Recommendations for the digital services offered by Cardiff Met to facilitate more effective learning outcomes of their students

A dissertation submitted in partial fulfilment of the requirements for the degree of Bachelor of Science (Honours) in Software Engineering

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Declaration

I hereby declare that this dissertation entitled Recommendations for the digital services offered by the university to facilitate more effective learning outcomes of their students 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:

The aim of this dissertation is to provide some recommendations on how the electronic services offered by the university could be improved and better meet the learning outcomes of the students. One of the objectives is to identify original findings from a secondary data, which has been collected from The Digital Literacy Project. Secondary data consist of questionnaire results as well as transcribed focus groups. The two methods used earlier to collect information has some patterns shared between them, therefore they were analysed using a thematic analysis as it allows the researcher to examine and record the themes or patterns across the dataset. The use of the two methods questionnaire and focus group, are powerful tools to improve the understanding of the university and students of the digital services offered to students to improve and better meet the learning outcomes of the students.

The data mentioned above is a mix of quantitative and qualitative data and can be called ‘mix methods’. The secondary data has many themes or patterns shared between them. Therefore, a thematic analysis was used to better understand the data and it also helps the researcher “to interpret large amount of data and articulate themes or patterns in a readable, constructive and meaningful way” (Ryan, 2008).

Qualitative approach can use either inductive or deductive approach to interpret the meanings that can be derived from the data. Inductive approach is what has been applied in this dissertation where it “uses the data to generate ideas (hypothesis generating), whereas deductive approach begins with the idea and uses the data to confirm or negate the idea (hypothesis testing)” (Thorne, 2000). In the findings part every recommendation is presented with the relevant service as bullet points.

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Literature Review:

Introduction:

In today’s technological era, the educational institutions are extensively driven by the digital services that are leading to enhanced teaching and learning outcomes (Avery, 2003). In this essence, e-prints, portals, e-journal platforms, digital libraries and web-bases systems are providing such services to the students with the help of which the complex natured interaction activities and intense tasks are undertaken. Various educators have assessed the correlation that exists between the digital services and the intermediate goals, which in turn lead to improvement in the student behaviour and engagement (Avery, 2003). Along with this, benefits associated with digital services have also been observed in terms of high achievement and attendance, as well as better performance in the classroom administrative tasks.

In this essence, this section of the literature review has discussed the viewpoints and perception presented by various eminent authors and scholars pertaining to the digital services offered by the university to the students so that their learning outcomes can be enhanced. For this purpose, the disparity that exists between the digital services provided and needed by the students and the related suitable recommendations have also been discussed in the light of the current literature that exists for the same. In addition to this, the assessment of the learning outcomes and the effective implementation of the digital technology have also been explored.

Need for digital services provided to students and their benefits:

In the perception of Marcus-Quinn (2013), the student experience is becoming highly significance for the universities in order to gain a competitive advantage with the help of better learning outcomes. The omnipresence of the digital services has brought numerous opportunities for the university students and has evolved the way the educational services are being delivered (Marcus-Quinn, 2013). In this essence, accessibility to a high-speed internet network that is provided to the students nowadays holds significant importance in order to ensure high quality learning and teaching. Connected classrooms are responsible for enabling the students and teachers with a faster access to the learning resources, information, experts and peers (Marcus-Quinn, 2013).

Ivers and Barron (2014) perceived that universities are adopting the usage of digital devices, including tablets and laptops so that the students can be connected to the subject-matter experts and educational tools over the internet in an easy and economical manner. Along with this, the teachers are also using the online networks incorporated with the digital services so as to interact with other universities and enhance their teaching practices accordingly, thereby improving the learning outcomes of the students by delivering quality education (Ivers and Barron, 2014). These digital services are also used by the students for establishing connections and networks with other students and engaging in the self-directed learning for fulfilling personal interest and honing the expertise.

In the opinion of Fry, Ketteridge and Marshall (2014), the university students are required to gain digital literacy so that they can confidently fit and adapt to the workplace requirements and specifications. The establishment of the networks exhibiting personal learning among
the students, administrators and staff members lead to creating an expanded base of opportunities available for ensuring skills’ acquisition, knowledge and student engagement (Fry, Ketteridge and Marshall, 2014). The investment decided to incorporate the digital services in the university curriculum for enhancing the student’s learning outcomes considers the aspect of their effective implementation, along with the designing of the software and hardware. In this essence, the implementation of the digital services is well-aligned with the educational goals that are established in advance. Along with this, the training of the teachers and students are also undertaken in a rigorous manner so that the services can be fully exploited for ensuring enhanced learning outcomes (Fry, Ketteridge and Marshall, 2014). Hai-Jew (2013) stated that the learning resources that include electronic and digital services are designed for effective pedagogy, along with the high-quality instructional designs so that numerous educational benefits can be provided. For instance, the interactive classroom boards used by the universities facilitate student engagement with the help of multi-media and interactive content (Hai-Jew, 2013). This also leads to ensuring creativity, collaboration and exploration with the development of the thinking and understanding skills so that the overall development of the student can be undertaken by the university.

Digital services are also being incorporated in the current pedagogy for providing quality education to the physically and mentally disabled students, who wish to pursue higher education (Hai-Jew, 2013). This is being undertaken with the help of assistive technologies and content presentation embedded in alternative modalities. In a similar manner, digital services are also been considered for designing the curriculum of subjects that require complex and sophisticated work tasks. With the help of such sophisticated software, the collection and examination of the data in terms of its specificity, such as data pertaining to atmospheric chemistry, temperature and weather, is being undertaken. This helps in viewing and displaying the information with the incorporation of colour-coded graphs and maps, which facilitate better understanding and learning.

According to Pahomov (2014), the digital services also have the ability of changing the dynamics associated with the space and time in universities. These provide the students with such a flexible environment that they can work independently and facilitate the one-to-one interaction of teachers with the students. In this essence, the assessment technologies have been proved to be highly beneficial for identifying the strengths and weaknesses of the students so that the instructions can be targeted in a better way, thereby ensuring enhanced learning outcomes (Pahomov, 2014). Along with this, with the help of digital record keeping, local communication networks and phones, the teachers have been able to put more efforts towards student development due to a reduction in the paperwork to a phenomenal extent. With the proper implementation of the technology, digital services are also capable of supporting higher-order thinking wherein the students are engaged in complex and authentic tasks in regard to the collaborative learning environment (Pahomov, 2014).
Disparities in educational services offered and required by the students:

The young generation of students entering the higher education sector is well equipped with the knowledge of the internet and the digital. They use it as a part of their daily life and can benefit immensely from using the digital assistance in their education. Therefore, many Universities have also included digital infrastructure as a part of their day to day activities to make learning easier for the students. In the views of Zichuhr, Rainie and Purchell (2013) there are various disparities which are still found in the services offered to the students and their needs. Nowadays, most of the universities offer online libraries or e-library services. A student can read from thousands of books and online resources at his computer. However, a user cannot read all the books at once or find the relevant information by reading all the books. Due to this factor, many users prefer going to traditional libraries to find the relevant books by the suggestion of the librarians (Zickuhr, Rainie and Purchell, 2013).

According to Colleen (2013), the presence of the digital libraries is relevant in the present times of tertiary reading. Digitalisation has also helped the distance learning or the students with limited resources. However, several cultural and social barriers hamper the learning process of the students. Some students have access to poor internet connection, which can prevent them from accessing the e-library quickly. It can affect their performance at the school and adversely affect on the psychology of the students. The international students have language problems when they come to study in a different country. When the library resources are present in a single language, the students have problems in comprehension of the text. Moreover, the students also do not have the facility to consult someone, in case, they have some problem. This issue is often cited as ‘Digital Divide’ (Colleen, 2013). Jones and Shao (2011) posit the students themselves prefer a moderate use of information technology in their learning. The use of technology depends on various factors such as gender or the demographic situation. The virtual learning environment is accepted to have immense scope for providing comprehensive education to the students. However, most universities are sceptical in their use due to the requirement of finances and technology adoption. The use of other online resources such as Blogs is also comparatively low among the students, although it is promoted by the educational experts to share ideas and knowledge (Jones and Shao, 2011). It can be deduced from the literature that there is disparity among the services offered and required by the students.

In contrast to this McMahon and Pospisil (2005) have discussed that the students have very high expectations of digital in their life. The literature findings reveal that the students expect twenty-four hours internet connectedness and an immediate retrieval of information. It is also inferred that students expect that digital infrastructure will build an environment which supports multitasking. Personal computers have become an integrated part of the student’s life and prefer when all the educational services can be accessed singularly by a computer. The teachers also play a critical role in the encouraging learning through technology. It is the duty of a teacher to integrate computer systems in the learning. Educational institutions have implemented information technology (IT) infrastructure; however, other features such as wireless access to the internet, power and projection facilities for facilitating various activities are not available in universities (McMahon and Pospisil, 2005).
Assessment of the digital services needed by students need to meet their learning outcomes:

According to Tsakonas and Papatheodoroum (2006), Electronic Information Services (EIS) mainly consider the aspects of usability and usefulness for developing such applications that are designed and customised according to the needs and expectations of the students. Usability refers to the significance of the features of the digital services provided to the students whereas the aspect of usefulness defines the vitality of the content for the student (Tsakonas and Papatheodoroum, 2006). The information system design has been greatly driven by the notions of ease of use and the perceived usefulness. For instance, digital libraries are considered to be a significant digital service for the students that can help then in meeting their learning outcomes with the help of easy retrieval and access to the required information irrespective of the factors such as time and place (Tsakonas and Papatheodoroum, 2006). The characteristic of the content is also a significant factor that makes the information retrieval an easy task for the students. In this essence, various information systems in the current modern scenario possess enriched system profiles as needed by the students, such as video, text ranging from HTML to PDFs and audio.

Tomei (2010) opined that for preventing the geographical restrictions to teaching the learning outcomes of the students, online learning lessons have been regarded to be vital for the students with the combination of the traditional classroom instruction and individualised approach. The involvement of the students in the development of the digital environment is necessary for establishing a connection between the expectation of the students and the functioning of the digital system. Instructional software is also arising as a needed digital service for the students wherein such a curriculum is provided to the students that is interactive and engaging (Tomei, 2010). This personalised method of learning is well-aligned with the pace of the students, thereby leading to enhanced learning outcomes. Along with this, the data warehouses and student information systems also contribute to the management, analysis and collection of the student data. This helps in decision-making, accountability and informing the instructions with respect to the curriculum development and implementation of enhanced student learning.

Avery (2003) was of the perception that the digital services also help in ensuring increased potential associated with the establishment of the learning plans on an individualised level. LCD projectors and interactive whiteboards are also needed by the students so that the study lessons can be made more interactive for the students in the presence of more digitalised information. This also lessens the insignificant efforts of the teachers so that they can focus more on the student’s personalised learning demands, thereby improving the attention provided to each student by the teacher (Avery, 2003). These modern digital services are taking over the conventional teaching and learning measures and approached in the universities so that the ever-growing information can be made available to the students without any difficulty. These digital services are needed to be incorporated in the present educational system led by the technological advancements so that the learning outcomes of the students can be enhanced to a phenomenal extent. These services lead to improved student engagement, access to vast and pertinent knowledge base and uninterrupted expert help and advice, thereby ensuring the development of student performance.
Recommendation to address the education disparities:

Digital medium and information technology covers a wide range of education information such as digital libraries, e-journals and portals. However, there are several disparities and needs which are still present in using digital at educational infrastructure, for which few recommendations are suggested below:

- Tsakonas and Papatheodorou (2006) have discussed in their literature that usefulness and usability are interrelated. It means that the users will more frequently use the digital tools which are useful. Thus, universities and learning institutions should analyse the usability of the digital tools before implementing it in the organisation’s infrastructure. It will reduce the unnecessary expenditure of the organisation. Universities can also employ agents to analyse the quality of the user interaction and tools (Tsakonas and Papatheodorou, 2006).

- McMahon and Pospisil (2005) have opined that providing lecturers with similar laptops as that of students can also encourage digital learning. The teaching staff and teachers organise the primary classroom and learning activities. So, if the lecturers will themselves have a laptop, then they are more likely to integrate digital medium. It will also make the teaching staff more competent (McMahon and Pospisil, 2005).

- The digital libraries provide books and other e-journals on a specific subject; however, they do not have borrowing facilities. More technical advancements are required in the field of digital libraries so that the students can borrow the book of their interest at a minimal cost.

- The students can access the library service quickly by using mobile applications. With the help of the mobile apps, a student can access the digital library very quickly. A mobile app will be developed specially for the purpose; therefore, it will have various features which can make it easier to navigate in different departments of the library. The students can store the books they require in the mobile app and can easily access it later. It will also ease the sharing of library resources for educational purpose (Hendriana, 2015).

- The higher education institutions are spending a lot of their financial resources on enhancing their IT infrastructure. The distance learning requirement is also met by virtual classrooms. The modern virtual classrooms have several limitations such as the lecturer cannot move unless there is someone else handling the camera. This limitation can be addressed by use of the camera with a remote control. The cost of the virtual classrooms and digital libraries can be reduced by developing applications on open source platforms. These platforms are free to use. The classroom notes can also be sent together with the live class so that the students do not miss the traditional classes (Gunawardena, 2016).
Research method:

Types of data gathered:

The secondary data used in this dissertation is obtained from the Digital Literacy Project and it contains both questionnaire results as well as transcribed focus groups. The use of the two methods mentioned earlier, can be classified as powerful tools to improve the understanding of the university and students of the digital services offered to students to improve and better meet the learning outcomes of the students. Questionnaires can be considered as quantitative research and were used because they enable the researcher to investigate the ease and success of the many electronic services offered to students. Moreover, “questionnaires help to understand students’ needs, expectations, priorities and preferences” (Evalued, 2006).

According to Gibbs “the main purpose of focus group research is to draw upon respondents’ attitudes, feelings, beliefs, experiences and reactions in a way in which would not be feasible using other methods” (Gibbs, 1997). Besides, focus group is considered as a form of qualitative research. Individual interviews are easier for the researcher to control. However, it would cost a lot of time to individually meet participants and transcribe the data. Therefore, focus group gives the researcher the ability to gain a larger amount of data compared to individual meetings and it can be completed in a shorter period of time.

The use of secondary data:

“Secondary data or data gathered previously can be internal to the organisation” (Cvet, 2009). It is known that secondary data saves time, however it is important to make sure whether the data meets certain criteria and whether it is applicable to the project or not. The secondary data is used rather than collecting new data is because of the following characteristics the secondary data has, which are:

- The data is current and therefore it is valid for analysis
- The data is useful for the project because it is possible to extract a large amount of information by using some form of analysis
- The data is verified by a member of staff therefore is it valid and the information is accurate
- Sometimes secondary data is insufficient and often needs to be supplemented with additional data collection. However, the number of people participated in both the questionnaire and the focus group is large enough to be used in projects and present new findings which are based on original data.

One of the main advantages of using primary data is that the researcher collects information for the specific purpose of their project. But, the secondary data used in this dissertation meets the purpose identified by the researcher.
Type of analysis:

Type of analysis:

The most common form of analysis in qualitative research is thematic analysis (Guest, 2012). Furthermore, it gives the researcher the ability “to examine and record patterns or themes within data” (Clarke, 2006). There are different ways used to analyse data using a thematic analysis some of which are; inductive and deductive approaches. The data gathered using questionnaire can be labeled as quantitative data and the data gathered using focus groups labeled as qualitative data. So, the data overall is a mix of quantitative and qualitative data which in some cases known as ‘mixed methods’. In order to analyse the data mentioned above in this dissertation, there are two approaches; either to use a deductive approach or inductive approach. By looking at the title of the dissertation it is clear that an inductive approach is more reasonable compared to the deductive approach because it begins with an observation and then detect patterns and finally providing some conclusions, theories or recommendations.

“Unquestionably, data analysis is the most complex and mysterious of all of the phases of a project” (Clarke, 2006). Therefore, choosing an appropriate method to analyse the data is critical to the success of the dissertation. Qualitative approach can use either inductive or deductive approach to interpret the meanings that can be derived from the data. Inductive approach is what has been applied in this dissertation where it “uses the data to generate ideas (hypothesis generating), whereas deductive approach begins with the idea and uses the data to confirm or negate the idea (hypothesis testing)” (Thorne, 2000). Thematic analysis can be considered as either inductive approach or deductive approach to analyse data, it also helps to investigate common patterns or themes shared between the questionnaire and the focus group results, thus it has been used in this dissertation. Thematic analysis gives the researcher the ability “to organise and give meaning to the data for the intended audience”. Furthermore, “thematic analysis enabled me to ‘make sense’ of a large amount of data and articulate themes in a readable, constructive and meaningful way” (Ryan, 2008). Another reasons why an inductive approach is used is because “An inductive approach means the themes identified are strongly linked to the data themselves” (Patton, 1990). So, it can be said that this form of thematic analysis is data driven.

In conclusion, “thematic analysis enabled me to ‘make sense’ of a large amount of data and articulate themes in a readable, constructive and meaningful way” (Ryan, 2008).
Data Analysis and Discussion:

Introduction:

The data analysis and discussion part of a research study involves studying of findings from the collected data. The analysis and discussion in this particular research work is based on the literature review and the primary data collected through questionnaire. This chapter is the most important part of a research study because it focuses on deriving meaningful information from raw facts and figures, which are collected by the researcher. In this particular research, 21 students were selected to attend a focus group. Ten themes were developed in order to understand the experience of students regarding CardiffMet Digital Service. Before starting the focus group session, students were asked to fill a questionnaire, which was designed to understand the experience of students using Cardiff Met App.

Analysis of the Focus Group Findings

The data collected from the students is quantitative in nature. The focus group session was based on the digital services provided by CardiffMet. For the purpose of data analysis, the thematic analysis method is used in the research. Under this method, various themes are developed on the basis of some common patterns in the collected data. Themes developed by the researcher are in accordance with the research question and research aim and objectives (Oxford Journals, n.d.).

Theme 1: Usage of Cardiff Met App

From the focus group session, it was found that the responses regarding the use of CardiffMet App were more negative than positive. The respondents were asked about the frequency of usage of CardiffMet App in response to which most of the students had a negative answer. The response was quite reliable because most of the students already tried the CardiffMet App. The respondents from the focus group session said that they used CardiffMet App for several purposes like knowing the availability of computers in learning centres, and checking emails on tablets and phones. One of the respondents from the focus group session said that CardiffMet App could be used in presentations for flicking. It was found during the focus group session that adding timetables in the CardiffMet App can make the App more useful, and they will use it more often. In addition to this, it was also found that there were several negative issues involved with the CardiffMet App that led to its decline, which involves slow processing and repeated login requests. During the focus group session, many students suggested that the look of CardiffMet App should be changed to be like a portal. This will help the students in navigation, and the CardiffMet App will be used more. It was also explained by Marcus-Quinn (2013) that presence of digital services has enhanced the learning opportunities and revolutionised the educational services.
The factors like slow processing, bugging, the absence of multi-tasking option and repeated login requests have constituted to the low usage of CardiffMet App. It is also evident from the literature review that adding more features to CardiffMet App can help in navigation. Moreover, it will also help in studying books and they can easily access it whenever they want to. Overall, it was found that although most of the students downloaded the CardiffMet App to make the studies easier, they uninstalled the App because of several issues like slow processing and bugs. It is necessary to add more features, which will provide the facility of multitasking and navigation facility so as to increase the use of CardiffMet App.

Theme 2: Use of portal

Most of the respondents responded positively regarding the use of portal service. Only a small number of students had a negative response for portals. The students selected for focus group said that they were very much satisfied with the portal because they do not have to look for services on different pages. Every feature and services of the portal are on one page, which made the portal very convenient to use. However, the respondents from focus group suggested that navigation is not immediate. A respondent also suggested that the 5-minute guide for referencing in the portal was very much unexpected, which made the portal different and it is very much helpful. This 5-minute referencing guide in portal not only differentiated this service but also attract many students for using this service. In addition to this, the respondents from the focus group also suggested that grouping and categorisation of portal services is a significant feature that was added. It can be observed here that grouping and categorisation of services led to the increased use of portal service. Grouping and classifying communications services, information & technology services and counselling services are some of the examples, which were given by the respondents during the focus group session.

According to a respondent, some seasonal features should also be added to the portal service, which are used by the students once a year. Enrolment was suggested by a respondent that can be added as a seasonal feature, which this will also increase the use of portal service by the students. It can be examined here that there is a high need for digitalisation of educational services, which can enhance the learning outcomes. The new external website, via which the access to the portal was designed, was severely criticised by the respondents of the focus group. In addition to this, the removal of the drop-down menu from the top of the portal to the bottom also complicated things for the students and this was also criticised by the students. Overall, it can be analysed here that 5-minutes referencing guide was very helpful to the students for their learning. In addition to this, grouping and categorisation of services were also very helpful in the learning process of the students.
Theme 3: Use of electronic mail for communication

Most of the respondents answered in the questionnaire that they always use e-mail service provided by CardiffMet. Along with this, they also said that the e-mail service provided by CardiffMet is very easy to be used. The response during the focus group session was also very positive. None of the students said anything against the use of e-mail for communication and learning. During the focus group session, the medium, which they used for communication was asked. In response to this, the students responded that they are more adapted to use e-mail. Their responses indicated that e-mail service was the main media for communication. The lecture notes were transferred using e-mail service of CardiffMet. Most of the students also said that they use e-mail service several times a day or daily for getting missed lectures. From this statement of respondents, it can be analysed that e-mail is playing a significant role in the learning and development of the students.

Students use e-mail service for covering their missing lectures and transfer of notes. The service of linking student’s e-mail to normal e-mails is also an important service, which is used by students for communication. However, it was found during the focus group session that two respondents were not aware of the e-mail linking feature. The students suggested that a new version of Facebook should be launched, which is entirely based on University’s work and activities. This is because, in the questionnaire, most of the students said that they always use Facebook and it is very easy to use. The notification service of Facebook is very significant in remaining up to date for the students. Students said that instead of blackboards, Facebook should be used for giving notes and lectures. It can also be examined that universal access of Facebook and its notification service is very much useful for the purpose of learning and communication. From the analysis of the focus group session and questionnaire, it can be said that e-mail is a very important service for the purpose of communication and education (Acevedo, 2016).

Theme 4: Use of Blackboard (Virtual Learning Environment)

All the respondents agreed that they use blackboard regularly. In the response to the questionnaire and during the focus group session as well, all the students said that they use blackboard for various purposes, which involves taking lecture notes, assignments and printing PowerPoint presentations. From this, it can be analysed that virtual learning environment provides user satisfaction and fulfils the learning needs (Cardiff Metropolitan University, n.d.). One of the respondents said that the file extension Bb should be restricted because of the problems in the opening of files. One of the students from the focus group said that blackboard is sending e-mails of previous year assignment due to which the respondent had to unsubscribe the module. In the questionnaire, the respondents were asked about the frequency of the usage of CardiffMet Blackboard service. In response to this question, all of the students agreed and said that they use blackboard service often. The students also said that it is very easy to use the blackboard service. It can be analysed here that students use blackboard service extensively for the purpose of communication and learning & development.

It can be analysed from the findings that blackboard service of CardiffMet is sending e-mails of a different subject to different students. This indicates that there is a technical problem with this service of CardiffMet. For the blackboard service, respondents also suggested that
they should use Facebook instead because of its notification service and because many students were not aware of the existence of blackboard discussion service. Others said that they found out about an assignment when it was too late due to the absence of notification service. It can be analysed here from the above findings and responses that blackboard service of CardiffMet is mostly used by the students, but adding a notification service in it can make it more useful for students. A group also suggested that results should be displayed online for easy access and usage. It was also highly recommended by the students during the focus group session that there should be more material to be accessed for training on CardiffMet Blackboard service.

**Theme 5: Use of electronic timetable**

Most of the respondents in the focus group said that the absence of timetable on CardiffMet App is one of the important factors behind students not using this service. In Theme 1, which was based on the use of CardiffMet App, also describes that presence of timetable, that can lead to increased use of CardiffMet App. The respondents said that they store the timetable in the gallery to make the use of this service easier. From this, the importance of electronic timetable can be examined. Some other respondents of the focus group said that the timetable provided by the CardiffMet is not customised for the individuals, but it is applicable to everyone in the University. It can be analysed here that there is a need for a personalised timetable for every student.

The students suggested that they should use timetable on Facebook because of the customisation service provided by it. Another drawback that can be analysed from the findings of questionnaire and focus group session is the absence of the feature showing the module, which the student is currently following. It is suggested by all the respondents that the timetable should only show those modules, which are being currently followed by the student. On the other hand, some students also suggested that the timetable feature should show both, personalised or customised and generalised timetable. This will help them in being alert with their modules and they will also be able to know the module that their friends are following. During the focus group session, some students mentioned that it is very difficult to access the timetable. It can be analysed that students were facing the problem of repetitive login due to which it is problematic for students to access the timetable. Hence, it is necessary for the CardiffMet service to remove this problem of repetitive login. Overall, it can be interpreted that students need customised timetable, which helps them in following their module. Moreover, notification service should also be added to help students in receiving lecture notes and other modules easily for the purpose of learning and development (Blackboard, 2016).
Theme 6: Requirement of password

When the respondents were asked, if passwords were required for the accessing the services, most of the responses were negative. One respondent said that “I don’t think it needs to be that private.” This finding can be supported by the views of the Warburton (2009), who has discussed that in the multi-user virtual environment such as digital education services too many passwords create barriers to the learning. A student has to remember different passwords for different services, and if he forgets the password, then it creates more problem as the student has to request the University for Password reset (Warburton, 2009). Hara (2010) has highlighted the agony of the students in distance learning. Communication mismatch and the technical problems are the biggest problems in distance learning. The literature has also discussed that the management of two or three passwords becomes problematic for students. To resolve this problem, the students use a standard password for two or three services, which makes them more vulnerable to privacy attacks. If the password of one account is compromised, the perpetrator can use it for other accounts, which can result in result in damage in the education as well as personal life of the student (Hara, 2010).

The primary findings have also stated that the frequency of password reset is considered unnecessary among the students. One respondent has said that “If the password goes down, it is difficult to get a reset from off campus.” In this regard, Holly (2008) has discussed that many Universities prohibits access to modification in the e-services from off campus or home. Thus, the students have the problem in getting access or a password reset from home. The students who have some problem with the resource allocation or passwords have to come physically to the University campus for authorising some changes in their account (Holly, 2008).

Theme 7: Physical access to learning centres

When the respondents were asked the question if they can easily access the learning centres, most of the responses were negative. One respondent said that “I can’t work at Uni any more-if you get to the library at say 10 or 1, that’s it”. Other respondent stated that many students are using computers for Facebook or playing games. Zichuhr, Rainie and Purchell (2013) have discussed that nowadays, most of the universities provides computers for accessing the digital libraries and other educational websites from the University premises only. It is done so that the students who do not have access to the computers can quickly access the relevant information at the University campus. It will also provide equal opportunity for all the students to perform in their exams (Zickuhr, Rainie and Purchell, 2013). In this context, Hopkins (n.d.) has discussed that nowadays, the universities are doing a number of efforts to enhance their IT Infrastructure and encourage the knowledge of students.

The Universities are using various networks such as TELENET and TYMNET to connect the users in Universities for easy information exchange. These networks can also connect a university’s network to another university’s network so that the users can connect to the resources of another library and use it to enhance their knowledge (Hopkins, D.S. n.d).

However, the interview findings state that the initiatives of the universities are not effective as per the expectations. Many respondents have stated that the students use computers for
purposes other than educational. These students also fill the computers at an early hour which makes it difficult for the students who have come for educational purposes to use the resources. The interview respondents have also suggested various recommendations to improve the system and make physical resources more accessible to the students. One respondent has suggested that the staff members should periodically monitor if the students are using the resources for the educational purposes only. Certain social media website such as Facebook or Twitter should have a time-out option, which means they automatically stop working after a certain time.

From the interview findings, it can be inferred that the majority of the respondents have cited the use of Facebook and social media as the major hurdle in the effective use of University resources and suggested that the social media must be completely banned entirely in the University campus. In this regard, Mashrafi (2013) has discussed that the unethical use of the University resources is dependent on the personal moral and the behaviour of the individuals. The literature has highlighted that the males are more inclined to unethical behaviour in comparison to female students. Further, in spite of awareness campaigns and strictness from the University authorities, there persists immoral behaviour among the students (Mashrafi, 2013).

Theme 8: Benefits of Summon/ electronic library

When the research participants were asked questions about the Summon and electronic library, the responses were mostly negative about Summon and positive about the electronic library. Summon is a fast search engine which helps to find relevant information from books, journals and dissertations from library collections of a University. It provides educational content which can be helpful to the students (Proquest, n.d.). The responses of the participants regarding Summon were mostly negative due to various drawbacks associated with it. Sometimes, the search results of the Summon are not accurate and one respondent has stated that sometimes a code of the article comes instead of the actual article. Another respondent said that “it is better if the book cover or the cover of journal comes in Summon”. Some respondents have stated that the lack of knowledge also prevents the students, library staff and lecturers to use Summon effectively. In contrast to this, one participant indicated that Summon is the third most used service by one participant and she gives priority to it in comparison to Google Scholar and only uses it when she cannot find things on Summon. Kurbanoglu et al. (2010) have discussed that Summon search engine provides similar search facilities to that of Google; however, it focuses more on academic content. The search engine is efficient in exploring the educational media and academic content. Further, technological advancements can increase the potential of this search engine (Kurbanoglu et al., 2010). When the participants were asked about the electronic library, their responses were more positive. One respondent stated, “The electronic library is handier and easy to access through the portal”. More than half of the respondents indicated that they always or more frequently use library services. The literature of Colleen (2013) has also supported the viewpoint that library services are relevant in the present times. The present generation is proficient in digital applications and has their own personal digital devices. Digital library can assist the students to access the academic resources at any time and from any place. It also increases the digital literacy of the students. A virtual learning environment can also prove to be beneficial to distance learning students (Colleen, 2013).
Theme 9: Printing resources and cost issues

When the respondents were asked questions about the printing resources and the cost issues they face in the University, only one focus group raised the lack of printing resources as a big issue. The focus group was a group of students which required colour printing frequently in their course. One respondent said that “I had to print out something this afternoon-17pp because we need it for lab”. The cost of printing in the university library is high. In this regard, Scheeren (2015) have stated that most of the universities and schools use high-quality printers for the school libraries as they utilise the school printers for printing all the documents of the schools. High-quality laser printers are often selected for printing graphics and text quickly. All these printers are relatively costly and when the students use it for their personal use, they have to pay a high price for it (Scheeren, 2015). The primary findings have also stated that the printing services are very poor quality. One respondent has stated that “We gave 85p for something I don’t think I should have paid for”. This statement highlights that printing quality is poor which can be either because the printer is old or not functioning properly. In this context, it can be inferred that the University has not allocated resource properly. Heijer (2011) has stated that the universities have an immense pressure on the budget due to an imbalance between the demand and supply. The interference from the local government also impacts the resource allocation process of the University. The literature has highlighted that the university should make some strategic plans periodically for resource allocation to obtain optimal results and performance (Heijer, 2011).

Theme 10: Other digital services

The interview respondents were also asked their views about other digital services such as email, Blackboard, laptop loan, book loan, university portal, and timetable. Some respondents have suggested that that the “laptop loan services in the university is beneficial but full of hassle”. Another respondent stated that “A student has to bring a laptop every time; he has to renew the subscription. There is no provision to avail the service from home”. It can be deduced from the interview findings that the laptop loan service has a high potential for the benefits of the students; however, it requires some improvements. Wood (2014) posits that in the present era, computers and information technology are omnipresent. The computer users are no longer bound to access the internet from their desktop computers.

In this essence, the students should also have the same facility to access the internet from anywhere. Many universities have initiated the service to offer laptops on loan. However, the service still needs improvements as it is difficult for the librarians to operate the laptop loan services twenty-four hours for the students (Wood, 2014). The majority of the respondents have stated that digital library and book loan services are excellent in the university. A few respondents have complained about the university portal because “it has so many links and already registered candidates too have to fill the information again and again”. The interview findings also suggested that many candidates have little information about the digital services offered by the university. Therefore, more promotion is required for the services. Various interview respondents have also stated that there is no specific
facility to learn about various technologies. One interview respondent suggested that “There must be quick links to the help a user around the university portal and University sessions at the beginning of the academic year.” The college students also gave positive feedback on the electronic payment services. According to the interview, the electronic payment service is occasionally used or not at all by half of the respondents. Further, it can be deduced that the electronic payment service can be improved if small money amount such as library fines and café money can be collected from it.

Conclusion:

It can be concluded from the data analysis that the digital experience of the student was mostly positive; however, there are only a few services which are used dominantly by the students such as Blackboard, email, timetable and the student portal. Many students are not aware of the certain services offered by the University or do not have knowledge of how to use it. It can be concluded from the findings that the respondents view the services separately and do not consider them a single digital assistance. The students find printing cost very high and printing quality less than average. The students were more concerned about singular issues such as complexities of the password setting and the printing rather than awareness of the varied services offered by the university. Few small improvements such as removing multiple login requests, personalisation of timetable and making sure that the workstations are used for work rather than other activities can improve the satisfaction of the students. These improvements in the services can be achieved easily and transform the education system in the university. Furthermore, the knowledge of the existing services can be improved by running a session at the beginning of the academic year and placing quick help links in the university portal.
Findings and Discussion:

Introduction:

This chapter presents and discusses the findings of the primary research in the light of existing literature, research aims, and objectives. The present research is aimed at finding the range of the digital services offered by the university and provides recommendations on their basis to facilitate the learning of the students. The findings chapter of the research study is one of the most critical chapters as it represents the findings of the research study. The aim of any research is to identify and explore some new information or phenomenon. This chapter represents the information and the findings from different sources in a simple and comprehensive manner. In the subsequent section, the findings from the primary and secondary resources are discussed.

Discussion:

It can be inferred from the research that the CardiffMet App was not quite as popular as anticipated among the students. It was due to its slow processing and multiple login requests. A high number of students had installed the app in their mobiles but later uninstalled it due to its limited benefits. Marcus-Quinn (2013) have discussed that technology can benefit the universities in development of a comprehensive educational system which can benefit the learners and facilitate better learning outcomes. However, as implied by the primary data, only limited features and obsolete technology will reduce the student’s attraction towards them. CardiffMet has limited features such as it can be used for flicking during presentation. The students have suggested various features adding timetable and multitasking facility will help to improve the facility. It is evident from the primary literature that slow processing, bugs, absence of multi-tasking and repeated logins have raised the unpopularity of the application. Tsakonas and Papatheodorou (2006) have opined that e-portals can benefit the educational system a lot. The e-portals can provide regular updates about universities’ activities and keep the student’s records. O’Doherty (2008) has conducted a survey, which clearly shows that the use of e-portals is quite popular among students (O’Doherty, 2008). In this regard, the primary findings also state that the use of e-portals is quite popular in the universities. The students were satisfied as they do not have to look for the services at different pages. In the University’s e-portal, all the services and features were at the same page so navigation was easy; however, it was not quick. The portal took several minutes to load and move from one page to another which is the reason the e-portal service in unpopular to few students.

It can be inferred from the research that the five-minutes referencing guide made the portal very useful for the students. Classification and grouping of the service also lead towards the increased usage of the portal.

One of the major findings of the research is that the use of CardiffMet e-mail was quite popular among the university’s students. The students found the e-mail easy to use and used it multiple times daily. The students used it to share the study matter and classroom notes with their peers. The students also suggested that the university should also start its own Facebook like website. It can be used for sharing the study material and the classroom
notes and built exclusively for the students. The notification feature of the Facebook makes the website beneficial and helps a student remain up-to-date with the class proceedings. The literature by Ivers and Barron (2014) also support the findings and discusses that online networks can be used to communicate with the subject-matter experts and the teachers. The students themselves can use social networks to remain connected with their peers and exchange information with them. Kabilan, Ahmad and Abidin (2010) have also supported the fact that social networking sites like FaceBook can be used to facilitate the education and learning of the students (Kabilan, Ahmad and Abidin, 2010). In the digital learning, virtual learning environment is quite popular. The interview findings imply that Blackboard or virtual learning environments are frequently used by them. The students started that they used Backboard to take notes, assignments and printing PowerPoint presentations. It can be inferred from the interview findings that all the students were satisfied with the quality of service provided by blackboard. At times the blackboard suffers from the technical incompetence such as when the blackboard sent the students mail of an assignment of the previous years. In CardiffMet, the blackboard is also sending mails of different subjects to different students which are creating problems for the students. Further, few students use CardiffMet discussion board since they do not know about the service. Few students complained about the lack of notification in the service, because of which they came to know about the assignments very late. Therefore, the students use Facebook to share the information and updates about their classes.

This finding can be supported by the literature of Jones and Shao (2011) which has discussed that the virtual learning environment has immense potential for the student’s education. It can be used to provide education to distant learning students or local students at home. Overall, it can be surmised that the students also have problems in accessing the time-tables. The students also encounter problems due to a generalized time-table for all the students. The students have to identify their module and then the subject, which is time-consuming. Some students have suggested that a customized timetable can help the students a lot. Some students have offered that there should be facility of both customized timetable as well as generalized timetable. It will help them to look into their timetable as well as timetable of their friends. The primary data also indicate the fact that a high number of passwords make the efficiency of the system redundant. The primary findings state that it becomes difficult for the students to learn a large number of passwords and if the students forget the passwords, it problem reset creates more problems for the students. Moreover, if the student uses same password for one or more sites, the privacy and security of the student may compromise. Hara (2010) and Warburton (2009) have also stated in the literature that a large number of passwords in digital services can compromise the quality of digital educational services.

The interview findings also suggest that the universities are investing a lot in developing the IT infrastructure of the campus. The libraries are offering services of using computers in university campus so that the students can easily access the internet from there university only. However, most of these efforts are not as effective as the students are using the physical resources for social media websites and playing games. The students occupy the computers early in the morning and the actual students requiring the resources are unable to avail it. It can be deduced from the student’s interview that electronic library is quite popular among students. The students were happy with the digital library services and the students are able to access the library services at any time from any place. The students were negative about Summon it was slow and inefficient. The students taking modules
which require extensive printing services were also unhappy about the printing costs in the university. The students were also unhappy about other digital services such as laptop loan service, book loan service and university portals. The students were unhappy about too much information filling in availing service and slow speed of portals. Terry (2009) and McMahon and Pospisil (2005) have presented recommendations to improve the quality of digital education. Terry (2009) has discussed that pedagogical effectiveness can be improved by online education. The literature has suggested that integration of games and case studies with learning can improve the efficiency of the online learning. In the same context, McMahon and Pospisil (2005) have opined that online book borrowing facility, mobile apps and virtual classrooms can raise the standard of the digital learning.
Conclusion:

Currently, a large number of universities are offering digital services to the learners to facilitate learning and produce more effective learning outcomes. It can be concluded in the research study that the educational institutions are using technology to enhance the teaching and learning services. Digital helps the students to remain connected with their peers, students, and teachers and provide fast access to the learning resources and information. At the present technological era, there is the need for the education institutions to adopt technology to help the student's learning and better learning outcomes. The students can also use the technology for self-directed learning and seek knowledge according to their personal interest. Moreover, technological knowledge is also required for the students so that they can easily fit in the workplace. Presently, most of the workplaces have integrated technology and digital mediums for efficient working. In this scenario, it has become important for the students to learn to operate digital devices and become proficient in it. Technology can also be used to hold the interest of the students by using multimedia and interactive content. Digital services can also be used in to provide quality education to physically and differently abled students. It can also be used for the designing curriculum and can be utilised by the teachers for the enhancement of learning.

The present literature has identified several disparities in the existing educational services provided to the students. The absence of librarian in digital libraries extracts the feature of valuable suggestions from the librarians on the quality of books and their assistance. The digital learning has also facilitated in distance learning. The students can access the study materials and the teachers quickly with the help of internet. Several universities also lag behind in offering features like wireless access to internet or projection facilities for educational activities. The CardiffMet App also suffers from various limitations due to which the students' usage of the App has reduced. Repeated login request, the absence of multi-tasking and slow processing has made the App quite unpopular among the students. The University e-portal is also slow, and the access to the portal through the only external website has also reduced the use of the e-portal. Furthermore, it can be summarized that the students frequently used the e-mail services provided by the University.
Recommendations:

CardiffMet, a digital application has facilitated the learning in the students and produced better learning outcomes. In the present section, few recommendations are made based on the research to improve the digital application.

- Enrolment can be added as a seasonal feature, which this will also increase the use of e-portal service by the students.

- Notification feature can be added to the electronic mail and CardiffMet App, so that the students become aware when any update takes place. Many students become late in their submissions because they come to know about their assignments very late. Thus, the students will be benefitted a lot by the addition of notification feature. In addition to it, the students’ results should be displayed online for easy access and usage.

- The timetable provided by the CardiffMet is not customized for the individuals, but it applies to everyone in the University. Therefore, there is a need for a personalised timetable for every student. Moreover, the timetable should only show those modules, which the students are currently following. In addition to it, CardiffMet App should show both, personalized or customized and generalized timetable so that the student would be able to know the timetable of their friends.

- The multiple login requests and password requirement should be reduced in the University (Hara, 2010).

- Certain social media website such as Facebook and Twitter should be prohibited on the university campus so that the students use physical resources for educational purposes only. The staff members should also periodically monitor if the students are using the resources for the educational purposes only.

- The efficiency of the Summon search engine can be enhanced, by adding the feature of the book cover or journal cover in the search results. In this manner, the students can easily find what they are looking for.
Originality of work:

The secondary data is collected from different literature sources. The obtained secondary data is critically evaluated and presented from the researcher viewpoint. It is also ensured that the plagiarism and direct quotations of the author are avoided to maintain the originality of the work. The primary data is collected from interview method as well as questionnaire. In the interview, some new information regarding the CardiffMet App such as its weaknesses and the student perception towards it are evaluated. The researcher has made best efforts to ensure that the primary data is presented in an exact manner and without any modification to ensure the originality of the work.

Accomplishment of research objectives:

In order to accomplish the research objectives, the interview questions were formulated as per the research aims and objectives. The interview data identified the need and the disparity in the digital services for the students. Furthermore, based on the primary findings and the literature sources, various recommendations have been made to improve the digital services offered to the students.

Future research and limitations:

The present research has few limitations which can affect the result of the research. The interview was conducted only with the students of the University; therefore, the sample size was small, and the research shows the views of a particular section of the society. The research has identified that the students frequently use mobile apps to access the e-libraries. The future research direction can be to develop mobile apps for educational purposes.
References:


Cardiff Metropolitan University. VLE transition- from blackboard to Moodle. [Online]. Available at: http://www.cardiffmet.ac.uk/about/ltdu/Pages/VLE-transition.aspx [Accessed on: 02 April 2016].


Appendices:

Ethical approval is designed to ensure detailed scrutiny of all research projects conducted in the university (The university of Edinburgh, 2016). Therefore, an ethical approval was fully approved by the ethics committee in Cardiff Metropolitan University before the research commenced. Here is the ethics approval number: 2015D0576

In the next few pages, I have included the application for ethics approval
Appendix I:

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

*If the project requires ethics approval from an external agency (e.g., NHS)*, you will not need to seek additional ethics approval from Cardiff Met. You should however complete Part One of this form and attach a copy of your ethics letter(s) of approval in order that your School has a record of the project.

The document *Ethics application guidance notes* will help you complete this form. It is available from the Cardiff Met website. The School or Unit in which you are based may also have produced some guidance documents, please consult your supervisor or School Ethics Coordinator.

Once you have completed the form, sign the declaration and forward to the appropriate person(s) in your School or Unit.

**PLEASE NOTE:**

*Participant recruitment or data collection MUST NOT commence until ethics approval has been obtained.*

**PART ONE**

<table>
<thead>
<tr>
<th>Name of applicant:</th>
<th>Mohammed Alhaidery</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supervisor (if student project):</td>
<td>Dr. Hilary Berger</td>
</tr>
<tr>
<td>School / Unit:</td>
<td>CSM</td>
</tr>
<tr>
<td>Student number (if applicable):</td>
<td>St20031470</td>
</tr>
<tr>
<td>Programme enrolled on (if applicable):</td>
<td>BSc (Hons) Software Engineering</td>
</tr>
<tr>
<td>Project Title:</td>
<td>Recommendations for the digital services offered by Cardiff Met to facilitate more effective learning outcomes of their students</td>
</tr>
<tr>
<td>Expected start date of data collection:</td>
<td>N/A</td>
</tr>
<tr>
<td>Approximate duration of data collection:</td>
<td>N/A</td>
</tr>
<tr>
<td>Funding Body (if applicable):</td>
<td>N/A</td>
</tr>
<tr>
<td>Other researcher(s) working on the project:</td>
<td>N/A</td>
</tr>
<tr>
<td>Will the study involve NHS patients or staff?</td>
<td>No</td>
</tr>
<tr>
<td>Will the study involve taking samples of human origin from participants?</td>
<td>No</td>
</tr>
</tbody>
</table>

**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 tissue samples | No |
| Practice based not involving human participants (eg curatorial, practice audit) | Yes |
| 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:

The aim of the project is to provide recommendations for the digital services offered by Cardiff Met to facilitate more effective learning outcomes of their students. The aim will be achieved by the following:

Identifying the range of the digital services currently provided to student by Cardiff Met.
Establishing any disparity between the digital services provided and those needed by students.
Exploring the digital services that student need to meet their learning outcomes.
Finally, providing recommendation to address the identified gaps.

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 disseminate any material produced as a result of this project without the prior approval of my supervisor.

Signature of the applicant: Date:

FOR STUDENT PROJECTS ONLY
Name of supervisor: Date:

Signature of supervisor:

Research Ethics Committee use only
Decision reached: Project approved [ ]
Project approved in principle [ ]
PART TWO

A RESEARCH DESIGN

A1 Will you be using an approved protocol in your project? No

A2 If yes, please state the name and code of the approved protocol to be used

n/a

A3 Describe the research design to be used in your project

**e.g.**

This dissertation uses both qualitative quantitative data to gain information on the development and use of the application described above.

This dissertation uses both qualitative quantitative data to gain information on the research domain described above.

**Questionnaires/Interviews/Case study** will be used to collect primary data and will be developed from the analysis of current literature within the given domain.

The questionnaire will be distributed to <identify specific group> to gain quantitative information on how their current and possible use mobile technology (n=<identify specific number>).

Interviews will be conducted with students to investigate their thoughts on the given project (n=<identify specific number>).

The results will then be analysed using excel to gain descriptive information for discussion.

Interviews will be coded and themes developed, ensuring that the anonymy of the interviewees is maintained.

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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.
A4 Will the project involve deceptive or covert research?  
No

A5 If yes, give a rationale for the use of deceptive or covert research research.
Click here to enter text.

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.
This may affect some students undertaking research on Data Security. Complete this section if needed.

B PREVIOUS EXPERIENCE

B1 What previous experience of research involving human participants relevant to this project do you have?  
None

B2 Student project only
What previous experience of research involving human participants relevant to this project does your supervisor have?
Over <number of years> of student dissertation and research at both undergraduate and postgraduate level.

C POTENTIAL RISKS

C1 What potential risks do you foresee?
Delete as appropriate
Arranging interviews – causing inconvenience to interviewees during their working day.
Personal information on the questionnaires.
Risks of not meeting the research deadlines.
A risk to the participants would be the confidentiality of the data they provide.
Personal information and data storage must be taken into account.

C2 How will you deal with the potential risks?
Delete as appropriate
The interviews will not be conducted without a signed consent form and the questionnaires will have a confidentiality and agreement not to participate at the top.
Consent for the interviews will be provided by oral and participant consent form which will be signed before the interview. Interviews times will be arranged at a time and place convenient for the interviewees. The customer questionnaires will state terms of participation and insure confidentiality at the top of the form. If participants wish not to contribute then they simply will not fill the form in and reply.
Completion of the questionnaire is taken as consent and will be stated at the beginning.
The questionnaire and interviews will not contain any questions that reveal the
identity of the contributor and will insure contributor’s anonymity throughout. This will be stated in the participant consent form for the interviews and the beginning of the questionnaires. If participants feel uncomfortable during any part of the research gathering process withdrawal from the process can be immediate. Audio recordings of the interviews will be transcribed and the participant will be referred to as a pseudonym.

Every effort will be made to complete the research phases in accordance with the anticipated research deadlines.

All data will be held on a secure password protected external hard drive and paper copies will be kept in a locked cupboard. Access to the data will be restricted to the contributor and supervisor. Questionnaires will have no trace back to the contributor.

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

An exemplar information sheet and participant consent form are available from the Research section of the Cardiff Met website.