

RGB Lights, Water-cooling Tubes, Trashed Motherboards and Dusty Fans Disentangling the Transindustrial Labour of our Computational Culture

Introduction

This essay places into dialogue two radically different, yet inherently connected, socio-technical contexts gravitating around our planetary needs for digital growth and computing power, crucial in sustaining our digital interactions and behaviours. Taking a material and infrastructural turn on “the digital”, the reflection focuses on the way we interact with personal computers (PCs): part of the foundational “hardware layer” upon which our algorithmic needs and desires depend. It focuses on two conducted fieldworks and communities situated on the life cycle of computers, located at the level of their design/optimisation and recycling/reuse. The first fieldwork is COMPUTEX 2023 (Taipei, Taiwan). COMPUTEX is one of the major computer fairs in the world, whose role is to showcase and celebrate the industry’s latest advancements. With a focus on computing power, graphics and gaming machines, it is an important *rendez-vous* for hobbyists interested in computational culture. It showcases the work of scratch-builders and case-modders, a community of hardware enthusiasts interested in exploring their computers’ aesthetics and design, and turning them into functional sculptures and installations. On the opposite side of the technological value chain, the second fieldwork the article builds upon is a second-hand computer recycling site in Agbogbloshie (Accra, Ghana). Auctioned by binational families in Europe and the United States, the computers are sent to the electrical and electronic equipment (EEE)¹ processing site,

where they are maintained, dismantled and recycled by local workers attempting to extract economic value and profit.

In connecting these two contexts, the analysis maps through space and time how computing is inherently *transindustrial*. By doing so, it reframes these two socio-technical embodiments as intertwined and entangled along the same central axis: tropes emerging from the metaphor of the technological cloud.² While the narrative contributes to obfuscating the politics of our computational culture,³ the reflection traces lineages and connections between these two material infrastructures of computing at the level of their labour dynamics and inequalities. From the work of COMPUTEX’s hobbyists used by computer brands for their marketing or design, to Agbogbloshie’s recyclers struggling with the maintenance and recycling of computers that are increasingly more compact and streamlined, it nuances our preconceived ideas of technological progress, and sheds light on power dynamics at play on both sides of our computational culture.

Scratch-building and case-modding in COMPUTEX (Taipei, Taiwan): 3D-designing, printing, benchmarking, gaming

Builds and *mods* take the form of custom-made computers that have been repurposed and approached as artistic sculptures and installations. Originating from two overlapping communities active online and in Taipei, case-mods and scratch-builds are different in the materials and techniques they use. Case-mods originate from *modding*: a slang used to refer to the action of modifying a technological object.⁴ In this context, what is modified is the computer case: painted with airbrush, stencils, decorated with all kinds of stickers, 3D-effects, engravings and other shiny materials and textures. In the computer modding discipline, one aspect prevails: the case needs to be visible. This means that, even if all the inner components of the computer have been replaced — such as with custom glass sides or red, green and blue (RGB) tubes and cooling fans, cases need to be kept and well visible. In opposition, scratch-builds are everything but the way computers would normally look. In opposition with mods where the structuring component — the case — has to be well identified, *builds* hide computers and their components in sculptures. At COMPUTEX 2023, a build for example can take the form of a volcano made out of *papier-mâché*. Next to it stands a steampunk-inspired oversized black and golden computing fan that its creator designed in reference to old cars. On the left: a

1 DK. Osseo-Asare and Yasmine Abbas, “Investigating 3E-materials at Agbogbloshie”, *Conference on Raising Awareness for the Societal and Environmental Role of Engineering and (Re)Training Engineers for Participatory Design* (Leuven: Belgium, 2015), 41–50.

2 Maarten A. Hajer, *The Politics of Environmental Discourse: Ecological Modernization and the Policy Process* (Oxford: Oxford University Press, 1997).

3 Langdon Winner, “Do Artifacts Have Politics?” *Daedalus*, vol. 109, no. 1, “Modern Technology: Problem or Opportunity?” (Winter 1980), 121–136.

4 Another example of the use of the word is the case of game mods, changing the source code of video games in order to alter and modify the game.

beer tap, where the local Bucksin⁵ flowing through visible tubes is also used as part of the (hidden) computer cooling system.

Both at the level of *case-mods* or *scratch-builds*, hobbyists need to work with state-of-the-art computers. This is due to the fact that, in these events, the focus is, above all, on computing power; on the advancements of the industry through the latest production chips, motherboards, memory sticks and so on. In contact with tech corporations such as *Nvidia*TM, *AMD*TM, *Intel*TM or *Asus*TM, modders and builders often take custom orders or sign sponsorships to produce objects that are then showcased on these brands' booths. By doing so, the brief is simple: the latest products need to be exhibited in innovative ways in order to attract visitors and be the most visible. This creates in turn a plethora of design practices that vary following each creator's interests and collaborations with the industry. Some of these practices of modding and building embrace the materiality of computing and computer devices in radically different ways:

from *Ali Abbas*' middle-age and baroque-inspired wooden PCs to *Blue Horse Studios*' retro-sci-fi and black-magic inspired propositions. Hobbyists also develop and finetune their own production techniques and processes. MP Customised (abbreviated MP) for example, a well-known Belgian scratch-builder met and interviewed in Taipei and whose work won several times the *Case Mod World Series*, always starts with drawings. After a clear view on how to mix the different colours and components, he then uses *AutoCAD*[®], a 3D-design software that enables him to test his design decisions and visualise how the different parts of his sculpture blend in harmonious and striking ways. Sometimes, the nature of these custom orders requires collaborations with craftsmen. During the interview, MP shared his experience of a specific build made for a Dubai-based gaming company. The project was to build a 24K Gold case mod for a private event showcasing a new game. Recalling the nature of his collaboration with a Belgian gold jeweller, he pointed to the challenges of glueing and covering complex-shaped components with gold plates.

In the celebrated context of our computational culture, the transindustrial nature of technology occurs at the level of labour relationships between tech companies and individuals. In this case, dynamics take the form of a transfer and instrumentalisation between modders and builders and tech corporations using objects produced by gamers to attract customers and gain new ideas for the next generation of devices,



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- Fig. [1] A selection of red, green and blue (RGB) computer cooling fans mounted on the wall
 Fig. [2] Scratch-build of an oversized computer fan
 Fig. [3] Computer case mod using airbrush
 Fig. [4] Computer scratch-build: example
 Fig. [5] Beer-tap scratch-build
 Fig. [6] Computer case mod: example
 Fig. [7] Volcano-like scratch-build

which are then sold on the global market. In echo with the following fieldwork on Ghanaian second-hand computers, these examples nuance our mainstream views emerging from the *cloud* metaphor. While the symbol depicts technology as an opaque and fixed system exterior to our labour practices, which we simply observe from afar,⁶ disentangling the role of *modders* and *builders* inside the broader computing market and industry points to the unequal labour dynamics at play between individuals and tech corporations.

⁶ Tung-Hui Hu, *A Prehistory of the Cloud* (Cambridge, MA: MIT Press, 2016).



[2]

⁵ Bucksin is one of the most popular brands of Taiwanese beer.



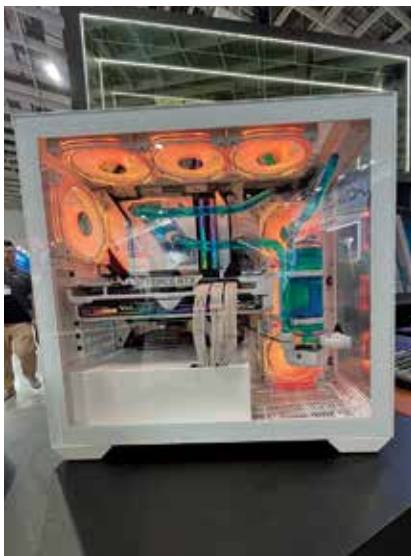
[3]



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- Fig. [8] Laptops maintained and sold
 Fig. [9] Dismantled laptop Motherboards
 Fig. [10] Multimeter (bottom left) used to repair a desktop's Graphical Processing Unit (GPU)
 Fig. [11] Maintenance of secondhand laptops
 Fig. [12] Laptop's Integrated Circuit (IC)

Second-hand PCs and laptops

around Agbogbloshie (Accra, Ghana):

bulk-buying, dismantling, glueing, scrap-dealing

Accraian laptops repairers gravitate, on the other hand, around a central, strategic site: the second-hand electrical and electronic equipment (EEE) processing site of Agbogbloshie. Closely connected to Tema, the Ghanaian harbour and central road where shipments arrive by boat or trucks,⁷ Agbogbloshie is a key site where EEE is reappropriated and transformed. A landscape made of piles of trashed as well as untested computer parts and other devices, Agbogbloshie and its surroundings are where repairers find the miss-

7 On the planetary and trans-African flow of EEE around Agbogbloshie, see: Richard J. Grant & Martin Oteng-Ababio "The Global Transformation of Materials and the Emergence of Informal Urban Mining in Accra, Ghana", *Africa Today* vol. 62. no.4. (Summer 2016), 3–20.



[12]

ing components they need:⁸ from PC cases to dismantled motherboards sold *à la pièce* with valuable Integrated-Circuits (ICs), CPUs, and hard drives.⁹ Agbogbloshie is also the main location where old computers, auctioned by Ghanaian bi-nationals in countries such as the United-Kingdom, Canada or Germany, are stored and sold back on the local market. While *modders* and *builders* are interested in working with powerful and state-of-the-art machines, these second-hand devices are not developed for gaming. With a requirement for heavy maintenance work, they are selected based on their robustness and on how easily they can be repaired. They are computers used for administrative work, chosen for the ability to run the Microsoft Office® softwares, and browse on the internet. Another difference is that, while gamers located in the previous context of our computational culture focus on desktop machines, devices are chosen in terms of space optimisation during shipments. As a result, they are often laptop machines, specifically: *Dell, Lenovo, HP*.

A recurrent issue and challenge for refurbishers and repairers is the fact these computers are often stripped from their hard drives. This is because recovering data from hard drives of these trashed computers can, in addition to delivering sensitive information about their past owners, lead to fraudulent practices of data reselling and stealing. Another characteristic of the market challenging and disrupting the work of repairers is how compact and smaller computers are becoming — based on planetary advancements of the industry as showcased in COMPUTEX. This compactness and black box¹⁰ is explicitly the case with laptop motherboards, whose

inner components and capacitors become exponentially too small to be unsoldered and replaced.

Landfills such as Agbogbloshie are therefore not simply “dumping sites” and “computer graveyards”, as they are portrayed in European and Western-centric media discourses and narratives. They first and foremost act as informal depots where repairers and maintainers find missing parts in direct collaboration with the landfill network of bulk-buyers, dismantlers, and scrap-dealers. Outside of these dominant tropes around electronic waste lies a plethora of practices, rendered precarious by the lack of infrastructure and

8 Jonathan Sterne, “Out with the Trash: On the Future of New Media”, in Charles R. Acland, ed., *Residual Media*, (Minneapolis, MIN: University of Minnesota Press, 2007).

9 Due to the sensitive nature of the data produced by actors that then “trash” their computers, hard drives are a scarce resource inside EEE markets. See Emily Chung, “B.C. students buy sensitive U.S. defence data for \$40 in Africa”, *BBC* (23.06.2009).

10 Bruno Latour, *Pandora's Hope: Essays on the Reality of Science Studies*, (Cambridge, Mass: Harvard University Press, 1999).

recognition workers have inside our planetary circuits of computing. Take for example X, an Accraian laptop and desktop repairer I met and interviewed in Accra, and whose workspace is in the district of *Circle*, a twenty-minute drive from Agbogbloshie. X's tools are rudimentary. When asked what were the most important tools he uses in his daily life, he replied: a *blower*,¹¹ a screwdriver, and a toothbrush. That is because a lot of the malfunctioning computers are caused by the accumulation of dust becoming harder to remove due to the devices' compactness. Accumulation can lead to multiple problems, ranging from the computer's operating system (OS) drastically slowing down because of faulty motherboard overheating, to computer ports being blocked. While the screwdriver enables him to remove and isolate the parts he needs to work on, the blower is efficient in dusting the parts. For parts he cannot remove, he uses the toothbrush. Another important tool of his daily repairs is the digital multimeter—simply referred to as a *metre*. Using the *metre*, he can measure the circuits' volt and amp in order to further assess the computer's integrated-circuits (ICs). Finally, *super glue* is also an important tool for his repairs: especially when repairing the computer's keyboard and *neck*.¹² The rudimentary characteristics of these tools have, in turn, an impact on X's efficiency: limiting him to an average number of three computer repairs a day. He, however, hopes that one day he will be able to acquire more sophisticated tools. One of the tools he dreams of is a computer-assisted scanning machine: detecting the *fault* without the use of the rudimentary *metre* X uses.

As the opposite side of the computer value chain, Agbogbloshie and its surroundings also embody power structures that mirror the ones at play between *modders*, *builders*, and computer corporations. As part of the transindustrial nature of our computing culture, these take the form of labour dynamics between actors whose scale, impact and profit are unequal. Here, this manifests itself in the control over the compactness and reparability of computers by tech companies that renders in turn the work of Ghanaian recyclers exponentially more difficult and precarious. Likewise, a comparison of gamers located on the prominent side of our computational culture with recyclers in Ghana at the other end of the cycle leads us to question mainstream discourses surrounding computational technology. Contradicting the metaphor and the embedded beliefs it enacts, the technological cloud appears here as pervasive and tentacular; its control and monopoly by a handful of corporations further infiltrates communities already rendered precarious and made invisible by dominant tropes.

Conclusion

This contribution underlined the interactions between case-modders and scratch-builders gathering at COMPUTEX and repairers and dismantlers operating from Agbogbloshie. By placing these seemingly opposite contexts in dialogue, it highlights the similarities in labour inequalities between tech giants and individuals located on both sides of our planetary computational culture. From these dynamics, the article borrows moreover from the use of *trans* in chemistry and isomerism: as a type of configuration where atoms are structured across opposite faces of the same molecule.¹³ Inspired by this both asymmetrical and symmetrical tension—asymmetrical at the level of atoms, symmetrical in the way they are organised around the same molecule and central axis—the analysis disentangles the production, optimisation and recycling of computers.

From these dynamics, it argues for the inherently transindustrial characteristics of our computational culture. More specifically, it anchors these two socio-technical embodiments as intertwined and echoing the same central axis: unequal labour structure obfuscated by the metaphor of the technological cloud. As with the trans-isomerism and structure used in chemistry, an asymmetrical and symmetrical tension arises between these two contexts. While asymmetrical at the level of tools, capital, views and discourses, symmetrical dimensions also emerge at the level of mirroring labour dynamics at play between individuals and pervasive tech giants. Whether from Taipei's case-modder and scratch-builders, or Accra's recyclers, maintainers, dismantlers and scrap dealers, studying these communities and their roles in crafting, maintaining and recycling computers reveals the politics of inequality and perversion occurring on both sides of our (planetary) sociotechnical culture. Crack open the black box of the technological cloud, they reveal the inherently transindustrial nature of our computational culture. 🔍

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11 The term *blower* is used by the Ghanaian computer community to refer to a hair dryer, useful when removing the soil and dust from their machines.

12 The *neck* signifies here the part that connects the screen with the rest of the computer.

13 W. Reusch "Stereoisomers Part I." in *Virtual Textbook of Organic Chemistry* (MI: Michigan State University, 2010).



Case mod: glossy colour palette. Source: COMPUTEX2023. Credit: Cyrus Khalatbari, 2023