The PC Recycling Paradigm: Solutions to E-Waste

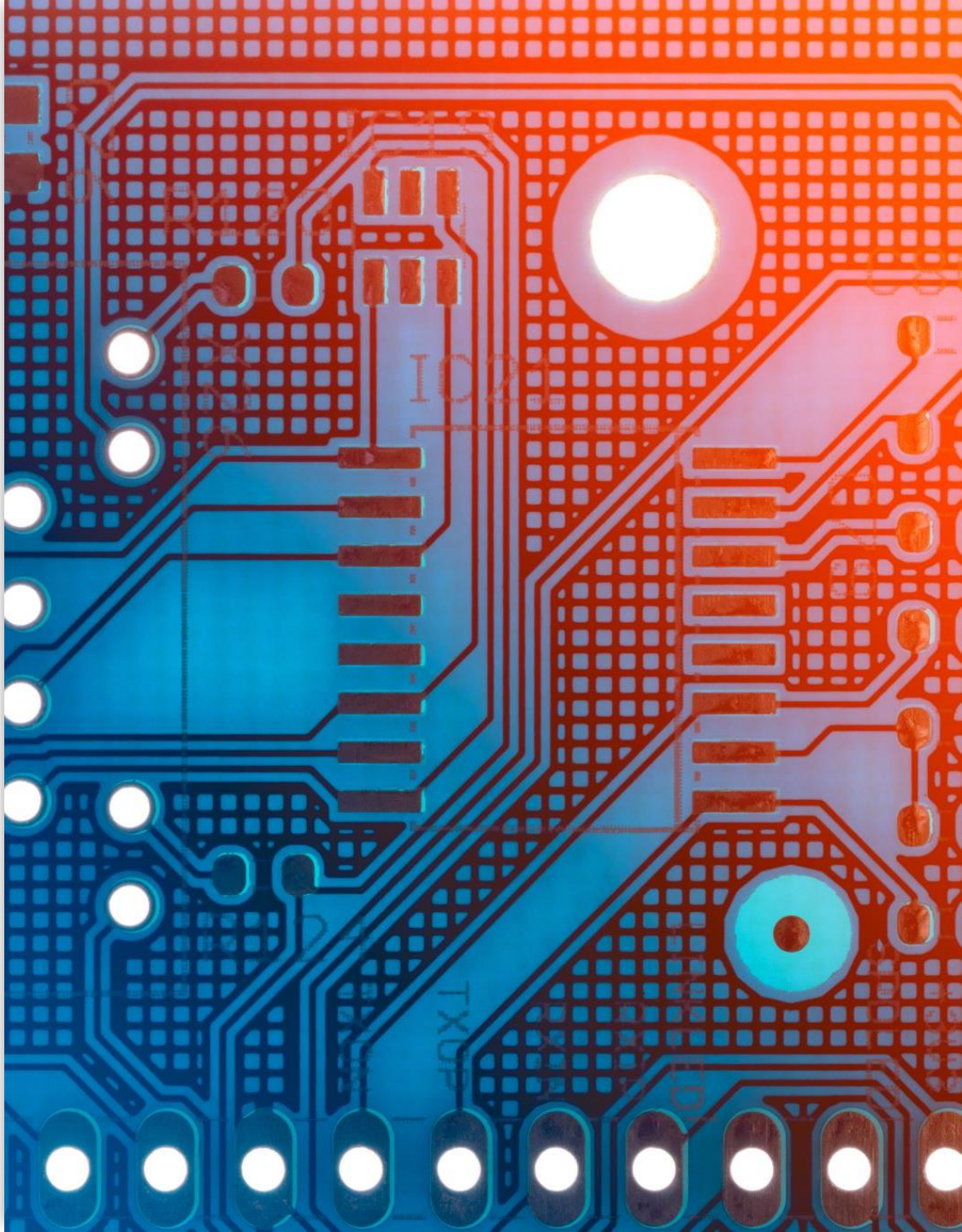
By Amrita Rangi, Carlo-Cristan Micu, Rahimullah Rasul and Hansel Rodrigues

Introduction to Personal Computers (PCs)

A Personal Computer (PC) is a microcomputer designed for use by one person at a time.

Whether they are home computers or business ones, PCs can be used to store, retrieve and process data of all kinds.

(Lutkevich, 2023)



Environmental issues

PCs use relatively low energy when designed efficiently but the high energy manufa cturing process and short life span raises dilemmas including…

- air pollution
- climate change
- water pollution
- thermal pollution
- solid waste disposal

Environmental impact of energy (2017)

High energy consumption (Economical issue)

- Companies require high-performance servers.
- The servers themselves require a lot of money to buy.
- It costs even more money to pay for the high energy consumption of the servers.
- And the costs can go even higher as money is spent to cool down the servers to keep them stable/working.
- This means that money is wasted cooling and paying for the high energy consumptions instead of using it to expand the company or improve their service and equipment.

Health Hazards (Social Issue)

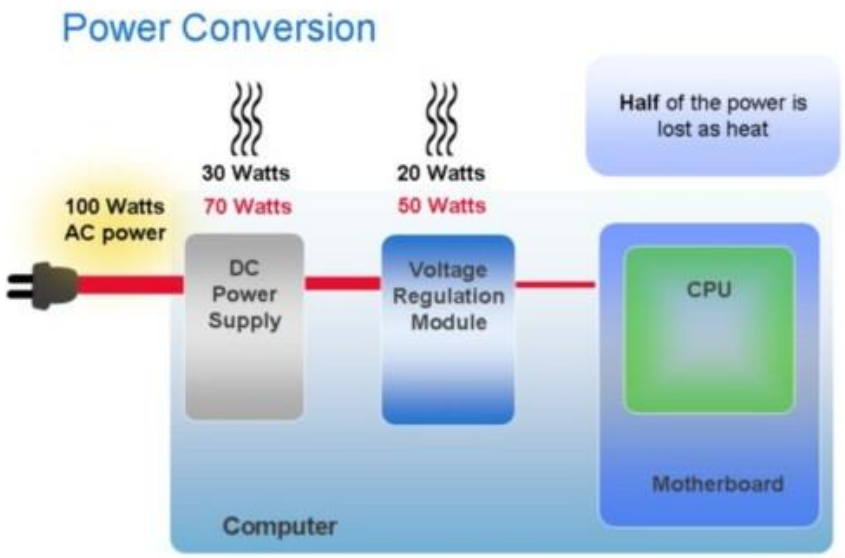
- Many developing countries lack adequate e-waste recycling facilities.
- They disassemble the computers without taking suitable safety precautions.
- As a result, workers in these e-waste recycling activities are subjected to hazardous conditions that may jeopardize their health.
- Heatlh issues caused by e-waste pollution frequently result in increased healthcare costs.
- This exerts a financial strain on those impacted.

E-Waste Prevention Strategy: Energy efficiency

Energy efficiency simply means using less energy to perform the same task.

However, the taxonomy of power, energy, consumption, and efficiency can become interchangeable. Which is the right term? It depends on the environment the PC is being used in.

Energy efficiency brings a variety of benefits: reducing greenhouse gas emissions, reducing demand for energy imports, and lowering our costs on a household and economy-wide level.



Peter, E. (2008), (Environmental and Energy Study Institute (EESI))

Addressing Environmental Issues:

By improving the design principles and service features to..

(1) promote long lifetime with the original user

(2) facilitate refurbishment and reuse

(3) be easy to disassemble

(4) contain minimal valueless pieces/components at end of its lifespan.

Fitzpatrick, C. et al. (2014)

Addressing Economical Issue: How energy efficiency can lower the costs

- Making a better usage of the energy would result in reducing the heat caused by the computers.
- This reduces the costs of maintaining the servers.
- Less heat being produced means that less money needs to be spent on cooling down the servers.
- There are two main approaches when it comes to using energy efficiently.
- First approach is to change the hardware design making it more energy efficient.
- Second approach is to make optimized code which would result in hardware needing less energy overall.

In summary E-waste can be reduced by energy efficiency improvements including

- Improving the design principles and service features
- Optimising computer functionality (hardware design and software)
- Constructing PCs with more consideration to sustainable (i.e. more eco-friendly materials, better dismantlement and recycling facilities)

Addressing Social Issue: How energy efficiency can lessen Health Hazards

- When computers are energy efficient, they consume less energy which increases their lifespan.
- This leads to a decrease in e-waste generation which means that there is less need for hazardous dismantling of computers.
- Energy efficient computers use components that are more eco-friendly and less toxic, which means that the hazardous material present in them are minimised when recycled.
- All these factors results in significantly decreasing health risks.

- *"The interchange of information is creating a new paradigm for the energy efficiency market."*

-Greg Turner
Stephen Lacey (2013)

Please feel free to ask any questions you may have.

Appendix and bibliography

References:

1. Environmental and Energy Study Institute (EESI) (no date) *Energy efficiency*, *EESI*. Available at: https://www.eesi.org/topics/energy-efficiency/description (Accessed: 31 October 2023).
2. *Fitzpatrick, C. et al. (2014) 'Sustainable Life Cycle Engineering of an integrated desktop PC; a small to medium enterprise perspective', Journal of Cleaner Production, 74, pp. 155–160. doi:10.1016/j.jclepro.2014.03.042 (Accessed: 26 October 2023).*
3. *Environmental impact of energy (2017) European Environment Agency [online]. Available at: https://www.eea.europa.eu/help/glossary/eea-glossary/environmental-impact-of-energy#:~:text=The%20environmental%20problems%20directly%20related,pollution%2C%20and%20solid%20waste%20disposal. (Accessed: 22 October 2023).*
4. Stephen Lacey (2013) *Intelligent Efficiency: Innovations Reshaping the Energy Efficiency Market*. [online] Available at: https://www.greentechmedia.com/articles/read/intelligent-efficiency-innovations-reshaping-the-energy-efficiency-market [Accessed 28 Oct. 2023].
5. Environmental and Energy Study Institute (EESI) (no date) *Energy efficiency*, *EESI*. Available at: https://www.eesi.org/topics/energy-efficiency/description (Accessed: 31 October 2023).
6. Peter, E. (2008) 'The energy efficiency of the PC', *Proceedings of the IEEE*, 96(6), pp. 911–912. doi:10.1109/jproc.2008.921603.

Appendix and bibliography

Others (Images, backgrounds, etc.):

1. *https://www.alamy.com/hard-drives-image25654.html?imageid=603A020F-6EF6-4206-BB51-D8F84BC3206D&p=2062&pn=1&searchId=02ec1b85cf6416d4a4bfdd6baa26fe4e&searchtype=0*
2. https://encrypted-tbn2.gstatic.com/images?q=tbn:ANd9GcQwu6ulepkLj8uu3EGRTiURvLF6sC01y0xPb2Z3vHiwn5lTniAc
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6. https://www.benefyd.com/wp-content/uploads/2020/10/energy-efficient-computers-vs-regular-computers.jpg
7. https://3.bp.blogspot.com/_ZaGO7GjCqAI/Rm7fXV4pryI/AAAAAAAAC0c/Z55Knaty3tY/s640/climate2.jpg
8. https://www.vecteezy.com/free-png/economy
9. https://www.linkedin.com/pulse/how-consumer-behavior-affects-economy-talha-mubarik

Team Contribution Statement (1/2)

Assignment Number: 2
Group Number: 13.1

Write the name of each of your group members in a separate column. For each person, indicate the extent to which you agree with the statement on the left, using a scale of 1-4 (1=strongly disagree; 2=disagree; 3=agree; 4=strongly agree). Total the numbers in each column. Include a completed and signed Team Contribution Statement in your group submission file.

Criterion	Amrita Rangi	Carlo-Cristan Micu	Rahimullah Rasul	Hansel Rodrigues
Attends group meetings regularly and arrives on time.	4	4	2	4
Contributes meaningfully to group discussions.	4	4	4	4
Completes group assignments/tasks on time.	4	4	1	4
Prepares work in a quality manner.	4	4	2	4
Demonstrates a cooperative and supportive attitude.	4	4	3	4
Contributes significantly to the success of the project.	4	4	2	4
TOTALS	24	24	14	24

Team Contribution Statement (2/2)

FEEDBACK ON TEAM DYNAMICS
How effectively did your group work? • We split the work into smaller piece and share it amongst each other; making the workload more manageable • We had constructive discussions to further everyone's understanding and to generate ideas for potential subjects that could be written about later
What did you learn about working in a group from this project that you will carry into your next group experience? □ Planning and managing time efficiently □ Presenting skills; such as voice projection, keeping audience engaged etc.

Team name sign off:
Amrita Rangi, Carlo-Cristan Micu, Rahimullah Rasul and Hansel Rodrigues