what options applied to them accordingly. Twenty-five students (92.59%) chose to study as their top reason to why they use Cardiff Met’s Wi-Fi. Twenty-one students (77.78%) said they use it for socialising, thirty students (48.15%) for work, seven students (25.93%) use it for shopping, seven students (25.93%) for banking and five students (18.72%) for other purposes.

The results have identified that studying and socialising is the most popular reason to why students use Cardiff Metropolitan’s Wi-Fi. (see figure 4).

Q6 - What do you use Cardiff Met's WIFI for? (Please select all that apply)

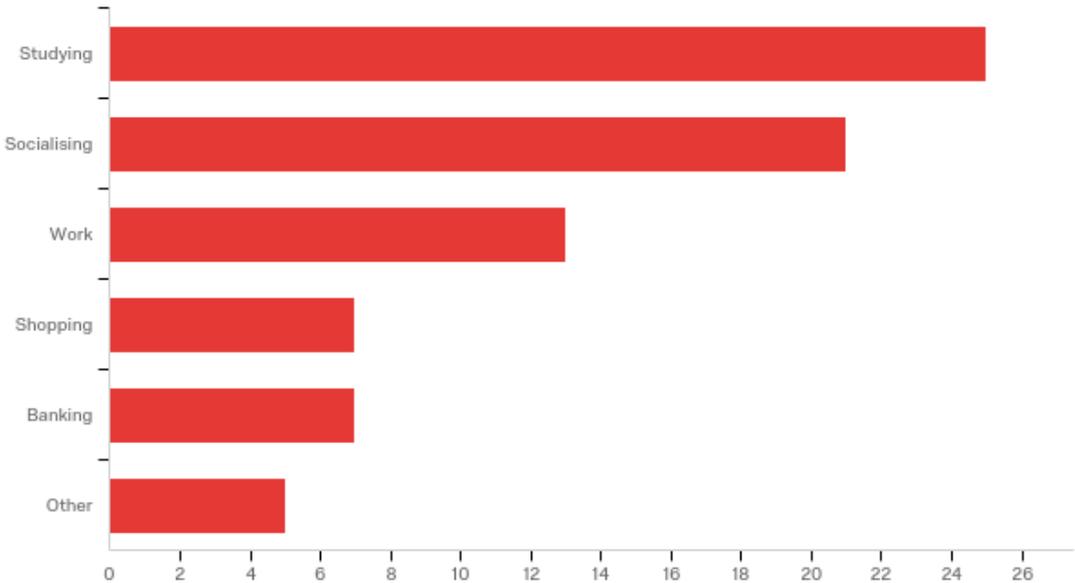


Figure 4 – What do you use Cardiff Met’s Wi-Fi for

4.1.6 Question 7

Students were asked to state what devices they currently have connected to Cardiff Met’s Wi-Fi infrastructure. Results show that 25 students have their smartphone connected, fifteen students have their laptop connected, eight students stated they’ve got their MacBook connected, two students said they’ve got their iPad/Tablet connected, 1 student said they’ve connected to the Wi-Fi with a PC, and lastly two students have stated they have other devices connected to the Wi-Fi at Cardiff Met.

Q7 - Please state what devices you have connected to Cardiff Met's WIFI? (Please select all that apply)

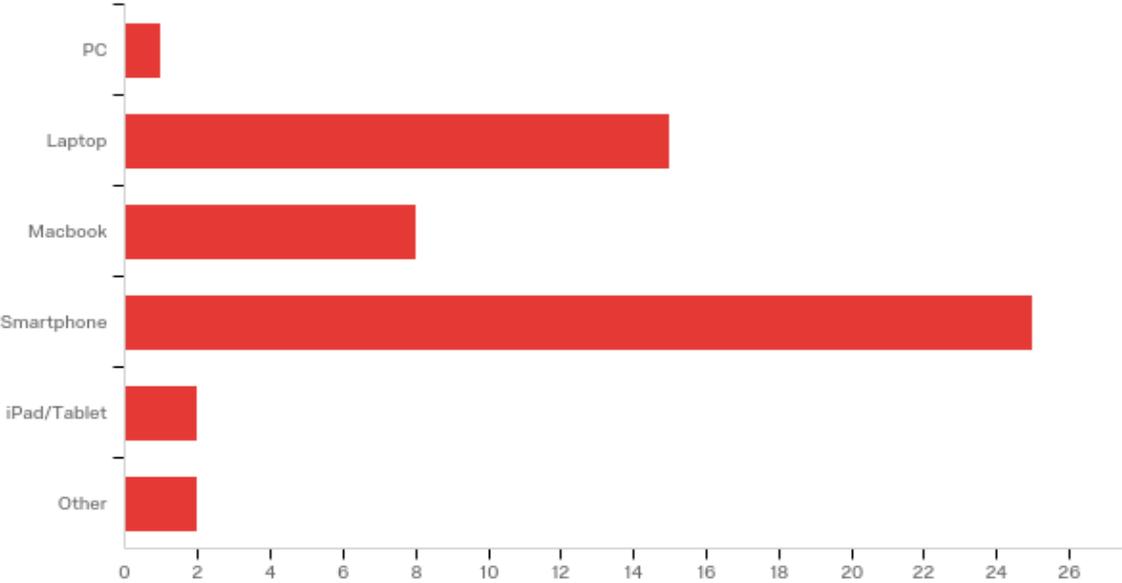


Figure 5 – What devices you have connected to Cardiff Met’s Wi-Fi

4.1.7 Question 8

Question 8 was set out to ask students to rate the following areas from a scale of 1-10, with ten being the highest score available. Findings are presented in a series of tables in order to give a clear view of the amount of students who's selected what rating for each area.

Download Speed

Quantity of Students	Rating
6	7
6	3
4	8
2	10
2	5
2	4
1	2
1	9

Table 2 – Download Speed

Upload Speed

Quantity of Students	Rating
9	7
5	4
3	6
2	10
2	9
2	5
2	3
1	2
1	0

Table 3 – Upload Speed

Volume/Media

Quantity of Students	Rating
7	7
5	5
4	8
2	1
2	4
2	6
2	9
1	2
1	3
1	10

Table 4 – Volume/Media

Availability

Quantity of Students	Rating
8	7
3	9
3	3
2	8
2	10
2	6
2	5
2	4
2	2
1	0

Table 5 – Availability

4.1.8 Question 9

Students were asked on a scale of 0-10 with 10 being the highest to rate the security of Cardiff Met’s Wi-Fi infrastructure. The highest amount of responses went to the rating of eight, which saw a number of eight students selecting that option. Ratings six and seven were also very popular with five students each selecting that option. Rating number nine had a return of four students, and both ratings ten and five had two students selecting those ratings.

Q9 - On a scale of 0-10 with 10 being the highest, how would you rate the security of Cardiff Met's WIFI?

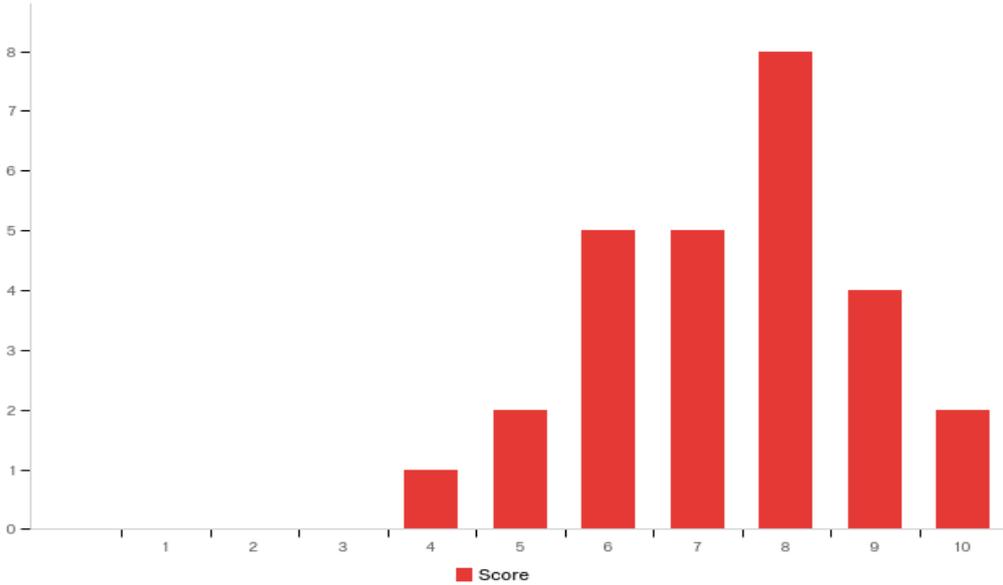


Figure 6 – Rate the security of Cardiff Met’s Wi-Fi

4.1.9 Question 10

Question 10 entailed asking students what they felt were the key issues with security was at Cardiff Met. Unfortunately, there were only thirteen respondents to the question given out. Six respondents have all agreed that they don't feel there are any key issues with security at Cardiff Met. One of those respondents said that *“I have never experienced any security issues with the Wi-Fi at Cardiff Met so far, or as far as I know. I have used the Wi-Fi for online banking through my smart phone and have not come across any problems with doing so on the university's Wi-Fi”*.

Three respondents have given very similar views explaining the issue of the network being closely monitored. One student has put *"Traffic is monitored which makes me feel uneasy about using it"*, and another student has put "Monitored traffic by system admins makes me feel uncomfortable about using the internet". Interestingly enough one of the respondent has written "MITM vulnerabilities. (Good luck defending from an APT)". This respondent is indicating to myself he doesn't trust Cardiff Met's Wi-Fi security one bit. Overall, question 10 has shown that the majority of students are content with the security at Cardiff Met and have an address there are no major key issues to mention. However, there are some very interesting points have been made which are an address for concern.

4.1.1.0 Question 11

Students were asked what experiences they encountered while using Cardiff Met Wi-Fi. Students were allowed to select each of options that best applied to them. There were twenty-seven respondents to the question, and twenty-three of those students (85.19%) have said they've had some sort of experience with connectivity problems. Twenty-one students (77.78%) have said they've experienced slow performance issues, thirteen students have responded with setting up difficulties, and seven students (25.93%) have had problems with maintenance issues. One student (3.70%) has responded with they've had other types of issues.

Q11 - What issues have you experienced while using Cardiff Met's WIFI? (Please select what applies)

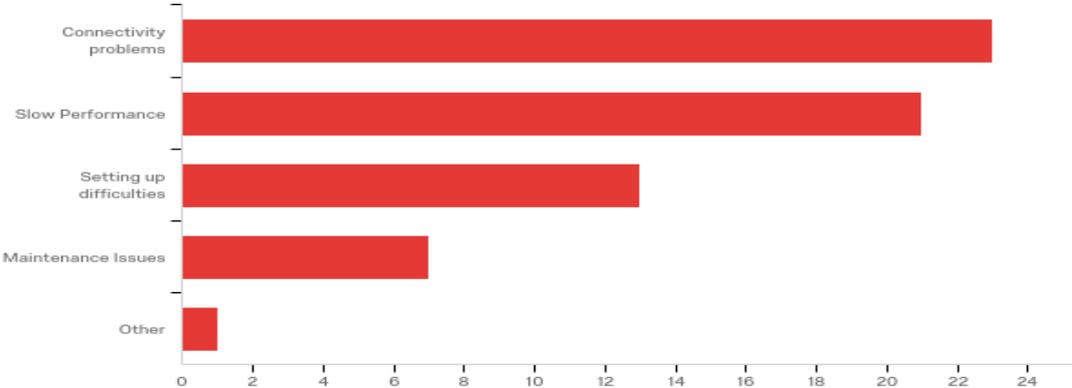


Figure 7 – Issues experienced when using Cardiff Met’s Wi-Fi

4.1.1.1 Question 12 & 13

Question 12 asked students whether they think the overall performance of Cardiff Mets Wi-Fi could be improved. Twenty-five students (92.59%) said yes, and two students (7.41%) said no they don't believe it could be improved.

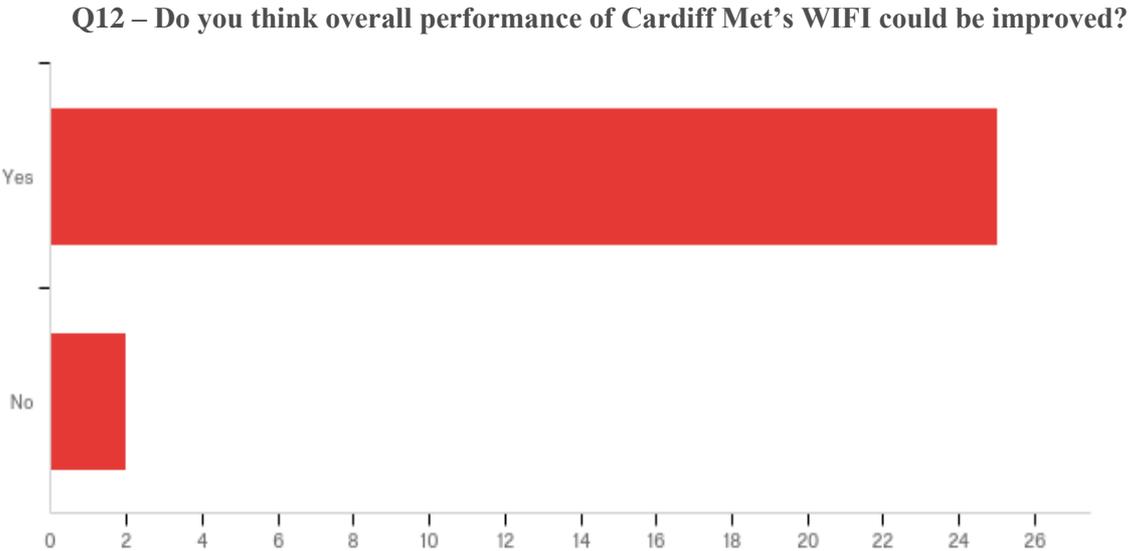


Figure 8 – Do you think overall performance of Cardiff Met’s Wi-Fi could be improved

Question 13 comes in conjunction with question 12 as it asks students to explain their reasoning behind their answer. A total of twenty-one respondents gave their reasoning behind their answer and five students replied with the speeds could be improved, but no justification explain how it could be improved. A few students have replied about how difficult it can be in order to setup using the Eduroam feature. A common theme found was that MacBook users find it difficult to connect. Two students have said they feel the bandwidth needs to be improved and the connection around campus tends to be ‘patchy’ in certain areas.

4.1.1.2 Question 14 & 15

Question 14 asked students if they have access to Wi-Fi at home. Twenty-six students (96.30%) selected yes, and one student (3.70%) selected no to have access to Wi-Fi at home.

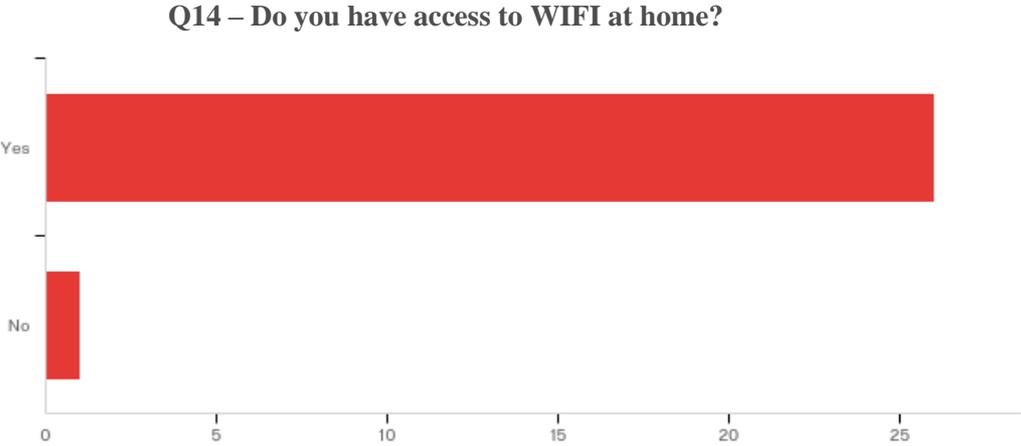


Figure 9 – Do you have access to Wi-Fi at home

Question 15 asked students to compare their Wi-Fi at home to Cardiff Met’s provision. They were asked to give their rating on a scale of 1-10 with 10 being the highest available. A high score represents that their Wi-Fi at home is much better than the Wi-Fi at Cardiff Met. (see Table 6 for results)

#	Answer	%	Count
0	0	0.00%	0
2	2	0.00%	0
1	1	0.00%	0
6	6	3.70%	1
4	4	3.70%	1
5	5	3.70%	1
3	3	7.41%	2
7	7	14.81%	4
8	8	22.22%	6

9	9	22.22%	6
10	10	22.22%	6
	Total	100%	27

Table 6 – Home Wi-Fi Comparison to Cardiff Met Wi-Fi

Students were then asked to justify their answer they gave for question 15. The majority of students have said it's down to the matter of faster speed available at home. One student has said, "I have fibre optic at home, so the difference in upload and download speeds is very noticeable." Also, another student has stated that they "Don't have problems at home unlike Cardiff Met". Results have shown that Wi-Fi at home has a much better approval compared to the Cardiff Met's provision.

4.1.1.3 Question 16

Question 16 has asked students to state whether they use public Wi-Fi. Nineteen students (70.37%) answered yes, and eight students (29.63%) have answered no. Students were then asked to state where they have used public Wi-Fi too. Students who selected they don't use public Wi-Fi are exempt from answering the question.

Students have given many examples of where they have used public Wi-Fi. The examples given were such institutions such as McDonald's, Starbucks, Wetherspoons, Costa and Cardiff bus service.

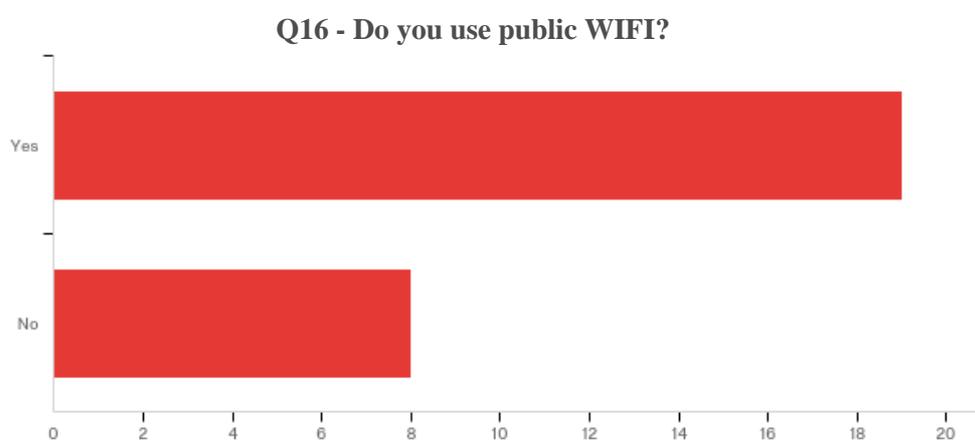


Figure 10 – Do you use public Wi-Fi

4.1.1.4 Question 17

Students were asked to state what they use public Wi-Fi for out of the following areas set out. Students were allowed to chose more than one option if it applied to them. There were twenty respondents and showed that eighteen students have chosen socialising as one of their options. Results also showed that studying had (8 respondents), work had (5 respondents), banking had (3 respondents), and other had (3 respondents). It seems to be that socialising seems to be the most popular reason to why students are using public Wi-Fi.

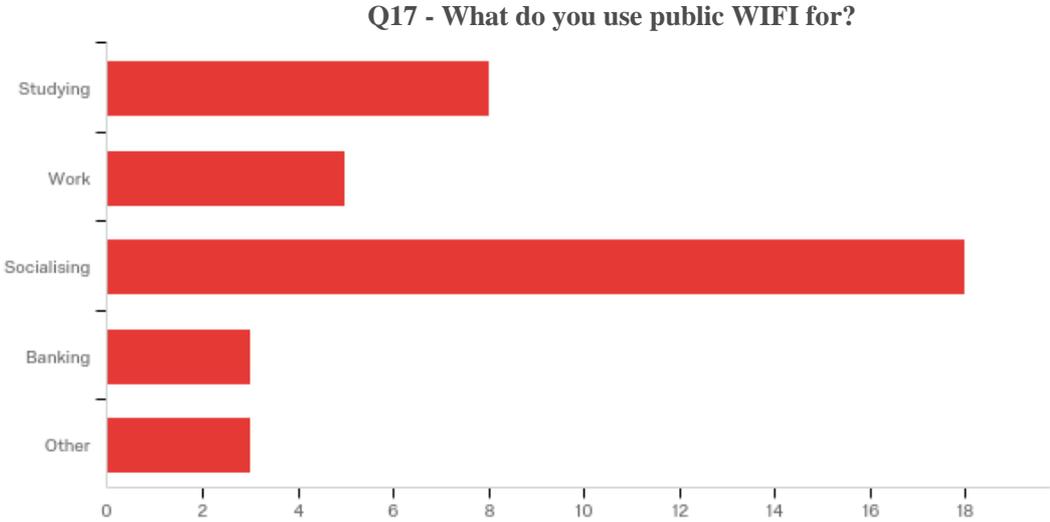


Figure 11 – What do you use public Wi-Fi for

4.1.1.5 Question 18 & 19

Students were asked ‘Overall, how do public Wi-Fi compare to Cardiff Mets Wi-Fi provision?’ There were twenty-two respondents to this question, and there was a tie split in the ratings. Results show there was a split tie of five students each choosing ratings five and three. These equivalent to (22.73%) each of the ratings. Even though the results are tied, it still shows peoples opinions are on the low side of the spectrum. (see Table 7 for results).

#	Answer	%	Count
0	0	18.18%	4
1	1	4.55%	1

2	2	4.55%	1
3	3	22.73%	5
4	4	9.09%	2
5	5	22.73%	5
6	6	4.55%	1
7	7	0.00%	0
8	8	4.55%	1
9	9	4.55%	1
10	10	4.55%	1
	Total	100%	22

Table 7 – Results of public Wi-Fi comparison

Question 19 asked students to “*Justify their reasoning behind their ‘score’*”. Eighteen responses were calculated, and results showed that the majority of students said public Wi-Fi tends to be much ‘slower’ than Cardiff Met’s provision. One respondent stated that Cardiff Met’s “*speed is much faster than public Wi-Fi*”.

4.2 Student Interviews

Three students were interviewed to obtain information on how students utilise the Wi-Fi provision at Cardiff Met, what they believe are the most popular devices used, and to identify the key issues Cardiff Met have with Wi-Fi provision as a whole. I thought that three students were an appropriate number of students to use, as you can gain three different personal views from students, in a personal environment.

An anonymised transcript of the interviews can be found in the Appendix section titled Appendix F

4.2.1 Question 1

‘Please explain how you use Cardiff Met’s Wi-Fi provision’ was the question asked to each of our three interviewees. All three interviewees had very similar responses to this question. The first interviewee said, “*I use the Wi-Fi at Cardiff Met mostly for studying purposes, but I do also use it for keeping updated with my social media*

accounts". The second interviewee said, *"I use it to keep in the know of what's happening at University. I like to keep up to date with checking my emails and the Moodle notice board for my modules."*. Lastly, the third interviewee said *"I take my laptop to university every day because the computer rooms here are always very busy. So using the Wi-Fi Facility on campus is a must for studying and checking up on my social media account. I also like to use it for personal pleasure such as Netflix, YouTube and catching up with daily news."*

4.2.2 Question 2

For question 2 the interviewees were asked to 'Please state which devices you feel are the most popular device to use at Cardiff Met?' The interviewees were giving a list of options which were PC, Laptop, MacBook, Smartphones, iPad/Tablet and other to choose from. The first interviewee said *"Smartphones, laptops and MacBook's"*. The second interviewee replied with *"Smartphones and Laptops"*, and the third interviewee said *"Definitely Smartphones and Laptops"*.

4.2.3 Question 3

The third question which was asked to each interviewee was to 'discuss in detail the key issues of Cardiff's Wi-Fi provision regarding the following areas which are 'Download Speed, Upload Speed, Volume media and Availability'.

Download Speed:

The first interviewee said that *"the download speed is pretty good"*, but it could be *"improved"*. The second interviewee was asked the same question and replied with *"The download speed is pretty poor, I think it needs to be sorted out"* they went on to say, *"The download speed probably affected by the amount of students at University all connected at once"*. Lastly, the third interviewee said *"The download speed is pretty annoying, it has it peak times where it's really good and then others it's pretty poor. It seems to be a regular situation"*.

Upload Speed:

The first interviewee when asked about the following area said *"The upload speed is pretty good at Cardiff Met. I've never really had any issues when uploading to the internet"*. The second and third interviewee gave a similar response by explaining they thought the upload speeds were *"pretty good"* and they've *"never"* had any problems with uploads speeds.

Volume/Media:

When asked about their views on volume/media the first interviewee replied with *"I don't really use the Wi-Fi to watch any videos, but I do generally think it's ok here at Cardiff Met."* The second interviewee was asked the same question, and they replied with *"It's generally pretty good, I haven't experienced any issues."* The interviewee also said, *"I can't think of any negatives"*. The third interviewee said that *"I watch a lot of videos in my free time at University, and I have experienced some issues but nothing major. There is are no major issues to my knowledge with it."*

Availability:

The interviewees were asked to give the key issues regarding 'availability' of Cardiff Met's Wi-Fi. Interviewee number one was keen to point out that the availability was very good at Cardiff Met. They said, *"I've never had any problems gaining access to the Wi-Fi"*. The second interviewee had a similar view by saying *"That I'm always able to connect to the Wi-Fi, it automatically connects whether it's on my iPhone or through my laptop"*. However, interviewee number three said they had some *"issues in the past with maintenance"* in the past, but it's generally *"available most of the time"*.

4.2.4 Question 4

For the fourth question, they were asked 'Would you say Cardiff Met Wi-Fi provision is secure enough for your own personal purposes?' The first interviewee replied with *"I don't really use the Wi-Fi for that intention, but as I do use it for keep up with social media I would have to say yes to that question"* They went on the further to say *"I guess you've got to have some sort of degree of trust in order to use a University's Wi-Fi"*. The second interviewee said *"Yes I believe it's safe enough due to the constant monitoring system involved in the University. Even though it may be fond upon, they are only doing it for the safety of themselves and others"*. Lastly, the third interviewee said they *"I believe it's generally secure, but it's always a concern that you're being monitored"*.

4.2.5 Question 5

Question five asked all its interviewees 'Can you give me any specific problems you've encountered while using the WIFI here at Cardiff Met?' The first interviewee said *'I can't think of an issue I've encountered with the Wi-Fi. If I were to be picky, I'd have to say the connection was a little bit slow at peak times, but generally, it's very good'*. The second interviewee said *'I've had a few problems with slow connectivity. This has to be due to the lack of bandwidth available'*. The third interviewee said *'I have had issues with slow performance and I've also found it hard to connect to Met-Wi-Fi (Eduroam). But once connected, it's usually fine'*.

4.2.6 Question 6

Question six asked, "How would you improve the provision at Cardiff Met?" The first interviewee said they would *'update'* the infrastructure in order to cope with the amount of devices connected to the Wi-Fi'. The second and third interviewee both said similar responses and said their biggest issue they problem face is the amount of devices connected and the network cannot cope with it properly. A new network infrastructure put in place that could handle the amount of devices would lead to being a much quicker network.

4.2.7 Question 7

What is your most frequent choice of Wi-Fi usage? (Cardiff Met Wi-Fi, Home or Public) was asked to all three interviewees and they all had the same responses. Each of them chose home Wi-Fi as the most frequent choice of Wi-Fi usage.

4.2.8 Question 8

For the last question to the interviewees, they were asked 'What is your overall opinion of Cardiff Met's Wi-Fi compared to your home or public Wi-Fi access?' The first interviewee said *'If you're comparing Cardiff Met Wi-Fi to public Wi-Fi then I think Cardiff Met has a much better infrastructure. However, comparing Cardiff Met's Wi-Fi to a home Wi-Fi then a home connection is much quicker and reliable'* The second and third interviewee both had similar views and said similar responses.

4.3 Conclusion

This chapter has presented all of the findings which were found for the primary research for this section. These findings have laid down a path to where the research objectives for this thesis can now be achieved. Student's have illustrated their opinions on several areas on both the questionnaires and interview questions. The findings will now be discussed and related back to the literature review in the next chapter of this thesis.

CHAPTER 5 – DISCUSSION

5.0 Introduction

This chapter will gather, evaluate and discuss the data found and compare it against secondary research when relevant, which was conducted in the literature review. A comparison between both will help gain a perspective on the results found. The discussion will link the relevant research aims to the data that has been collected.

5.1 Research Objective 1: "Identify how students utilise the Wi-Fi provision at Cardiff Met."

The first research objective was to find out how the students at Cardiff Met utilise the Wi-Fi provision at Cardiff Met. Question six and seven of the questionnaire asked students "What do you use Cardiff Met's Wi-Fi for?" and "To state what devices you have connected to Cardiff Met's Wi-Fi?".

Question six allowed students to choose what option applied to them and the results showed there were a wealth of students who chose studying (92.59%) and socialising (77.78%) as their top two choices of using Cardiff Met's Wi-Fi. Question Seven showed the most popular devices to be connected to Cardiff Met's Wi-Fi was smartphones and laptops. These devices are the most popular devices students tend to have connected the Wi-Fi provision at Cardiff Met. These findings relate back to the study which was carried out by CSW Group (2012) stating that students expect to be able to access a course management system on their laptop one minute and their mobile devices the next without any problems. The study shows the use that students get from Wi-Fi on the university campus and shows the way the different ways students achieve that use, whether it be from using their laptops or smartphones.

5.2 Research Objective 2: "Examine the Wi-Fi performance at Cardiff Met."

The second objective set out was to examine the Wi-Fi performance at Cardiff Met. There were many different questions from the questionnaires and from the interviews which helped examine the Wi-Fi performance at Cardiff Met.

Question eight of the online questionnaire asked students to give a rating from 1-10 with 10 being the highest in the following areas which included: Download speed, upload speed, volume/media and availability.

Download Speed:

Results showed that there was a split in the right ratings with six students each giving a rating of three and seven. As there were higher scores given in other ratings, it's concluded that students have scored an 'average' rating in relation to the download speed at Cardiff Met

Upload speed:

Results showed that there was a higher quantity of students who rated the upload speed to Cardiff Met was worthy of a rating of seven. Again, the results showing this is not a poor score but not an excellent one either. The results are suggesting there aren't any main issues for this area. However, there are students who have marked much lower ratings which scores which equal to zero.

Volume/Media:

Results have shown that students are very much content with the volume/media at Cardiff Met by the highest quantity choosing a rating of seven. This area again is showing an average score across the board. The results are suggesting there aren't any main issues in this area. Although, there are a few students or have given a rating as low as one.

Availability:

Results have shown for this area that a higher quantity of students has chosen a rating of seven, which again is a rather average score. This result is suggesting there are some issues as such with availability. But however, there are some other students who have given a rating as low as zero.

The same question was repeated and told to the students who participated during the interview process. Interviewee number one said that they felt the download speed was pretty good, but it could be improved. Whereas interviewee number two said that they thought the download speed was pretty poor and it needs to be supported. In a survey by Education Dive (2015) it was said that due to the increasing amount of devices connected to the limited amount of bandwidth available, the network tends to suffer. This could be in the format of streaming videos online, to uploading documents online, the network tends to suffer. This could be used as supporting evidence to back up interviewee's two comments, but others can argue this is not sufficient amount of evidence to do so.

Question eleven asked students what experiences they have encountered while using the Cardiff Met Wi-Fi and there was a huge response with students saying they've experienced connectivity problems and slow performance problems. During the interview process, the second interviewee said *I've had a few problems with slow connectivity. This has to be due to the lack of bandwidth available*. This statement is backing up the the results shown within the questionnaire. Students were asked on how they would improve the provision at Cardiff Met, and they all replied with they need to update the infrastructure to cope with the amount of devices connected the Wi-Fi. Even in today's current climate, it seems the same situation is still happening. In a study from CDW-G (2012), it stated that 87% of IT professionals have said they need to upgrade their institution's infrastructure. The statement also goes on to say that higher institutions need to ensure there is adequate bandwidth to accommodate the amount of devices on the network. The statement made backs up the findings found for question eleven showing there hasn't been much of a change and the network infrastructure still isn't ready enough.

Question nine of the questionnaire asked students to give a rating between 0-10 with ten being highest on the security of Cardiff Met's Wi-Fi. The highest quantity of students chose a rating of eight, which is a fairly higher score. Students were then asked in question ten to highlight any key issues they felt there were with the security at Cardiff Met. One student said they felt uneasy about it as it's the traffic is monitored frequently by system administrators.

Related back to the secondary research findings it's said that *"Higher education provides a treasure chest of high-value information for cyber-attackers"* and it's important that there is a sufficient security protocol in place to protect themselves from attacks. It seems Cardiff Met has justified this statement have provided a safe and secure network for it's staff and students to use. The second interviewee was asked do you feel the network is safe enough and they responded with *"Yes I believe it's safe enough due to the constant monitoring involved in the University"*. There seems to be great confidence amongst students that the security of the Wi-Fi is more than safe enough.

Lastly, there was a comparison of Cardiff Met's compared to Public Wi-Fi and Home Wi-Fi. Question 15 asked students to compare their home Wi-Fi to Cardiff Met's, and the results showed that there was a high amount of students who said their home Wi-Fi was much better than the Wi-Fi at Cardiff Met. When asked to justify their answer a respondent replied with "I have fibre optic at home, so the difference in upload and download speeds is very noticeable. It seems that students get a much faster service to the internet than what they do at home.

Question 18 of the online questionnaire asked students to compare public Wi-Fi to Cardiff Met's Wi-Fi provision. Results showed that students felt that public Wi-Fi was much slower than Wi-Fi at Cardiff Met. When asked the same questions in the interview process it seems that all the respondents are in agreement that the home Wi-Fi tends to be a lot faster and public Wi-Fi tends to be a lot slower than Cardiff Met's Wi-Fi

5.3 Conclusion

This chapter gathered all the findings found from the primary research part of this thesis. The results were discussed and evaluated against previous literature when appropriate. The discussion showed the different areas within the Wi-Fi performance overall at Cardiff Met and illustrated the good and the bad qualities within it. As there was relevantly minimum literature on the Wi-Fi performance across education, it's was difficult to compare findings against secondary research. However, the research objectives have been achieved and help towards the overall aim that is to investigate Cardiff Met's Wi-Fi performance from a student's perspective.

CHAPTER SIX – CONCLUSION

6.0 Introduction

This chapter sets out to give the conclusions from the discussions of the primary and secondary data, as well as the conclusions of the aims and objectives which were set out. The chapter will also be discussing any recommendations, alongside the limitations and validity of the research which has been carried out. The chapter will then finally give a discussion about the possibility of any future work to be carried out.

6.1 Research Aim

The aim of this research carried out is to investigate the Wi-Fi performance from a student's perspective at Cardiff Metropolitan University."

I believe that this research aim has been met by achieving the individual research objectives. The overall research aims for this thesis has been achieved under some difficult conditions being there wasn't a lot of literature out there which related to Wi-Fi performance of a higher educational institution. There was a wealth of data related to Wi-Fi in an education sector but none related to the performance of Wi-Fi.

6.1.1 Objective One

"Identify how students utilise the Wi-Fi provision at Cardiff Met."

Objective one was achieved by focusing on primary research for the thesis. To achieve this objective, questionnaires and interviews we conducted and presented to students of Cardiff Met. The questionnaire asked students to put down what they used the Wi-Fi provision for, and ultimately the top two highest scoring answers were studying and socialising. Alongside that students were asked to state what devices they had connected to the Wi-Fi at Cardiff Met. The two top results showed that smartphones and laptops were the most popular devices used.

With the focus of selecting the right questions to be asked in both the online questionnaire and the interviewees, it helps determine and result in the completion of this objective. However, was a small use of secondary research used which was an underlying base for the primary research carried out.

6.1.2 Objective Two

“Examine the Wi-Fi performance at Cardiff Met.”

Objective two was achieved by both secondary and primary research. The secondary research which was found helped put an underlying for the basis of the primary research to be carried out for the thesis. The questionnaires and interviews were a big part of achieving success with the objective set out because due to the selected questions given out to students, it helped gather the sufficient evidence needed to achieve this objective. The Wi-Fi performance was split up into several different areas which helped to give an overall perspective of aspects concerning Wi-Fi's performance at Cardiff Met. It's found that Download speed was a real concern for students and something that needs to improve at Cardiff Met.

Secondary research helped support the findings situated within the primary research. It's helped support and back up the findings and to make Cardiff Met aware of the difficulties students are facing with the performance at Cardiff Met. It's apparent that objective two was executed and findings have shown what the key issues are with the performance at Cardiff Met. It's important to show there were some good as well as bad points made by students. A majority vote said that the security at Cardiff Met was very good and that student's feel safe enough to use their Wi-Fi provision for other than just studying.

6.2 Recommendations

Relating back to the findings section of this thesis, students have expressed their concern about how the Wi-Fi provision needs updating and the current network can be a lot faster. This seems to be the most important key issue students have addressed throughout this thesis, and it's something that Cardiff Metropolitan should

look into. If the university looks into the possibility of updating or replacing their network infrastructure, it's important to take into consideration that there needs to be a system in place which can handle the heavy amount of devices which are, in return, using the majority of the bandwidth available. This is the current ongoing issue which is leading to the slow performance issues and connectivity problems found at Cardiff Met.

Cardiff Metropolitan should also look into the current design of the network. It was found in the secondary research that according to SecurEdge, most of the Wi-Fi performance issues have come down to the poor execution of the wireless design (SecurEdge, 2017). This could be looked at by Cardiff Met to ensure they've set up correctly and they are confident they are achieving the best coverage possible for its students around campus.

6.3 Limitations

Limitations in regards to the study would include the limited timescale for the completion of the study.

When gathering data, there were complications as there was more expectation to receive more students to complete a questionnaire and to participate in interviews. There were difficulties achieving positive results due to incompletions of questionnaires, this had an effect on the overall out of the thesis.

There was concern about the wealth of secondary information which was collected for the literature review. As there wasn't a vast amount of data already available, it was thought that it might have a negative effect on the primary research found as there was nothing to back up and compare to the findings. This has significantly affected the word count for this thesis.

There was no other research in the area of Wi-Fi performance at Cardiff Met, so there were problems looking for areas from the past.

The aims and objectives were broad and were simple to achieve. Due to time constraints, there was no time to discuss findings in greater depth.

6.4 Validity and Reliability of the Research

As the questionnaire given out as an online survey and there was nobody around to give assistance to the students if they needed help, there might have been some confusion with the questions. This may have contributed to the final outcome of the results which in-turn makes them invalid. If this were to happen, I would have probably been more aware if it took a noticeable effect to everyone. As for the interviews, they were asked directly the question and could ask if the researcher if they could repeat the question or to ask what they mean by that particular question. There is a much lower risk involved with information being invalid or unreliable during the interview process. The questionnaires will, however, be valid and will serve a purpose because every participant is a student at Cardiff Met, gathering the opinions from a student's perspective.

Having listed the errors made within the thesis, it's still creditable to think that this study could be used in order to be conducted in further work in the future.

6.5 Further Work

As far as Wi-Fi performance goes, it's a very tricky area to retrieve information out there. But this thesis has now opened up the possibilities for other researchers to now investigate and put their findings together. Technology is always growing, quicker than ever in today's climate. There's a strong possibility that Wi-Fi performances are going to improve as technology improves. As for future work, there is definitely room for improvement to this particular topic. I believe other researchers could interview academic staff about the performances and try to uncover the issues with it in greater depth. This thesis could open possibilities to other research topics such as what effect does the use Wi-Fi have on Cardiff Metropolitan University. This gives researchers the option to explore and measure what impact it has on the university, staff and students. The researcher strongly believes that this is an area which needs to be looked at again and change needs to happen to the Wi-Fi

performance at Cardiff Metropolitan and across other institutions. As discussed in earlier chapters, students have illustrated that studying is the most popular reason students use the Wi-Fi for, so it's important that Cardiff Met realises this and work to improving the slow performances the network can bring. A slow performance on the network can lead to student's not being able to achieve their potential.

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APPENDICES

Appendix A

PART ONE

Name of applicant:	Dean Hawker
Supervisor (if student project):	Dr Hilary Berger
School / Unit:	Cardiff School of Management
Student number (if applicable):	20065512
Programme enrolled on (if applicable):	BSc (Hons) in Business Information Systems
Project Title:	Investigation of Cardiff Metropolitan University WIFI's performance from a student perspective
Expected start date of data collection:	03/01/2017
Approximate duration of data collection:	4 weeks
Funding Body (if applicable):	N/A
Other researcher(s) working on the project:	N/A
Will the study involve NHS patients or staff?	No
Will the study involve human samples and/or human cell lines?	No
Does your project fall entirely within one of the following categories:	
Paper based, involving only documents in the public domain	No
Laboratory based, not involving human participants or human samples	No
Practice based not involving human participants (eg curatorial, practice audit)	No
Compulsory projects in professional practice (eg Initial Teacher Education)	No
A project for which external approval has been obtained (e.g., NHS)	No
If you have answered YES to any of these questions, expand on your answer in the non-technical summary. 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	
In no more than 150 words, give a non-technical summary of the project	
This research project involves examining the performance of the Cardiff Metropolitan University's WIFI from a student's perspective. The empirical data will identify if the current WiFi provision meets the needs of the students, and if not what other provision[s] are needed.	
DECLARATION:	
I confirm that this project conforms with the Cardiff Met Research Governance Framework	
I confirm that I will abide by the Cardiff Met requirements regarding confidentiality and anonymity when conducting this project.	
STUDENTS: I confirm that I will not disclose any information about this project without the	

prior approval of my supervisor.	
Signature of the applicant: Dean Hawker	Date: 22/11/16
FOR STUDENT PROJECTS ONLY	
Name of supervisor: Dr. Hilary Berger	Date: 22/11/16
Signature of supervisor: Hilary Berger	
Research Ethics Committee use only	
Decision reached:	Project approved <input checked="" type="checkbox"/> x Project approved in principle <input type="checkbox"/> Decision deferred <input type="checkbox"/> Project not approved <input type="checkbox"/> Project rejected <input type="checkbox"/>
Project reference number: TBA	
Name: Dr Jason Williams	Date: 03/01/2017
Signature: Dr Jason Williams	
Details of any conditions upon which approval is dependant: None	

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 ¹	
N/A	
A3 Describe the research design to be used in your project	
<p>Using an interpretive research philosophy the research study will involve a multi method strategy utilising both quantitative and qualitative data gathering methods. The research strategy will be an inductive approach where the empirical data collected will meet the research objectives.</p> <p>The qualitative research will consist of an online questionnaire, involving both open and close ended questions to generate appropriate mixed empirical data.</p> <p>The sample population will reflect students age 18+ from Cardiff Metropolitan University utilising a Purposeful Sampling technique. The sample population size is aimed at 20+ university students to generate both Quantitative & Qualitative data to enable valid analysis of both statistical data and relevant views and opinions to identify trends and patterns in the data. Data analysis involves a thematic approach where data are organised into common genres and then further analysed to draw out key issues.</p> <p>Recruitment of participants [students] will occur by email with an e-link to the questionnaire inviting them to participate. Participation will be purely optional and should take no longer than 10-15 minutes.</p> <p>All data will be kept confidential and stored securely on a password protected PC.</p>	

¹ 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

Participants will remain anonymous and able to withdraw at any time without penalty.	
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	
A6 Will the project have security sensitive implications?	No
A7 If yes, please explain what they are and the measures that are proposed to address them	
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?	
My supervisor has 15 years of research involving human participants relevant to this project.	
C POTENTIAL RISKS	
C1 What potential risks do you foresee?	
<ol style="list-style-type: none"> 1) Missing the deadline of the dissertation. 2) Collection of data does not meet the aims and objectives of the research study. 3) Participants may have concerns over data security 	
C2 How will you deal with the potential risks?	
<ol style="list-style-type: none"> 1) Put a schedule in place to meet deadlines. 2) Ensure that the design of the questionnaire meets the states aim and objectives. Suitable types of questions asked for the questionnaire provided. 3) All data gathered will be password protected and stored in a secure location. 	

Appendix B

PARTICIPANT INFORMATION SHEET

Investigation of Cardiff Metropolitan University WIFI's performance from a student perspective

Cardiff Metropolitan University Protocol Number:

Project summary

The purpose of this research project is to establish current views and figures of Cardiff Metropolitan's WIFI. Your participation will enable the collection of data which will form part of a study being undertaken at Cardiff Metropolitan University.

Why have you been asked to participate?

You have been asked to participate because you fit the profile of the population being studied; that is you are the age of 18 and over and will have used Cardiff Met's WIFI during your time at campus. However, since the investigation is on Cardiff Mets WIFI you will need to be:

- The age of 18 & over
- Be a Cardiff Met Student
- Need to have an interactive device (PC, Laptop, Smart-phone etc.)

During the interviews/questionnaires you will be asked about your experiences with Cardiff Mets WIFI and will be asked what improvements could you suggest to improve it. You will be asked what devices you use to access Cardiff Mets WIFI also.

Your participation is entirely voluntary and you may withdraw at any time.

Project risks

The research involves the completion of a questionnaire and participation in a interview and which will be recorded for later analysis. We are not seeking to collect any sensitive data on you; this study is only concerned with the behaviours of the WIFI of Cardiff Mets and what your experiences are with it and also what suggestions you believe may help it in the future. We do not think that there are any significant risks associated with this study. However, if you do feel that any of the questions are inappropriate then you can stop at any time. Furthermore, you can change your mind and withdraw from the study at any time – we will completely respect your decision.

How we protect your privacy

All the information you provide will be held in confidence. We have taken careful steps to make sure that you cannot be directly identified from the information given by you. Your personal details (e.g. signature on the consent form) will be kept in a secure location by the research team. When we have finished the study and analysed all the information, the documentation used to gather the raw data will be destroyed except your signed consent form which will be held securely for 5 years. The recordings of the Interview will also be held in a secure and confidential environment during the study and destroyed after 5 years.

YOU WILL BE OFFERED A COPY OF THIS INFORMATION SHEET TO KEEP

If you require any further information about this project then please contact:
Dean Hawker, Cardiff Metropolitan University
Cardiff Metropolitan University email: St20065512@cardiffmet.ac.uk
Or the supervisor Dr Hilary Berger at Hberger@cardiffmet.ac.uk

Appendix C

Cardiff Metropolitan University
Ethics Committee

PARTICIPANT CONSENT FORM

Cardiff Metropolitan University Ethics Reference Number: 2016D04790

Participant name or Study ID Number:
Title of Project: Investigation of Cardiff Metropolitan University Wi-Fi's performance from a student perspective
Name of Researcher: Dean Hawker

-
- Participant to complete this section:** **Please initial each box.**
- 1. I confirm that I have read and understand the information sheet for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. []
 - 2. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason. []
 - 3. I agree to take part in the above study. []
 - 4. I agree to the interview being recorded []
 - 5. I agree to the use of anonymised quotes in publications Yes [] No []
 - 6. I would like my organisations' name to be anonymised in all publications [] []

Signature of Participant Date

Name of person taking consent Date

Signature of person taking consent

Appendix D

DEVOLVED ETHICS APPROVAL APPLICATION SUMMARY

Student Name: Dean Hawker

Student Number: 20065512

Module Name: Dissertation Project

Module Number: BCO6000

Programme Name: BSc (Hons) BIS
Berger

Supervisor Name: Dr Hilary

To be completed by student <u>and</u> supervisor before submission to Ethics Approval Panel	Student Signature;		Supervisor Signature;	
	Yes	N/A	Yes	N/A
Application for ethics approval	[x]	-	[x]	-
Participant information sheet	[x]	[]	[x]	[]
Participant consent form	[x]	[]	[x]	[]
Pilot interview/s	[x]	[]	[x]	[]
Pilot questionnaire/s	[x]	[]	[x]	[]
Letter/s to participating organisation/s	[]	[x]	[]	[x]
Confirmation of interviewee participation	[]	[x]	[]	[x]

First Submission [x]

Resubmission []

Date: 02/01/17

For use by the devolved ethics approval panel:

Panel Members Name Signature

Module leader, Chair: Dr. Jason Williams

Supervisor: Dr. Hilary Berger

CSM Ethics Committee Rep: Prof. Tom Crick

Date: 03/01/2017

Date of Reassessment: N/A

Outcome:

Project Approved

[X]

Reference number issued:

TBA

Chair's Action

[]

Application not approved

[]

Comments for projects not fully approved:

--

None

The original to be retained by the supervisor and a copy given to the student and module leader.
In the case of a resubmission being required this original form should be submitted with the resubmission not a new, blank, on

Appendix E & F

Blank questionnaire & consent page

Investigation into Cardiff Metropolitan University's WIFI performance from a student perspective.

INVESTIGATION INTO CARDIFF METROPOLITAN UNIVERSITY WIFI PERFORMANCE FROM A STUDENT PERSPECTIVE My name is Dean Hawker and I'm a third year student at Cardiff Metropolitan University. As part of my third year I am required to complete a dissertation as part of my studies. The data collected from this questionnaire will provide me with the relevant information to complete my dissertation. This project has received the approval of Cardiff School of Managements' Ethics Committee, Cardiff Metropolitan University. By taking part in the questionnaire you consenting to the following: 1. I understand that participation in this project will require completing a questionnaire about Cardiff Metropolitan University WIFI performance which will take approximately 5 -10 minutes to complete.2. I understand that participation in this study is voluntary and that I can withdraw from the study at any time without giving a reason or I can contact the following if there are any issues. Dean Hawker of Cardiff Metropolitan University:st20065512@outlook.cardiffmet.ac.ukDr. Hilary Berger Dissertation Supervisor in Cardiff Metropolitan University: HBerger@cardiffmet.ac.uk 3. I am aware that any identifying information provided by myself will be held confidentially, such that only Dean Hawker can give this information back to me.4. I understand that my data will be stored on password protected computers, anonymised after completion of the survey and that no one will be able to trace my information back to me. The raw data will be retained for five years when it will be deleted/destroyed.5. If you are 18 years of age or over, please take time to understand the statement above and consent to the participate in this study. Thank you very much for participating in this project and being part of the research.

I consent to participating to this questionnaire and helping towards to the research of this project

Q1 What age group do you fall within?

- 18-21 (1)
- 22-25 (2)
- 25+ (3)

Q2 What campus are you studying on?

- Llandaff (1)
- Cyncoed (2)

Q3 Please name your degree programme/course title

Q4 Which year of your degree are you currently studying?

- Year 1 (1)
- Year 2 (2)
- Year 3 (3)
- Year 4 (4)

Q5 Do you use the WIFI provision at Cardiff Met?

- Yes (1)
- No (2)

Q6 What do you use Cardiff Met's WIFI for? (Please select all that apply)

- Studying (1)
- Socialising (2)
- Work (3)
- Shopping (4)
- Banking (5)
- Other (6)

Q7 Please state what devices you have connected to Cardiff Met's WIFI? (Please select all that apply)

- PC (1)
- Laptop (2)
- Macbook (3)
- Smartphone (4)
- iPad/Tablet (5)
- Other (6)

Q8 On a scale of 0-10 and with 10 being the highest, how would you rate Cardiff Met's WIFI performance of the following...

	0 (1)	1 (2)	2 (3)	3 (4)	4 (5)	5 (6)	6 (7)	7 (8)	8 (9)	9 (10)	10 (11)
Download speed (1)	<input type="radio"/>										
Upload speed (2)	<input type="radio"/>										
Volume/Media (3)	<input type="radio"/>										
Availability (4)	<input type="radio"/>										

Q9 On a scale of 0-10 with 10 being the highest, how would you rate the security of Cardiff Met's WIFI?

- 0 (0)
- 1 (1)
- 2 (2)
- 3 (3)
- 4 (4)
- 5 (5)
- 6 (6)
- 7 (7)
- 8 (8)
- 9 (9)
- 10 (10)

Q10 What do you feel are the key issues with security at Cardiff Met?

Q11 What issues have you experienced whilst using Cardiff Met's WIFI? (Please select what applies)

- Connectivity problems (1)
- Slow Performance (2)
- Setting up difficulties (3)
- Maintenance Issues (4)
- Other (5)

Q12 Do you think overall performance of Cardiff Met's WIFI could be improved?

- Yes (1)
- No (2)

Please explain why you've chosen your answer?

Q14 Do you have access to WIFI at home?

- Yes (1)
- No (2)

Q15 Overall, how does your home WIFI compare to Cardiff Met's WIFI provision? (Please select 0 if you don't have access to home WIFI)

- 0 (0)
- 1 (1)
- 2 (2)
- 3 (3)
- 4 (4)
- 5 (5)
- 6 (6)
- 7 (7)
- 8 (8)
- 9 (9)
- 10 (10)

Please justify your answer

Q16 Do you use public WIFI?

- Yes (1)
- No (2)

Please give examples of where you have used public WIFI?

Q17 What do you use public WIFI for?

- Studying (1)
- Work (2)
- Socialising (3)
- Banking (4)
- Other (5)

Q18 Overall how does public WIFI compare to Cardiff Mets WIFI provision?

- 0 (0)
- 1 (1)
- 2 (2)
- 3 (3)
- 4 (4)
- 5 (5)
- 6 (6)
- 7 (7)
- 8 (8)
- 9 (9)
- 10 (10)

Q19 Please justify your reasoning behind your 'score'?

Appendix F

Interviewee Transcript One:

Question	Response
<p>1. Please explain how you use CM Met WIFI provision? (The key activities i.e (Studying, Work, Social, Banking, Shopping, Other)</p>	<p><i>I tend to use the Wi-Fi at Cardiff Met mostly for studying purposes, but I do also use it for keeping updated with my social media accounts.</i></p>
<p>2. Please state which devices you feel are the most popular to use on Cardiff Met? (PC, Laptop, MacBook, Smartphone, iPad/Tablet, Other)</p>	<p><i>In order of popularity it has to be Smartphones, laptops and MacBooks. You don't really see students using iPads on campus.</i></p>
<p>3. Can you discuss in detail the key issues of Cardiff's wifi provision?</p> <p>Areas:</p> <p>Download Speed</p> <p>Upload Speed</p> <p>Volume/media</p> <p>Availability</p>	<p><i>Download Speed:</i></p> <p><i>I think the download speed is pretty good here at Cardiff Met. My college in Ystrad had a terrible download speed, you would be there for ages waiting!</i></p> <p><i>Upload Speed:</i></p> <p><i>Again, I think the upload speed is pretty good at Cardiff Met. I haven't had any problems with it whatsoever.</i></p> <p><i>Volume/Media:</i></p> <p><i>I don't really use the Wi-Fi to watch any videos or any other media, but I generally think it's ok here at Cardiff Met.</i></p> <p><i>Availability:</i></p> <p><i>I think the availability is really good. I've never experienced any issues</i></p>

	<i>gaining access to the WiFi.</i>
4. Would you say CM WIFI provision is secure enough for your own personal purposes?	<i>Ummmm, I don't really use the Wi-Fi for that intention, but as I do use it for keeping up with social media I would have to say yes to that question.</i>
5. Can you give me any specific problems you've encountered whilst using the WIFI here at Cardiff Met?	<i>I can't think of an issue I've encountered with the Wi-Fi. If I were to be picky, I'd have to say the connection was a little bit slow at peak times, but usually, it's very good.</i>
6. How would you improve the provision at Cardiff met?	<i>I don't really think it needs updating in the first place but I guess the only way to improve would be to update the provision.</i>
7. What is your most frequent choice of WIFI usage? (CM WIFI, Home, Public)	<i>Home Wi-Fi</i>
8. What is your overall opinion of CM WIFI compared to your home or public WIFI access?	<i>If you're comparing Cardiff Met Wi-Fi to public Wi-Fi then I think Cardiff Met has a much better infrastructure. However, comparing Cardiff Met's Wi-Fi to a home Wi-Fi then a home connection is much quicker and reliable</i>

Interviewee Transcript two:

Question	Response
<p>1. Please explain how you use CM Met WIFI provision? (The key activities i.e (Studying, Work, Social, Banking, Shopping, Other)</p>	<p><i>I use it to keep in the know of what's happening at University. I like to keep up to date with checking my emails and the Moodle notice board for my modules.</i></p>
<p>2. Please state which devices you feel are the most popular to use on Cardiff Met? (PC, Laptop, MacBook, Smartphone, iPad/Tablet, Other)</p>	<p><i>Smartphones and Laptops</i></p>
<p>3. Can you discuss in detail the key issues of Cardiff's wifi provision?</p> <p>Areas:</p> <p>Download Speed</p> <p>Upload Speed</p> <p>Volume/meda</p> <p>Availability</p>	<p><i>Download Speed:</i></p> <p><i>I think the download speed is pretty poor, I think it needs to be sorted out pronto. It's probably down to the amount of students all connected at once.</i></p> <p><i>Upload Speed:</i></p> <p><i>As for upload speeds, I've never really had any major problems to be honest. Upload speeds here are good.</i></p> <p><i>Volume/Media:</i></p> <p><i>It's generally pretty good, I haven't experienced any issues or felt unsecure. I can't think of any negatives about the security here.</i></p> <p><i>Availability:</i></p> <p><i>That I'm always able to connect to the Wi-Fi, it automatically connects whether it's on my iPhone or through my laptop</i></p>

<p>4. Would you say CM WIFI provision is secure enough for your own personal purposes?</p>	<p><i>Yes, I believe it's safe enough due to the constant monitoring system involved in the University. Even though it may be fond upon, they are only doing it for the safety of themselves and others</i></p>
<p>5. Can you give me any specific problems you've encountered whilst using the WIFI here at Cardiff Met?</p>	<p><i>'I've had a few problems with slow connectivity. This has to be due to the lack of bandwidth available'.</i></p>
<p>6. How would you improve the provision at Cardiff met?</p>	<p><i>Needs updating I think. Too many people on the network is slowing it down. An update might accommodate for the amount of people</i></p>
<p>7.What is your most frequent choice of WIFI usage? (CM WIFI, Home, Public)</p>	<p><i>Got to be Home Wi-Fi. I use it all the time.</i></p>
<p>8. What is your overall opinion of CM WIFI compared to your home or public WIFI access?</p>	<p><i>Against public Wi-Fi it's so much better but home Wi-Fi is much better. It's quicker and you've got more control over what you can browse.</i></p>

Interviewee Transcript three:

Question	Response
<p>1. Please explain how you use CM Met WIFI provision? (The key activities i.e (Studying, Work, Social, Banking, Shopping, Other)</p>	<p><i>I take my laptop to university every day because the computer rooms here are always very busy. So using the Wi-Fi Facility on campus is a must for studying and checking up on my social media account. I also like to use it for personal pleasure such as Netflix, YouTube and catching up with daily news.</i></p>
<p>2. Please state which devices you feel are the most popular to use on Cardiff Met? (PC, Laptop, MacBook, Smartphone, iPad/Tablet, Other)</p>	<p><i>Definitely Smartphones and Laptops.</i></p>
<p>3. Can you discuss in detail the key issues of Cardiff's wifi provision?</p> <p>Areas:</p> <p>Download Speed</p> <p>Upload Speed</p> <p>Volume/media</p> <p>Availability</p>	<p><i>Download Speed:</i></p> <p><i>The download speed is pretty annoying, it has it peak times where it's really good and then others it's pretty poor. It seems to be a regular situation.</i></p> <p><i>Upload Speed:</i></p> <p><i>Never had any issues with uploading to the internet. I think it's pretty good here.</i></p> <p><i>Volume/Media:</i></p> <p><i>I watch a lot of videos in my free time at University, and I have experienced some issues but nothing major. There is are no major issues to my knowledge with it.</i></p> <p><i>Availability:</i></p>

	<i>I've experienced some issues connecting in the past but nothing major.</i>
4. Would you say CM WIFI provision is secure enough for your own personal purposes?	<i>I believe it's generally secure, but it's always a concern that you're being monitored 24/7.</i>
5. Can you give me any specific problems you've encountered whilst using the WIFI here at Cardiff Met?	<i>I have had issues with slow performance and I've also found it hard to connect to Met-Wi-Fi (Eduroam). But once connected, it's usually fine.</i>
6. How would you improve the provision at Cardiff met?	<i>I think the whole system just needs updating to be honest. I don't think the network can handle everyone connecting all at once.</i>
7. What is your most frequent choice of WIFI usage? (CM WIFI, Home, Public)	<i>Home Wi-Fi</i>
8. What is your overall opinion of CM WIFI compared to your home or public WIFI access?	<i>I think Cardiff Met's Wi-Fi is better than public but nowhere near as good as home Wi-Fi.</i>