Part Two: Global implications of the use of Big Tech and their 'clouds'[1]

Foreword

NHS England and successive governments have seen digitalisation and its technologies as a means of solving the problems of the NHS. This paper is one of two that, together, look at the implications of technologies engaged in the digitalisation of the NHS. This second paper focuses on the global implications of our dependence on Big Tech and their 'clouds'.

Introduction

In recent years we have seen the emergence of a new economic system variously called 'surveillance' or 'intellectual monopoly' capitalism, sustained in part, by the accumulation of huge concentrations of wealth, knowledge and power by a small number of tech companies ('Big Tech'). However, within this system,

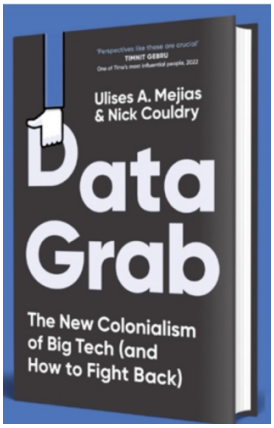
> 'control over information in a data-driven world is shifting in favour of those who generate, store and analyse information flows on their digital platforms. ....Today, data colonialists rule much of the world'.[2]

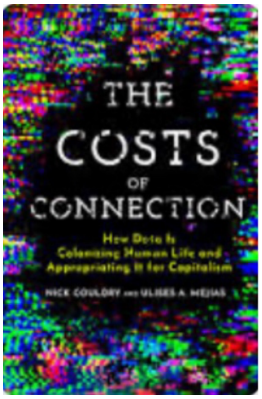
That said, we are not all equally affected.

Q. What does the continued existence of Big Tech 'cloud' depend upon?

1.Data colonialism

Data colonialism refers to the 'scraping' – or unwarranted seizure - of human data from legally unprotected global sources[3], mainly from poorer countries in the Global South.[4] It takes place because incredibly huge amounts of data are required by Big Tech to develop knowledge/digital intelligence, and for the training (or self-training) of the generative form of Artificial Intelligence (AI).





[1] For an overview of the power dynamics of cables, satellites, antennas, servers, computers, cell phones, extractivism, programmed obsolescence, electronic waste, running coding, content moderation, excessive water and energy consumptions please see the amazing Tech Cartography by Coding Rights

[2] Mayer-Schönberger V, Ramge T (2022) Access rules: freeing data from big tech for a better future. University of California Press, Oakland Quoted in: 'Digital expansionism and big tech companies'. https//doi.org/10.1057/s41599-024-02924-7

[3] https://www.iccl.ie/news/class-action-against-oracle/

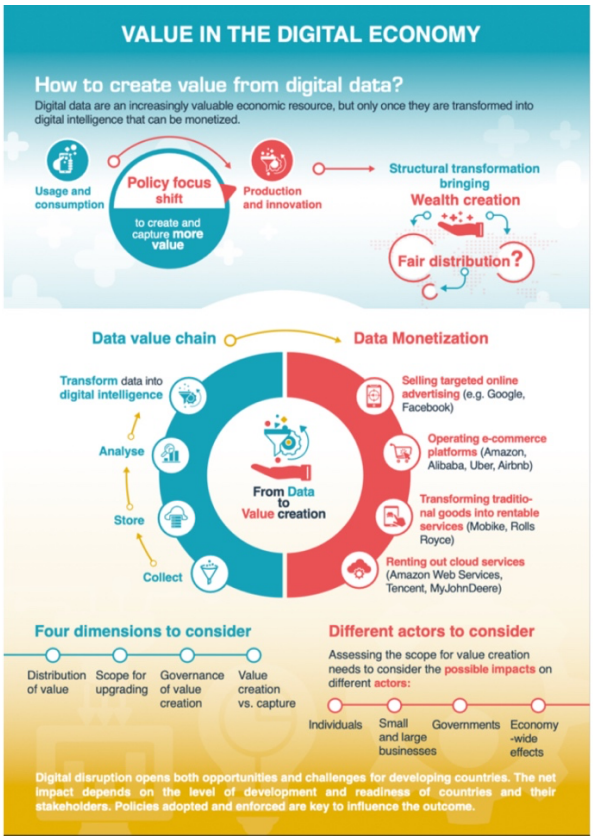
[4] Please see Professor Nick Couldry's short, clear video to introduce his book Data Grab and for those interested a brief video about the book written by him and Ulises Mejias called The Costs of Connection https://youtu.be/5tcK-XIMQqE?si=iA9hGE-PqDonzyR9 concerning the current and future social harm that digitalisation will bring.

The United Nations Conference on Trade and Development (UNCTAD) in its Digital Economy Report 2021[5] highlights a 'data-divide' between countries of the Global South and North when it comes to the ability to own, control and harness data resources into valuable intelligence, and translate the same into opportunities for development. Ten economies account for:

i) 90 per cent of all global patents, and

ii) 70 per cent of all exports directly associated with advanced digital production technologies including AI, big data analytics, 'cloud' computing, internet of things (IoT) including wearables, advanced robotics and additive (3D) manufacturing.

In an economy where digital intelligence is ever more central to production, countries and communities of the Global South that lack data processing and AI capabilities will be unable to optimise their data resources. Forced to relinquish control of their own data that becomes extracted and locked up within Big Tech's AI systems, they have limited means to a 'fair share' of the benefits. This results in gross economic unfairness in the global digital economy that is underpinned by the absence of any effective global oversight.



UNCTAD 2019

The lack of a globally accepted governance regime to regulate data's social and economic applications only perpetuates this status quo of economic imbalance and deepens inequalities in the shift towards the use of AI. Compounding this inequity is the aggressive push for cross border data flows in the global economy that benefit a few powerful countries whose corporations gather data and assert de facto ownership over the same.

In addition as an aid for data extraction, it is estimated that Big Tech own 30-50% of the undersea cables required to move data around the world, so further tightening their control of the market.[6] For a

[5] UNCTAD. (2021). Digital Economy Report 2021. Cross-border data flows and development: For whom the data flow. UNCTAD.

[6] https://botpopuli.net/digging-deeper-assessing-big-techs-capture-of-the-internets-infrastructure/

list of Big Tech owned cables see here (and to see and interact with a map showing the existence of the global undersea 'cloud' click on the name of any cable on the list and then click 'show all cables' and look around the world).

2. The exploitation of workers providing the materials and tech hardware

The colonial nature of the digital economy becomes most visible in the old and new arenas of 'extractivism' all around the globe. The manufacture of sufficient numbers of electronic and digital devices to develop digitalized services relies not only on the exploitation of rare earth elements, other metals and human labour, but also the associated fossil-fuelled logistics of their transportation. Further, the necessary production generates waste, pollution, and toxicity.

Mining

Mining is often the deadliest arena for defenders of human and environmental rights- often indigenous communities. Global Witness reports that almost 2000 of these defenders have been killed between 2012-2023, with many more assassinations going unreported, as they seek to defend their lands from exploitation.[7] Whether it is lithium mining in South America[8], child and bonded labour in 'artisanal mining'[9] for cobalt in the Democratic Republic of Congo[10], or tin mining on the 'tin islands' of Bangka[11] and Belitung off the coast of Sumatra, today's low-tech, labour-intensive and dangerous mining has destroyed local ecosystems which provided a livelihood for local people. The mining has created stagnant pools of water which are breeding grounds for disease, produced untold pollution, led to freshwater shortages for locals, and proved deadly for miners. Both the 'green' and the digital transition are increasing the extractive nature of this economy, while the futures of many of the countries involved become deeply entangled with the geo-political fights that are happening for such rare earths.

High-tech manufacturing

After the extraction of resources, high-tech manufacturing contaminates and poisons *its* workers and their communities. Microchip production, for example, which had been offshored from California and New York to cheaper, more leniently regulated, globalised sites on 'Silicon Island' (Taiwan) or in 'Silicon Paddy' (China), involves intensive chemical inputs simply to use extracted ores. During work on microchips in the US in Endicott, New York, thousands of litres of carcinogenic solvents such as trichloroethylene (TCE) and perchloroethylene (PCE) ended up spilling into the ground, poisoning the groundwater and leading to increased rates of cancer and birth defects. During court proceedings, led by over a 1,000 of Endicott's residents, IBM had to disclose the contents of a 'Corporate Mortality File', where it had tracked demographic data and the cause of death for 33,730 former employees. The data shows increased rates of respiratory, intestinal and breast cancer as far back as 1969. IBM tried to pump out the contaminated water, but it took 24 years and an order from the New York State Department of Environmental Conservation for the company to test the air quality and install mitigation systems in homes and public buildings. The pollution in Endicott is by no means unique.[12] The Santa Clara Valley, more commonly known as Silicon Valley, has 23 locations catalogued as 'Superfund' sites—contaminated with hazardous substances—the most of any county in the US.[13]

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[7] https://www.globalwitness.org/en/press-releases/almost-2000-land-and-environmental-defenders-killed-between-2012-and-2022-protecting-planet/

[8] https://www.theguardian.com/world/2023/jan/25/bolivia-lithium-mining-salt-flats?CMP=share_btn_url

[9] Subsistence mining using one's own resources, usually by hand.

[10] https://www.npr.org/sections/goatsandsoda/2023/02/01/1152893248/red-cobalt-congo-drc-mining-siddharth- kara

[11] https://geographical.co.uk/science-environment/devastating-tin-mining-goes-offshore-in-bangka-island

[12] https://logicmag.io/nature/in-the-shadow-of-big-blue/

[13] https://www.theatlantic.com/technology/archive/2019/09/silicon-valley-full-superfund-sites/598531/?utm_source=copy-link&utm_medium=social&utm_campaign=share

Successful clean-up is by no means certain. Many, many more places face similar issues all over the world.

3. Excessive energy usage that threatens the environment[14]

The continual development and running of more complex, data dependent algorithms requires increased compute power, greater storage and an ever increasing demand for more electricity. The emergence and popular demand to use large language models such as ChatGPT and Bard by businesses and the increased request to use 'cloud' has exemplified this.[15] The difference in energy consumption between standard servers and those containing AI processors is about x20, increasing from 4 kilowatts (a family house) to 80 kilowatts. There are hundreds or even thousands of these in a single data centre.

An important paper by de Vries[16] on energy and AI sustainability is now 'paywalled' so the following was put together from several newspaper reports that quote from it. If Google were to integrate generative AI into every search made on its search engine it would use 29 billion Kilowatt hours per year - more than many countries such as Croatia or Kenya. Without more, cheaper, cleaner energy it could be argued that such use of AI is environmentally unsustainable as the International Energy Agency announced in March this year that energy-related CO_2 emissions had risen again to more than 37 billion metric tons[17]. In the US, data centres account for 4% of electricity consumption and this is expected to rise to 6% by 2026. It is estimated that ChatGPT responds to 200 million requests per day while consuming 0.5 million Kilowatt hours.

De Vries believes that the only realistic action in terms of policy in the short to medium term is to require disclosure. He states it took a long time to begin to restrain the enormously excessive use of electricity by 'cryptocurrencies' but despite this insight, it is disappointing that the world has not even begun to get a handle on the huge consumption by AI. By 2027 the AI industry could consume 85-134 Terrawatt hours (TWh) of electricity per year, about 0.5% of our total global energy consumption or as much energy as a country the size of the Netherlands (his place of birth) per year.

4. Freshwater usage that threatens the environment

Freshwater consumption

A huge amount of water is required to generate the electricity to power the computers and storage required, and to cool them. The environmental harms caused by these massive set-ups is excessive.[18] To produce a microchip[19] takes around 2,200 gallons of Ultra-Pure Water (UPW). One hundred and fifty semiconductor chips are produced each year for every human on the planet i.e. more than a trillion, and the number is growing. Also, training a large language model like GPT-3 can consume millions of litres of fresh water, and running GPT-3 inference (drawing conclusions for new data/questions) for just 10-50 queries consumes 500 millilitres of water. GPT-4, the model currently used by ChatGPT, reportedly has a much larger size and hence is likely to consume more water.

In the figure below you can see two major uses for water called Scopes-1 and -2 and sometimes collectively called *operational water consumption*. There is also a Scope-3 which is 'embodied' water consumption for AI supply chains.

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[14] Kleinman, Z and Vallance, C (2023), Warning AI industry could use as much energy as the Netherlands, BBC https://www.bbc.com/news/technology-67053139

[15] In Scotland the 'multi-cloud service provider' Data Vita has gone from 1-2 enquiries a week in 2023 for 'cloud' services to several hundreds.

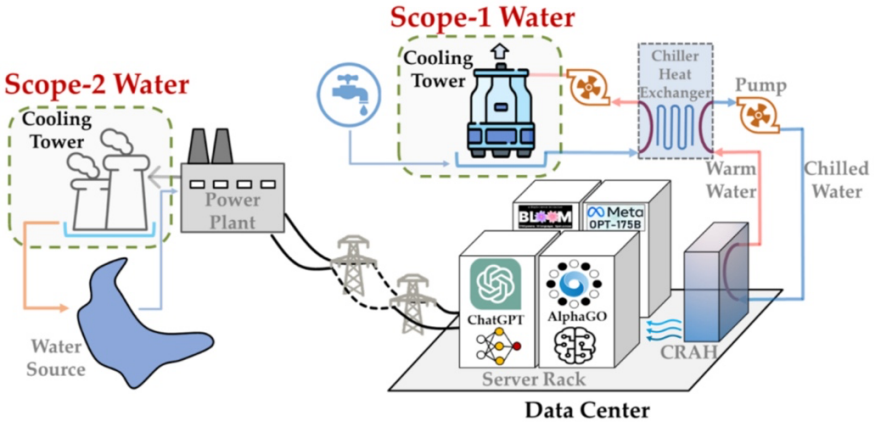
[16] De Vries, A. 'The growing energy footprint of artificial intelligence'(2023) Joule; Vol. 7, Issue 10, 18 Oct 2023, Pg.2191-2194

[17] https://www.iea.org/reports/co2-emissions-in-2022

[18] Ren, S. (2023), How much water does AI consume? The public deserves to know, OECD. AI Policy Observatory. https://oecd.ai/en/wonk/how-much-water-does-ai-consume

[19] https://ig.ft.com/microchips/

Figure from Ren S. (2023):



Water withdrawal and water consumption

There are two related but different types of water usage: water withdrawal, aka *water abstraction*, and water consumption. Both are important for an understanding of the impacts on water stress and availability. While water withdrawal refers to freshwater taken from the ground or surface water sources, either temporarily or permanently, and then used for agricultural, industrial or municipal uses, water consumption is more technical and defined as "water withdrawal minus water discharge", and means the amount of water "evaporated[20], transpired, incorporated into products or crops, or otherwise removed from the immediate water environment". By default, 'water footprint' refers to water consumption. But water withdrawal is also a crucial measure indicating the level of competition and dependence on water resources among different sectors. Indeed, electricity generation is among the top sectors for water withdrawal in many countries.

Global AI water requirements

Global AI demand may require 4.2-6.6 billion cubic meters of water withdrawal in 2027, which is more than the total annual water withdrawal of 4- 6x Denmark or half of the United Kingdom. If the US hosts half of the global AI workloads, the operation of AI may take up 0.5 – 0.7% of its total annual *water withdrawal*. Simultaneously, the *water consumption* of global AI could exceed 0.38 – 0.60 billion cubic meters i.e. roughly evaporating the annual water withdrawal of half of Denmark or 2.5-3.5x Liberia.

The exponential growth in demand for AI has increased its water footprint, with most Big Tech water consumption for server cooling coming from drinkable sources which is evaporated and "lost" into the atmosphere.

AI has not taken our most essential natural water resources as yet, but AI's increasing water usage is of great concern. Water scarcity has become one of the most pressing global challenges, what with a growing population, depleting resources, and ageing infrastructures especially in drought-prone regions. The concern is not just about the absolute amount of water usage, but also about how AI model developers are going to respond to the shared global challenge of water shortage, as everyone needs to take their share of the responsibility to address this challenge. There are already tensions over water usage between AI data centres and local communities,[21] and if AI models keep on guzzling water, these tensions will become more frequent and lead to social unrest.

[20] While evaporated water stays within our planet just like any other matter, it may go somewhere else and further contribute to the already uneven distribution of global water resources.

[21] https://blogs.lse.ac.uk/medialse/2022/11/02/big-techs-new-headache-data-centre-activism-flourishes-across-the-world/

The need for water transparency

Water has been undervalued for so long and today, AI's water footprint has received much less attention than it deserves. Information from AI model cards[22] about how an AI model is trained and how it should be used states the off-site carbon footprint emission for model training but does not contain any information about water. This lack of transparency is impeding innovation to build genuinely sustainable AI. While Big Tech has expressed wishes to achieve 'water positive' by 2030[23] for their data centres, none of this can-be confirmed until there are reliable measurements.

5. Geopolitical drivers

The geopolitical influence bestowed on Big Tech by their home countries (and their allies) through political support and the tacit acceptance of their business behaviours hampers many global institutional attempts to change current inequities and exploitation. The aim is to use Big Tech to achieve global gains in wealth and power through general tech advantage in the market, and the specific development of 'intelligence' and military technologies.[24,25] The balance of power of the technological 'armies', and a hint at their current medically based financial 'supply chains' can be seen in the graphic below.

Many of the founders/senior managers/early investors of Big Tech providers now in our NHS have large share interests in the corporations with expanded voting rights and therefore direct control. The major external investors are massive 'bedrock' US corporations. There is a symbiotic type of relationship between these investors and Big Tech with BlackRock attributing much of its success to its big-data system, Aladdin (Asset, Liability and Debt and Derivative Investment Network) which not only

[22] First proposed in 2018, model cards are short documents provided with machine learning models that explain the context in which the models are intended to be used, details of the performance evaluation procedures and other relevant information. A machine learning model intended to evaluate voter demographics, for example, would be released with a model card providing performance metrics across conditions like culture, race, geographic location, sex and intersectional groups that are relevant to the intended application.

[23] https://www.aquatechtrade.com/news/industrial-water/aws-water-positive-2030

[24] https://www.palantir.com/partnerships/cloud/ AWS, Google, Microsoft for defence, intelligence, secure collaboration, readiness

[25] Oracle 'cloud' which also features heavily in our healthcare system has just partnered with Palantir to supply its military/intelligence software to any US ally. https://www.oracle.com/at/news/announcement/oracle-and-palantir-join-forces-to-deliver-mission-critical-ai-solutions-to-governments-and-businesses-2024-04-04/

manages its investment portfolios, but also those of Vanguard and State Street, as well as Google, Apple, and Microsoft.

TABLE 1: *Top Tech Firms' Largest Institutional Shareholders*

	Alphabet	*Amazon*	*Apple*	*Meta*	*Microsoft*
1	Vanguard	Vanguard	Vanguard	Vanguard	Vanguard
2	BlackRock	BlackRock	BlackRock	BlackRock	BlackRock
3	Fidelity	State Street	Berkshire Hathaway	Fidelity	State Street
4	State Street	T. Rowe Price	State Street	State Street	Fidelity
5	T. Rowe Price	Fidelity	Fidelity	T. Rowe Price	T. Rowe Price

Source: Nasdaq.com, 6 March 2022

TABLE 2: *Assets Under Management*

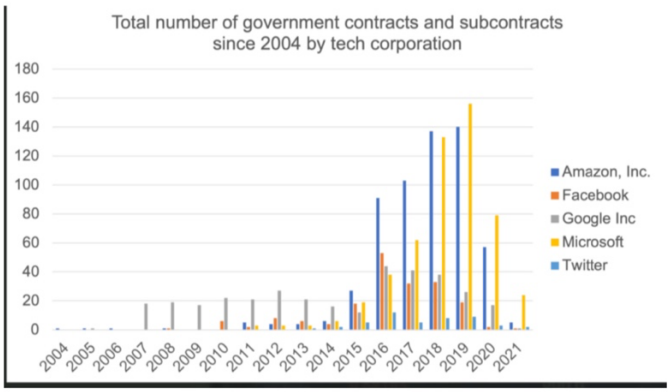
	2017	*2022*
BlackRock	$5.4tn	$10tn
Vanguard	$4.4tn	$7.2tn
State Street	$2.4tn	$3.9tn
Fidelity	$2.1tn	$4.5tn
T. Rowe Price	$1tn	$1.6tn
Total	*$15.3tn*	*$27.2tn*

Source: Nasdaq.com, 6 March 2022; Peter Phillips, *Giants: The Global Power Elite*, New York 2018.

TE Ström NLR 135 May/June 2022. (Alphabet=Google)

There has been a relationship between tech, state intelligence and the military for decades. This has grown as 'what it is possible to do' has also grown. The use of spy planes and satellites to collect huge amounts of information became increasingly useful to militaries when AI was used to integrate it into 'actionable intelligence' (Project Maven)[26]. Now 'drone' attacks decided by 'military AI' such as 'The Gospel' and 'Lavender'[27] developed with years of help from Big Tech[28] can distance their users almost totally from the 'moral injury' of massacres. In the same article it is made clear that it would be reasonable to hypothesise Microsoft Azure, AWS and Google cloud as a trio of 'public clouds' incorporated into the Israeli Defence Force's 'common fabric' and that Oracle would be a reasonable guess for the fourth. So Palantir working in Gaza would be doing so on one of those 'clouds' and indeed Palantir is only able to work on the NHSE Federated Data Platform with the essential assistance of [29]AWS and Microsoft 'clouds.'

In the US…..



Total spend on Big Tech contracts 2004-2021:
Dept. of Defense $43.8bn; Dept. of Homeland Security $348m; State Dept[30]. $258m; Dept. of Justice $138m.

'Big Tech Sells War' state that the above figures are very likely an underrepresentation of contracts and subcontracts that these corporations hold even though they are from Tech Inquiry.[31] Despite being the

[26] https://www.tni.org/files/2023-04/Militarising%20%20Big%20Tech.pdf
[27] https://www.972mag.com/mass-assassination-factory-israel-calculated-bombing-gaza/
https://www.972mag.com/lavender-ai-israeli-army-gaza/
[28] https://jackpoulson.substack.com/p/microsoft-and-google-have-been-working
[29] https://blog.palantir.com/palantir-and-the-nhs-dd1362982fa9
[30] https://www.state.gov/about/ 'we now work to fight terrorism, protect US interests abroad, and implement foreign policy initiatives while building a more free, prosperous, and secure world.'
[31] https://techinquiry.org/SiliconValley-Military/

most comprehensive collection of publicly available databases, they do not include information on many possibly significant contracts due to lack of public disclosure for reasons that are unclear.

6. Pro Big Tech Digital Industrialisation and Trade Agreements[32]

The Power of Big Tech (again)

Deborah James from Our World Is Not For Sale (OWINFS)[33] has highlighted the challenges in bringing about digital industrialisation that uses data as a public good and creates shared prosperity, given the constraints imposed by trade agreements.[34] These agreements consistently prioritise corporate interests over public interest, limiting the state's capacity to regulate or apply labour and environmental laws that hold corporations accountable for harms caused.

In this, the World Trade Organisation is complicit.[35] WTO digital trade rules negotiations broke down back in 2017 with the Global South unable to reach an agreement and withdrawing. The North countries decided to continue 'pluralistic' negotiations without them while attempting to bring South countries back in one at a time. Developed countries have been saying for years that it is important for developing countries to participate. "If you're not at the table, you're on the menu" but when developing countries make proposals, they are rejected.

It seems that the true purpose of digital trade agreements is not to promote shared prosperity through trade in digitalized products. It is to achieve the wealth extraction for corporations (see above) and to prevent poorer states' ability to:

i) engage in digital industrialisation;

ii) regulate digitalisation in the public interest (applying labour law and ensuring anti-discrimination in the digital sector; holding corporations accountable for harms caused; plus ensuring community benefits); and

iii) use data in the public interest.

The negotiations tend to ignore deep concerns about the impact of digital trade rules on society; the lack of transparency in trade agreements; and the need for greater international cooperation, alternative technologies, and regulatory frameworks that enforce human rights and social protections.[34]

Why is this happening?

The reasons mentioned for this imbalance between public and corporate interests can be traced back to several factors:

- Corporations wield significant influence over policymakers, and in some cases even draft the trade proposals.
- The persistence of colonial mentalities in some trade relationships perpetuates inequalities between developed and developing nations.

[32] Multilateral Trade Agreements once signed can be very difficult to change because of the number of countries involved. Breach of any agreement can lead to legal actions from other signatories.

[33] https://ourworldisnotforsale.net part of CEPR

[34] Workshop ('Digital Capitalism' TNI June 2024) run by TNI/SOMO/IT for Change/State Watch. https://youtu.be/TWh_zsQpaOM?si=5flyk4wdHw12wKBz

[35] See 'Updates and articles on the WTO negotiations' https://ourworldisnotforsale.net/digital

- Low-income nations' lack of negotiating power, and less technical or legal capacity, makes it hard to counter the sheer weight of pro-corporate knowledge production, lawyers and trade negotiators.
- The rise of Big Tech has so concentrated power in the hands of a few corporations that it makes it challenging for governments and citizens to assert control over digital spaces.

What would a people's trade agenda look like?[36]

New Tax Rules ensuring that Big Tech pays its fair share of taxes.
New Anti-Discrimination Rules addressing rampant discrimination and harms from AI.
New Liability Rules preventing corporations from profiting from harm.
New Cybersecurity Rules preventing repeated leaks and hacks.
New Rights for Gig Workers and applying existing workers' rights in the gig economy.
New Antitrust Rules to break up monopoly behemoths.
New Competition Policy Rules to end monopolistic abuses and regulate competition.
Fair Opportunities for SMEs[37] *and Start-ups* to ensure they have a fair shot in the economy.
New Data-Sharing Rules promoting data for the public good.
New Environmental Rules, making the digital economy more environmentally sustainable.
Strengthened Digital Privacy and Data Protection enforcing new rules to protect privacy and data.

Epilogue

Artificial Intelligence (AI), big data analytics, 'cloud' computing, the internet of things (IoT), advanced robotics and additive manufacturing (3D printing); we find ourselves in a global economy where digital intelligence is ever more central to production and increasingly so to our education, health and social care. If we remain on the current trajectory of so-called 'partnerships' with Big Tech empowered by 'intellectual monopolies' and geopolitical roles, we will lose control of the development and deployment of innovations.

As described in our first paper, our public services and those of other countries will instead be responsive to corporate investor interest, and the types of services that people may wish for professionally, may only occur if they are considered 'best value' or 'most productive' not just for national treasuries but also for the owners of innovation. We can already begin to see this in the NHS with the push for Physician Associates, Virtual Wards, and stand-alone Urgent Primary Care hubs viewed as part of a 'productivity' driven '10 year plan' but essentially requiring ever more data extraction and large and ongoing investments in tech and algorithm development.

The Big Tech 'clouds' we will be dependent on are currently driving huge global inequalities, encouraging worker exploitation, damaging the environment, worsening climate change, and are fundamentally involved in the development and deployment of military and intelligence tech enabling actions such as mass population surveillance and genocide.

[36] Given her criticisms, a fairly predictable but still bitterly disappointing list of demands posted by Deborah James who is also Director of International Programs at the Center for Economic Policy Research (CEPR) and Board member of Global Exchange https://globalexchange.org

[37] Small and Medium Size enterprises/companies- which along with 'start-ups' can easily be bought out if they are successful and/or a market threat, by venture capital-rich corporations.

So, are we to become, as some have predicted, the 'society of control' by corporations who are entranced by 'the joys of marketing',[38] with all that means in terms of ethical values, inequities, and the other excessive, unacceptable costs required to gain and continue their dominance? By placing our NHS on a 'public cloud' we may benefit from certain advances but we, perhaps unknowingly, support all the above injustices, the huge inequalities and the global dangers that they generate. There must be a better way forward than this!

[38] https://cidadeinseguranca.wordpress.com/wp-content/uploads/2012/02/deleuze_control.pdf