Memorandum

TO: Mr. George Drouant and Dr. Franny Howes

FROM: Zak Rowland

DATE: May 1, 2019

SUBJECT: Technical Report Proposal and Bibliography

I would like to begin by thanking George Drouant for taking the time to assume the role of my technical reader. Mr. Drouant has been truly influential on my education through his enthusiasm for teaching. Our first meeting, which took place on April 26, 2019, consisted primarily of going over my chosen topic, quantum computing, and what makes it important. We discussed my knowledge and research thus far, as well as the research questions and intention of my report. The purpose of a technical reader is to provide relevant experience and past knowledge to aid in research and the creation of the report itself; this includes evaluating the rough draft as well as the finished report.

The topic of my technical report will be quantum computing. I have chosen this topic because I find the concept particularly interesting as well as its relation to my field of computer hardware engineering. Research will be primarily motivated by the following questions:

- What is quantum computing exactly?
- How does it work (quantum physics?)
- What are the benefits over current technology? Are there drawbacks?
- How much progress has been made?
- How does quantum computing apply to Moore's Law?
- When, or will, this technology ever be "the standard?"

Quantum computing is important to research because it is the future of computing. Current processors, which consist of cramming millions of transistors onto computer chips, will eventually lose traction due to size and space limitations. Modern transistors have already reached the atomic scale and going any smaller would not allow them to function properly. Utilizing quantum mechanics for computing allows for processing speeds that are dozens, if not hundreds, of times faster than current technology. Once the idea is fully realized and perfected, the future of general processing, simulating, video rendering, and even gaming will be changed forever.

The intended audience for this report is primarily those in the broad field of Computer Science. This includes computer scientists, hardware engineers, software engineers, and others. While some of these categories won't have as much impact on the evolution of quantum computing as others (hardware vs. software,) all fields will be affected once the technology is commonplace. Writing software for a

quantum processor will likely be vastly different than writing software for modern processors. Similarly, developing additional hardware that plays nicely with quantum processors will also be an entirely new process.

An outline of the report is provided below. This is subject to change as needed for the finalized report.

- Abstract
    - The abstract will be used to give an overview of the topic, the argument being made, and the resulting conclusion.
- Table of Contents
    - All headings and subheadings as well as their associated page numbers will be listed here.
- List of Figures
    - An ordered and cited list of used figures will fill this section.
- Introduction
    - The introduction will provide the reader with a more in-depth description of the topic, purpose, and other introductory information.
- Understand Quantum Computing
    - Quantum Physics and the Qubit
        - Includes research on how quantum computers work and the ways in which they differ from current computers.
    - The Future of Computers
        - This section will cover the benefits of quantum computing over normal computing, as well as the potential drawbacks.
        - The relevance of Moore's Law will be discussed here as well.
- The Progress of Quantum Computing
    - Current Quantum Computers
        - Research on facilities that currently operate quantum computers and the progress made thus far will be presented in this section.
    - The Industry Standard
        - In this section I would like to gather information and opinions from the engineers working on these computers in order to discover when/if this technology will become a household standard.
- Quantum Computing and Cybersecurity
    - In this shorter section I will discuss the threat quantum computing has on our current online security (passwords,) and how online security might change.
- Conclusions
    - The conclusion will include a recap of the report including the topic, argument, the importance of the topic, recommendations for the audience, and closing thoughts.
- Works Cited

- All sources used will be cited in this section using IEEE format.

Action and Date	Assignment	Due Date
• Begin reading through and gather research on May 4. • Finish researching and begin drafting a section of the report on May 6. • Finish section draft and begin progress report memo on May 11. • Finish and turn in draft and memo by May 13.	Progress report and section draft	May 13, 2019
• Continue researching and begin drafting other body sections May 13. • Finish at least seven pages of the report and begin working on other sections of the report if time permits by May 19.	Formal report rough draft	May 19, 2019
• Finish gathering research and begin editing body sections on May 20. • Finalize body sections and begin abstract and conclusion on May 27. • Finish abstract and conclusion and begin work on table of contents and works cited on May 30.	Formal report	June 3, 2019

• Finish table of contents and works cited then finalize the report by June 3.		

Once again, I would like to thank George Drouant for providing assistance on this report. If schedules permit, I would like to meet again with Mr. Drouant the week of May 6 to discuss this project proposal. I can be contacted at zachery.rowland@oit.edu regarding any questions or concerns.

A bibliography of sources will be attached to this memo.

References

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