

Transcript of talk given by Prof. Cecilia Rikap on Intellectual Monopolies, Big Tech and Healthcare (edited from computer transcript and video by Dr M. Blanchard) 14th January 2024 DiU/SHAL/KONP data WG

Thank you for inviting me this Sunday evening. It is a pleasure to be here to talk with you. I will first make a key point and that is: collectively, as a society, the type of knowledge we can create from tech and data will be far, far more powerful for changing realities and solving problems than when it is solely used by the Intellectual Monopolies of Big Tech and Big Pharma.

In what follows I will move from the general to the more specific: I will start by introducing what I see as Intellectual Monopolies (IMs) and from my research illustrate what I mean and how it is different from what is seen as a usual monopoly-that is one that is held by a single company in the market-and I will describe the different power dynamic that is involved. I will then discuss the specificities of Big Tech and within those the relevance of AI and the Cloud and the way that they are trying to use these to 'conquer healthcare', and the specific aims Big Tech have in healthcare. If there is time I may also talk about regulatory matters and the relationship between Big Tech and nation states, which in some ways is worsening the situation in which we find ourselves.

Intangible assets

Examining IMs, we can see the use of intangible assets, and the concentration of corporate profits; we can see that an increasing amount of value that we all produce is being captured by corporations; and we can also see how this contributes to the current enormous global inequalities. Studying the top major corporations in the world then you can see:

- 0.001% of global corporations earn 1/3 of all corporate profits.
- Growth from 17% of S&P 500 assets as intangibles in 1975 to 90% by 2020

Intangibles are different forms of knowledge that have been transformed into private property and are used for capturing value from society. Once captured in this way, such knowledge is no longer available for the service of collective well-being but instead is used to create a specific company's private profit.

Patents

There are different ways to transform knowledge into intangible assets, one typically is patents, and the extent of their use is shown by the fact that the top 2000 companies in the world as measured in BERD¹ owned 63% of total IP5 patents² between 2016 and 2018. Apart from the creation of sole ownership to use, patents are important as they are often used to prevent competitors entering the market. There is a phenomenon called 'patent seekers' in healthcare, and a controversial example is Pharma patenting 'me-too' drugs. These are not really innovations as they are not significantly different from, and they do not significantly improve a current treatment, but the patent can enable the company to continue to capture value from their intangible.

¹ Business Enterprise R&D Expenditure UNESCO

² IP5 patents are inventions that were simultaneously patented in the world's five largest patent offices.

Intellectual Monopoly

The other important and critical development is the increase in concentration in Information and Communication Technology (ICT) both software and hardware. In the list of the top 2500 BERD companies 41.5% are ICT and 20.8% are health (a total of 62.3%). It is not by coincidence that in these sectors we see not only patents being concentrated into a few hands, but all forms of knowledge and information increasingly being monopolized by leading corporations. This is what has led myself, and other colleagues to talk about 'intellectual monopoly capitalism'.

Intellectual Monopoly can be defined as 'a systemic, sustained capturing of knowledge and information (including data) from society, and turning that knowledge and information, which was co-created with others, into the company's assets to achieve a monopoly'. Such a monopoly changes the development of a temporary advantage into a persistent advantage: the usual idea has been that an innovator did something new that made production more efficient or came forward with a new product and would get an advantage in the market for a certain period of time. Eventually the innovation would be copied or adopted by others, or another organisation would displace the innovator with their new product or process. But what we are seeing here is that the 'winner' keeps reinforcing themselves overtime. What we see in digital is that the development race is always won by Big Tech, and for the development of drugs it is always lead by Big Pharma companies. So Big Tech corporations are moving from a temporary to a sustained advantage and becoming permanent and proactive rentiers.

Beyond patents

There are a few caveats here though. The activity of Big Tech goes beyond the use of intellectual property rights and patents, it is actually a process in which we can see knowledge being split into pieces. Think of knowledge as a very large 'puzzle' that is not only split into disciplines, but that every advantage, every development is actually the result of re-combining small pieces, small modules of information. It is a development that has been helped by ICT technologies and how much less expensive it now is to transfer information from one place to the other, and helped by the development of the Internet which enables those at the frontier of development to rapidly identify any new module of knowledge that can be integrated into their particular 'puzzle'. This has enabled intellectual monopolies to emerge. But we are not talking about a transformation only at the level of technologies themselves, it is also a transformation at the level of policies and regulations. These have become less vigilant of issues related to antitrust, or the concentration of monopoly power, unless they have a direct impact on consumers. Some of the companies involved do not sell directly to consumers-for instance Big Pharma sell to governments-but what we often see with Big Tech companies is that they seem to be offering us, the consumers, something for free or very cheap like on Amazon. It is only once we start to identify their business models we realise that they are capturing value from many places and from many other companies, and they do so on the basis of capturing and appropriating data from all of us while we use their platforms. These activities have been neglected by policy makers while at the same time changes have strengthened the intellectual property rights regime through an increase in what can be patented and protected and an extension of their duration. All this has further contributed to a process where 'the winner keeps winning again and again'.

Subordination-Global Value Chains (GVCs)

In this process, the winners are not necessarily those who produce the innovations. Let me re-emphasise, I am not speaking here about market monopolies but about the fact that the existence of companies who constantly capture new knowledge and transform it into intangible assets simply leads to more market concentration. Ultimately, it is not about identifying markets at the level of the market itself, because in reality it is better for these companies not to keep rivals out of the market but instead to subordinate them and to organise what the economic literature, and the social sciences literature more generally, has described as Global Value Chains (GVCs). As an example, NIKE is a global shoe design company whose shoes are manufactured by companies around the world in cheaper locations of labour, cheaper in terms of salary and of the rights and safety of workers in the workplace. What happens in the organisation of a GVC is similar to the intellectual monopoly dynamic mentioned before. Nike concentrates the intangibles which is the design of the shoe, the brand of the shoe and trademark protections, but also, going beyond that, the identity that makes someone feel that the shoe is something different because it is Nike. It is because of these intangibles that Nike is able to control a whole set of other companies which are part of the value chain and part of the supply chain and can tell them not only exactly what to do and how to do it, but also what price it expects to pay for the shoes. This is what we see in all the franchising chains throughout the world, with the corporation concentrating intangibles and using this power to take part of the profit from the franchisees. The same happens with platforms³, and the same goes for the way Pharma companies are producing their drugs.

Subordination-Corporate Innovation Systems (CISs)

With Big Pharma and Big Tech platforms it is usual to see what Rikap describes as Corporate Innovation Systems (CISs) that operate along the same lines as GVCs but to produce new knowledge. In the last 20-30 years Pharma companies have started to outsource a lot of the steps of the innovation process to biotechnology start-ups and universities. They then capture the pieces and end up being the bottleneck that transforms them to be able to go 'from bench to bed'. Because the Pharma company concentrates all the intangibles in the 'journey', they end up profiting the most from the knowledge that was co-created by many others, sometimes even without their involvement. In the case of Tech, in particular AI and the digital technologies, the same dynamic is taking place. Here Big Tech companies do produce part of the knowledge in house, but always use and codevelop the knowledge with many others such as: open-source development platforms, universities, and public research organisations. All these actors seen together create a CIS.

Demonstrating the existence of the CIS

All the different organisations in the CIS are connected to Big Tech or Pharma through the intellectual monopoly which they use to steer the R&D and set the lines and the priorities that will be the focus of all those within the CIS. And afterwards, it is Big Tech or Pharma who, having appropriated that knowledge, profit from it disproportionately. This is the basis of the 'predatory' practices described by Rikap. While this all may sound interesting, it is important to find some concrete insights that prove it-some information that goes beyond a

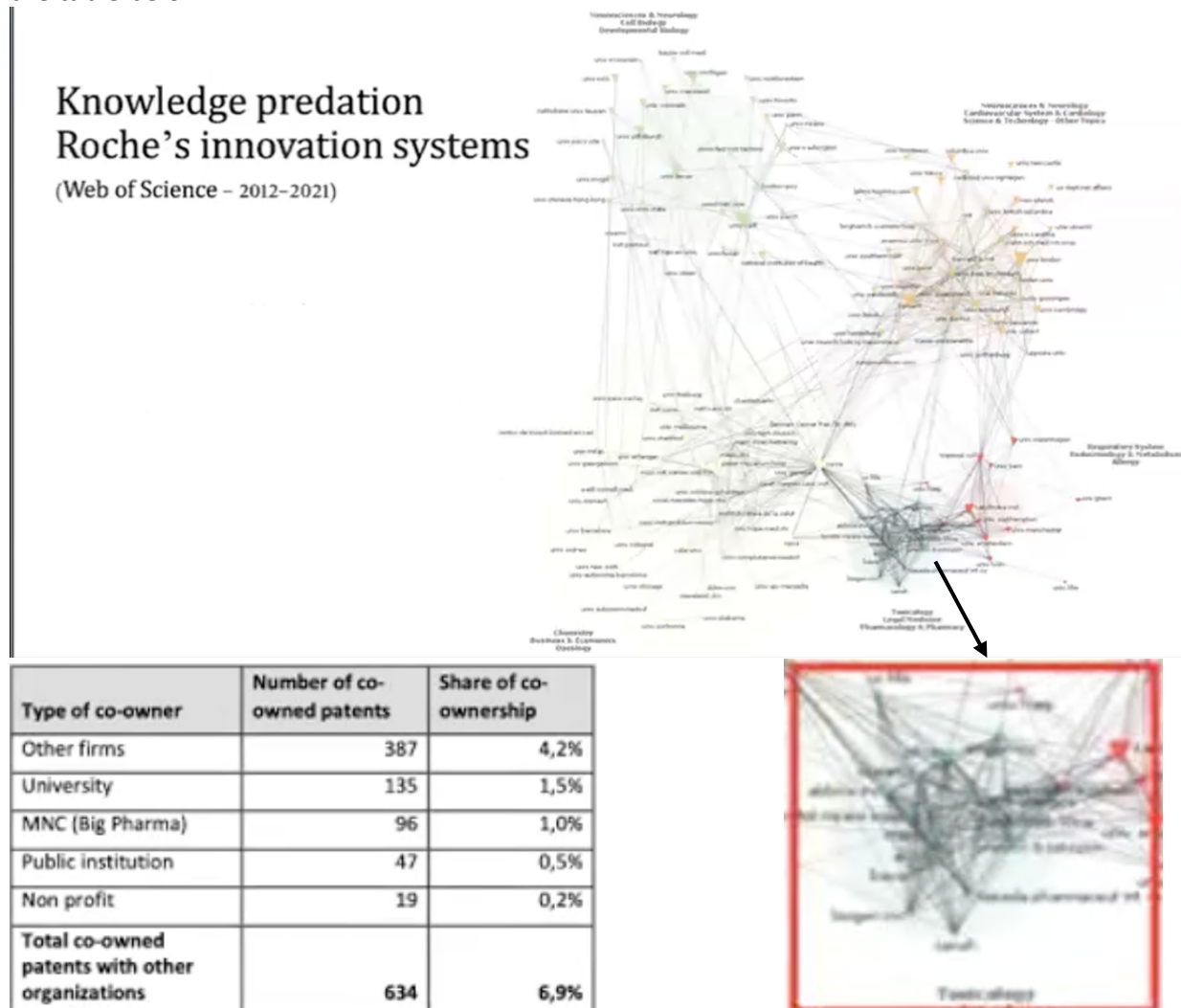
³ A computer or hardware device and/or associated operating system, or a virtual environment, on which software can be installed or run.

case-by-case analysis. An example can be seen in the development of vaccines, and how Big Pharma can end up profiting from research that was mostly done by other organisations, and that was funded mostly by the state, with taxpayers' money, by all of us, but for the profit of a few companies. How can we show this? Let us have a look at Roche.

Knowledge predation

Roche

It is possible to identify Roche's scientific publications between 2012-2021 from Web of Science and map the most frequent co-authors. There was co-authorship with 15,584 organizations (this happened at least ten times with 1,409), including universities, public research organizations, hospitals, non-profit organizations, and other firms. This sort of analysis, which Rikap has done for similar companies with similar findings, shows that they are publishing papers and co-producing knowledge with thousands of other organisations. But when it comes to patents, they barely share any of the ownership and this is shown in the table below.

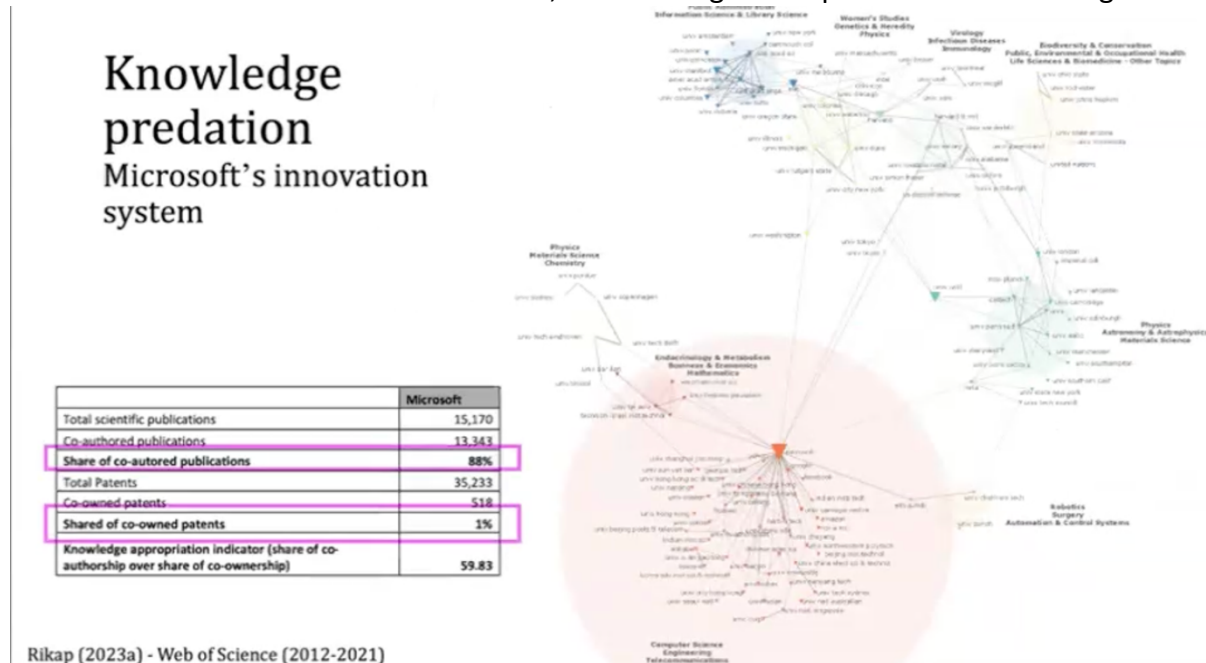


Ultimately less than 7% of Roche's patents between 2012 and 2021 were co-owned with other organisations while almost every single paper has co-authors. It is clear that this is not just one-time projects, but there is the emergence of different clusters of collaboration, with

a lot of organisations often working together with Roche to develop potential new drugs and treatments. There is also a specific cluster indicated in the red box that shows the collaborations **between** Big Pharma companies, with frequent co-authors of scientific publications being Sanofi, Takeda, Pfizer and Johnson and Johnson as well as the US Food and Drug Administration.

Microsoft

Now, moving on to the case of the Big Tech Microsoft⁴. This too is knowledge co-developed by many, but again when one looks at the patents as part of the available information (remember patents are only one of the mechanisms of appropriation of this knowledge) you can see that in the case of Microsoft even if almost 90% of its scientific publications between 2012 and 2021 had at least one co-author, and were again the product of the investigations



developed with at least one other organisation in terms of potential co-owned patents, Microsoft only shared the ownership of 1% of its patents. I mentioned that this is not the only appropriation mechanism, and this is important because often what these companies do is to keep the knowledge secret. For instance, in the case of Tech they offer scholars, not only from computing science departments but also from the healthcare sector, the chance not only to migrate to their companies and start doing research for them, but also to keep what they describe as 'double affiliations' which means basically, that they are both at the university and at the company. But, and here is an important point, they sign 'non-disclosure' agreements which means that they cannot share what they are doing at the company with the university, while they share everything that they are doing at the university with the company. Ultimately, they steer all the research that they are doing at the university along the lines of what the company is interested in.

⁴ I have chosen this corporation, but I have been doing research and this type of analysis for all the Big Tech (and Big Pharma) and, in every single case we find the same things, the same dynamic of co authorship with a large number of organisations, which is a proof of how, I insist, research is co-created and developed.

The specificity of Big Tech


What is it that Big Tech is doing research on? What are their main interests? Here you have the summary of the content of the scientific publications of five different Big Tech companies, three from the US and two from China between 2014 and 2019.

The specificity of Big Tech

Google	Amazon	Microsoft	Tencent	Alibaba
machine learning	machine learning	machine learning	neural network	neural network
neural networks	deep neural networks	speech recognition	convolutional neural network	recommender systems
speech recognition	neural network	data sets	social networks	reinforcement learning
Deep learning	genetic algorithm	training data	machine learning	user behavior
deep neural networks	data sets	neural networks	benchmark datasets	deep neural network
language model	cloud computing	video coding	training data	convolutional neural network
acoustic models	natural language	language model	Neural Machine Translation	social networks
approximation algorithms	speech recognition	social networks	image retrieval	data sets
learning algorithms	knowledge graph	search engine	big data	natural language
reinforcement learning	convolutional neural network	based approach	topic model	e-commerce platforms
training data	acoustic model	data center	attention mechanism	proposed algorithm
mobile devices	training data	image retrieval	representation learning	big data
recurrent neural networks	data centers	natural language	computer vision	search engine
natural language	predictive models	computer vision	target domain	attention mechanism
search engines	social media	deep neural networks	domain adaptation	Online Shopping
computer vision	computer vision	mobile devices	transfer learning	benchmark datasets
automatic speech recognition	approximation algorithms	data structures	feature learning	question answering
efficient algorithms	data streams	web search	reinforcement learning	network based
convolutional neural networks	learning algorithms	convolutional neural network	learning approach	display advertising
energy efficiency	sentiment analysis	learning algorithms	learning algorithm	user experience
data mining	object detection	programming language	search results	representation learning
voice search	big Data	search results	face alignment	transfer learning
language processing	topic models	software engineers	face images	short text
computational cost	transfer learning	recurrent neural network	community detection	data analytics
cloud computing	word embeddings	approximation algorithms	learning methods	recurrent neural networks

Source: Rikap and Lundvall (2021) - Web of Science 2014-2019

Big Data will make the market smarter and make it possible to plan and predict market forces so as to allow us to finally achieve a planned economy



Jack Ma - Alibaba

Before all the hype on AI, these five companies were already extremely focused on it.

Artificial Intelligence is not only the code, is not only the algorithms but is also the data and the compute power. You can see already here highlighted in blue, terms that refer to data, and in green you can see the terms that refer to the specific AI focus which is machine learning, and within machine learning deep nodal networks and deep learning, which is part of the big umbrella that includes the generative AI that we are seeing today in the large language models. Around five years ago these companies were extremely focused not just on research specific to social media and how to attract more people's attention, or research on e-commerce platforms, but they were already covering, from a mental knowledge perspective, the whole AI field. You can also see in yellow, key words that refer to the functional applications of AI, typically speech recognition, computer vision and natural language.

By the way, this information was obtained by text mining from the publications, the result of the use of algorithms to identify in the titles, abstracts and keywords of the scientific publications, the terms that frequently appeared again and again in different documents. I did this to avoid any claims that I 'cherry picked' things that referred to my research interest.

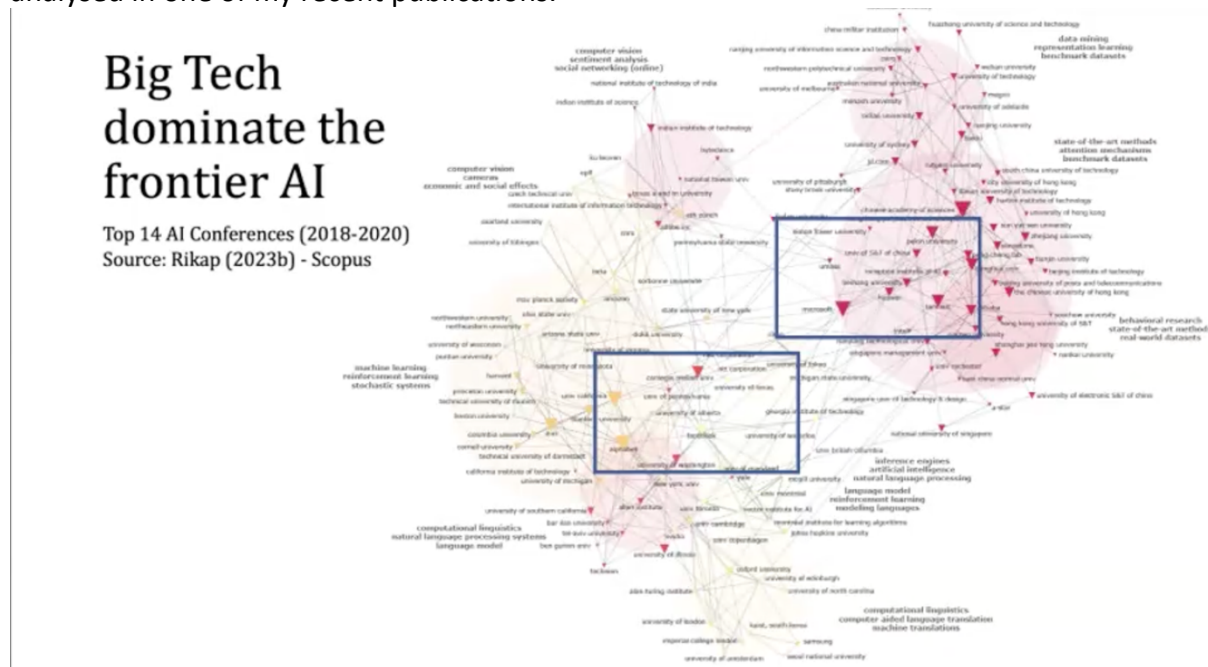
'Achieving a planned economy....'

The Big Tech focus on AI clearly speaks to what Jack Ma, Alibaba's founder, and CEO, is saying there on the slide. This is 'that 'big data' will make the market smarter and make it possible to plan and predict market forces to allow us to finally achieve a planned economy'. This is basically, what these companies are doing when they tell other organisations what research to do and how to do it; when they organise supply chains; when they organise platforms and set the rules of what can be done and how things should be done on their

platforms and so on. All these are examples of ‘planning regulations’ that are disguised as ‘market relations.’

Influence at the frontier

One could still say OK, these Big Tech companies are doing a lot of research on AI, but there are so many other organisations doing research on AI that ultimately, it's not a big deal. But let us have a look at the Top 14 AI conferences. There are differences between healthcare and AI research because in healthcare one typically thinks that getting published in the journals with the highest impact factor is what determines the most prestigious research, and that is the sort of research that will in a way conform the prevailing global research agenda. Whereas in the case of AI there is a tendency to publish everything very quickly in repositories, while the distinction between very good quality research and the rest is decided in AI conferences. The top AI conferences are where everybody is trying to identify the frontier, what is at the forefront in AI. I therefore felt it was relevant to research all the presentations that took place in these conferences for last 10 years. Below is the three years analysed in one of my recent publications.



What I did was to extract from all these data the organisations that were the more frequent presenters of papers at these conferences. From all the organisations two, Microsoft and Alphabet/Google,⁵ which are also crucial organisations when it comes to healthcare, have what is called the largest ‘betweenness centrality’ and ‘closeness centrality⁶’. It does not matter what indicator you are looking at in terms of identifying the crucial nodes in this network, Microsoft and Alphabet/ Google stand out as the first two in all these metrics. This indicates that these are the crucial organisations in setting the whole field of AI. The case of Microsoft is particularly impressive because Microsoft is the bridge that connects all these

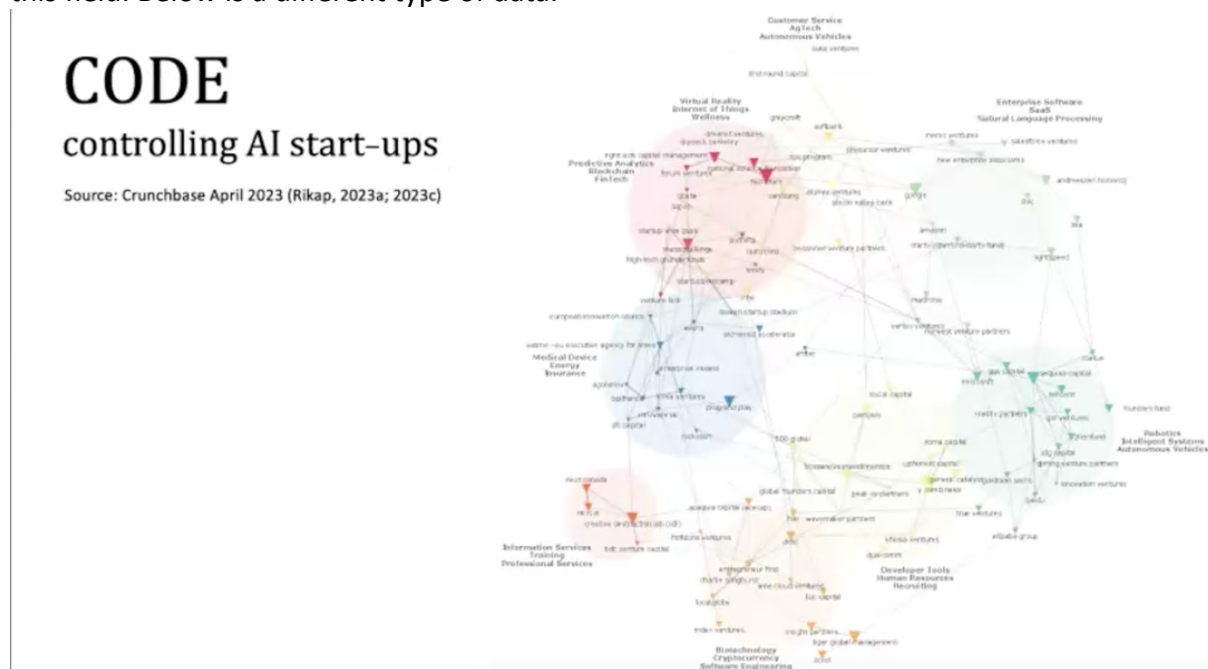
⁵ Facebook, Amazon and the Chinese Big Tech also feature on the map, but I will just for the sake of time focus on Microsoft and Google.

⁶ In graph theory ‘Betweenness centrality’ indicates a node that is critical for the passing on of information quickly, and ‘Closeness centrality’ is a way of detecting nodes that are more able to spread information very efficiently.

clusters on the right in red, mostly populated with Chinese organisations, to those on the left in yellow populated mostly with western organisations. This means that Microsoft is the crucial node connecting the core Western countries⁷ with China. There is no decoupling in the AI research field mostly because of Microsoft, and this gives Microsoft an extraordinarily crucial geopolitical role in AI. It is no wonder that Microsoft, and other Big Tech, are occupying a place in the regulation of this technology and, especially in the case of Microsoft and Alphabet, steering their governments towards developing certain policies in relation to China. If I have time, I will come back to this later because it is interesting that, while at the same time as these companies keep saying to the United States and more widely that China is a huge threat, Microsoft is crucially integrated into the national innovation system of China and therefore appropriating knowledge not only from western organisations but also from those in China.

Big-Tech control (2)

But this is not only a story about co-creation of knowledge with universities, public research organisations and other firms. At a more fundamental level it is also a story about how these companies control even the ‘AI start-ups’, the new businesses that are being initiated into this field. Below is a different type of data.

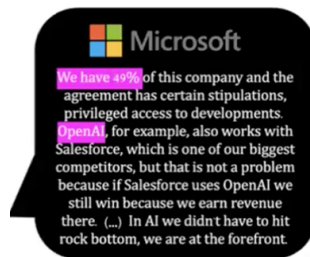


Above are the main investors in ‘AI start-ups’ consisting of typical venture capital companies like SoftBank but also all the Big Tech companies from the USA, and China. There is Microsoft, Google and Amazon yet again. In every ‘AI start-up’ that is being developed there is a high chance of Big Tech involvement. It’s not that they will necessarily be acquired, although Big Tech companies do acquire, and the Big Tech US companies are the largest acquirers of all ‘AI start-ups.’ Google in 2014 acquired DeepMind, a start-up company that spun off from UCL in the UK; it ended up being part and parcel of Google and the heart of Google's AI. Microsoft however, decided to pursue a different strategy, instead of acquiring an AI forerunner they decided to control it. This is what happens more frequently, at the

⁷ Rikap says core as opposed to peripheral because it is only the wealthiest western countries that have well developed tech.

level of hundreds of companies at the same time, and Big Tech is among the most important investors so that they can control them. They put seed money into these companies and control what they are doing, and they get privileged access to the knowledge being developed without owning the assets. This not only reduces the economic risks but also the regulatory risks. Open-AI is perhaps the paradigmatic case of this type of dynamic, and below you have a snippet from one of my recent interviews.

I have done almost 100 interviews with people working as AI scientists, AI engineers, AI developers, software engineers, software developers and so on. Not only those in Big Tech companies but also in other large companies that are developing digital technologies and using them from Big Tech.



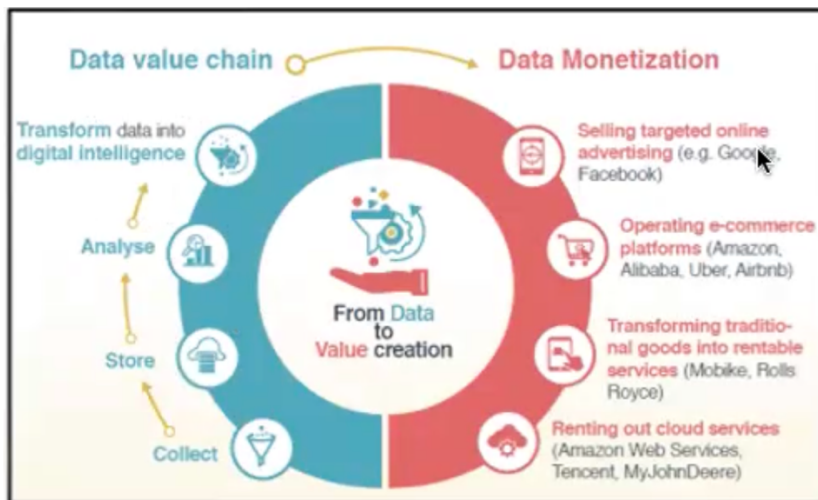
When talking to someone from Microsoft it was very clear that they own 49% of the company Open AI, and that it was a strategic move because by not owning the company but just controlling it, they get privileged access to the knowledge and everything that Open AI is doing; they can also steer the company's AI models as they are developing (apparently, they even encouraged Open AI to develop what ended up being Chat GPT). At the same time, they can expand the sales of the resulting products even to rivals who would not be so keen on purchasing something directly from Microsoft, while getting a service from Open AI seemed to be completely innocuous.

AI is strategic.

So again, why is this so important? Why is this different from the way in which Big Pharma have been appropriating knowledge and acquiring start-ups from the healthcare sector? Well, **it is different because AI is strategic**, and without going into too much detail, AI is not simply a frontier technology, but it has a crucial geopolitical power in many areas. AI is strategic, with geopolitical (including military) roles and this raises issues in data governance politically and ethically; human rights; industrial espionage; national sovereignty; and economic power.

There have been some misleading comparisons between data and oil. When we speak of Big Data and these Big Tech companies, we are speaking about millions, and millions, and millions of bits of data that are being constantly created and that are being processed by algorithms. The algorithms are sort of refineries, **but a sort that perform better the more data they are processing**. So, it is not the data itself that has a lot of value, but it is the fact that it is put together and processed with AI algorithms with a computing code and that produces what UNCTAD⁸ describes as 'digital intelligence'. I find the UNCTAD road map very important and easier to understand than many:

⁸ United Nations Conference on Trade And Development



It shows us that value extraction is not just about collecting the data, nor is it just about making data available online to be harvested. **But what matters is the capacity to ‘crunch’ the data, to have ‘the means of production’ that are unique, because the more the algorithms are used then the better they get.**

A machine typically depreciates the more it is used, and eventually it will need to be replaced. While an AI algorithm, the deep-learning algorithms, get better the more data they process, and this is why we can begin to conceive of a ‘means of production’ that appreciates the more we use it, and this leads to a new method of invention and innovation, and so we are already beginning to understand why it is so strategic for healthcare.

Tonnes and tonnes of patient data, and other types of data used for healthcare purposes, can be processed. With this as a potential new method of innovation, eventually it could be possible to identify the spread of diseases, new patterns of disease, new causation and potential new treatments and cures.

Processing power

There is a lot of promise in relation to healthcare for the use of this, what can be described as, ‘technology package’. It is not just the code, it is not just the algorithm, but it is the data, the code, and of course a lot of compute-a lot of processing power. Without the processing power it is impossible to run, to train, and regularly use any AI model. This is where Big Tech have been very clever from the start, because they have monopolised, what I have described together with other colleagues as, ‘the means of information and knowledge appropriation’. It is not just concentrating data, it is not just concentrating algorithms and appropriating parts of various models that are being developed in the Open-source community, in the universities and so on. But it is through the concentration of processing power. This is why below you have some pictures of ‘hyperscale’ data centres, and some figures on how much these companies have expanded also at the level of tangible assets. But these tangible assets are not just factories/machines that will produce shoes, or burgers, or whatever. These are the compute that is necessary to process all that data on AI and this is why associated with the expansion of AI, we see the expansion of a business that was developed particularly by Amazon, Microsoft and Google-which is the business of the Cloud.

Means of Information & Knowledge Appropriation

MIKA

Between 2015 and 2021, Amazon's AWS square footage (proxy for datacentres surface area) grew 289%

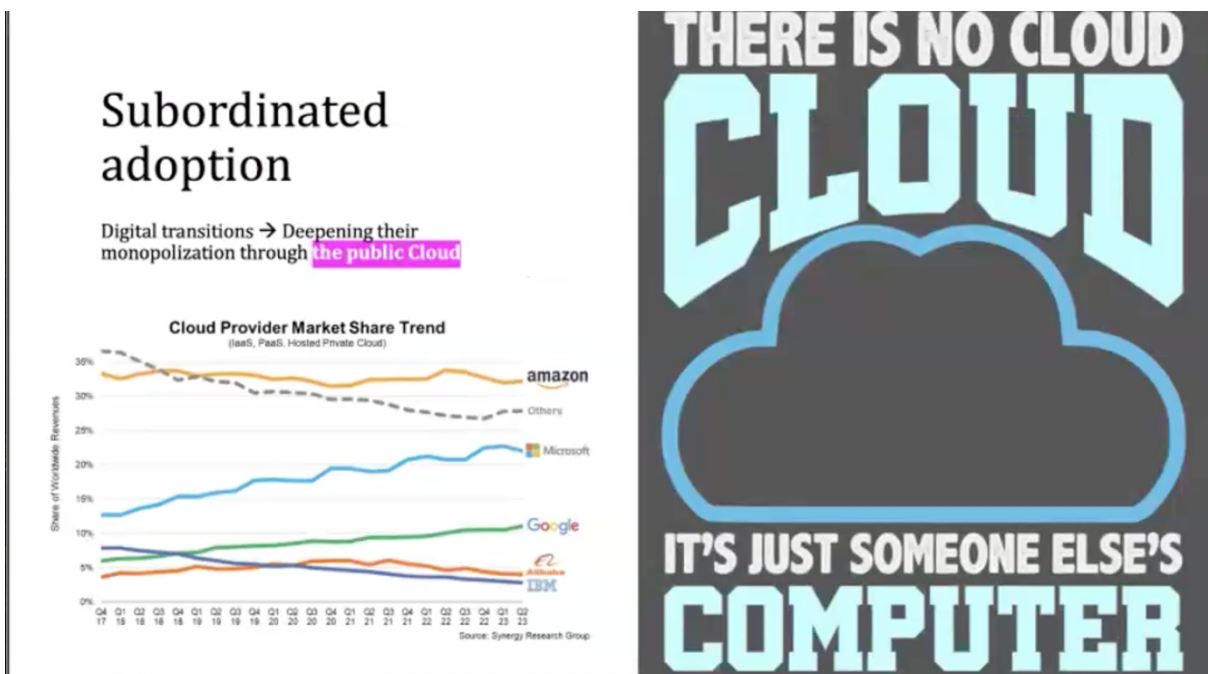
By 04/22: Microsoft had around 200 datacentres in 35 countries (160 locations)

4 Big Tech own over 50% of the world internet undersea cable

Design their own AI accelerators/processors: Google TSU & AWS Inferentia

The Cloud

The more an organisation wants to start to process data and use AI, the more dependent it will become on what is described as the 'Public Cloud', while in reality it is a private and very



profitable business of ultimately only three companies. Between the three, Amazon Microsoft and Google concentrate over 65% of the world Cloud computing market. This may seem just like any other market but what is sold there are software as a service (SaaS) platform as a service (PaaS), and infrastructure as a service (IaaS). So, it is not only a place to

store data but also has platforms to process it. For example, there is one very popular one on Google called 'Big Query' which is a huge platform to process data and answer queries from that data. But there are also software as a service, such as a part of an AI code that can, for example, be used to provide information about the weather that could be used by companies for logistics purposes when they are going to ship goods. There are 1000s of different things that can be sold as pieces of software and as pieces of hardware, that can be used for specific purposes. Zoom for instance, that we are using for this webinar, does not have any data centre, it all runs on the Cloud.

The structure of Cloud

In principle this seems to be very similar to any other market in the platform world; companies capture value and control third-party players exactly like in the Amazon.com where a lot of companies offer their products for sale. Likewise, a lot of companies offer their products and services on Amazon's 'marketplace for the Cloud' which is called Amazon Web Services. There are different types of companies, some of these offer software, some hardware as a service, while other companies work as a salesforce or as customer service. So, it is not Amazon that directly provides all these services on its Cloud; they subcontract companies, and all these companies pay a fee to Amazon for being part of this so-called 'ecosystem' that is in fact quite unstable and unequal between the parties.

This structure also serves another important purpose, which is to be able to notice in advance that some businesses are thriving. As an example, Nuance⁹ was selling cloud computing software as a service specifically targeted at hospitals and other healthcare institutions. Microsoft acquired it not only because of the knowledge Nuance had, and not only to get all the clients that Nuance had as well, but also because by offering these specific services Nuance was developing very advanced algorithms for speech recognition.

Use without 'access'; a market of 'black boxes.'

Up to here, one could say 'OK it's a bit more of the same, it is just a market for computing power and software' but there is something very different about this market. What is being purchased in this market is knowledge, knowledge that has been transformed into intangible assets, and code that was developed not necessarily by these companies, but that these companies ultimately profit from by transforming it into 'black boxes.'

When an organisation like the NHS moves its data to the Cloud it will not simply be using for example Big Query from Google or other software as a service to process its data. Because in doing so it will make the algorithms of these companies better, it will help to show the companies which algorithms work better or worse for its purposes, and it will be using all this software without accessing the code. This is '**use without access.**'

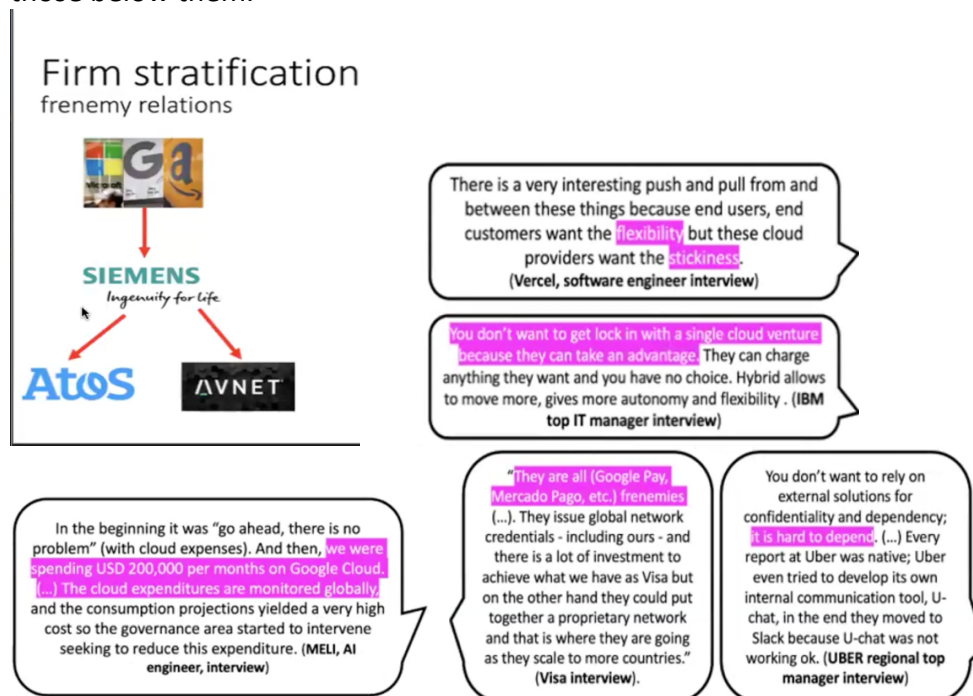
In the economics of innovation literature, it was typically assumed that the user of the technology, because it was using it, could learn by using, by 'doing and interacting'. But if you really do not gain access to the technology you use but just access a 'black box' your chances to learn are seriously curtailed. This is why we can speak of 'power relations' between the producer and the user of the technology- or actually, between the user and

⁹ **Nuance Communications, Inc.** is an American multinational computer software technology corporation, headquartered in Burlington, Massachusetts, that markets speech recognition and artificial intelligence software.

the appropriator of the technology because, again I insist, this software or platforms that are sold as a service on the Cloud are not the result of knowledge that was exclusively produced inside the provider organisation. **So ultimately the more organisations use the Cloud the more Big Tech companies entrench their power.** Also on the Cloud is a place where all different pieces of knowledge from the digital technologies are assembled, are recombined, and the ones controlling all this are Big Tech.

The 100 interviews with tech workers

From the results of my interviews, I want to give you some flavour of the problems, and for you to realise that even large companies from around the world such as Samsung, Procter and Gamble, and Walmart are having difficulties. They all seem to be becoming more and more data driven. This is also the case in Pharma where companies are trying to use all the data they have been harvesting, in not such ‘techy’ ways from the clinical trials. They are trying to transform all that into huge datasets that will be processed with things like Google Big Query to gain insights, and processed with AI provided by Big Tech, but without really gaining access into it, to steer their businesses. This results in structures of power where companies like Siemens for instance, an important intellectual monopoly that has a big role in the healthcare sector, as well as Big Pharma companies, become more dependent on Big Tech but they accept this dependency because by doing it they can further subordinate those below them.



Ultimately the hierarchies of power become more complex, but still these large companies by capturing more data and more knowledge from organisations like the NHS, reinforce their power and keep on capturing value widely from society. Again, different snippets from interviews with different companies emphasise that it's hard to depend on the technologies provided by Big Tech. I am sharing this with you because if a company like Uber is saying that it's hard to depend on Big Tech companies, if a company like Visa is claiming that all these companies are ‘frenemies’ or a company like IBM is trying to sell hybrid clouds as a way to tell big companies you do not want to get locked in with a single Cloud provider, imagine

what may happen with an organisation like the NHS. So, if the largest organisations in the world are concerned about the power of Big Tech, imagine again the public sector and public institutions. While all this is happening Big Tech companies are entering the healthcare sector. It's not just that they are providing technology, their strategy is really to rely on the intangibles, on the AI and data that they have been amassing and transforming into assets so that they can enter new sectors where they can capture new data sources and knowledge that will keep on reinforcing their leads. They will call this 'partnership'. You will hear this term often, again and again, they call this 'a strategic partnership' but these partnerships are not market relationships, they are not relationships among equals. When these guys act as 'partners' they try to sell the idea that everybody is winning something without really measuring who is winning what, and who is investing more, or compromising more.

Healthcare? Beyond healthcare?... Both?

So, what's going on in terms of healthcare? In healthcare, and healthcare digitalization in particular, Big Tech are using AI as a method of invention. Some examples are that Google is applying AI to disease detection for diabetes, Parkinson's disease, and heart diseases; while Amazon work with universities and hospitals on applying AI to diagnosis, precision medicine, voice-enabled technologies, and medical imaging. I can also share with you a publication that is specifically about Google entering the healthcare sector and that has many more examples.¹⁰ Big Tech are also using what is called 'Emergent Medical Data'¹¹. This is constructed from all the big data sets that they have, to infer things that are related to healthcare. For instance, during the pandemic Google was using searches to try to identify COVID-19 symptoms, so if someone was unwell and losing their sense of smell, and having stomach aches and having a sore throat, and these symptoms seemed to be happening together in many places of the world at the same time, then probably all these could be symptoms of COVID. Meanwhile Facebook is also using AI to try to predict suicide attempts from information people post on their platforms. On the face of it, these seem very useful actions as we really need to prevent suicidal attempts, and it is very helpful to identify the symptoms of a disease. But who is deciding the priorities, and how this is dealt with, addressed, and tackled? You really do not need me to say how complicated these processes are, particularly things like predicting suicide attempts and what needs to happen afterwards. Just sending messages to people saying 'go and seek help' would hardly solve the underlying issues that result in depression and mental health problems that can lead people to consider the option of committing suicide. Really these companies are saying we have the power to identify potential diseases and behaviours for which action can then be taken. Certain of such abilities may appear useful to the National Health care systems, and through this relationship Big Tech try to access NHS data, and this has already led to unfortunate incidents¹². They also seek access to other new data sources¹³ not only to develop potential applications for healthcare, but also again, to train their algorithms for other, private purposes. **This is because AI is a general-purpose technology meaning that**

¹⁰<https://openaccess.city.ac.uk/id/eprint/28886/8/The%20expansive%20strategies%20of%20intellectual%20monopolies%20Google%20and%20the%20digitalization%20of%20healthcare.pdf>

¹¹ exclusive access to the major big data sources that can indirectly inform on potential healthcare industry opportunities (Alibaba City Brain, Facebook predicting suicide attempts, Google Covid-19 symptoms)

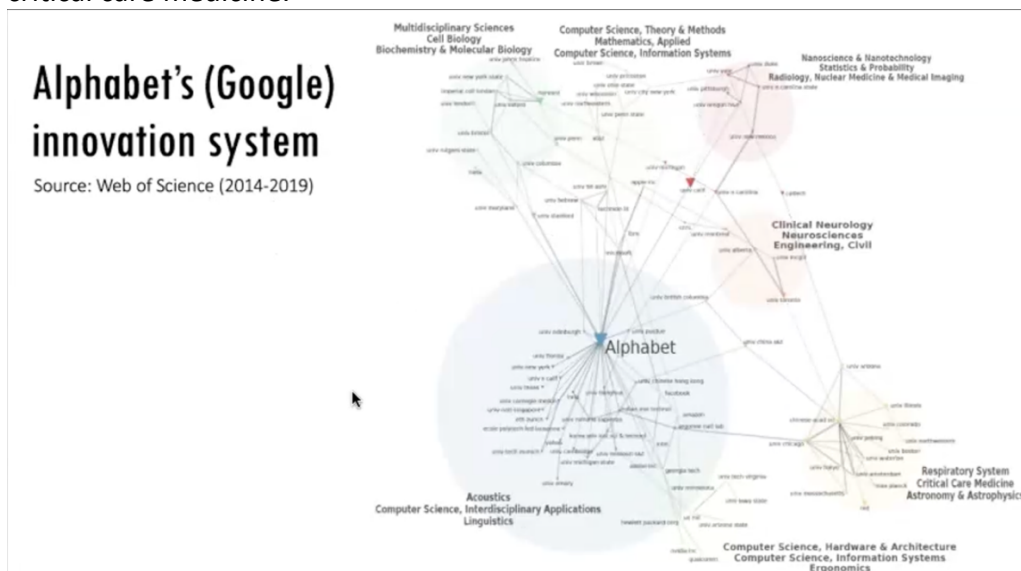
¹² <https://www.theguardian.com/commentisfree/2017/jul/05/sensitive-health-information-deepmind-google>

¹³ EHRs, Wearables' data, 23andMe, Alexa for hospitals, Tencent's WeDoctor an all-embracing healthcare platform.

you can train it with a lot of healthcare data, and what the model will learn, and what those coding it will learn, will go way beyond healthcare.

The NHS as a ‘lighthouse’

Yet again one may say, ‘OK maybe you're exaggerating about all of this. These are tech companies, and they are doing a few things in relation to healthcare, but they are not really interested in the sector.’ But if you look at, for example, Alphabet/Google’s scientific publications between 2014 and 2019, and who the main co-authors are, you will find that in many cases these are not the typical universities majoring in computing science research, but universities specialising in Medical Sciences research such as Harvard. Then if you look at the content of the publications, you can clearly see from the seven clusters on the map below, four of them are addressing healthcare issues specifically. You have one cluster with cell biology, biochemistry, and molecular biology; then one with nanoscience and nanotechnology statistics and probability, radiology, nuclear medicine and medical imaging; another with clinical neurology and neuroscience and a fourth with respiratory systems and critical care medicine.



So Big Tech is using their technology in healthcare research to enter the healthcare sector. That is also the case, if one specifically investigates the patents related to healthcare. Google had, by the time I did this research, applied for just over 500 healthcare related patents, and shared the ownership of only 20. So, it is co- development of research and again appropriation of the results. I mentioned before the role of acquisitions, and from 2014 onwards Google became more interested in two specific sectors making eight acquisitions in education and four in healthcare. They also continued to increase their acquisition of companies working on AI and data and analytics. **One final thing is that as part of the interviews that I have been doing, I talked with someone from the Google strategic solutions team which is basically a team that offers what they describe as ‘One Google’; that is the entire pipeline of Google products being offered to strategic partners, i.e. partners that are the top priority for Google in Europe. They have 80 European organisations marked as such, and by the time I met to do the interview they had decided**

that one of the crucial 'verticals'¹⁴ was going to be healthcare. Among the three priorities of organisations in healthcare, one was the NHS- Google has already made the NHS a priority. You may wonder why that is, and the answer is that it is because of all the data, it is because it can become what they describe as a 'lighthouse' partner, appointed to help Google gain trust and better position itself with other players. If Google are seen as a privileged partner of the NHS, then many other healthcare systems, and private companies will be more prone to do business with Google. Also, of course they have no issues in terms of 'business rivalry' as there is no risk that the NHS is aiming to become a digital power, or anything like that.

The 'stickiness' problem

I want to emphasise that in my interviews with Google and Amazon as well, they were openly stating that they code all the algorithms they sell in a way that they describe as creating more 'stickiness'. This 'stickiness' of the system makes it harder to leave and can lock-in the organisations. **Once the NHS moves everything, let's say to Google Cloud and storage, and starts operating with their systems and processing the data with their algorithms, it is not only that they will not be able to do these things by themselves because they use the technology without accessing knowledge, but also that it will be too expensive to leave these companies.** Big Tech companies have/are entering many other sectors as well and dominating them, while the adoption of Chat GPT and the like has been massive, and is expanding not only the use of AI but is also generating more and more Cloud consumption.

"The sexy thing about Google is not the cloud, where it is the third player, the sexy thing is the access to the whole range of solutions and products, it's a bit of a common card they play on us and that's why my team was created because cloud has the mandate to grow." (Google strategic solutions interview).

"Amazon has a lot of SaaS and tries to increase the stickiness of the system. (...) it is not in your control to switch to other companies easily. (...) If you want to move from one cloud provider to the other, it takes months of planning" (AWS senior software development engineer).

Summary

To sum up, I wanted to bring you a larger picture of how accumulation is driven by intellectual monopolies and how the basis of their power is to capture knowledge and data that has been co- produced by many, and then use it for capturing value from those that are subordinated inside the structures of power that they control. I wanted to show that Big

¹⁴ A vertical market is made up of companies that offer goods and services to meet the needs of customers in a specific industry or niche market. In a vertical market, similar products and services or compatible products and services are developed and marketed to a designated set of customers.

Tech are special among all the intellectual monopolies because they control digital technologies and because more and more organisations are depending on the Cloud to use these technologies, seeing them as avenues for new research and for the uptake of AI. Healthcare is a desired sector for the development of all this unfortunately, not only because of the data but also because it is a place where AI can be used and 'the AI technology package' can be tested. Concerning the use of AI in science, if you think about which type of research is being used the most, it is not social sciences, it is more for research on healthcare and biomedical sciences. This transformation of how research is done is not only relevant for the NHS as an organisation but is relevant for all the research that is being done in the public sector in relation to healthcare, and AI is putting all these dynamics 'on steroids.'

One thing that we could discuss is what is the understanding of health that underlies the use of AI? This artificial intelligence which is being developed by Big Tech-even though they do not develop it all by themselves, they are creating and controlling the entire field. And this idea that AI will replace some of the tasks that people from the healthcare sector are doing now. What is the conception of intelligence that is underlying this way of thinking about artificial intelligence?

Artificial intelligence is in the end just lines of code and advanced statistics for processing large datasets with a lot of compute power. So, even if it processes all the history, all the medical records of the people in the world, all the medical sciences books in the world, it will never have the imagination and the experience, and the co-creation that takes place inside the hospitals, and inside the different healthcare institutions between the practitioners, and it will never have the sensibility of the practitioners that is crucial for treating patients and for caring. So, there is also underlying all this, an idea of what intelligence is that is very dangerous, especially for healthcare and in particular in our need for caring.

So, thanks a lot, sorry that I spoke for more than 45 minutes and as I said before I'm super-open to questions and debate on your comments.



