**Raspberry Pis, Arduinos, Makey Makeys, and Other Small Computing Devices**

**Overview**

As computing power and miniaturisation continues to develop we are able to achieve smaller and more powerful computer devices. Some such devices are the Raspberry Pi, Arduino and Makey Makey. A Raspberry Pi is essentially a small credit-card sized computer [1], while an Arduino is a programmable microcontroller.[2] Makey Makey is a system of introducing science, technology, engineering and mathematics (STEM) education around electronics and programming at a young age. By mimicking a keyboard and mouse the Makey Makey lets you control computer programs with everyday objects. [3] All of these are small computing devices that can connect to all different sensors that can then do some action based on some event.

The current Rasberry Pi board is up to version 4. It has up to 4GB of RAM, gigabit Ethernet, 2 USB 3 ports, 2 USB 2 ports and two micro HDMI ports allowing support of 2 4k displays.[1] The Arduino comes in many forms. You have your basic Uno board, the smaller Nano and the Mega.[2] Other companies make Arduino compatible boards with a variety of extra features. Some of these boards are designed with industry in mind making Arduino based programmable logic controllers (PLCs).[5]

While Makey Makey might be more designed for games and instruments, Arduino and Raspberry Pi’s are capable of complex electronic circuitry. They are inexpensive and simple to use. This allows anyone to create things such as autonomous vehicles, 3d printers, irrigation systems and with the Raspberry Pi things like Twitter bots, baby monitors and web servers. You can connect many sensors to the Arduino such as thermistors which can detect temperatures and buttons to detect user input. Then the Arduino can output to things such as LCD screens to display user-readable information.

We are likely to see more use of these technologies in the classroom environment as STEM education expands, enabling younger and younger inventors to create projects. Currently, fifty percent of current jobs with skill shortages are in STEM fields. [4] In the next three years or so we should see more modules and shields developed for market and more open-sourced projects available online. We are likely to see more ruggedized housings for Raspberry Pi essentially making them PLC’s, ready for industrial usage.

Open-source software, hardware plus the maker community makes it possible for almost everyone to develop complex machines. Almost any kind of sensor you can think of is available as either as components, modules or shields. Shields are a term used to describe boards that can be plugged directly into an Arduino board to give it enhanced features.

**Impact**

I believe the people primarily affected by these developments are students looking to make projects for schooling and engineers/developers looking for a cheap way to prototype effectively.

Because the cost of these small computing devices is so low people can prototype unique solutions to problems and test the solution before production. This allows the industry to produce a final product based on the components and code needed, making the solution more efficient and robust.

This technology is primarily used for computer science and engineering education or small projects and prototypes. There is the capability of automating a lot of real-world applications with these types of boards, making some tasks redundant, easier or more efficient. I don’t think these devices will replace or make redundant any jobs but perhaps the use of these devices will enhance employee skill sets, making them more valuable to the job market. Teaching electronics with the aid of Arduino is already happening now and will probably continue in the next three years.

**Personal Impact (300 words)**

These technologies will affect me in my daily life by being incorporated into my hobbies and continuing education. I have an Arduino board that I tinker with at the present and I will also incorporate Arduino projects into my university studies where I can. My background is in electronics and I enjoy programming so with these cheap solutions I can forge personalized products for around home.

I will also use my knowledge of electronics and programming with these systems to help educate my niece and nephew on these concepts, helping them get a head start into more complex and exciting learning subjects. I bought my nephew an Arduino electronics kit for Christmas last year and he is very excited to learn all about it.

My family might directly benefit from my small to medium scale projects I deploy around the household. My house may become more and more ‘smart’ as the years go on and my education expands incorporating smart irrigation, lighting and security systems.

1. ‘https://raspberrypi.org’ n.d. Raspberry Pi Foundation. [online] Available at: <https://www.raspberrypi.org/> [Accessed 1 Jan 2020].

2. ‘https://www.ardiuno.cc’ (2020). Arduino. [online] Available at: <https://www.arduino.cc/> [Accessed 1 Jan 2020].

3. ‘https://makeymakey.com’ (2019)Makey Makey LLC. [online]Available at: <https://makeymakey.com/> [Accessed 1 Jan 2020].

4. ’https://www.education.wa.edu.au/what-is-stem’ n.d. Government of Western Australia. [online] Available at: <https://www.education.wa.edu.au/what-is-stem> [Accessed 1 Jan 2020].

5. ‘https://www.rs-online.com/designspark/arduino-based-plc-from-industrial-shields’ n.d. RS Components. [online] Available at: <https://www.rs-online.com/designspark/arduino-based-plc-from-industrial-shields> [Accessed 3 Jan 2020].

6. Greenfield, David. (2019) ‘Is Raspberry Pi Ready for Industry?’ [online] Available at: <https://www.automationworld.com/products/control/blog/13319680/is-raspberry-pi-ready-for-industry> [Accessed 7 Jan 2020].

7. Hoffer, Brandyn Moore, "Satisfying STEM Education Using the Arduino Microprocessor in C Programming" (2012). Electronic Theses and Dissertations. Paper 1472. https://dc.etsu.edu/etd/1472