//I’ve left this unformatted to make the job of converting it to HTML more simple, make sure to remove the word counts and retitle to what looks good on the page. - jason walstab

**IT Technologies 1: Raspberry Pis, Arduinos, Makey Makeys and other small computing devices.**

**What does it do? (600 words):**

Small single-board devices like Raspberry Pis, Arduinos andESP-32s are generally used in many applications, from appliances, factories, home automation, network security, healthcare, robotics, education, hardware/invention prototyping and IoT applications. They can be used as regular computers but are often used as controllers for electrical devices (everything from light bulbs, factory robotics, fridges to large commercial hot water systems). Generally the use of one of these pieces of hardware would be to run a small script or program on the micro-computer, with its GPIO pins connected to whatever device and/or devices you would wish to control.

What these computing devices do is allow someone to use them as a computer to control the electrical signals sent to the GPIO pins that have inputs/outputs to connect to sensors and receive/send information based on what inputs/outputs the micro-computer is receiving. The driving technological force behind these single-board computers has been the constant technological advancements in being able to manufacture smaller and more efficient computer parts, such as storage, CPU and ram as well as the lowering of costs associated with these parts.

An example of what a micro-controller would do in a home automation setup would be having a Raspberry Pi with a movement detector (or ultrasonic distance detector) to see if someone or something is moving in view of the sensor. If movement/change is detected, a camera installed on the Pi can automatically begin recording and either store the video data locally or send remotely to a cloud server. A setup like this would not be expensive compared to previously available commercial security camera setups that involved expensive DVR equipment and a central server to store video data.

Another example for factory use would be having an ESP-32 micro-computer connected to a PLC control board which is controlling say a conveyer belt. The ESP-32 could be programmed to send instructions to the PLC control board using the ‘Modbus’ computer language through an open source software such as Node-Red. This ESP-32 could then be setup to create and send weekly reports to a server based on the conveyer belts speed, to get a rough assessment of productivity during the week.

Further, an example for appliance use would be that of a hot water system. An Arduino could be installed with a temperature sensor attached and located within the tank which sends the internal tank temperature to a cloud server to send data back to the head company to get statistics on how well their hot water systems are performing in the field. Using this kind of technology, a company would be able to detect trends over time and to a degree of accuracy that would not have been possible with just sending an electrician/plumber to check numbers every time a tank is serviced.

A final example for network security would be the use of a raspberry Pi as a remote VPN. Maybe you are a journalist/government employee/high corporate going to a foreign country where internet access is heavily restricted, and you need to send or view sensitive information over the internet. Before you leave, you could setup a Raspberry Pi at a secure location in your own country with an Open-VPN server, which you could then connect to remotely with an Open-VPN client when you have landed at your new location. This would allow you to have cheap access to a secure stable line that could not be viewed by a third party, such as a commercial VPN provider.

What these devices do is up to the person who is using it, as there are so many different uses and applications and the list is only growing as the technology matures.

**What is the likely impact? (300 words):**

I believe the likely impact of small single-board computers will be the computerization of many products that were previously not computerised or networked. The price point for single-board computers has been dropping considerably, especially over the last decade. This makes it more accessible for people to use single-board computers in their product designs/tech solutions.

The impact will especially be felt in the IoT sector, which is growing at incredible rates. The IoT market is fuelled by the rise of single-board computers such as the Raspberry Pi and Arduino and is expected to reach $1,102.6 billion US dollars by the end of 2026[1]. Due to the huge growth in this sector, we can expect to see this whole new industry around small single-board computers become a much bigger deal in the future as well as providing many new jobs, challenges, solutions and problems. The single-board computer market itself is expected to reach $1 billion US dollars by the end of 2025[2].

Another impact will be especially felt in developing countries where small single-board computers have been at the heart of robotics development in Kenya, Africa. This has spurred a huge education drive towards programming, robotics and computers and will be one of the big driving factors of helping to develop these countries by providing jobs, industry and education to areas that were previously not able to access and work with high cutting edge technology.[3][4]

With these developments in small single-board computing technology, even countries national security may be impacted in the future. In April 2018, America’s space agency NASA was attacked and comprised via the use of a $35 Raspberry Pi. As people's homes, workplaces and governments are increasingly connected and equipped with small single-board computers the risk of hacking and cyber-attacks may increase and cause many potential problems in the future.[6][7]

**How will this affect you? (300 words)**

In daily life, I believe the affect it will have on me and others will be substantial. The idea of a computer being a large, bulky and expensive device is no longer a reality for the home consumer. If you want to watch movies, browse the internet or listen to music you can simply purchase a cheap single-board computer and plug it into any TV to do the trick. The rise of this cheap computing revolution will no doubt bring people who were previously not interested in tech into the fold as it becomes a part of daily life.

Privacy concerns will also arise, as with these small computer devices all being networked and presumably connected to the cloud, people's homes will be more susceptible to attack [8]. This could affect myself, friends or family personally and the need to stay diligent regarding cyber-security will be a necessity of everyday life. The need for everyday people to understand the basics of network security will be an issue for both myself, friends and family, who will need to learn and adapt to these new technologies.

As people who are studying IT or strive to work in an IT field, the growing industry of IoT and single-board computers will be of huge interest and have a great effect on IT professionals. Electronics has been left on the way side of IT skills for a long time now, but with the rise of single-board computers the need for many IT specialists to also have a working idea of electronics will create rise to new types of specialists, and as people who work in IT we will need to rise to meet this challenge if we wish to remain up to date with this new rising technology. Since the use of single-board computers generally requires a broad knowledge of IT, combing all aspects of previously separated fields such as hardware/networking/programming and electronics, this will not be an easy task.

[1]"Internet of Things Market Size, Growth | IoT Industry Report 2026", *Fortunebusinessinsights.com*, 2020. [Online]. Available: https://www.fortunebusinessinsights.com/industry-reports/internet-of-things-iot-market-100307. [Accessed: 03- Jan- 2020].

[2]I. Global Market Insights, "Single Board Computer Market to surpass $1bn by 2025: Global Market Insights, Inc.", *GlobeNewswire News Room*, 2020. [Online]. Available: https://www.globenewswire.com/news-release/2019/02/13/1724445/0/en/Single-Board-Computer-Market-to-surpass-1bn-by-2025-Global-Market-Insights-Inc.html. [Accessed: 03- Jan- 2020].

[3]"Engineering students create wall climbing robot prototype", *The Star*, 2020. [Online]. Available: https://www.the-star.co.ke/sasa/2019-07-26-engineering-students-create-wall-climbing-robot-prototype/. [Accessed: 03- Jan- 2020].

[4] "Bringing The Maker Revolution To Africa, One Raspberry Pi At A Time", *Fast Company*, 2020. [Online]. Available: https://www.fastcompany.com/3023170/bringing-the-maker-revolution-to-africa-one-rasperry-pi-at-a-time. [Accessed: 03- Jan- 2020].

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[8]2020. [Online]. Available: https://www.washingtonpost.com/technology/2018/12/20/nest-cam-baby-monitor-hacked-kidnap-threat-came-device-parents-say/. [Accessed: 03- Jan- 2020].