Sustainability Report

Aim

This report aims to measure the social and environmental impact of the mega:bit and address future goals and areas of improvement in this area.

Environmental Impact

Environmental consciousness in the production, distribution and subsequent usage of mega:bit is a crucial concern. It is important to ensure that the usage of power, materials and resources in creating this product is justified and that it is made in a responsible manner with reduced wastage. However, since mirco:bit is a not-for-profit organization that serves for educational purposes, affordability for every student is also vital. Therefore, a balance must be made in considering low-cost options as well as environmentally friendly methods.

Production Considerations

The mega:bit is designed to be sent to mass production with 5000 units initially with a potential market of 100,000 units. Consequently, it is important to keep it as environmentally-friendly as possible, reducing damaging and unsafe resources. To make the product more sustainable several points were considered when designing it:

- **Materials Wastage**: Creating the product entirely as a printed PCB would result in copper wastage as there would be some unused space. However, this would be more practical for production and usage as an additional step of complex wiring and assembly would be reduced minimizing human resources. The plastic outer covering will be also mass produced and by keeping the design unchanged a single mold will be used reducing cost as well as metal wastage.
- **Shipping:** Although outsourcing production of PCBs and plastic molds is greatly cheaper, rooting manufacturing in the UK is more sustainable. This reduces the carbon footprint associated with cargo shipping from overseas massively. The quotes prices in the UK were checked to be within the preplanned budget.
- **Recyclable Materials:** The plastic case will be made from a thermoplastic, [1] which is in nature recyclable. PCBs are also recycled by certain companies.

[1] "3 Words: Recyclable Thermoset Plastics." *Nanalyze*, 23 Feb. 2017, www.nanalyze.com/2017/01/recyclable-thermoset-plastics/.

Product Usage Considerations

It is also important to ensure power consumption is minimal when mega:bit is used in schools.

- **Power Options**: In order to reduce wastage with non-rechargeable batteries, mega:bit offers powering with USB ports (portable chargers) or directly connecting to power sockets. To ensure teachers have flexibility in power options, 9V battery port is also included. However, they will be informed in the instruction manual to dispose used batteries responsibly.
- **Components Choices:** Power efficiency was taken into account in the product design and component choices. For example, a Buck converter was chosen for stepping down voltage instead of a linear regulator due to lower power consumption.
- **Long-term Usage:** Mega:bit is designed to be robust and durable in a classroom set-up without need for constant replacement. The outer plastic case protects the product from damage from handling by children and falls.

Areas for Improvement

- **Recycled Plastic:** In the subsequent productions, the larger number of units manufactured might reduce costs such as prices of components due to economies of scale. This could give some leverage to invest in using recycled plastic instead for the outer case.

Social Impact

The micro:bit foundation has a leading role to play in kindling interest in coding amongst children and developing a generation of tech pioneers. Mega:bit will serve a major role in enabling this process by enhancing the learning experience for children and being an effective companion for teacher to create a stimulating learning environment.

Educational Benefits

- **Promotes Collaboration:** Micro:bit is already being used by thousands of students in the classroom but the mega:bit allows for easy demonstration and sharing of work and ideas among children. This fosters teamwork and the quality of learning from one another.

Inclusion Benefits

- **Cater to Special Needs:** Beyond being used as a demonstration tool, individuals with special needs can use mega:bit as a complementary tool with their micro:bit. The larger display helps those with partial sight or low vision to code more easily ensuring micro:bit remains an inclusive device for coding.

Future Work

- **Haptic Feedback:** A possible extension discussed with the client was having haptic feedback. Instead of LEDs, tactile buttons can be configured to enable micro:bit to be used in existing coding programs for the blind.

Conclusion

The mega:bit reinforces micro:bit's position as a useful and inclusive educational tool for computer education. The Micro:bit Educational Foundation has had massive positive impact globally on teaching coding and is continuing to expand in developing countries. The mega:bit would be a versatile tool that would complement and enhance the learning process with the micro;bit reaping more benefits. In future releases, there could be more research into using recycled materials and reducing carbon footprint in an affordable manner.