GAMES PRODUCTION & DEVELOPMENT

Activity 3: *Device Life Cycle*

University students, B.A. and M.A. levels

Basic

40-50 minutes

Up to 20 participants

Knowledge of basic concepts related to climate change (offset, climate neutrality, device life cycles, greenwashing)

Data projector or alternatively a whiteboard

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SUMMARY

The aim of this activity is to make students aware of the life cycle of the device they have in their pocket. The activity takes students through the different phases of the life cycle of a mobile phone and its environmental and social impacts. The lecturer guides students to identify and discuss problematic stages in the cycle by asking appropriate questions. The activity should lead to a reflection on hardware user habits, how these are influenced by the profit-driven hardware market, and how game developers can influence them positively or negatively.

TASK

The task is to go through the various stages of the device life cycle and their environmental impact. You will discuss the complex material structure behind the technology we use and their environmental impact. At the end of this activity, we will summarize the implications for game developers.

CONTEXT

We live in a world full of technology. However, it is often not seen that behind most of these technological devices, there are complex and often unsustainable processes of extraction, production, and transportation of numerous elements. It is important to be aware of this invisible structure and keep it in mind with respect to device life cycles, especially from the perspective of software developers and their potential role in it.

PREPARATION

Data projector or alternatively a whiteboard.
Open https://www.fairphone.com/en/ or https://www.ifixit.com (or other illustrative online resources) in a browser in the background so it is ready to show in the discussion.

LEARNING OUTCOMES

- Students are made aware of the materiality behind the technologically networked world.
- Students understand the basics of the device life cycle and its impact on the environment and people.
- Students can critically evaluate the possible environmental and social impact of their purchases, the larger economic structures and forces that can influence consumer choices, and they can include these considerations in their own purchase decisions.
- Students learn about the possible implications of the device life cycle for game developers.

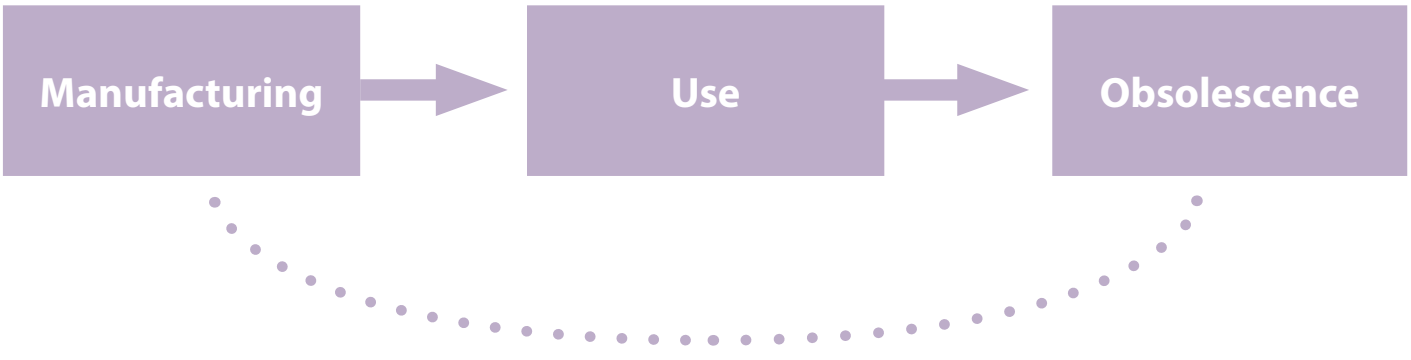
Step 1 *Introduction (up to 5 minutes)*

Let us discuss the environmental impact of the devices we use every day, with a specific focus on mobile phones. We will think about what happens with the device during different stages in its lifespan.

Every device has a 'life cycle', which we can be split into three time periods:

- Manufacturing - period before the device gets to customers
- Use - period during which we use the device
- Obsolescence - period in which the device is no longer meeting our demands

Although the reality is more granulated, it is not necessary to be detailed in this initial exercise. To illustrate and record all student input, draw a simple three step circle graph on a large sheet of paper, whiteboard, or using a data projector. Record students' inputs to your questions under each of the three categories (see the graph below).



Step 2 *Manufacturing (up to 10 minutes)*

In this task, the instructor moderates the debate.

Tips:

- *List the options that students mention on the whiteboard or display them using a data projector.*

- *If necessary, guide students to most of the essential points below. For example, ask about the elements the mobile phone is made of, where they come from, and how they are mined.*

Let's think about the manufacturing period, i.e. the time before the equipment reaches the customer. What activities and processes would you include in this phase?

List of examples:

- Mining of minerals - related to cheap labor, conflict minerals
- Research & development - very long process including initial prototyping to technology development
- Component manufacturing - including batteries
- Transportation of materials
- Software development
- Materials processing - related to energy consumption
- Distribution - related to transportation and distribution infrastructure
- Certifications - related also to environmental standards
- Packaging - related to waste management and recycling
- Certifications

Let us discuss the potential environmental impact of these activities.

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Lecturer moderates the debate and goes through the examples and tries to motivate students to discuss with guiding questions if necessary.

***Human costs**: conflict minerals, 3TG (e.g., "Blood in the mobile", https://policy.trade.ec.europa.eu/development-and-sustainability/conflict-minerals-regulation/regulation-explained_en)*

***Human costs**: long hours, low wages, bad working conditions for workers (e.g., Foxconn and Apple, https://dyingforaniphone.com, https://en.wikipedia.org/wiki/Foxconn_suicides#cite_note-autogenerated1-20, Phone Story phonestory.org)*

***Environmental impact**: large energy consumption, transport, both leading to emissions (e.g., https://ourworldindata.org/ghg-emissions-by-sector)*

***Environmental impact**: mineral scarcity (e.g., https://www.reuters.com/markets/commodities/lithium-producers-warn-global-supplies-may-not-meet-electric-vehicle-demand-2023-06-22/)*

***Social impact**: shortage of chips during the Covid pandemic and trade conflicts, outsourcing all supply chains to China is unsustainable (e.g., https://en.wikipedia.org/wiki/2020–2023_global_chip_shortage)*

Step 3 *Use (up to 10 minutes)*

Let's move to the period during which we are using our device. How do you use your device? Are there any more processes involved?

In this task, the instructor moderates the debate.

Tips:

- *List the options that students mention on the whiteboard or display them using a data projector.*
- *If necessary, guide students to cover most of the points below. For example, ask whether they use their devices in combination with other accessories, such as cover cases, protective glass, additional chargers.*

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List of examples:

- Charging and electricity use - not extremely significant in the grand scheme, but a phone is a device using electricity
- Cloud / Backups - essential to extend and save our data to properly use the smart device. Requires servers.
- Accessories - ask about whether students use cover cases, glass, chargers, whether they still have a physical Sim Card etc.
- New digital content - downloading of new software from various servers
- Multiplayer games - requiring servers
- Transport - how did the phone get to students? Was it made on my continent? Did it go by ship or by plane? Transport is one of the largest emission heavy industries

Now, let us discuss the potential environmental impact of these activities.

The lecturer moderates the debate and goes through the examples and tries to motivate student discussion with guiding questions.

Step 4 *Obsolescence (up to 10 minutes)*

Let's talk about the period of obsolescence.

The instructor moderates the debate.

Tips:

- *List the options that students mention on the whiteboard or display them using a data projector.*
- *If necessary, guide students to cover most of the points below. For example, ask what they have done with their last device and where it might have ended up.*

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List of examples:

- *Keeping it in your "doom drawer" - very unsustainable, because the device and its components are out of the cycle, becoming more obsolete with time (manufacture-use-obsolescence — reuse/repair/recycle) and are not being reused.*

- *Repair - Can the device be repaired by the consumer or even the repair shop at an affordable cost? Are the necessary components accessible? Why is buying a new phone more cost-effective? (see Planned obsolescence, EU's right to repair movement, including new legislation impacting accessibility of repair for consumers adopted in 2024, maker and repair website empowering people to repair ifixit.com)*

- *Recycle materials - where? Are there local options? Does the manufacturer provide solutions and explain what happens to the device? Are all the materials recyclable?*

- *Sell or gift - the product continues to be used by others instead of being discarded*

- *Throw away - very unsustainable as it creates dangerous and unused e-waste, which is often shipped outside of the Global North countries to landfills. See India's largest e-waste market in Seelampur*

And what is the environmental impact of these options?

The lecturer moderates the debate and goes through examples from the list. The lecturer asks students which of the options they consider more environmentally friendly. In general, the lecturer distinguishes between:

- *options that keep materials in the production cycle of newer devices, (recycling and potentially selling the device),*
- *options allowing to use a device longer (repair)*
- *and all the other options with an arguably worse impact on the environment. (keeping in the drawer or throwing out, that might be furthermore toxic to the environment and people, see India's largest e-waste market Seelampur)*

Optional activity

If you have spare time, you can explain and discuss the following concepts:

Recycling - do students know of any recycling opportunities for their phones in their area? Do they know how it is done? How effective is it?

Planned obsolescence - a business practice of building an expiration date into a device, using software (updates) or hardware limitations (battery, unrepairability) or both (see Planned obsolescence)

Step 5 *Lessons learnt (up to 5 minutes)*

I don't want you to feel guilty about your hardware. With this exercise, I simply wanted to illustrate how many processes, people, and materials are involved in producing a device like a phone. The same applies to other devices often used for gaming, for example, game consoles or VR headsets (see environmental impact of a Playstation 4).

It is most important to be aware and to keep the device's life cycle in mind. One way is to support several hardware projects focused on ethical manufacturing (e.g. Fairphone, Framework) if you absolutely need a new phone for your work or school. However, the most sustainable device is the one you already own.

From the game developer's perspective, this brings us to one conclusion. Making someone's device last as long as possible is something you can influence to some extent as a game developer too.

Over three billion people play games. It's an important part of many people's leisure time. If they don't have to buy new hardware to play your games, you will contribute to potentially large reductions of environmental and social harm. What might that look like?

- You can develop games that are easy on hardware requirements
- You can offer multiple levels of visual quality for your games, making it run more smoothly on older hardware
- You can develop your game for a large number of platforms. If someone doesn't currently have one type of console/smartphone, it's possible they have another.

Such tactics are not always easy to implement, but if those options exist, why not take advantage of them?

Credits & Acknowledgements

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The project "Greening Games. Building Higher Education Resources for Sustainable Video Game Production, Design & Critical Game Studies" (2021-2024) supports educators in addressing the interdisciplinary nature of green digital gaming.

More information may be found at: https://greeningames.eu.

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