CX3001

Technical Investigation & Skills

Capstone Project

Research Diary

2016-2017

**Introduction**

Welcome to your capstone project.

You are all currently undertaking the Foundation year as part of your extended degree and this project will allow you to undertake some research in an area which relates to your degree choice. In this respect, it is important to choose a title that not only relates to your degree choice but is also interesting to yourself. You will be guided in the choice of title and any revision that may be necessary.

The ability to undertake research and convey this information is essential in Higher Education. Therefore this exercise is designed to support you in subsequent study beyond your Foundation year.

The aims of the project are:-

* To develop your communication skills by presenting a poster;
* To reinforce your ability to retrieve information;
* To introduce reflective practice and its value in research;
* To develop your ability to work independently.

**Why keep a research diary?**

Reflection is a key part of the learning process, helping to identify events / experience and how we react to this. Keeping a research diary allows you to:

* Keep a detailed history of your research process as it unfolds;
* Track the development of your research skills and understanding;
* Reflect on your research and the problems that it throws up;
* Have an overview of the progress you are making over a period of time and provide reference for when things happen in the research process.

The research log is intended to be a reflective diary forming part of the learning cycle. It should not only include where success was achieved but where the process did not work and how reflection on this allowed you to move forward.

We hope you enjoy your project and that the process allows you to see how research is undertaken.

**Section 1: Project Proposal**

Submission Deadline 20th January 2017

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| **Name** | | Tomasz Przybylski | | | |
| **Student IDs** | | KC68744 | | KU1602155 | |
| **Degree Route** | | Computer Science (Network Communications) | | | |
| **Initial Title** | | Quantum Computing – The Future of Information & The Possible Implications for Networks | | | |
| **Project Proposal (Insert your initial proposal here)**  As Quantum Computing is slowly changing from Science Fiction to Science Fact, it is already impacting how we perceive the flow of information and the way information & technology is understood.  The fundamentals of Quantum Computing and using Quantum Physics in technology revolves around the use of Qubits as well as other Principles of Operation which I will be talking about. What I also find interesting is the impact of this technology on how we interpret bits and binary, and on existing ideas like Turing Machines and how they would be affected by this technology, and if in fact they can stand the test of time and the introduction of these new technologies, or if they should be discarded in favour of new ideas/models.  There are some already existing Quantum Technologies, like the D-Wave computer system in America and the Quantum Satellite launched by China with the intention of providing a much more secure internet service (using Quantum Cryptography) that I will be investigating.  Some topics of interest are Quantum Computing, Communications & Cryptography. This is something that interests me personally, and will add to my understanding of the subject and broaden my knowledge.  My main methods of research will be via Journals & Articles, as well as other forms of online research, and maybe even Seminars if possible.  My research will result in a poster, which will aim to give a basic overview of the ideas and principles behind Quantum Computing, how this technology can and will change the world & affect everyone, from the richest to the poorest, and ultimately will answer the question;  Why should we care? | | | | | |
| **Received**  **(Tutor/Date)** |  | | **Approved** | | **Yes ~~No~~** |

**Section 2: Research Log (Finding / Gathering information)**

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| **Date** | **Resources Used**  **(Name of library database, online resources etc)** | **Search Terms Used**  **(Keywords, subject tags)** | **Relevant Resources Identified**  **(List all materials identified e.g. Name of a book; Web-link; Journal; Professional Bodies)** |
| **21/03/17** | **D-Wave Systems website** | **Quantum Computing systems, commerical** |  |
| **21/03/17** | **Encyclopaedia Britannica** | **Quantum, computing** | **Identified people to look into(Isaac Chuang, Neil Gershenfeld, Mark Kubinec)** |
| **21/03/17** | **Encyclopaedia Britannica** | **Quantum, computing** | **Journal Link (Nuclear magnetic resonance)** |
| **21/03/17** | **Encyclopaedia Britannica** | **Quantum, computing** | **Professional Body (NIST)** |
| **21/03/17** | **Journal – Association for Computing Machinery** | **Qubits** | **Journal – Association for Computing Machinery – S.Weisner(1983)** |
| **21/03/17** | **Journal – Quantum Computation and Quantum Information (ISBN 978-1-107-00217-3)** | **Qubits** | **Journal – Quantum Computation and Quantum Information (ISBN 978-1-107-00217-3)** |
| **21/03/17** | **qubits.org** | **Qubits** | **Website – qubits.org**  **Oxfordquantum.org** |
| **22/03/17** | **Oxfordquantum.org** | **“Research Stories”** |  |
| **22/03/17** | **Oxfordquantum.org** | **“Impacts”** | **Long list of articles, journals & research papers** |
| **23/03/17** | **Encyclopaedia of Mathematics** | **“Quantum Turning Machine”** |  |
| **23/03/17** | **Google** | **“Physical Implementations of Quantum Computing”** | **“A one-way quantum computer” – Robert Raussendorf and Hans J Briegel -phys.rev.lett.86,5188** |
| **03/04/17** | **Nobel Prize website** | **David Wineland, Nobel** | **https://www.nobelprize.org/nobel\_prizes/**  **physics/laureates/2012/** |

**Section 3: Reflective Log**

This log will be monitored in your workshop classes throughout the project

Final submission date 28th April 2017

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| **Resource Used** | **Reflect and assess the usefulness of the identified resources**  **(Did you adjust your search strategy at all? Explain why this was necessary. Reflect on the resources you used, the difficulty on using them and what you learned about using resources for your research)** |
| **Google** | **Provided me with a lot of ‘leads’ to begin my research and was helpful when dealing with definitions or quick things that I had to touch up on regarding my knowledge.** |
| **Nobel Prize website** | **Used this for a section on my poster. Straightforward and easy to use, provided me with enough information about what I wanted & explained it well. Contained many different resources which was very useful.** |
| **Encyclopaedia Britannica** | **Used mostly for understanding the topic in depth. Pointed me to a lot of topics, people and things I ended up talking about. Didn’t lack in content about the things I was researching, however it was sometimes a little too in depth or difficult to understand so I also looked elsewhere for the same information.** |
| **Oxfordquantum** | **Useful resource for showing me what to look for and giving me ideas. Ended up sparsely using the resource directly, although again it did point me in a few directions in terms of research and ideas.** |
| **D-Wave Systems website** | **Quoted the resource in my poster. Used to as an example of already existing quantum computing technologies and showed me some of the paths that this technology could be heading down.** |

**Section 4: Poster Presentation**

Tuesday 2nd May 2017 to Friday 12th May 2017

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| **What are the key aspects of the project you are trying to convey in the poster?** |
| The idea of using Quantum Mechanics in computing, the current technologies aiming to do just that, the future prospects for Quantum Computing and what it could achieve. |
| **How did you decide on what material to include in your poster?** |
| I knew I would need a section dedicated to explaining the physics behind the idea, and that I would need to explain the double-slit experiment. I also thought it would be a good idea to show that this is an area of active research, as shown by the current technology and research section |
| **How did you decide on the layout of the information in the poster?** |
| I thought it best to make a poster that focuses on explaining or trying to explain the ideas behind Quantum Computing. I attempted to create a poster that was visually appealing but wouldn’t its ability to explain everything it needed to. |

**Section 5: Abstract/Summary**

Submission deadline: You will bring this with you to your allocated presentation slot, already completed.

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| **How did you decide on what information to place in your abstract?** |
| I thought that a general summary of the purpose of the poster would be a good idea, as well as putting in the main points made on here. I included existing technologies and I decided against including any of the explanation of quantum mechanics. |
| **Copy of your abstract:**  Quantum Computing is the application of quantum mechanics and computation. It is a very young field of research, and as such is still mostly in the theoretical stages. However, there is already some key data available that hints at the possibility of using this technology in the future. So far, the current amount of qubits, and therefore quantum computational power, is exceeding “Moore’s Law”, with more than doubling each year. The Chinese ‘quantum’ satellite, “Mozi”, launched just over a year ago and is already working on quantum encryption and quantum teleportation. The D-Wave system is a computer system that incorporates quantum mechanics and quantum computing alongside conventional computers.  Google recently said that within 5 years time, quantum computing will already be an exploitable technology, and commercial or even personal usage would not be out of arms reach within the next couple of decades.  With this in mind, I wanted to create a poster that brings together all of these points and more, and creates a platform from which anyone could be able to understand the concepts and begin to understand how important this technology is, and why it will affect all of us. |

**Section 6: Reflection** Name……………............ KU ID……………

KC ID……………...

Complete the following sections **immediately** after you have had your poster marked by two assessors at the presentation event. Submit this **Reflection** plus your **Poster** **before** you leave the presentation.

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| **Summarise the feedback you received from the poster presentation session and describe how you will use this for future projects/posters?** |
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**Evaluation of Skills Developed**

**Reflect on the whole process of your project and the poster presentation. Identify the skills you feel you have developed as a consequence and identify the activities that allowed you to demonstrate these skills**

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| **Skill Developed** | **Activity that demonstrated your ability to undertake this skill** |
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*Continue overleaf if required*