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Breaking up Big Tech: Separation of its Data, Cloud and Intelligence Layers

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IT for Change

Data Governance Network

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Abstract

Big Tech is seen to have become too powerful, and causing many economic, social and political problems. But there still has hardly been any real challenge to its apparently unstoppable march. Piecemeal efforts – from huge fines and sanctions to disallowing platforms from competing with dependent businesses – have failed to make any significant dent on the dominant digital economy model, which is getting entrenched as the 'new normal'. The problem here may be that the regulators are trying industrial era remedies on digital age problems.

Digital economy paradigm must be understood in its significant discontinuities with the industrial age. Regulation of digital economy needs to focus on the central role of data and data-derived intelligence. Competition regulators either ignore these key factors, or simply take a superficial view. A relatively better understanding about them is developing in the somewhat distant realm of technology governance; with its new focus on data sharing, data infrastructures, cloud neutrality, open digital ecosystems, domestic AI competencies, and public interest AI. Technology governance, however, normally does not have the enforcement teeth of competition regulators.

Bringing together these two governance or regulatory traditions – about competition and technology, the paper proposes a composite new regulatory framework for the digital economy. Digital ecosystems are presented as the key new structural feature of the digital economy, increasingly superseding IP firms led industrial value chains. The focus is then drawn on the effective economic governance of data, cloud computing and AI – the building blocks of these digital ecosystems.

Considering data and cloud computing as infrastructural elements, with open and equitable access for digital businesses, will ensure the greatest digital productivity. AI based global power concentration can be addressed by models that adequately distribute society's digital intelligence in space and ownership. While behavioural remedies have their role, the paper also presents a regulatory ideal-type of structural separations between the four key functional layers of digital value chains; data layer, cloud computing layer, intelligence layer and consumer facing intelligent services layer. The paper concludes that any successful regulation of the digital economy will require a new legislation and a separate digital economy regulator.

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1. Introduction

Big Tech is a term employed for global digital monopolies like Google, Amazon, Facebook, Apple and Alibaba. It is a common refrain nowadays in media, and among politicians and people, in general, that Big Tech has become too powerful. It is starting to dominate our economy, society, culture and politics. As digital technologies become integral to managing our personal lives, digital corporations are disrupting, and controlling, major parts of sectors like commerce (Amazon) and transport (Uber). Early trends indicate that a similar fate may only be a matter of time for other sectors – whether hotels, food, health and education or agriculture and manufacturing. A strong view is emerging that such concentration of economic and social power with a very few global digital corporations is both unprecedented and unsustainable.

No effective framework exists for regulating such immense digital power. Current responses, if any, are reactive and piecemeal, and not based on an adequate analysis of digital power. Examples of such reactions are; asking digital platforms to share ad revenue with media houses,[1] declaring ride-hailing platforms as employers of cab drivers,[2] and, in India, using foreign investment laws to regulate e-commerce platforms.[3]

Digital economy comprises very new forms of economic relationships and structures, representing a fundamental shift from industrial era economic organization. Existing regulatory frameworks are built for the industrial era. Their failure in regulating a digital economy is more and more evident. The digital economy has to be viewed as a novel and distinct kind of economic system, involving key new factors of production of data[4] and digital intelligence.[5] Based on such an understanding, new principles

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1 Packham, C. (2020, April 19). Australia plans law forcing Google, Facebook to share ad revenue with domestic media firms. *The Globe and Mail.* https://www.theglobeandmail.com/business/international-business/article-australia-plans-law-forcing-google-facebook-to-share-ad-revenue-with/

2 Dillet, R. (2020, March 4). Uber driver reclassified as employee in France. *Tech Crunch.* https://techcrunch.com/2020/03/04/uber-driver-reclassified-as-employee-in-france/

3 Press Note 2 (2018). *FDI Policy Circular.* https://dipp.gov.in/sites/default/files/pn2_2018.pdf

4 Why 'Big Data' is the fourth factor of production. *Financial Times.* https://www.ft.com/content/5086d700-504a-11e2-9b66-00144feab49a

5 Accenture. *Artificial Intelligence is the Future of Growth.* https://www.accenture.com/in-en/insight-artificial-intelligence-future-growth and see Digital Economy Report, 2019, UNCTAD. https://unctad.org/en/PublicationsLibrary/der2019_en.pdf

of regulation need to be framed for the digital economy. This paper makes an initial attempt in this direction.

The paper begins by pointing out a few strong indications of unsustainable digital power concentration (section 2), and then examines how it is currently being addressed by researchers, policy-makers and regulators (section 3). Next, it argues why current approaches are failing, and how even the strongest among them are unlikely to be effective (section 4). The paper proposes that a more pro-active regulatory framework is required that is specially designed for the new realities of a digital economy (section 5). The following section discusses the unique nature of digital economy and important concepts required to understand it (section 6). Digital ecosystems, in contrast to platforms, are then presented as the key structural feature of a digital economy and society (section 7). The paper proposes a new regulatory approach based on structural separation between four important functional layers of data and digital intelligence value chains (section 8). The following three sections discuss governance of data (section 9), governance of cloud services (section 10), and governance of society's digital intelligence (section 11). Citing from emerging policy documents in some countries, the closing section argues for new legislation to underpin digital economy regulation, and a separate digital economy regulator (section 12).

The paper employs a political economy lens, examining the nature and location of power in emerging digital economy systems, and ways to distribute it more equitably. It attempts to interpret and analyse digital economy developments in non-business and non-technical terms (with a fair amount of tech demystification), employing social, economic and political economy vocabulary. To this end, the paper ventures into new concepts and theory development where needed. It considerably leans on bringing together two distinct regulatory traditions – market power regulation anchored in competition authorities on one side, and technology regulation by telcom/IT regulators on the other. Both have been trying to address digital dominance, but in different and relatively unconnected ways.[6]

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6 One example of it is the centrality of AI in most digital society discussions, but there being almost no economic conception or approach around it. On the other hand, technology space driven ideas like data infrastructures tend to skirt key issues regarding how resources related transactions actually take place in an economy.

2. Digital economic power and its concentration

The global list of top ten companies by market capitalization was dominated in 2009 by oil corporations, the industrial era giants. Ten years later, seven of the top ten have data-centric business models.[7] These digital corporations built their multi-billion fortunes in a fraction of the time taken by their predecessors. *The Economist* considers such developments as possibly indicating an alarming concentration of economic and political power in the near future.[8] With many parts of the economy still to digitalize, tech firms are expected to grow even bigger as they diversify into more industries.

When Microsoft became the most valued company at the turn of the century, it was genuinely a provider of technology. Computing was entering into everything, and most personal computers ran Microsoft's operating software. As applications on personal computers needed to talk to one another, Microsoft tapped the network effect. Once a clear lead over its competitors was developed, it had a free run, given the very low marginal cost of producing software. Fast forward to 2015 when Microsoft gave its Windows 10 software upgrade for free.[9] The company has become a big votary for free and open source software,[10] which its leaders had called a 'new communism' and a cancer in the heydays of its software monopoly.[11] Much of personal computing today is done on mobiles and tablets, dominated by the free operating software Android provided by Google. If technology is being given out for free, one must explore what is the real stock-in-trade of dominant digital corporations that makes them so rich and powerful so quickly.

Google started as a service that organized information on the web and made it easily searchable. Running such a platform, it developed expertise in managing and exploiting

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7 Desjardins, J. (2019, June 21). A Visual History of the Largest Companies by Market Cap (1999-Today). *Visual Capitalist*. https://www.visualcapitalist.com/a-visual-history-of-the-largest-companies-by-market-cap-1999-today/

8 How to make sense of the latest tech surge. (2020, February). *The Economist*. https://www.economist.com/leaders/2020/02/20/how-to-make-sense-of-the-latest-tech-surge

9 Griffin, A. (2015, January 22). Windows 10 free: Why is Microsoft giving away its new operating system? And who's losing out? *The Independent*. https://www.independent.co.uk/life-style/gadgets-and-tech/news/windows-10-free-why-is-microsoft-giving-away-its-new-operating-system-and-who-s-losing-out-9995492.html

10 Lunden, I. (2018, October, 26). Microsoft closes its $7.5B purchase of code-sharing platform GitHub. *Tech Crunch*. https://techcrunch.com/2018/10/26/microsoft-closes-its-7-5b-purchase-of-code-sharing-platform-github/

11 Penenberg, A. (2005, November 21). Red Herring. *Slate*. https://slate.com/technology/2005/11/the-open-source-movement-isn-t-communism.html

people's data. Google's approach to dominating various sectors comes from its exceptional data competencies. Google's sister automobile company, Waymo, is tipped in ten years to be bigger than Ford, GM, Fiat, Honda and Tesla combined.[12] Didi in China began by organising taxi drivers on a digital platform. It now advices global car-makers on designing cars, since it holds the data about how cars get actually used.[13] Apple, Google and Amazon are getting into the health sector.[14] Becoming the sector's main technology provider is not their real objective; it is to control its key data. And, based on the insights or intelligence so obtained to fundamentally transform the health sector.[15]

Digital corporations' presence in various sectors is currently at different levels, but the prognosis and trends are telling for almost all of them. In some places digital corporations are entering into partnerships with traditional players; at others the traditional players are themselves seeking to become data-centric. In any case, it is owning and controlling data, and data-based intelligence, that is emerging as the main business advantage. It is likely to exceed the advantage of owning key intellectual property in any sector. It is this shift that can be considered as denoting the advent of a digital economy. Major global car manufacturers are grumbling that digital corporations may be pushing them to the lower rungs of automobiles value chains. Similar is the emerging digital dependency of major news brands.[16] In a digital economy, companies that have a sector's key data, and posses the highest data competencies, will digitally re-organize every sector. Such digital corporations will thus lead the respective sector's value chains, hitherto led by companies holding important intellectual property or IP.

Modern IP-based firms tend to focus on their core competencies, preferring to outsource as much of the physical activities as possible. E-commerce value chains seem to

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12 Ibid.
13 Horwitz, J. (2018, April 25). Cars designed for ride-hailing will be either super swanky or really uncomfortable. *Quartz*. https://qz.com/1261415/chinas-didi-partners-with-carmakers-to-design-vehicles-for-ride-sharing/
14 Dyrda, L. (2020, February 10). 50 things to know about Amazon, Google and Apple in healthcare. *Beckers' Health IT*. https://www.beckershospitalreview.com/healthcare-information-technology/50-things-to-know-about-amazon-google-and-apple-in-healthcare.html
15 Mui, C. (2017, December 4). 5 Reasons Consumer Technology Companies Will Transform Health Care. *Forbes*. https://www.forbes.com/sites/chunkamui/2017/12/04/5-reasons-consumer-technology-companies-will-transform-healthcare/#73b34b5c3b6c
16 Bell, E. (2016). *Facebook is eating the world.* Columbia Journalism Review. https://www.cjr.org/analysis/facebook_and_media.php

be showing the opposite trend, of tighter vertical integration. E-commerce platforms are going upstream, into manufacturing and trading, and downstream into logistics, distribution and payments. This corresponds to how, around the advent of 20th century, the early 'corporation' was created through vertical integration of allied businesses. (As section 4 of this paper explains, with digital corporations too this may be a temporary, first-phase, phenomenon.) At another level, the IT industry used to be most open. A corner-shop could assemble personal computers out of globally sourced components. Software and applications were developed separate from the hardware, and could be employed across hardware platforms. But such openness, it appears, was for the pre-digital and pre-data era. The dominant global digital players are now developing their own computer chips, hardware, cloud computing infrastructure, data lakes, and AI software, going right up to consumer facing digital services in different sectors. Consolidation is also occurring horizontally, across sectors, with the same data company getting into sectors as diverse as travel, employment, automobiles, health and education.[17]

A key facet of digital power is in how digital corporations exercise deep and granular real-time control over all activities and actors in a value chain. Such unprecedented micro-control is mediated not so much by market power or legal contracts – as with industrial era value chains, but through employing intelligence derived from data. Uber plans to control the entire transportation sector and not just the cab business.[18] It claims to be developing an operating system for everyday life.[19] Uber's new financial services for drivers, based on their data, could trap them in never-ending loan cycles, thus enslaving them forever.[20] With Uber Money, consumption and expenditure by Uber drivers could also be cycled within Uber's systems. Caught in Uber's 360 degree data-based watch and control, drivers risk becoming a veritable appendage of the Uber

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17 Google, for instance, is in all these sectors.
18 Siddiqui, F. And Bensinger, G. (2019, May 10). Food delivery, freight and logistics: How Uber aims to move things around the world. *The Washington Post*. https://www.washingtonpost.com/technology/2019/05/09/food-delivery-freight-logistics-how-uber-aims-move-things-around-world/
19 Khosrowshahi, D. (2019). *An Operating System for Everyday Life*. Uber Newsroom. https://www.uber.com/newsroom/everyday-life-os/
20 Dubal, V. (2019, December 5). Uber's new loan program could trap drivers in cycles of crushing debt. *The Guardian*. https://www.theguardian.com/commentisfree/2019/dec/05/uber-loan-program-debt

corporation. This is quite unlike traditional employment or other economic relation-ships. (That is of course only until driverless cars are found more profitable to deploy.)

There is a marked geo-economic angle to digital consolidation. US and Chinese firms account for ninety per cent of the market capitalization value of world's seventy largest digital platforms.[21] These two digital super-powers are fast moving so ahead of the rest of the world in digital terms that even an economic power-house like the EU is threatened by digital colonization.[22] This is a very dramatic shift, absolutely unthinkable just two decades back. The current trajectory points to the digital layer of global value chains in all sectors cornering the bulk of control and value in not-too-distant a future. This digital layer is tightly concentrated in the hands of a very few global corporations, almost all based in the US or China. The race between these two for digital supremacy has become so intense that global technology value chains are splitting between them, creating the fear that a 'digital Berlin Wall' might be emerging.[23] All other countries may find themselves forced to 'choose a side' in terms of whose digital technologies to adopt, with potentially serious long-term economic and security ramifications.[24]

If already not under-way, data-based transformation will take place in all sectors, as surely as industrial revolution mechanized all sectors, structurally transforming them. These digital transformations are attended with an unprecedented concentration of power in the hands of a very few global digital corporations. As digital transformation matures in all sectors, digital power concentration of the current early digital era will further intensify. The head of International Monetary Fund observes that "... this troubling trend is reminiscent of the early part of the 20th century – when the twin forces of technology and integration led to the first gilded age…. There is no substitute for high-quality regulation and supervision."[25]

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21 Digital Economy Report, 2019, UNCTAD. https://unctad.org/en/PublicationsLibrary/der2019_en.pdf

22 Gooptu, B., Chanchani, M & Barman, A. (2018, February 26). India should never be a digital colony like Europe: Naspers CEO Bob van Dijk. *Economic Times*. https://economictimes.indiatimes.com/small-biz/startups/newsbuzz/india-should-never-be-a-digital-colony-like-europe-naspers-ceo-bob-van-dijk/articleshow/63074511.cms?from=mdr

23 Georgieva, K. (2019). *Decelerating Growth Calls for Accelerating Action*. https://www.imf.org/en/News/Articles/2019/10/03/sp100819-AMs2019-Curtain-Raiser

24 (2019). The Next Digital Superpower. https://www.eurasiagroup.net/live-post/the-next-digital-superpower#whitepaper

25 Inman, P. (2020, January 17). IMF boss says global economy risks return of Great Depression. *The Guardian*. https://www.theguardian.com/business/2020/jan/17/head-of-imf-says-global-economy-risks-return-of-great-depression

At that time, powerful new industrial technologies and economic integration were relatively distinct phenomenon that were brought together through a new organizational form – the 'industrial corporation'. Digital technologies, on the other hand, are themselves means of integration of economic activities as they also transform the processes and outputs of production. Their integration and control feature, in fact, is one of their most important values and roles in the new digital economy systems. Data based intelligence helps integrate and closely manage economic activities right from the global level to micro-processes penetrating what people and machines do at homes and at workplaces. The 'digital corporation' therefore is a very new animal, and the dangers of economic domination from it are likely to be much worse.

3. Emerging regulatory responses to digital dominance

Digital power concentration does not just impact the economy, but also media, politics, security, and more. It creates the basis for all-round economic, social, political and cultural power. There is a rising concern across the world that dominant digital corporations need to be regulated, reining in their economic and social power. It is strongly evident in the EU, which fears marginalization in the emerging bi-polar digital world led by the US and China.[26] Developing countries are worried about a new form of subjugation through digital colonization.[27] Even in the US, home to most global digital behemoths, academics, politicians and regulators alike are seeking urgent action to address tech power.[28]

Traditional economic governance perspectives are being brought to bear upon the digital economy phenomenon in its many novelties. Most dominant digital corporations operate some kind of a platform that becomes the main space for online interactions

26 Barker, T. (2020, January 16). Europe Can't Win the Tech War It Just Started. *Foreign Policy*. https://foreignpolicy.com/2020/01/16/europe-technology-sovereignty-von-der-leyen/

27 Kwet, M. (2019, March 13). Digital colonialism is threatening the Global South. *Al Jazeera*. https://www.aljazeera.com/indepth/opinion/digital-colonialism-threatening-global-south-190129140828809.html

28 Newcomer, E. (2019, October 25). What Big Tech Could Look Like Under President Elizabeth Warren. *Bloomberg Businessweek*. https://www.bloomberg.com/news/articles/2019-10-25/how-elizabeth-warren-would-break-up-big-tech

among economic actors in a sector. It is these digital platforms that are attracting most policy and regulatory attention.[29]

Early regulatory approaches treated platforms as two sided markets. Facebook, for instance, provides social networking services on one side, and advertisement services on the other – to very different users. Such a 'market' tends to subsidize its users on one side employing revenues from the other side. It is aimed at rapidly enhancing the user base on the subsidized side. Such an increased user base enhances the value of the platform for the other side as well, thus establishing a virtuous cycle. The platform seeks to quickly establish a dominant, hopefully monopoly, position in a sector, as its default 'go to' place. Such cross subsidy, often resulting even in free services to consumers, can create considerable entry barriers. This obviously has a strong anti-competitive impact. But regulators have mostly taken a benign view of such cross subsidy considering it consumer welfare enhancing. Platforms, it is argued, provide innovative services and ensure conveniences, and do so at low costs or free, which is best not to interfere with.[30]

Due to network effect – i.e. more the number of actors already on a platform, more useful it is to additional users – and economies of scale, such platforms tend to quickly become a monopoly. Their online dominance, however, may not be considered anti-competitive if the market of online transactions of any goods or services is not taken to be a distinct market, but a part of the larger market for those goods/services which includes traditional offline channels.[31] The Competition Commission of India (CCI) took this view in relation to e-commerce in 2014.[32]

Later, in 2018, the CCI agreed to consider e-commerce as a distinct market, but held that there were a number of platforms in it and therefore no dominance.[33] In early 2020, the

29 Gurumurthy, A., Bharthur, D., Chami, N., Vipra, J. & Anwar, I. (2019). Platform Planet: Development in The Intelligence Economy. https://itforchange.net/sites/default/files/add/Report-Platform%20Planet_Development_ in_the_intelligence_economy.pdf. IT for Change.

30 Uberoi, N., Nanda, A. & Verma, T. (2019). India. In E-Commerce Competition Enforcement Guide (edition 2). Global Competition Review. https://globalcompetitionreview.com/insight/e-commerce-competition-enforcement-guide-second-edition/1209657/india

31 (2018). Amazon expected to contest competition case in Germany. https://www.pinsentmasons.com/out-law/news/amazon-competition-case-germany

32 In Re: Ashish Ahuja Case no. 17 of 2014. https://www.cci.gov.in/sites/default/files/172014.pdf

33 Vaish Associates. (2019). India: CCI Holds Neither Flipkart Nor Amazon As Dominant In The Market For Online

Appellate Tribunal overturned this CCI order and asked it to investigate allegations of market dominance by the top e-commerce platform in India.[34] The petitioner, an association of sellers on online platforms, had argued that they are very strongly dependent on e-commerce platforms. They asserted that *inter alia* user reviews and ratings create a 'lock-in effect on sellers'.[35] Just two months before the decision of the Appellate Tribunal, CCI had admitted another complaint against top e-commerce platforms and this time initiated an investigation. The CCI chair observed: "We will get to understand the entire business model of the e-commerce sector through this investigation".[36]

This investigation coincided with the CCI releasing a study of the e-commerce market.[37] It identified a lot of potential competition related issues with this market. The CCI study observed that bargaining power imbalance and information asymmetry between e-commerce marketplace platforms and their business users was at the core of such issues. It argues that in the context of "economics of platform markets, where the winner takes all or most, eliminating anti-competitive behaviour that further tilts the scales or deters entry assumes utmost importance". While maintaining that insights from the study will inform future competition enforcement in these markets, the CCI refrained at this stage from making any determination, or framing any *ex ante* rules. The study advices that marketplace platforms should adopt self-regulatory measures in five areas outlined by it, with some guidelines under each. These guidelines can be seen as a preview of the kind of remedies that the Commission may impose on dominant platforms in the future. Some of them may get formalized as *ex ante* rules for digital platforms that meet certain threshold conditions.

Marketplace Platforms- Hints At Considering Online Market As A Separate Market For Market Analysis. https://www.mondaq.com/india/Anti-trustCompetition-Law/807614/CCI-Holds-Neither-Flipkart-Nor-Amazon-As-Dominant-In-The-Market-For-Online-Marketplace-Platforms-Hints-At-Considering-Online-Market-As-A-Separate-Market-For-Market-Analysis

34 NCLAT asks CCI to probe against Flipkart over allegations of unfair practices. (2020, March 4). *Deccan Herald*. https://www.deccanherald.com/business/business-news/nclat-asks-cci-to-probe-against-flipkart-over-allegations-of-unfair-practices-810485.html

35 NCLAT asks CCI to investigate charges against Flipkart again. (2020, March, 5). *Financial Express*. https://www.financialexpress.com/industry/nclat-asks-cci-to-investigate-charges-against-flipkart-again/1889380/

36 Chitravanshi, R. (2020, January 14). CCI to probe Amazon, Flipkart for deep discounts, preferred sellers model. *Business Standard*. https://www.business-standard.com/article/companies/cci-to-probe-amazon-flipkart-for-deep-discounts-preferred-sellers-model-120011301150_1.html

37 Market Study On E-Commerce In India. (2020, January 8). Competition Commission of India. https://www.cci.gov.in/sites/default/files/whats_newdocument/Market-study-on-e-Commerce-in-India.pdf

UK's Digital Competition Experts Panel ("UK Panel") proposes establishing a digital platform code of conduct, based on a set of core principles outlined by it.[38] The code would apply to those digital platforms that get designated to have a strategic market status. The UK Panel warns against the danger of relying solely on traditional competition policy tools for regulating the digital economy, advocating legislative changes as required.

An awareness is growing that digital platforms cannot be governed by traditional competition rules alone. Theirs are no ordinary services – not even ordinary marketplace services, like provided by a shopping mall – operating in a market that they may or may not dominate, which becomes a matter for case-to-case determination. Digital platforms posses certain essential features that tend them towards dominating and monopolistic positions. The CCI study and the UK Panel discuss at length many such inherent tendencies of digital platforms. A European Union Report on 'Competition policy for the digital era' ("EU Report") makes an interesting observation that "to protect competition on a dominant platform …in many cases might be the same as protecting competition "in" the market...".[39] "In this respect, we argue that platforms play a form of regulatory role as they determine the rules according to which their users, including consumers, business users and providers of complementary services, interact, and, when they are dominant, have a responsibility to ensure that competition on their platforms is fair, unbiased, and pro-users."

Julie Cohen proposes that "platforms do not enter or expand markets; they replace (and rematerialize) them".[40] This view corresponds to the EU Report comparing management of platforms to market governance, with platforms acting as the regulators of economic interaction spaces that they enclose. It also relates to the kind of regulatory approaches for digital platforms being considered in India[41] and the UK. Rather than

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38 (2019). Unlocking digital competitionReport of the Digital Competition Expert Panel. https://assets.publishing. service.gov.uk/government/uploads/system/uploads/attachment_data/file/785547/unlocking_digital_ competition_furman_review_web.pdf

39 Cremer, J., Montjoye, Y. & Schweitzer, H. (2019). Competition Policy for the digital era-Final report. European Commission. https://ec.europa.eu/competition/publications/reports/kd0419345enn.pdf

40 Cohen, Julie E., Law for the Platform Economy (June 22, 2017). *UC Davis Law Review*, Volume 51. Available at SSRN: https://ssrn.com/abstract=2991261

41 *Draft National E-commerce Policy.* (2019). https://dipp.gov.in/sites/default/files/DraftNational_e-commerce_ Policy_23February2019.pdf

competition 'in' the market of online marketplaces or digital platforms (which remains a separate concern), the focus here is on ensuring competition 'on' a digital platform, which is considered as a 'market in itself'. We can call this the 'platform as market' paradigm of regulation.

Coming from telecommunication regulation, the principle of net neutrality requires a transmission network to remain agnostic or neutral to the content transmitted over it. This principle has been extended to platforms in the form of 'platform neutrality'. Also employed by the referred CCI study on e-commerce market, this term first appeared in a 2015 report of the French Digital Council. It observed: "The goals behind the neutrality principle should also be factored into the development of digital platforms".[42]

One way to regulate 'Platform as market' is through what in competition policy parlance are called behavioural remedies. The dominant player is obligated to undertake a series of actions or abstentions in order to improve competition. These could range from simple transparency and information sharing to non-discrimination among products and services traded on the platform. The EU Report observed that, since platforms function as regulators, competition policy should focus on regulating and disciplining the rules-setting power of digital platforms.[43]

A new EU regulation on B2B interactions on platforms seeks to ensure a fair, predictable, sustainable and trusted online business environment.[44] Its provisions address issues of transparency and complaint redressal. Transparency requirements include information about the basis for product ranking, any differential treatments to own products, and use and access to data, and its sharing with third parties. Apart from putting many such transparency requirements for e-commerce platforms, the draft e-commerce policy of India proposes an outright ban on differential treatment.[45]

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42 (2014). Opinion no. 2014-2 of the French Digital Councilon platform neutrality. https://cnnumerique.fr/files/uploads/2014/06/PlatformNeutrality_VA.pdf

43 Supra n 39

44 *Regulation (EU) 2019/1150, 2019.* https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32019R1150&from=EN

45 *Draft National E-commerce Policy.* (2019). https://dipp.gov.in/sites/default/files/DraftNational_e-commerce_Policy_23February2019.pdf

The self regulatory code proposed by the CCI Study, and the UK Panel's digital platform code of conduct, also centre on behavioural remedies, as does the EU Report. Focus is mostly still on market relationships between a platform and the sellers on it – like exclusive agreements and preferential sellers, and price issues like deep discounting.[46] But behavioural remedies are increasingly also about data – transparency about data collection, data interoperability, and data access and sharing. The EU is investigating the issue of rights to data about goods sold by traders on the Amazon platform from a competition viewpoint.[47] In the CCI Study restaurant owners working with food delivery companies wanted the latter to share data about their customers with them.

Interventions for regulating 'platform as market' try to monitor and check a platform's behaviour *vis a vis* economic actors using the platform. Promoting competition among digital platforms, the original issue of their dominance, also remains important. These two kinds of problems and corresponding remedies are connected. Reduced lock-in and greater independence for economic actors on a platform both increase competition on that platform as well as between platforms. On the other hand, a competitive field of digital platforms in a sector tends to decrease the lock-in and increases the independence of economic actors transacting on them. Interventions for ensuring competition among digital platforms have hitherto been weak or non-existent. These mostly relate to data portability and data sharing. Such obligations are very difficult to monitor and enforce without specialized capacities among the regulators, including technical ones, and have not been effectively applied in any jurisdiction so far.

The problem with behavioural remedies is that they require constant close monitoring and frequent action by the regulators. This issue is greatly aggravated in the digital context which changes extremely fast and contains too many unknowns – or difficult-to-knows. This renders enforcing behavioural remedies for digital platforms a very difficult task for any regulator, much more so for a general cross-sectoral competition regulator.[48] Herold

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46 (2020). CCI directs probe against Amazon, Flipkart for alleged malpractices. https://yourstory.com/2020/01/cci-directs-probe-amazon-flipkart

47 Lomas, N. (2019, July 17). Europe is now formally investigating Amazon's use of merchant data. *Tech Crunch*. https://techcrunch.com/2019/07/17/europe-is-now-formally-investigating-amazons-use-of-merchant-data/

48 Stigler Committee on Digital Platforms. Stigler Centre for the Study of the Economy and the State.Final Report. (September 2019). University of Chicago. https://research.chicagobooth.edu/stigler/media/news/committee-on-digital-platforms-final-report; Supra n 39 and Supra n 38

Feld of Public Knowledge, a US based non-profit, considers the nature of digital platforms, and their domination, to be unique enough to require specific sectoral regulations (for each digitalized sector) as well as a specialized cross-sectoral legislation and supervisory body. He makes the case for a Digital Platforms Act and a Digital Platforms Commission.[49] A tool-kit of behavioural regulatory interventions is proposed. But deeper structural remedies of forcing separation of platforms related businesses may also be considered, if required. The criterion of 'cost of exclusion' can be employed to measure platform dominance.

In her paper 'The Separation of Platforms and Commerce', Lina Khan argues that, apart from being difficult to undertake, behavioural remedies will not be adequate to tackle the market power of platforms.[50] Being an essential facility controlling access to the market as well as regulating the behaviour of actors on them, she advocates structural separation of platforms from the commerce taking place on them. The platform owner is thereby not allowed to compete with actors trading on the platform. Khan traces the history of successes of antitrust regulation in the US, in employing structural separations in important sectors that exhibited market domination. Since the 1970's, regulators seem to have mostly avoided structural remedies but she feels that these need to be brought back if the unprecedented market power of digital platforms is to be successfully addresed. India already enforces structural separation between a platform and the commerce taking place over it for foreign-funded e-commerce companies.[51]

4. Why current approaches fail

The digital economy is almost definitionally considered to be centred on data. In this regard, there remains a fundamental contradiction and lag in current regulatory approaches to digital economy, which, if not entirely industrial era, still only focus on

49 Feld, H. (2019, May). The Case for the Digital Platform Act: Market Structure and Regulation of Digital Platforms. Roosevelt Institute. https://www.publicknowledge.org/assets/uploads/documents/Case_for_the_Digital_Platform_Act_Harold_Feld_2019.pdf
50 Khan, L. *The Separation of Platforms and Commerce. Columbia Law Review, Volume no. 119* (Issue 4). https://columbialawreview.org/content/the-separation-of-platforms-and-commerce/
51 Press Note 2 (2018). *FDI Policy Circular*. https://dipp.gov.in/sites/default/files/pn2_2018.pdf

platforms as the key structural feature of a digital economy. Data's role gets treated at best in a secondary and piecemeal fashion, as an add-on to the functioning of platforms.

Lina Khan proposes the strongest regulatory intervention of structural separation of platform businesses.[52] But data is discussed by her only in terms of 'appropriation by platforms of information' about businesses operating on the platform. Such information, her paper holds, may have significant competition implications, including being used to develop competing products by the platform. Khan argues that although appropriation of sensitive competitor information was always considered by competition regulators, because of its sophisticated nature in digital markets 'both the risk and cost of information appropriation is heightened'. Herold Feld, who proposes strong action in the form of a 'Platform Act', is most inspired by regulatory history of media and communication. He compares data with platforms to 'sensitive commercial information' flowing on a third party telecommunication network, and calls for similar regulation for data.[53] Focussing on 'information' as traditionally understood in business and regulation, both these perspectives miss the central, transformational, role that data plays in a digital economy. They are therefore unlikely to ensure successful regulation of a digital economy that is essentially organized around data.

While still focussed on platforms, recent policy documents in Europe on digital economy regulation are increasingly more attuned to the central role of data. The referred EU Report considers data as an important input for online services, production processes, logistics, smart products, and AI. It recognizes that there will be cases "where duties to ensure data access – and possibly data interoperability – may need to be imposed". The UK Panel argues strongly for data portability and data openness. The latter involves data sharing, including of a mandated kind, where needed.

Being a kind of partial divestiture, mandatory data sharing comes closest to a structural remedy based on data. It has attracted much discussion in the EU.[54] Some such regu-

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52 Supra n 50
53 Supra n 49
54 A report of the German Ministry of Economic Affairs discusses a 'data for all' framework Schweitzer, H., Haucap, J., Kerber, W., & Welker, R. Modernising the law on abuse of market power. https://www.bmwi.de/Redaktion/DE/Downloads/Studien/modernisierung-der-missbrauchsaufsicht-fuer-marktmaechtige-unternehmen-

latory intervention is now considered necessary by many policy reports to break the dominance of US digital corporations in the EU market.[55] EU's recent data strategy paper shows significant progress in its thinking about mandated data sharing.[56] It proposes a Data Act to be brought out by 2021. But details remain scanty on how data sharing will actually be operationalized, and what kind of legislative support it requires.

Effective implementation and enforcement of data sharing require significant political will that is taking time to build. It can represent a significant break with the dominant global digital economy paradigm. Such political will, however, is shaping up, and may precipitate as digital power concentration causes more and more crises in different sectors.[57]

Equally required meanwhile are new theoretical frameworks of what a digital society is, and the central role of data in it. Sections 6 and 7 of this paper make an initial attempt in this direction. The key proposition of this paper is that instead of treating networking based platforms as the central structural feature of a digital economy, and data playing a part in their functioning, we need to completely invert the paradigm. The central structural feature of a digital society and economy is data and data-derived intelligence, operating and interacting with various social and economic actors within techno-enclosures that may be termed as 'digital ecosystems'. Platforms as networking-centric forms are an early manifestation of digital economy changes. They get subsumed and superseded by data-intelligence centric digital ecosystems. Any successful regulation for the digital economy requires to be built upon this theoretical foundation.

The rest of this section explains why even the strongest remedy among the currently proposed, of structural separation between a platform and the commerce over it, will not be adequate to regulating digital power and preventing its monopolistic concentration.

zusammenfassung-englisch.pdf?__blob=publicationFile&v=3; available in German here: https://www.spd.de/aktuelles/daten-fuer-alle-gesetz/

55 AI for Humanity. (2018). https://www.aiforhumanity.fr/en/
56 (2020). A European Strategy for Data. https://ec.europa.eu/info/files/communication-european-strategy-data_en
57 One such crisis is being witnessed in the media sector, where major media organizations are complaining of an unsustainable situation in that they are heavily losing out ad revenue to digital platforms. For instance see, Duke, J. (2017, December 4). ACCC to probe Facebook, Google over media disruption. *The Sydney Morning Herald*. https://www.smh.com.au/business/companies/facebook-google-set-for-accc-probe-over-media-disruption-20171204-gzxxow.html

At the heart of economic power of platforms is the network effects based monopolistic tendency of any sectoral interaction space or market. This is true even for a physical shopping mall as a marketplace. Monopolization by a shopping mall, however, gets limited by physical elements of distance, constraints on stores space and therefore offerings, and crowds and congestion. These physical factors do not operate for online marketplace platforms. With some ingenuity and avoiding catastrophic mistakes, the first mover can quickly monopolize any online marketplace. Thereon it can simply extract rent from it. Such platform power is certainly a key ingredient of digital power (but not the only, or even the most important, ingredient, as data power is discussed later in this paper). Transparency and non-discrimination requirements can reduce platform rents and power, but not to an adequate degree. These remedies are unlikely to suffice for creating platform competition. Even disallowing platforms from competing with businesses dependent on them constitutes a temporary remedy of slowing down platform power concentration. It does not address it in the long run, because it leaves untouched the principal factor of rent seeking arising from very high network effect (not even considering, at present, the data factor). Network effect, and therefore the rent, would keep rising for a platform that has achieved dominance. Undertaking own commerce and self-discrimination are just spin-off benefits for platforms – a kind of extra greed. (Although, as discussed a little later, it may be more of a strategy for digital disruption of the entire ecosystem and rebuilding it in a manner better integrated with the platform.)

E-commerce platforms like Amazon dealing in consumer goods represent the classic case proposed for structural separation. Such platforms do tend to enter both the upstream elements of the value chain – getting into manufacturing and trading – as well as downstream ones of branding/marketing, and delivery. This however is not much different from what offline retail chains like Walmart do as well.

Venturing of e-commerce platforms especially in upstream activities of manufacturing and trading may in fact be temporary. Use of ICTs to maintain close process and quality control over remote centres of manufacturing enabled IP based lead global firms to outsource manufacturing. With even better remote controls possible through

advanced data based digital technologies, there should *prima facie* be no reason for digital platforms to in-source manufacturing. The motivation, it appears, may be to force the pace of digitalization of the whole ecosystem. This is undertaken by disrupting activities in different parts of the value chain by setting up own competing businesses. The latter are designed to be much more data driven and, as importantly, integrated into the data and intelligence systems of the platform company. Because of the immense efficiencies of close data- and intelligence-based integration, platform owned competing businesses are expected to out-perform the productivity of third-party businesses that are less data-fied and less integrated with the platform's systems. This puts competitive pressure on these other businesses (even without a platform discriminating in favour of its own products in any obvious manner), forcing them towards digitalization/datafication and integration into the platform's data-intelligence systems. As the whole ecology gets suitably datafied and integrated into the platform's data-intelligence systems, it may actually be better for platforms to pull out of the physical elements of manufacturing (and perhaps also trading), as IP based firms do. They would prefer to focus on their core competency of intelligent management of the entire 'digital ecosystem' and extract profit and rent from it.

This end-state of a fully datafied and integrated e-commerce ecosystem, as desired and planned by dominant digital platforms, cannot be foreclosed by simply banning preferential self-discrimination or even by structural separation, although progress towards it may get slowed down. In such a situation, platforms will in any case provide various kinds of data- and intelligence-based incentives to manufacturers (and traders) in a manner that improves the latter's productivity and allures them to integrate into the platform's data-intelligence systems. The platform may also create competitive pressures for digital integration by first selectively providing such incentives to some manufacturers/traders and not others. Data and intelligence based incentives and relationships are complex, and relatively easy to hide from the regulator's eye. This incidentally speaks against the effectiveness of data-related behavioural remedies.[58]

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58 The referred CCI study wonders why sellers that are dominant on one platform make almost no sale on others, which suggests hidden vertical integration.

The above analysis applies both to manufacturers and traders on a platform. Data and intelligence driven efficiencies among manufacturers and traders of goods and services sold on a platform is beneficial to the latter because of reduced price and better quality that increase overall sales. But integration of entire activities of actors dependent on the platform into its data and intelligence systems is the more important motive in the mid to long run. This enables the platform to closely control all such activities and actors, and develop strong lock-ins.

Interpreted in data-intelligence terms, a digital platform undertakes two key functions; (1) employ data-intelligence to squeeze new value from various economic processes, and distribute a part of such digital surplus selectively among the actors involved, and; (2) use data-intelligence to coordinate, organize and control the entire set of activities and actors involved. (The paper will be using the term 'digital ecosystem' to represent such an evolved form of digital platform.)

The ultimate aim is to eliminate independent traders as mediators between producers and consumers. They are to be rendered into wholly-dependent agents of the platform, who help manage the *physical elements* of marketing, distribution and sales. Alibaba, Amazon's closest global competitor, in fact does not undertake vertical integration with manufacturing and trading layers of the consumer goods value chain.[59] It thus already maintains a *de facto* structural separation between the platform and commerce over it. But its digital power is no less for that. It accounts for 58% of the online sales in China, and its user base is more than US's total population. On one day alone, on the 'Singles Day' in 2019, it recorded $38 billion worth of orders.[60] Alibaba is among the top ten global corporations by market capitalization, and the largest in China.[61] It is making huge investments in cloud computing and AI, showing what kind of integrations may be more important to develop digital power.

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59 Blystone, D. (2019, October 20). Understanding the Alibaba Business Model. https://www.investopedia.com/articles/investing/062315/understanding-alibabas-business-model.asp

60 Horwitz, J. (2019, November 10). Alibaba's Singles' Day sales hit record $38 billion; growth slows. *Reuters*. https://www.reuters.com/article/us-singles-day-alibaba-sales/alibabas-singles-day-sales-hit-record-38-billion-growth-slows-idUSKBN1XK0HD

61 *The 100 largest companies in the world by market value in 2019*. Statista. https://www.statista.com/statistics/263264/top-companies-in-the-world-by-market-value/

After achieving considerable domination of national e-commerce, Alibaba realized that China's rate of growth of e-commerce, while quite sharp, was not good enough for how fast Alibaba itself wanted to grow. It decided to expand its digital competencies to offline retail. It approached mom-and-pop stores in China allowing them to retain the shop-front but taking over their supply lines.[62] Alibaba calls it 'new retail', an integration of all retail channels. In this role, Alibaba does not own the consumer interaction space or the consumer's access to the market and therefore is not a B2C e-commerce platform as typically understood. But in terms of key aspects of its business, there is not much difference in what Alibaba does at the back-end of mom-and-pop stores and what it otherwise does in e-commerce as directly a consumer-facing marketplace.

Reliance Industries in India entered the e-commerce sector without first developing an e-commerce portal.[63] Building over its dominance in data services, its subsidiary Jio Platforms began by providing free or cheap applications that supported business activities of even very small shopkeepers, including managing their supply lines.[64] This is very similar to Alibaba's strategy of supporting small shopkeepers. Much like Alibaba's 'new retail', Reliance calls this as 'new commerce'.[65]

The core competency and business of Alibaba and Reliance-Jio here is evidently not (necessarily) of directly controlling the consumers' online access to the market and therefore being an e-commerce platform as understood traditionally. The typically advocated separation between platform and commerce makes little sense in such a context. Things are simply not that linear in the digital economy. What digital platforms undertaking e-commerce really do is to employ the power of data and digital intelligence to digitally orchestrate and control the whole consumer goods value chain.

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62 Hao, K. (2018, January 5). Alibaba is trying to reinvent China's mom-and-pop stores. *Quartz.* https://qz.com/1171743/alibaba-is-trying-to-reinvent-chinas-mom-and-pop-stores/

63 It has now introduced one, called JioMart.

64 (2019, February 9). With RIL's New E-Commerce Platform, Network of Mom-n-Pop Shops to Take on Likes of Walmart. *News 18 News.* https://www.news18.com/news/business/with-rils-new-e-commerce-platform-network-of-mom-n-pop-shops-to-take-on-likes-of-walmart-1801783.html

65 Jain, V. (2019, August 12). New Commerce will completely transform unorganised retail market: Mukesh Ambani. *Economic Times.* https://retail.economictimes.indiatimes.com/news/industry/new-commerce-will-completely-transform-unorganised-retail-market-mukesh-ambani/70641276

Rather revealing, in the context of this discussion, is Reliance-Jio's recent sale of around 10 percent of its stock to Facebook. E-commerce players with foreign investment in India have to follow strict rules of platform-commerce structural separation, but not those without such investment. With the financial backing of India's richest business group, it was thought that Reliance's Jio will leverage this major advantage of being allowed platform-commerce integration to pose great challenge to the leading e-commerce platforms in India, Walmart backed Flipkart and Amazon. The latter being both foreign-funded had to maintain platform-commerce separation. In making this deal with Facebook, Reliance-Jio chose to forego that major advantage. Most commentators think that the real benefit for Reliance-Jio here is some kind of vertical integration of its e-commerce platform with Facebook-owned WhatsApp, which is a monopolistic personal digital communication platform in India. Such forgoing of the advantage of platform-commerce integration in favour of some kind of integration of the platform with a key digital communication layer, with enormous data-related implications, tells an eloquent tale.

Food delivery companies present an interesting case of going very quickly from being delivery partners of restaurants into 'manufacturing'/trading themselves. This is done by developing 'cloud kitchens', where centralized 'manufacturing' takes place.[66] In-house branding may also get adopted. The longer term goal is to fundamentally disrupt the food business, including by expanding into new unexplored markets.[67] Once such a system matures, it is likely, and makes business sense, for digital food companies to outsource the kitchen or 'manufacturing' part to closely controlled partners. They will focus on their cardinal role of data and intelligence based digital orchestration of the entire food value chain. (Restaurants too will have a new role in this digitalized food sector, while also preserving their traditional attractions.) This evidently is what the dominant digital business, normally understood as platforms, is about.

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66 Singh, M. (2019. November, 20). India's Swiggy bets big on cloud kitchens. *Tech Crunch*. https://techcrunch.com/2019/11/19/swiggy-cloud-kitchen-india/

67 (2019, November 12). How food tech startups are disrupting the industry. *Economic Times*. https://cio.economictimes.indiatimes.com/news/strategy-and-management/how-food-tech-startups-are-disrupting-the-industry/72019745

Most emerging sectoral platforms are not in products but services segment, like Uber and AirBnB. These platforms are generally not too keen on vertical integration. To the limited extent that they have done so, it appears to be for the afore-discussed disrupt-and-withdraw strategy.[68] Both these companies have fought legal battles to be recognized as pure tech platforms and not primarily engaged in the business of the sector that they service.[69] This is the exact opposite of vertical integration. Uber has resisted repeated attempts to be classified as the employer of cab-drivers in its network.[70] When a court in California devised a test for such a relationship, Uber changed its application to exhibit more independence for drivers so that it could retain its claim of being at an arms-length.[71] How would a regulatory framework focussed on separating a platform from businesses offering services on the top of it address the dominance issues with such services platforms?

One can force Uber to give back the power to drivers to fix the price, accept pick-ups or not (which any way is generally illegal under most taxi licensing rules), and so on. But so potent is the intelligence held by the platform, which the drivers do not have access to, that the latter will 'voluntarily' accept the services of Uber to fix the price, pick-ups, etc. for them. That would work out more profitable for them instead of exercising blind or ill-informed choices. The same applies to most economic actors organized by digital platforms or ecosystems. Distributed intelligence picked from traditional clue is mostly just not good enough as compared to data-based centralized intelligence of a digital ecosystem.

Significant vertical, and other kinds of, integrations and consolidations are certainly taking place in the digital economy. But these are not of the traditional kind that can

68 Burch, M. (2018, December 5). Airbnb Will Start Building (And Selling) Its Own Homes In 2019. *House Beautiful*. https://www.housebeautiful.com/lifestyle/a25415329/airbnb-building-houses-backyard/ and Shrivastava, A. (2015, September 15). Ola to spend Rs 5,000 crore to buy cars, will form separate subsidiary. *Economic Times*. https://economictimes.indiatimes.com/small-biz/startups/ola-to-spend-rs-5000-crore-to-buy-cars-will-form-separate-subsidiary/articleshow/48962951.cms?from=mdr

69 Boffey, D. (2019, April 30). Airbnb should be seen as a digital service provider, ECJ advised. *The Guardian*. https://www.theguardian.com/technology/2019/apr/30/airbnb-should-be-seen-as-a-digital-service-provider-ecj-advised

70 Sahar, O. (2017, November 15). Are Uber Drivers Employees? The Answer Will Shape The Sharing Economy. *Forbes*. https://www.forbes.com/sites/omribenshahar/2017/11/15/are-uber-drivers-employees-the-answer-will-shape-the-sharing-economy/#5f8c9e275e55

71 Paul, K. (2020, February 7). Uber changing app to avoid reach of California's new gig workers law. *The Guardian*. https://www.theguardian.com/technology/2020/feb/07/uber-ab5-changes-drivers-california

be viewed and regulated either through the marketplace-commerce lens or considering an employer-employee relationship. Regulatory interventions aimed at separating platforms from commerce over it, or simplistically forcing an employer-employee relationship, are both missing the point. Though perhaps temporarily useful, such measures will not be effective in the long term to check digital power concentration. We need to understand and focus upon the real nature of digital consolidations, and, before that, of digital power, which is fundamentally structured around data and intelligence.

5. Regulators' dilemma – To wait or to act now?

The terms 'digital' and 'digital economy' have evolved over the last quarter of a century or so. First it was about society-wide adoption of computers and software services, like office productivity tools and enterprise planning suites. The network effect of software services was good enough to make Microsoft the most valued global corporation at the turn of the century. Then came the Internet companies like Google and Facebook that employed the Internet and cloud software to network information and people. By the middle of the first decade of this century, people were already excited about an Internet revolution, in economic, social and political terms. Software power was superseded by Internet or network power. Little did the world realize that the real wonders and transformations were yet to come. In the second decade, attention shifted towards data and AI. Data power was evident in calling data a new factor of production,[72] and data's product AI as being comparable to what fire meant for the human race.[73]

These heady developments were captured in a series of economic terms quickly succeeding the earlier one – from new economy in the 1990s, to internet economy, platform economy, digital economy, data economy and now AI economy. Digital power can be considered a sum and culmination of software power, network power and data power. Each of these builds over the earlier kind and subsumes it. We will like to consider 'digital' as the techno-social phenomenon that represents this progression – from software to

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72 Supra n 4

73 AI will be more profound than fire or electricity: Pichai. (2020, January 23). Tech Central. https://techcentral.co.za/ai-will-be-more-profound-than-fire-or-electricity-pichai/95398/

network to data power – and its incorporation into our economic, social, political and cultural systems.

We are evolving towards a digital society and digital economy, in which data based intelligence is the key, and defining, resource and organising force. We call it digital intelligence. It defines a digital society in the same manner as industrial society was defined by mechanization, and its economic, social and political impacts. Mechanization can be considered as a process of disembodying physical power into machines. Digital intelligence, correspondingly, is disembodying intelligence power into machines. Its impact on organization and outputs of our society and economy will at least be as transformational as that of industrialization.

It was mentioned how every few years there appears a new name for our changing economic conditions; such is the ferment that we are witness to. Society's economic relationships, organization and outputs are undergoing a fundamental transformation. In some sectors, at some places, these are already quite different from those of the industrial age. Urban transportation, travel and consumer goods are a few areas of advanced change. Other sectors will follow. Economic regulation therefore cannot just be based on the industrial era paradigm. It needs to evolve with the shifting nature of our economy; it has to be fit for the digital age.

How best to regulate an economy that is transforming from one paradigm to another, from industrial economy to digital economy? A very conservative view is to wait out the period of ferment, till things settle down. Other than the obvious defect of this approach of mismanagement of the period and process of transition, the problem is aggravated by the nature of digital power. It tends to congeal and concentrate very quickly, developing strong lock-ins based on outsourced intelligence (as most activities and actors in a sector obtain their intelligence centrally from its dominant platform). Such outsourced intelligence based lock-ins are extremely hard to reverse. It may be difficult, perhaps impossible, for regulation to impact digital systems to any appreciable degree once they are mature and well-entrenched. The current difficulties with regulating Google and Facebook are just a forerunner for what are going to be even more

complex and irredeemable situations, as data and digital intelligence become central to our economic systems.

A second approach could be of taking a static, empirical view of how economic organization and performance are actually visible at any given time, addressing any evident problem with corresponding proportionate intervention. It is such an approach that is currently most advocated, although actual regulation even as per it remains patchy. There are two problems with this approach. One is that digital changes take place too fast. And a lot of them are latent, involving building digital presence and power below the surface, and therefore not easily visible nor their implications immediately evident. This could even be a deliberate strategy by the dominant players. In any case, major digital corporations take a considerably forward looking, long-term, view of disrupting industrial age systems and building new digital ones in their place. Their visible impacts (especially such as can get perceived in a negative light), full monetization, etc. are often planned to come in later. This is behind the astronomical investments into digital corporations that make little profit or may even be running huge losses, while offering free or subsidized services. Such a long-term approach of dominant digital businesses blindsides regulators looking to address only immediately visible issues. Considerably aggravating this problem is a second one. The regulatory thinking, frameworks and tools employed by this still conservative approach are of an industrial age vintage. They either render key digital developments even more invisible to the regulators (often more than what is visible to the plain eye, not employing the regulatory lens,)[74] or make them see and address such developments in a manner that is not effective. The stickiness of outdated regulatory theory in changed times is most conspicuous in the scarcity of appropriate academic work on digital economy regulation. Policy-makers themselves are getting relatively more aware of the uniqueness of digital realities around them, and their considerable insularity to existing regulatory approaches. They however are expectedly not up to new economic and regulatory modelling that requires considerable theoretical underpinning.

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74 Which is perhaps why popular outcry against digital power concentration has far out-paced regulatory responses.

This paper proposes a third, new, approach. Our current economic systems still mostly exhibit features of industrial age, but what is important to understand is the often invisible but very forceful digital logic that is transforming them. Such transformation is more rapid in some sectors than others. But it is inevitable in all sectors, as surely as mechanization and industrialisation transformed the economy and society. New regulatory theories, frameworks and interventions must be designed to address the digital logic and its transformational force. These interventions have to be applied side by side along with those arising from industrial age regulatory frameworks. The right mix will be pragmatic as well as bold and forward-looking. This requires developing new concepts, definitions and models of digital economy, an exercise attempted briefly and indicatively in the following two sections.

6. Digital economy as about data and intelligence

In examining the transformational nature of digital changes, we can begin with a clear empirical fact. Seven out of the top ten companies by market value globally are digital corporations, as mentioned earlier.[75] Investors evidently believe that the future is digital, and are ready to put their money on it. Every one of these corporations focusses on data and AI as their key strategy. Their strengths in hardware, software and/or platforms are all increasingly oriented to this cumulative purpose. They are even ready to subsidize these contributing services to acquire dominance in the data and AI layers. Mobile hardware is subsidized to hook one onto a telecom service network, telecom service gets offered for free or is subsidized to get one on certain applications, and applications are free or subsidized to get one's data.[76] Both by the global valuation of companies, and in digital practices on the ground, the centrality of value of data to emerging economic systems is very evident.

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75 Supra n 7
76 Free handsets for telecom service contracts is the main telecom service model in the US. Facebook sought to provide free connectivity for accessing its Free Basics application. So many applications are free because they collect valuable data.

Although still positioning themselves as technology companies, almost all dominant digital corporations aim for lead roles in different non-technical sectors. Their plan is not just to provide technology services to existing dominant players in these sectors; they challenge them through strategies aimed at disrupting the sector and leading its value chains through control over its data and AI. Commerce, transport, hotels and finance are some front-runner sectors for such disruption and capture, but others will follow.

If not old-fashioned technology support, what exactly do these digital corporations bring to a sector, so much so that they aim to lead its value chains? The CEO of Daimler – German auto-mobile company that makes Mercedes cars – observed in 2015 that, more than each other, traditional car-makers fear Google and Apple as competitors.[77] Traditional car manufacturers have all the industrial expertise and IP capital for the auto-mobile sector, neither do they lack in finance. What is it that Google and Apple have but traditional car-makers do not, which is so valuable in the new era that its possession can take one right to the top of the value chain? Technology support simply cannot be that resource of the highest value. This highest value resource is the data related competencies of Google and Apple, which can be generalized across sectors.

Daimler's CEO put it very well when he said that the contest is to be the 'brain' of the car, not its physical components. Alphabet's auto-mobile company, Waymo, sources cars from Fiat and Jaguar and installs its own computing hardware and software in them.[78] This quite fits the 'brain' analogy. A favourite quote of Waymo's CEO is: "We're not building cars; we're building better drivers".[79] This 'driver' being built by Waymo is machine intelligence replacing human intelligence. Evidently, Waymo's business is to develop mobility related digital intelligence. Similar is the main and defining business

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77 Daimler CEO Rants that they Won't be the Foxconn of Car Makers for Apple. (2015, September 17). *Patently Apple*. https://www.patentlyapple.com/patently-apple/2015/09/daimler-ceo-rants-that-they-wont-be-the-foxconn-of-car-makers-for-apple.html

78 McGee, P. (2019, January 31). Robotaxis: can automakers catch up with Google in driverless cars?. *Financial Times*. https://www.ft.com/content/dc111194-2313-11e9-b329-c7e6ceb5ffdf

79 Welch, D. & Bergen, M. (2018, June 1). Why GM and Waymo Rely on Allies in Self-Driving Race. *Bloomberg News*. https://www.ttnews.com/articles/why-gm-and-waymo-rely-allies-self-driving-race

of other digital corporations; building the digital intelligence for the traditional sector that they seek to dominate. It has been estimated that, in ten years, Waymo may be valued at more than the combined value of Ford, GM, Fiat-Chrysler, Honda and electric carmaker Tesla.[80] This shows what the business of owning the digital intelligence of a sector is worth, and how it comes to lead the value chains in an emerging digital economy context.

A digital economy can be considered to have arrived when the digital intelligence components of an economy become most valuable, more than the physical and even the IP components. (A corresponding parameter could be used to mark the shift from agrarian to industrial society.) This is not the intelligence of humans or their organizations, the knowledge capital. This is the disembodied intelligence that is digital and inside machines. It has its own (new) economics – with its unique new forms and processes of production, distribution and consumption. What is driving much of the current social and economic change therefore is the economics of digital intelligence, as it was economics of industrialisation and economics of IP in an earlier era (and not yet fully superseded).

Without comprehending the economics of industrialisation it was neither possible to understand the larger social and political processes, nor – more to the point of this paper – develop necessary frameworks of economic regulation. To regulate the digital economy we therefore need to first examine the economics of digital intelligence. This requires understanding how control and management of the resource of digital intelligence constitute the key logic and force of digital economy changes. And how the owner of digital intelligence comes to be at the top of emerging digital economy value chains in every sector.

Rather than digital or even data economy, a more appropriate term for the current economic form is 'intelligence economy'. The needed mental shift to comprehend the new paradigm of a digital society and economy is aided if we focus less on data and more on digital intelligence. Data and digital intelligence are of course intrinsically connected.

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80 Supra n 78

Digital intelligence is insights derived from data; and data may be considered as unrefined, or potential, intelligence. An intelligence-centric thinking and vocabulary can better help understand the value of key digital economy resources, and how they are applied to constitute a digital economy.

People tend to be somewhat blasé about their data being taken. It is much more difficult to maintain a similar attitude of nonchalance to intelligence about oneself being collected. Intelligence has this necessary actionable element, including of control, which evokes immediate concern. Data is taken for no other purpose than to derive intelligence from it, about the person or the group whose data it is. Shoshana Zuboff's term 'surveillance capitalism' well captures the deeper implications of culture, power and exploitation with regard to the dominant digital economy model.[81] But the general economic aspects and processes of digitalization may get better represented by 'intelligence economy'. This term is more neutral, and focusses on the central resource of a digital economy. 'Surveillance capitalism' is an appropriate term if the main purpose is to examine and expose problematic digital changes; 'intelligence economy' is preferable if planning to control and divert digital changes for the greatest public good. Both terms serve different important objectives. This paper's focus is economic.

Economic value of intelligence is much more self evident than that of data, as are the logic and means of its application in economic processes. One major problem with understanding the contemporary digital economy shifts is the invisibility in economic and regulatory texts of its key resources, data and intelligence, and how they interact with economic processes, reorganising them. Those beginning to look at the role of data and its derivatives still largely treat them as a kind of a separate, super-imposed layer over existing economic operations and models. This is very inadequate, and also misleading, as the role of data and intelligence becomes increasingly structural and transformational.

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81 Naughton, J. (2019, January 20). 'The goal is to automate us': welcome to the age of surveillance capitalism. *The Guardian*. https://www.theguardian.com/technology/2019/jan/20/shoshana-zuboff-age-of-surveillance-capitalism-google-facebook

AI as denoting the intelligence factor in a digital economy is also not most suited to our purposes. AI gets seen in technology terms (as a basket of human intelligence simulating technologies), whereas here we are interested in disembodied intelligence as a socio-economic resource and factor, even if doubtlessly a product of digital technologies. The term 'digital intelligence' fits this requirement much better. It stands for digitally disembodied intelligence in its social and economic role, as it plays out in the relevant socio-economic processes and systems.

The 'brain' analogy employed by Daimler's CEO can help understand the nature of digital economy systems, and the key resource and factor of production behind them. 'Brain' happens to be the name of Google's Machine Intelligence team since 2010. Alibaba's cloud intelligence platform is also called 'Brain'. Its smart city project in Kaula Lumpur, and a few other cities, is called 'City Brain'.[82]

Key digital corporations are basically aiming to be the 'brain' or the central intelligence of any economic system. What is Uber to transportation and AirBnB to short-term accommodation? It is simplistic to consider them just interaction platforms, which no doubt is what they started as. They still depend on that structural position as the means of interacting with users, and for mining all the valuable data. But their key economic role is increasingly to be the 'brain' or the central intelligence of their respective sector. Employing such intelligence to organize and orchestrate the sector's actors and activities is what makes them such valuable companies.

Apple seeks to leverage its wearable devices, as well as mobile phones, to become the main health data collecting platform, aiming thereby to be the 'brain' of the digital heath ecosystem.[83] Google is approaching the same goal from the side of generic data and AI competencies, partnering with traditional health players to help them organize their health data and obtain insights from it.[84] Google is also entering into wearable

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82 City Brain Now in 23 Cities in Asia. (2019, October 28). *Alibaba Cloud*. https://www.alibabacloud.com/blog/city-brain-now-in-23-cities-in-asia_595479

83 Evans, J. (2019, September 30). How Apple is building a world-class digital health ecosystem. *Computer World*. https://www.computerworld.com/article/3442099/how-apple-is-building-a-world-class-digital-health-ecosystem.html

84 Comstock, J. (2016, February 25). Google's UK AI subsidiary DeepMind partners with NHS to develop medical apps. *Mobi Health News*. https://www.mobihealthnews.com/content/googles-uk-ai-subsidiary-deepmind-partners-

devices,[85] apart from benefiting from its control over Android software running on most mobiles globally. Apple is improving its general AI competencies and also partnering with traditional health service providers.[86] The ultimate objective of key digital corporations is to own and control the intelligence of any sector's socio-economic activities, in this case of the health sector.

Intelligence as a resource has a uniquely centralising quality. On the input side, a combined dataset is many times more productive of intelligence than two or more separate datasets.[87] On the output side, since the main function of intelligence is to coordinate and organize, one integrated 'brain' performs better for any system than it being split into two or more. This inherent characteristic of intelligence is the main reason behind digital economy's evident tendency towards rapid concentration of economic power. The intelligence factor is even more centralising than the network effect, which, somewhat erroneously, continues to be considered as digital economy's primary monopoly inducing element. (Although it does remain a very important one. Also, the two factors of networking and intelligence interplay and work together.) Intelligence based centralization – whereby most actors in an economic system draw their digital intelligence from one centrally owned source – is much more difficult to reverse than one based just on ordinary network effect.

7. Going beyond the platform – Digital ecosystems

Cloud computing software and applications form the technology enclosures within which data is collected and digital intelligence is deployed to orchestrate various economic actors and activities of a sector. They provide the rules of interaction among

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nhs-develop-medical-apps

85 Bensinger, G. (2019, November 5). Why Google, a software giant, is spending billions to get into gadgets. *The Washington Post*. https://www.washingtonpost.com/technology/2019/11/04/googles-hardware-dreams-havent-yet-yielded-home-run/

86 *Institutions that support health records on iPhone and iPod touch.* Apple. https://support.apple.com/en-in/HT208647, The 5 ways Apple wants to transform health care. (2019, January 22). *Advisory Board.* https://www.advisory.com/daily-briefing/2019/01/22/apple

87 Customer value increases through combination of data sets. (2018, November 20). *Telia.* https://www.telia.fi/en/yrityksille/article/junction-telia-crowd-insights-data

various actors and activities. Command over the system's intelligence remains central, but next in importance is owning these techno-processes and the rules inscribed in them. The two roles are of course connected and mutually reinforcing.

With data and intelligence flowing through them, these digital techno-processes encompass huge swathes of socio-economic activity in any sector; going right down to micro-processes of production (tapping Internet-of-Things data along with enterprise data), surveilling intimate personal behaviour of consumers and other actors (picking data from personal devices), and managing everything in-between (logistics, intermediaries, payments, etc.). All socio-economic actors and activities of a sector digitally enclosed and connected in this manner together constitute a 'digital ecosystem', a term increasingly in vogue.[88]

Digital ecosystems represent a very new form of economic organization that penetrates much deeper into our social and personal spheres – also controlling them much more strongly, even as outwardly it is presented as a set of loosely held arrangements – than has been the norm in industrial economic systems (think, huge factories, retail and hotel chains, public transport system, and so on). Uber, Amazon and AirBnB are good examples of corporations leading digital eco-systems in their respective areas.

Every corporation desires to be the sole provider of technology and data-intelligence processes of a sectoral digital ecosystem. Both digital intelligence, and software based rules-of-play, have strong tendencies towards centralising power. However, as digital eco-systems are gradually taking shape in different sectors, digital corporations often have to enter into partnerships for this purpose. Such partnerships can be oriented to complementing competencies; like the Walmart-owned Indian e-commerce giant, Flipkart, partnering with Google for the latter's AI based Personal Assistant, in order to counter Amazon's advantage of linking its Personal Assistant Alexa with its e-com-

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88 Gartner Research defines digital ecosystem as "an interdependent group of enterprises, people and/or things that share standardised digital platforms for a mutually beneficial purpose, such as commercial gain, innovation or common interest". Bennett, M. (2017, April 12). What is a digital ecosystem, and how can your business benefit from one?. *The Telegraph*. https://www.telegraph.co.uk/business/ready-and-enabled/what-is-a-digital-ecosystem/

merce platform.[89] Partnerships may include traditional dominant actors in a sector. The Chinese company Baidu has developed a smart transport platform, 'Apollo', that is being partnered by Ford, Daimler, Volvo and Microsoft.[90] The threat of domination of transport intelligence by Alphabet's Waymo seems to be a common and unifying concern. Waymo has its own partners in the auto industry. After spending considerable time trying to develop its own industrial applications platform, General Electric brought in Microsoft as its partner, given the latter's well-established competencies in cloud computing and business applications.[91] Internal power struggles among partners would no doubt continue, but such partnerships are seen as important to cement control over the dominant digital ecosystem in any sector.

The key structural feature of the digital economy, in terms of its organization, therefore is neither the uni-dimensional value chains, led by IP firms, of the late 20th century industrial economy, nor the two dimensional cloud based interaction platforms pioneered by Internet companies in the 2000's, that are the subject of some regulatory attention of late. It is three dimensional digital ecosystems. The body of such digital ecosystems is composed of cloud computing infrastructure and applications, with the rules of interaction and performance inscribed in them. And its key flows, and the main resources, are data and digital intelligence. Such digital ecosystems will enclose, reorganize and intelligently manage economic activities in all sectors, defining what a digital society is essentially about.

The nature of such digital ecosystems – their tight integration, as well as jostling for key structural advantages within and across them – is made evident by some significant contemporary developments.

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89 Singh, J. (2018, April 12). Google Home in India: Why Google and Flipkart Believe the Time Is Right. *Gadgets 360*. https://gadgets.ndtv.com/smart-home/features/google-home-in-india-why-google-and-flipkart-believe-the-time-is-right-1836753

90 Statt, N. (2017, July 5). Baidu partners with Ford, Nvidia, and others to boost its self-driving car platform. *The Verge*. https://www.theverge.com/2017/7/5/15923966/baidu-apollo-self-driving-car-platform-ford-intel-nvidia

91 *GE and Microsoft enter into their largest partnership to date, accelerating industrial IoT adoption for customers.* (2018). Microsoft News Centre. https://news.microsoft.com/2018/07/16/ge-and-microsoft-enter-into-their-largest-partnership-to-date-accelerating-industrial-iot-adoption-for-customers/

The ICT industry has traditionally been a uniquely open one; 'openness' being a strong, almost ideological, value in this sector.[92] Hardware was separate from software, and the network from applications that run over it. Those times seem to be ending. So high is the economic prize in becoming the dominant digital actor in any sector, and across sectors, that, as far as possible, no serious player wants to risk dependence on another company for any key component or service. Erstwhile pure application companies like Google and Facebook are getting down to manufacturing their own computing chips.[93] The ICT value chain right from computing chips to AI engines is being consolidated by many key global digital corporations. It is not just that the supply chain is integrated, but components and services are increasingly designed for best optimality within a corporation's own or partners' technology systems.[94]

A strong geopolitical dimension has arisen to this race for dominating and leading emerging sectoral digital ecosystems. The US not only banned Chinese telco Huawei's 5G technology from its networks, it is also putting pressure on its allies to keep it out.[95] After the US stopped supply of chips for some Chinese companies, China is investing big time in chip manufacturing.[96] The US embargo on Huawei is recognized by many as a tipping point in the US-China tech war, which was building up for quite some time.[97] In response to the withdrawal of Google's applications from its phones, including Android, Huawei is developing its own mobile operating software, and other basic services like applications store and search engine.[98]

92 Girard, B. & Perini, F. (Eds.). (2013). *Enabling Openness:The future of the information society in Latin America and the Caribbea*n. IDRC. https://www.idrc.ca/sites/default/files/openebooks/578-6/index.html

93 Welch, C. (2018, April 18). Facebook is building a team to design its own chips. *The Verge*. https://www.theverge.com/2018/4/18/17254236/facebook-designing-own-chips-ai-report

94 Vincent, J. (2018, July 26). Google unveils tiny new AI chips for on-device machine learning. *The Verge.* https://www.theverge.com/2018/7/26/17616140/google-edge-tpu-on-device-ai-machine-learning-devkit

95 Bing, C. & Stubbs, J. (2019, April 16). U.S. to press allies to keep Huawei out of 5G in Prague meeting: sources. *Reuetrs*. https://www.reuters.com/article/us-usa-cyber-huawei-tech/u-s-to-press-allies-to-keep-huawei-out-of-5g-in-prague-meeting-sources-idUSKCN1RR24Y

96 China to Funnel $29 Billion Towards its Chip Ambitions. (2019, October 29). *Bloomberg News*. https://www.bloomberg.com/news/articles/2019-10-29/china-to-funnel-29-billion-towards-its-chip-ambitions

97 Stewart, E. (2019, August 19). The US government's battle with Chinese telecom giant Huawei, explained. *Vox*. https://www.vox.com/technology/2018/12/11/18134440/huawei-executive-order-entity-list-china-trump

98 Rahman, M.Huawei is testing its own Search app for its smartphones. *XDA Developers*. https://www.xda-developers.com/huawei-search-mobile/

The US and China are said to be engaged in an AI race. Such a description may be amiss in pitching it primarily as a technology race. Digital technologies in themselves are not that difficult to replicate – relatively speaking, certainly less than industrial technologies.[99] This is definitely so for a region like the EU with its world-beating industrial and scientific base. What then explains EU's exclusion from this 'AI race' if it was primarily technological? After all, China has (nearly) replicated US's digital strength in just over a decade and a half, starting from software capabilities that were perhaps less than India's. The more important competence that China developed was in running digital ecosystems (cloud applications enclosed data and intelligence flows) in live socio-economic settings. Appropriate policy conditions for development of domestic computing and data enclosures is what made such live digital ecosystems possible. They started small but scaled up fast, quickly reaching a critical mass due to China's large upwardly mobile middle-class. After gaining sufficient size and might, Chinese digital corporations successfully went global. Technology developments took place largely as backward linkages from such policy enabled business achievements, arising from rapid feedback loops and spirals (while not discounting the very high technology investments that China made). The failure of EU (and others) therefore may be related more to economic policy than to technology.

Appropriate economic concepts and vocabulary should be employed to present digital economy issues, reducing reliance on technology based descriptions. The race between the US and China is not of AI as much as to be the home of key centres of globe spanning digital economy ecosystems – that are configured and led by digital intelligence. All other countries face the imminent danger of having only, low value, physical economic activities left to them, with their intelligence outsourced to one of these two global digital power centres. The economic and political consequences of this should be self evident; fears of digital colonization are no exaggeration. Outsourced intelligence based dependencies will be much stronger, and therefore more exploitative, than those based on industrial value chains. Kai-Fu Lee, AI scientist,

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99   There are many reasons for this; the basic open architecture of digital technologies, they being social and collaborative artefacts, and so on. Compare a local enterprise developing the software platform for a ride hailing operation in a developing country to the technical requirements for manufacturing cars.

businessman and commentator, says that all other countries will be "forced to negotiate with whichever country supplies most of their AI software — China or the United States — to essentially become that country's economic dependent, taking in welfare subsidies in exchange for letting the 'parent' nation's AI companies continue to profit from the dependent country's users".[100]

For pressing economic, social, cultural, political and geopolitical reasons, it is important to devise ways to effectively decentralize digital power through new digital economy models. This requires new frameworks for regulating the digital economy which proceed from an understanding of how digital businesses and ecosystems aggrandize power causing its concentration in a few hands. The focus of such new regulatory frameworks has to be on flows of data and digital intelligence in digital ecosystems.

8. A framework for data-intelligence centric regulation

This section develops a simple model of key activity layers of data and digital intelligence value chains or digital ecosystems, from the point of view of their effective regulation. A common way to begin developing a digital ecosystem is by establishing a digital interface with consumers through a platform or application that provides attractive services in a given sector. These services could be informational or interactive, putting consumers in touch with different service providers. Any such platform is sought to be scaled up as rapidly as possible. This generally involves inexpensive or free services made possible by cross-subsidizing across a two-sided market and/or the support of deep-pocketed venture capital. In a winner-takes-all kind of a situation, the idea is to very quickly get way ahead of any possible competition. As interacting actors leave digital traces of their online activities, the platform in time becomes a monopoly (or duo- or tri-poly) data mine for that sector. Such data is stored and processed over cloud computing infrastructure, and insights derived from it, including AI based ones.

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100 Lee, K. (2017, June 4). The Real Threat of Artificial Intelligence. *The New York Times.* https://www.nytimes.com/2017/06/24/opinion/sunday/artificial-intelligence-economic-inequality.html

Other sources of relevant data may also be accessed in this process, including through partnerships or buying it off data markets. The ensuing digital intelligence gets employed to first coordinate, then reorganized, and finally control all or most actors and activities in the sector, creating a digital ecosystem.

Such an intelligence based management of a sector's activities releases a lot of new value. A part of this economic surplus can be passed on to different actors, suppliers as well as consumers, to ensure their stickiness. Simultaneously, through gradual tweaking of platform rules, and intelligence based allurements, both suppliers and consumers are induced to shift their behaviour and activities to sync more and more with the digital ecosystem operator's model. There are behavioural and technical lock-ins involved in such syncing, but, in time, the lock-in based on centralized intelligence about the entire operations far exceeds all other kinds. Such a lock-in through intelligence-dependence becomes nearly irreversible. Accumulation of data and accretion in system intelligence keep going up infinitely in quick loops. This is what causes immense concentration of economic power with the digital business that operates any digital ecosystem, and owns its intelligence.

Amazon, Uber, Facebook and Google are some examples of such consumer facing digital initiatives. Another strategy to become the key intelligence player in a sector is a B2B one. Here major traditional actors in a sector holding access to consumers, as well as to their data, are targeted for data-based partnerships. Alphabet's DeepMind partners with health organizations like the UK's National Health Service, and some hospitals in the US.[101] Apple, IBM and Microsoft have entered into similar partnerships with hospitals across the world. Both data collection and application of intelligence to sectoral activities in such a B2B strategy is done through the partners. The effort is to develop deep sectoral intelligence through such means, and then explore ways to use it to disrupt the sector and gain pivotal controlling position in its digital ecosystem. Alphabet is now also developing direct health data interfaces with consumers.[102]

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101 Boyd, C. (2019, October 21). Google gets green light to access five years' worth of sensitive patient data from NHS, sparking privacy fears. *Mail Online*. https://www.dailymail.co.uk/health/article-7588337/Google-gets-green-light-access-FIVE-YEARS-worth-sensitive-patient-data-NHS-trust.html
102 Through the acquisition of fitness tracking company FitBit.

The key activity segments or layers of data and intelligence value chains are; (1) collection of data, (2) data's processing over cloud computing infrastructure, (3) development of digital intelligence and its centralization or networking,[103] and (4) application of such intelligence to socio-physical activities and actors in the relevant sector. Digital power is built and entrenched by digital corporations through vertical integration (including partnerships based) of these four kinds of digital activities. This logic of digital domination is largely sector independent. In fact, digital consolidation of these activities often extends across sectors. Collection of useful data may be cross-sectoral; people's mobility data or commerce data, for instance, may contribute important health intelligence. As intelligence is created, it can also be applied cross sectorally in many ways. AI in visual, voice, natural language processing, and many other such areas, is of a generic kind, employed in almost all sectors. There could also be more specific cross applications, for instance between mobility intelligence and that related to consumer goods, or health. This explains why digital corporations are able to develop digital presence and power across sectors. Such presence and power can be strengthened through partnerships with existing traditional players in a new sector, at least initially as an entry strategy.

In order to check concentration of digital power, competition regulators, and economic policy makers, need to understand and work on the four key segments of digital value chains involving sourcing of data, its cloud-based processing, data's conversion into digital intelligence, and application of intelligence to real world systems. Various kinds of regulatory interventions and remedies are possible that aim at these key segments of the value chain, including behaviourial ones that force certain actions or abstentions on key actors. These would be oriented to ensuring transparency, openness, competition and fairness in each of the key segments of digital value chains. Intervention could be regarding access to data, something that regulators in many countries are actively considering.[104] It could involve expectations of transparency, openness (providing non-discriminatory access and services) and contractual fairness from

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103 Digital intelligence may all be pooled in one place, or it can operate as a distributed network, but mostly with considerable centralized control.

104 Supra n 56

cloud service operators, who provide the infrastructure for data storage and processing. The processes and economics of how digital intelligence gets developed and then applied to socio-physical systems in different sectors is yet an under-examined area. But this layer is most important as the source of real digital power in any sector. How to make the processes of development and application of intelligence more transparent, open, competitive and fair, needs to be explored.

Some such governance and regulatory thinking has begun. It is most visible in relation to the layer of data collection and provisioning. There is an increasing accent on economic rights over one's personal data and its portability, and the need for dominant firms to share important non personal data with other businesses. In the cloud computing layer, some work is being undertaken towards open standards, and interoperable platforms.[105] Promotion of domestic cloud computing infrastructure, including public infrastructure, is also advocated.[106] As mentioned earlier, economic governance of the intelligence layer is much less discussed. Although the general alarm about concentration of power in and through this layer is the highest; represented in the considerable rhetoric around an 'AI race' and 'AI supremacy'. AI governance is still in the 'harm prevention' phase, as was data governance till very recently. It has not moved into economic governance mode. Economic governance of digital intelligence should however soon become extremely important as it is at the root of digital power. There is some emerging work towards AI transparency, and open AI models. Public involvement in the intelligence layer is also being considered.[107]

Current explorations around economic governance of data, computing and intelligence will be greatly benefited if brought under a coherent framework of defining a digital economy, laying out the central role of data and intelligence in it, and examining the key logic and nodes of digital economic power concentration. Such a framework can

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105 Project GAIA-X. A Federated Data Infrastructure as the Cradle of a Vibrant European Ecosystem. Federal Ministry for Economic Affairs and Energy. https://www.bmwi.de/Redaktion/EN/Publikationen/Digitale-Welt/project-gaia-x.pdf?__blob=publicationFile&v=4

106 (2016). European Cloud Initiative -Building a competitive data and knowledge economy in Europe. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52016DC0178&from=EN

107 *Launch of first European Artificial Intelligence platform coordinated by Thales.* (2019). Thales. https://www.thalesgroup.com/en/group/journalist/press-release/launch-first-european-artificial-intelligence-platform-coordinated

provide a set of regulatory principles and tools for the digital economy, better predicting what kinds of regulation of digital economy are likely to be successful as well as their possible intended and unintended effects.

All the above discussed are behavioural remedies imposing conditions of specific action and/or abstention on firms that are dominant, or may tend towards domination. In an increasing order of depth of intervention, these could require certain kinds of transparency, non-differentiation, and/or resource sharing. All these are very important regulatory tools to be contextually employed as found useful. However, as discussed earlier, certain inherent features of the emerging digital economy greatly limit the effectiveness of behavioural remedies since they require constant evaluation of conditions, behaviour monitoring, and fine-tuning of interventions.

Firstly, digital economy changes occur far too rapidly, and in directions and manners that are difficult to anticipate. Second, the role of data and intelligence, and changes related to them, tend to be rather invisible. They are in the intangible realm in any case, but also no forms of denominating, accounting and auditing have yet been devised for them, as for instance done for finance or intellectual property. Data and intelligence operate behind impenetrable technical walls fully in control of the firms whose dominance is to be checked. Third, dominance entrenchment and lock-ins in the digital realm are very quick as they are intense, often irreversibly so. It will be very difficult, if not impossible, for regulators to closely monitor what is happening and continually attune appropriate remedial measures, all in right time before irreversible dominance develops. Various regulatory decisions against Google[108] and Facebook[109] involving fines and directives for behaviourial change, especially in the EU, hold testimony to the ineffectiveness of such interventions. These generally are too little too late, serving perhaps more to assuage regulatory guilt – or at best prevent some extremely egregious behaviour – rather than have any real impact on the ever-increasingly dominance of

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108 *Antitrust: Commission fines Google €4.34 billion for illegal practices regarding Android mobile devices to strengthen dominance of Google's search engine.* (2018). European Commission. https://ec.europa.eu/commission/presscorner/detail/en/IP_18_4581

109 *Mergers: Commission fines Facebook €110 million for providing misleading information about WhatsApp takeover.* (2018). European Commission. https://ec.europa.eu/commission/presscorner/detail/es/IP_17_1369

global digital corporations. Dominant digital corporations quickly make small shifts in their business models, skirting what is completely to be off-limit, but this does not affect their pivotal position as controlling the intelligence of the emerging digital economic and social systems.[110]

Behavioural remedies therefore are unlikely to succeed in containing digital power concentration. Regulators must also consider structural interventions that enforce permanent *ex ante* structural changes on economic operations of dominant firms. Regulators should have at hand a whole suite of data and intelligence value chains related regulatory possibilities – both behavioural and structural. These can then be contextually applied in appropriate mixes to effectively regulate the digital economy, towards sufficiently diffusing economic power across the economy.

A recent UNCTAD document on competition in digital economy cites the US technology law expert, Tim Wu, as suggesting:[111]

> "...(since) ex post intervention is unsuited to the information industry, a constitutional approach may be used to deal with the concentration of power in the information economy... "a regime whose goal is to constrain and divide all power that derives from the control of information", based on the separations principle, that is, "the creation of a salutary distance between each of the major functions or layers in the information economy" ."

Wu has been an adherent advocate of net neutrality, implying structural separation between the data transporting telecom layer and applications that work on such data. It was earlier mentioned how, based on this principle, the French Digital Council developed the notion of platform neutrality applying neutrality obligations to higher digital layers as well.

110 Bhardwaj, P. (2018, May 12). Eight weeks after the Cambridge Analytica scandal, Facebook's stock price bounces back to where it was before the controversy. *Business Insider*. https://www.businessinsider.in/tech/eight-weeks-after-the-cambridge-analytica-scandal-facebooks-stock-price-bounces-back-to-where-it-was-before-the-controversy/articleshow/64130658.cms

111 TD/B/C.I/CLP/54. Trade and Development Board. Trade and Development Commission. Intergovernmental Group of Experts on Competition Law and Policy. Eighteenth session. Geneva, 10–12 July 2019. *Competition issues in the digital economy.* Note by the UNCTAD. https://unctad.org/meetings/en/SessionalDocuments/ciclpd54_en.pdf

Governance of information and communication technologies has traditionally followed, as far as possible, a norm of separating key technology function layers; whether unbundling the backhaul network from retail connectivity in telecom,[112] and the application layer from data transport layer (net neutrality); or the Open Systems Interconnect (OSI) model for working of Internet technologies;[113] or separation of hardware from software;[114] or, lately, employing open Application Programming Interfaces (API) to separate data based enabling services from business operations that use them.[115] As digital technologies become the bedrock for global domination across sectors, such wholesome practices are increasingly given a short shrift, or get deformed and co-opted in captive technology models.[116] Digital technologies are intermingling with very powerful economic and social processes, in a manner that may often render it difficult to see them apart. Governance of digital technologies, especially since the 1990's, has been largely based on soft law[117] and self-regulation practices that are anchored in tech community's ideological openness and collaborative spirit.[118] In the current circumstances, upholding public interest in this all-important area requires such soft approaches to be buttressed by hard law, and its strict enforcement. It is here that the competencies and legal strength of market regulators can come to the rescue of technology governance.

The dominant digital economy model is based on integration into a single entity, or through close partnerships, the four key functional layers of data collection, cloud infrastructure, digital intelligence development, and its application to various sectoral activities. The resultant digital behemoth is what is causing so much consternation

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112 Also called open access network, see Cohill, A. (2019). *The Economics of Local Transport Services over Open Access Networks*. https://www.isemag.com/2019/03/municipal-broadband-open-access-broadband-networks/

113 What is the OSI Model. (2018). https://www.inetdaemon.com/tutorials/basic_concepts/network_models/osi_model/what_is_the_osi_model.shtml

114 B. Grad, (2002). A personal recollection: IBM's unbundling of software and services. *IEEE Annals of the History of Computing, vol. 24* (1), doi: 10.1109/85.988583.

115 About India Stack. https://www.indiastack.org/about/

116 Amadeo, R. (2018, July 21). Google's iron grip on Android: Controlling open source by any means necessary. *Ars Technica*. https://arstechnica.com/gadgets/2018/07/googles-iron-grip-on-android-controlling-open-source-by-any-means-necessary/

117 Hagemann, R., Huddleston, J. & Thierer, A, (2018). Soft Law for Hard Problems: The Governance of Emerging Technologies in an Uncertain Future. *Colorado Technology Law Journal*. Available at SSRN: https://ssrn.com/abstract=3118539

118 Yeoman, S. (2018). *Will self-regulation fix the Internet?*. https://www.datacenterdynamics.com/en/opinions/will-self-regulation-fix-the-internet/

among people, politicians and regulators alike. Such an integrated digital corporation is an unsustainable economic and social form. Left to itself, it will suck away economic, social, political and cultural power from all sides concentrating it with itself, by owning outsourced intelligence about everything.[119]

Regulators should consider structurally separating the four main functional layers of the digital value chain, with a view to check concentration of digital power. Such separation will ensure a fair play for a competitive field of digital businesses in each layer. It will mean a plurality of sources and management of digital intelligence of our society, providing a variety of options for enterprises, as well as for consumers and citizens.

The tool of digital structural separation should be available to digital economy regulators to employ contextually as required, considering the conditions and requirements of different sectors, size of digital businesses, and so on. The objective would be to anticipate and pre-empt sector-wide vertically-integrated monopolistic digital ecosystems. The actual forms of structural separations that are mandated may depend on many factors. It is possible that separation between some of these four layers is sought and not others. Partial structural separation between two layers is also possible. The model of requiring full separations across all the four layers is presented as a regulatory ideal-type.

Some kinds of digital structural separations are beginning to be considered, even if not yet formally going under the name of economic regulation. The following three sections discuss some such emerging developments, respectively in the data, computing and intelligence layers. It is proposed that these be subsumed under a holistic new regulatory framework for the digital economy, underpinned by appropriate digital economy theory.

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119 See for instance the amount of power Google-Alphabet – the archetypical vertically integrated digital corporation – is drawing away from traditional players in the automobile and media industry. And it is foraying domineeringly into other sectors like travel, health, employment, and so on.

9. Structural separation of the data layer

A primary driver of digital regulation has been concerns about people's control over their personal data. Recognising the limits of technical and other kinds of expertise that an individual can command, the function of personal data management is being institutionalized in specialized trustee organizations. Personal Information Management Services enable individuals to retain their data and allow specific purpose based access to it for companies offering data-based services.[120] The concept of consent managers proposed in India's Personal Data Protection Bill, 2019 has a similar application.[121] Japan's Information Banks, set up following government guidelines, not only allow individuals to control how their personal information is used for targeting services, but also to monetize such use.[122] This initiative also promotes use of data by local businesses as against data exploitation by world's 'Big Four' digital firms — Amazon, Apple, Facebook and Google.[123]

Such an arrangement can be viewed as structural separation of the function of personal data collection and management from that of processing data for providing digital services. Information Banks, for instance, can be viewed as independent personal data infrastructures that provides personal data to a wide range of digital service providers rather than such data getting monopolized by the initial collector. Trusted information or data utilities have been envisaged, working independently from the firms that use the data.[124] Some of these are proposed to be run by city authorities.[125] Use of such services is optional at present, both for data subjects and data-using digital service providers. But the viability of any optional arrangement is suspect, such is the all-round power of vertically integrated digital corporations (they have many a digital carrot and stick

120 Loayza, A. (2019, March 21). Personal information management systems: A new era for individual privacy?.*IAPP*. https://iapp.org/news/a/personal-information-management-systems-a-new-era-for-individual-privacy/
121 Personal Data Protection Bill, 2019 (s. 23)
122 Japan grants certification for first time to 'information banks'. (2019, July 9). *The Japan Times*. https://www.japantimes. co.jp/news/2019/07/09/business/japan-grants-certification-first-time-information-banks/#.XkjZrXUzZ7g
123 Ibid
124 Kumar, P. (2016, June 11). What Will Spur the Adoption of Financial Data Utilities?. *Golden Source Blog. https:// www.thegoldensource.com/will-spur-adoption-financial-data-utilities/*
125 Boorsma, B., Khoong, H., Rantanen, T. & Slembrouk, S. Should cities turn to special utilities to manage data?. *Smart Cities Association.* https://thesmartcityassociation.org/should-cities-turn-to-special-utilities-to-manage-data/

in their hands). Mandatory structural separation of the personal data collection and management layer from data's downstream processing for developing digital services has therefore to be considered, where required.

With consent of the individuals concerned, personal data intermediaries or managers may also anonymize data and provide it to digital businesses in a use specific manner. In an AI-based digital economy, anonymized group data is increasingly almost as valuable as personal data. Privacy rights and economic rights over one's data do not lapse with the act of anonymization; they continue to abide in anonymized data.[126] Such data should only be used for purposes sanctioned by the data subjects, individually and/or collectively. Personal data managers should be able track the use of anonymized data, and, if appropriate, also monetize it, distributing the profit among the original data contributors.

Significant issues arise about whether personal data managers or trustees should be private services, or community or public services. These services certainly require close regulation to protect data subjects. This paper will not get into these issues, but they are important to undertake further work on.

Data subjects are not the only sources of anonymized personal data. Many organizations may hold it in various forms. Many kinds of data from entirely non personal sources are also very useful and valuable. This could be data from machines and infrastructure, or other artefacts, or data from the natural environment. Data infrastructures as specialized third party institutions are emerging for managing and sharing non personal data needed for digital businesses.[127] Employing the imperative of structural separation, it may be required that businesses that themselves use such data may not also manage data infrastructures.[128] All those who collect various data – at least the designated important kinds – may be obligated to contribute it to data infrastructures. This may have to be

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126 As per the Japanese Act on the Protection of Personal Information (ss. 36-39), the rights of data subjects continue to abide in data subjects; Mittal A. (2020, January 14). Has India's Privacy Bill Considered the Dangers of Unrestricted Processing of 'Anonymised' Data?. *The Wire.* https://thewire.in/government/privacy-bill-anonymous-data

127 Broad, E., Tennison, J., Starks, G. & Scott, A. (2015). *Who Owns Our Data Infrastructure.* Open Data Institute. http://theodi.org/wp-content/uploads/2019/12/266889068-Who-Owns-Our-Data-Infastructure-1.pdf

128 Third party data trusts are emerging as such an institutional form, Hardinges, J. (2018). *Defining a 'Data Trust'.* Open Data Institute. https://theodi.org/article/defining-a-data-trust/

done for free or on FRAND terms[129] or through regulated data markets, depending on the nature of data, its criticality for important economic and other functions, specific costs incurred in collecting such data, and other relevant conditions.[130]

Data collection is often intrinsically linked to provision of digital services and it may not be easy to separate them. Digital service providers' access to data infrastructures (including personal data services), as well as that of data infrastructures to various data collection processes, have to be in real time, effective and secure. APIs can be employed to appropriately structure such ongoing access, as per predefined rules. For instance, an API of personal data manager can be integrated into the application of digital service provider. Personal data coming from an individual goes directly to the personal data manager, as per the provided consents, who in turn ensures protected use-specific access to the digital service provider in real time. Regulators will need to lay down the basic necessary processes and protocols for such purposes, and actively monitor them.

Some basic conceptualizations are required around the nature of data, rights to its value, and data sharing. Data is neither technology nor created knowledge or content. But it has technical aspects, as well as an essential relationship to specific human subjects (the most important data being personal or social). The latter, however, are normally not the ones who hold and control the data, and may not even have access to it. If data is to be shared, how widely should it be shared; just inside the social group that is the source and subject of the data concerned, or openly? Should data sharing follow the tradition of free and open source software that can then require all subsequent derived data-sets also to be openly shared,[131] or adopt the model of open content sharing whereby various discriminations may apply, like between commercial use or non-commercial use?[132] Data is different from both technology and content in that no creative element is involved. But this by itself cannot mean that data becomes

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129 Fair, reasonable and non discriminatory terms.
130 Supra n 54, 56; *Building a European data economy*. (2017). European Commission. http://ec.europa.eu/newsroom/dae/document.cfm?doc_id=41205
131 *Gnu General Public License.* (2007). https://www.gnu.org/licenses/gpl-3.0.en.html
132 Share your work. *Creative Commmons.* https://creativecommons.org/share-your-work/

an unencumbered resource, for anyone to partake, and that no particular economic rights exist for the human subjects of such data. It remains inexplicable why no clear efforts have gone into developing the basis, norms and laws for sharing data, even as it has today become the most important resource, with strong collective and public interest aspects.

There hardly exist any data-related legal economic rights for the data source and subject, whether individual or collectively as a group. In default, apart from a few privacy obligations, data collecting digital corporations face almost no constraint in using the data as they wish, and appropriating its entire economic value. Providing legal economic rights to data subjects – individually and collectively – can be key to tempering the power of digital corporations. Within such primary economic rights of data subjects, various kinds of privileges may be contextually allowed to those who collect and process data. Europe had floated the idea of data producers rights,[133] and India is considering a group's or community's economic rights to its data[134]. Such rights can provide the legal basis for structural separation of the data collection and provisioning layer (under control of data subjects or their trustees) from the higher layers of data and intelligence value chain. Targeting economic rights around key business resources that cause dominance has traditionally been a part of structural remedies in regulation.

Beyond consumers of digital services, such rights of data sources and subjects have significant implications for the power of various small economic agents in digital value chains. Such actors could be traders on an e-commerce platform, drivers working with a ride-hailing company, restaurant owners organized by a food delivery company, or workers in a datafied manufacturing plant. Access to and rights over data about the segments of economic activities directly connected to them can significantly enhance their control over their own activities, and their overall bargaining power.[135]

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133 Peter K. Yu. Data Producer's Right and the Protection of Machine-Generated Data. 93Tul. L. Rev.859 (2019). https://scholarship.law.tamu.edu/cgi/viewcontent.cgi?article=2302&context=facscholar

134 *Draft National E-commerce Policy.* (2019). https://dipp.gov.in/sites/default/files/DraftNational_e-commerce_Policy_23February2019.pdf; *Committee of Experts under the Chairmanship of Justice B.N. Srikrishna.* (2018). For a detailed treatment of the concept of 'community data' and common property rights frameworks for data, see Singh, P. J. (2019). Data and Digital Intelligence Commons (Making a Case for their Community Ownership). Data Governance Network Working Paper 02.

135 White, A. (2020, January 17). Amazon faces EU antitrust probe over use of data from smaller traders. *Business*

Collective data rights of such groups *vis a vis* the platform concerned can perhaps have even more impact on diffusing digital power, especially if supported by appropriate laws and regulation. Such data rights can provide the basis for effective collective bargaining as well as, possibly, such groups' co-ownership of digital businesses whose main asset after all is the localization developed from data contributed by these groups.[136]

Data localization has been advocated in many national jurisdictions, ostensibly mostly for privacy and security concerns. Behind these more-publicized reasons, (legitimate) national economic interests are often at play.[137] But these are either not articulated at all or presented in very broad and vague terms, without clarifying their basis and practical implications. Seen in an economic governance framework, data localization can be considered as a legitimate form of structural separation.[138] Here, a national community asserts its collective economic rights over its data to mandate storing and processing of data within its borders. Taking forward the earlier discussion on mandating third party data infrastructures, in control of data sources and subjects, it goes to reason that such data infrastructures remain close to the data sources/subjects and within the same jurisdiction as them. It allows data subjects to effectively exercise their economic and other rights over data, employing the power of law if required. Data localization reduces the vertical integration of data and intelligence processes of global digital giants. The structural separation here is physical, and jurisdictional, without *necessarily* a separation of economic control (which also is mostly needed as per the earlier discussion, and is facilitated by such physical/jurisdictional separation). It can have significant implications of digital power diffusion in favour of domestic industry. This is especially so if accompanied by other elements of digital industrial policy like economic data rights, enabling data infrastructures, supporting domestic digital industry, and so on.

    Standard. https://www.business-standard.com/article/companies/amazon-faces-eu-antitrust-probe-over-use-of-data-from-smaller-traders-119071701636_1.html

136 Singh, P. (2020, January). Economic Rights In A Data-Based Society. *Public Services International*. Friedrich Ebert Stiftung

137 Silber, T. (2019, February 28). GDPR Gives European Tech Companies A Major Advantage, Two EU-Based CMOs Say. *Forbes*. https://www.forbes.com/sites/tonysilber/2019/02/28/gdpr-gives-european-tech-companies-a-major-advantage-two-eu-based-cmos-say/#62a07710713f

138 Singh, P. (2018 September). Data Localization, a matter of rule of law and economic development. *IT for Change*. https://itforchange.net/sites/default/files/1584/Data_localisation.pdf

Physically distributed architectures of data storage and processing, keeping these activities close to the points of data's origin, is an emerging computing concept that is taking a strong hold.[139] It can better protect data, safeguard the rights of data subjects, and have a considerable impact on digital power concentration. Edge computing is one such data processing architecture where data is processed close to the points of origin instead of its centralized accumulation.[140] Addressing concerns about excessive personal data collection through mobiles, Google provides federated learning model on its Android platform; instead of data travelling to Google's central servers, it is insights from data that are periodically picked up.[141]

Such a distributed and federated data architecture can also be employed for institutions, say schools or hospitals.[142] Personal data stays within the institution and gets processed there, but it can still benefit from centralized intelligence services that pick periodic insights from data stored locally at multiple similar institutions. A private sector initiative in the US offers a platform for collaborative research that is powered by federated learning; "a framework for AI model development that enables us to train ML (Machine Learning) models on distributed data at scale across multiple medical institutions without centralizing the data".[143] "Hospitals and research institutions retain control and governance over patient data and can access a full and unforgeable record of which data has been used for what purpose." India's National Digital Health Blueprint recommends distributed institution-based storage of health data from where it can be temporarily accessed as per need, and with consent.[144] Country based data localization can also be viewed as a special case of distributed data systems.

139 *National Digital Health Blueprint*. (2019).

140 Shaw, K. (2019, November 13). What is edge computing and why it matters. *Network World*. https://www. networkworld.com/article/3224893/what-is-edge-computing-and-how-it-s-changing-the-network.html

141 McMahan, B. & Ramage, D. (2017, April 6). Federated Learning: Collaborative Machine Learning without Centralized Training Data. *Google AI Blog*. https://ai.googleblog.com/2017/04/federated-learning-collaborative. html

142 Rhodes, C. (2020, January 7). Federated Learning delivers AI to hospitals. *Tech Radar*. https://www.techradar.com/ in/news/federated-learning-delivers-ai-to-hospitals

143 *Owkin Manifesto*. Owkin AI for Medical Research. https://owkin.com/manifesto/, *Federated Learning*. Owkin AI for Medical Research.https://owkin.com/federated-learning/

144 Supra n 139

Overall, the principle of structural separation of the data collection layer manifests in the need to develop distributed architectures and independent institutions for data collection, storage, curation and provisioning in a manner that (1) strongly protects privacy and other interests of data subject individuals and groups, and (2) ensures that data required to effectively run a productive digital economy is available in an adequate and equitable manner to various businesses and other data users, and is not monopolized by a few dominant digital corporations collecting such data.

10. Cloud neutrality and open digital ecosystems

Cloud computing infrastructure is what supports data storage and processing. A recent article in *Wired* observed that rather than the Internet – which is based on public protocols and public interest governance – it is the cloud today that is digital economy's essential infrastructure.[145] Clouds, unfortunately, are all privately owned, and extremely non-transparent in their operations. On the lines of net neutrality, the article calls for cloud neutrality, citing how digital corporations are employing dominance over this vital infrastructural layer of digital economy to develop and entrench their power in the higher layers.

A cloud computing infrastructure should *prima facie* be an inert technical service of data storage and computing facilities. But the reality is much more complex, and getting further so. The line between an ostensibly inert infrastructure and the valuable processes of data and intelligence that run over it is increasingly diffused, and malleable. Strong competitors in the higher layers of digital economy therefore try to avoid dependence on a rival's cloud infrastructure.[146] It would not be so if cloud infrastructure was just like a road on which all vehicles can ply (perhaps with toll payment), or a container service providing global shipment, or a telecom network neutrally transporting data around.

145 Wood, M. (2020, October 2). We Need to Talk About 'Cloud Neutrality'. *Wired*. https://www.wired.com/story/we-need-to-talk-about-cloud-neutrality/
146 Walmart asked its suppliers to pull away from Amazon Web Services Unglesbee, B. (2017, June 21). Report: Walmart asking suppliers to quit Amazon cloud. *Retail Dive*.https://www.retaildive.com/news/report-walmart-asking-suppliers-to-quit-amazon-cloud/445509/

The kinds of benefits a cloud provider can obtain from another party's data processed over its infrastructure remains a vague area. Strictly speaking, such a computing service should have no access at all to other party's data, or – very importantly – to any of its derivatives. There being no clear economic rights around data, its storage and processing is managed through private contracts. Such contracts may not be able to cover all elements of value that can be picked up from data being stored and processed on a cloud. The contract may even be deliberately kept vague to allow room for the cloud provider to obtain some data and intelligence related benefits.[147] Such contracts depend on the relative power of the involved parties, and a lot of services get offered on a 'take it or leave it' basis. Cloud providers may also make available alluring subsidized (or even free) applications to those whose data is processed in exchange for being able to derive some benefits from their data. These services can be especially attractive when such uses of data appear not to impact short-term interest of those bringing in the data.[148] For example, a cloud provider offering a data-storage facility linked free or subsidized application for industrial data of small and medium enterprises, or for business data of small traders.[149]

Cloud computing providers are integrating AI software into their infrastructure. All the top cloud providers, Amazon, Microsoft, Google, Alibaba and IBM, have their own AI engines. These are available, often for free, for users to employ them to gain AI-based insights from their data. While most free AI engines can also be downloaded and independently operated on-premises, the computing power required for intelligent operations of even ordinary businesses is increasingly likely to be so huge that access to cloud computing infrastructure may become necessary. Additional top-up services like security, explainablity, data bias removal, etc. get offered, that may become indispensable at least for small to medium users. This ensures stickiness of cloud users. But such services generally need access to the underlying data, which means that the

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147 Higgin, B. (2018, January 31). When It's Your Data But Another's Stack, Who Owns The Trained AI Model?. *Artificial Intelligence Technology And The Law.* http://aitechnologylaw.com/2018/01/who-owns-cloud-trained-ai-model/

148 This is not much different from how the business of providing personal free or subsidized personal Internet applications and data collection through them

149 Jio MS to give data storage to traders Rel Jio, Microsoft join hands to offer cloud infra for businesses. (2019, August 12). *Economic Times.* https://m.economictimes.com/markets/stocks/news/rel-jio-microsoft-join-hands-to-offer-cloud-infra-for-businesses/articleshow/70639952.cms

computing service provider can very likely gain some insights from the data being processed.[150] The cloud provider will employ the old refrain of 'we will only use such data as is essential to provide a service and to improve it' which is too familiar from the terms of services for various personal digital applications. In sum, a dominant computing service provider seems to have many ways of deriving benefits from the data processed using its services.

The first wave of data businesses arose from personal Internet applications like those of Google and Facebook. Their free services attracted millions of people whose personal data, after a while, became the main stock-in-trade. Amazon and Uber took this model to physical sectors, where along with consumer data, supply side data was also important. The economy is getting into its second wave of datafication with a greater focus on intensive collection and deep processing of enterprise and business data. It is here that integrated offers of cloud computing and AI will be key. As most enterprises and businesses get datafied and interested to develop insights from their data for more effective functioning, they will have to depend largely on such integrated cloud services. This is a key piece of the puzzle towards developing captive digital ecosystems. To be able to comprehensively command and digitally orchestrate most economic actors in a sector, having them on ones own cloud computing and AI infrastructures is extremely useful.[151] If not among a select few players who own cloud/AI infrastructure, dominant digital corporations take great care in choosing their cloud and AI platforms, relying generally on very close partnerships.

Such muddying of the separation between the cloud computing layer and data and intelligence processes running on its top is a very important emerging means of digital power consolidation. Employing free or subsidized computing and AI services, cloud

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150 Amazon Sagemaker. *AWS*. https://aws.amazon.com/sagemaker/, Sarkar, T. (2019, November 25). Google's new 'Explainable AI" (xAI) service. *Medium*. https://towardsdatascience.com/googles-new-explainable-ai-xai-service-83a7bc823773, Sagar, R. (2020, February 7). Google's New ML Fairness Gym Has A Clear Mission — Track Down Bias & Promote Fairness In AI. *Analytics India Magazine*.https://analyticsindiamag.com/machine-learning-fairness-bias-google-open-ai-gym/

151 Primarily e-commerce companies, both Amazon and Alibaba are investing heavily in cloud infrastructure, AI and services.

computing infrastructures are likely to become enclosures for extracting intelligence value from the data of most enterprises and businesses.

At the very least, there will the problem of self-discrimination by the player owning the computing service layer while also competing, at another level, with businesses dependent on its computing infrastructure. This is akin to the issue of digital platforms and businesses dependent on them, resulting in calls for structural separation between the two. The structural position of cloud computing services is quite like that of the providers of essential infrastructures of transportation and telecommunication in the industrial economy, which required regulatory interventions including break-ups.[152]

All this make a strong case for cloud neutrality. A clear distinction, and regulatory separation, has to be enforced between the inert pure technology layer of cloud computing service and the data and intelligence systems working over it.

The recent EU initiative called GAIA-X well illustrates the implications of cloud computing governance and architecture on the higher layers of data and intelligence, and thus on the power of digital corporations. Considered to be a direct response to the dominance of American and Chinese service providers, this project proposes a federated cloud computing infrastructure for the EU.[153] With 'data sovereignty' as the driving motivation behind the project, the GAIA-X initiative is based on the idea that 'geography of the cloud matters'.[154] What this essentially means is that if a country or a region does not have its own cloud infrastructure it cannot really own its data, underlining the nature of vertical digital integrations that this paper focusses on.

GAIA-X project's approach to addressing vertical digital integrations is to support distribution of cloud infrastructure across many players with common, open and public, protocols of interoperability, migration, privacy, security and data sharing. Dominant cloud services and applications thus get deprived of their key power to set

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152 In this same analysis we can also add platform applications like Android and Alexa, and sectoral ones like Baidu's Apollo which proposes to be the Android of transportation.

153 Bedingfield, W. (2020, January 27). Europe has a plan to break Google and Amazon's cloud dominance. *Wired*. https://www.wired.co.uk/article/europe-gaia-x-cloud-amazon-google

154 Supra n 145

the rules-of-digital-interactions, which is handed over to neutral third parties. A series of such neutral institutions in the form of industry associations and community/public bodies is envisaged in a EU wide architecture. These neutral institutions will, *inter alia*, take up certification. Enforcement of such common rules of engagement ensures that cloud operators provide neutral technical services and cannot unduly appropriate value from other parties' data and intelligence processes.

Cloud services and applications provide the software inscribed rules of digital interaction for various actors. We discussed how, apart from command over the system's intelligence, it is control of these rules that ensures dominance over digital ecosystems. Such rules may be entirely proprietary of a single player, like for Amazon's e-commerce ecosystem. Or they could be partnership oriented, like for Baidu's Apollo smart transportation platform[155] and Facebook's digital currency Libra.[156] Such governance structures can be expected to remain closely attuned to the commercial interests of the principals. The GAIA-X project seeks to hit at this power of dominant digital corporations to set the rules for digital ecosystems and govern them.

Bringing a society's overall – and sector-wise – digital rules and means of interaction under public interest control, through public and/or neutral bodies, is one of the most important imperatives to check digital dominance. Appropriate public/community roles have to be reclaimed in the new digital institutional ecology, separating them from those roles that legitimately belong to the private sector. It requires working at two fronts. One is to develop and enforce frameworks of common rules and protocols, through suitable governance bodies. The GAIA-X project proposes an EU-wide cooperative body for this purpose.[157] Second, is to go further, where required, putting in public efforts to set up technical and basic services platforms for digital enablement and interoperability of all actors, big and small. Such platforms

155 *Apollo Governance*. Apollo. https://apollo.auto/docs/manifesto.html
156 Berenzon, D. (2019, July 17). Libra: A Governance Perspective. *Bollinger Investment Group*. https://medium.com/bollinger-investment-group/libra-a-governance-perspective-d1c2d9c87f65
157 Supra n 105

can be general or sector-specific. The EU is developing platforms of this kind for logistics and health ecosystems.[158]

India has been developing public/community platforms for interoperability and basic digital services support.[159] It has also been working on frameworks of rules and protocols for digital interaction among actors in specific sectoral ecosystem like health.[160] Indian government has put up a white paper on National Open Digital Ecosystems (NODE) as a general framework to regulate, enable and support digital interactions and collaboration in any sector. It is based on similar principles as EU's GAIA-X project (which also employs a 'digital ecosystems' vocabulary) – openness, interoperability, privacy, security and data sharing.[161] NODE rules of engagement will follow some common principles, which include inclusiveness, participatory design and co-creation. Like GAIA-X, it too has a strong accent on accountable and transparent, public interest governance for digital ecosystems, that "ensure(s) fair value sharing while keeping stakeholder behaviours in check, with both preventive and corrective measures laid out".

These EU and Indian frameworks represent a very different design for digital ecosystems than the currently dominant model discussed throughout this paper. At its heart is a set of public interest rules of digital interactions for all players, anchored in suitable governance structures that are participatory, transparent and accountable. However, good intentions, or even project level efforts, including building of a few enabling platforms, will not suffice to move the very powerfully entrenched dominant digital ecosystem model in the desired direction. Whether the transport instance of GAIA-X in the EU, or the transport NODE in India, will govern the transport digital ecosystem in the respective places, or it will be controlled by Uber, Waymo or Baidu's Apollo platform

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158 *AEOLIX: The first harmonised platform for logistics information sharing in Europe.* Co-gistics. http://cogistics.eu/aeolix-the-first-harmonised-platform-for-logistics-information-sharing-in-europe/ and *Our Mission.* The Global Connector. https://echalliance.com/our-mission/

159 An example of a general platform for basic enabling digital services, like digital identity, consent for data processing, e-authentication, etc., is IndiaStack [https://www.indiastack.org/about/]. A sector specific platform is National Urban Innovation Stack [https://smartnet.niua.org/sites/default/files/resources/national_urban_innovation_stack_web_version.pdf]

160 *National Digital Health Blueprint.* (2019).

161 White Paper on National Open Digital Ecosystem. (2020). https://www.medianama.com/wp-content/uploads/mygov_1582193114515532211.pdf

remains an open question. Yochai Benkler was rather prescient to, more than a decade back, call it "the battle over the institutional ecology of the digital environment".[162] A concerted and holistic national and international approach is required, backed by necessary laws, with new digital economy specific regulatory frameworks and strong public sector initiatives.

Since infrastructural capacities are necessary to have the independence of managing one's digital ecosystems, also required are considerable investments in building domestic data centres and strong cloud computing capabilities. Some countries are now focussing on this imperative, seeing it as an important step towards building national digital power and lowering dependence on vertically integrated global digital corporations.[163]

Some digital corporations like Microsoft and IBM have less vertically integrated business models – focussing more on technology support than leading and managing sectoral value chains. They may have a relatively more open approach to globally distributed and less vertically integrated cloud services than those like Amazon and Google whose main interest often lies in higher, non-technical, digital economy layers.[164] Such significant differences in digital business models are important to understand for appropriate regulation of digital economy, and undertaking other policy initiatives. Technology support business should in general be kept separate by regulation from various sectoral businesses.

11. A distributed intelligence model

Whether governing data or computing, the real implicit target is of diffusing control over digital intelligence. Being digital economy's key economic resource, and factor of production, it is the main basis for digital power concentration. Governance in the area

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162 Benkler, Yochai. (2006). The wealth of networks : how social production transforms markets and freedom. Yale University Press.http://www.benkler.org/Benkler_Wealth_Of_Networks.pdf

163 *Draft National E-commerce Policy.* (2019). https://dipp.gov.in/sites/default/files/DraftNational_e-commerce_ Policy_23February2019.pdf

164 Strategic interests and directions of companies do change, and thereby also their business models. We mention such differences of business approaches only to underline that different digital economy models are indeed possible, even while working with large digital companies.

of digital intelligence is still in a very early phase. 'AI openness' is a term beginning to be used. However, openness of AI currently relates mostly to the input side of developing digital intelligence, being mainly about open scientific research and open sourced AI software. It is such openness of AI that has been embraced by digital majors, with suspicious-looking enthusiasm.[165] They have taken their lessons from how open source software was found to be key for building Internet platforms, whereby even the king of proprietary software, Microsoft, now evangelizes open source. With a much larger set of data/AI scientists and techies getting devoted to collective improvements in this field, open sharing of AI research and basic AI tools quickly scales-up general AI knowledge. Rapid enhancement in AI science, and general methodologies and tools, is obviously most beneficial to those digital corporations that are in the best position to apply AI to large-scale social and economic activities, and are closest to supremacy in AI. This is why dominant digital corporations are foremost in facilitating such openness of AI.

While not at all discounting the importance of technical breakthroughs in the science and technology of AI – and dominant players do safeguard some key technology developments for their exclusive use, now or in the future,[166] the real contest may lie elsewhere. It is in the areas of (1) how much, and what kinds of, data one can bring to these AI tools, and, (2) next in importance, how much computing power one can muster. Perhaps even more than these, the real trophy comes from embedding such AI into real world socio-physical systems in any sector, and dominating them by controlling their intelligence. We mentioned in an earlier section how what is termed as the global AI race may really be about commanding globe-spanning sectoral digital ecosystems, and not mastering AI technologies *per se*.

Two conclusions may be drawn from this discussion. One, on the input side of AI, 'AI openness' cannot just be about openness of AI related technical developments and tools – while no doubt it is very important. It has at least equally to be about open and equitable access to (1) data, and (2) computing power. Thus, on the input side, it is

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165   Shafto, P. Why Big Tech Companies Are Open-Sourcing Their AI Systems. *IFL Science*. https://www.iflscience.com/technology/why-big-tech-companies-are-open-sourcing-their-ai-systems/
166   Simonite, T. (2018, July 31). Despite Pledging Openness, Companies Rush to Patent AI Tech. *Wired*. https://www.wired.com/story/despite-pledging-openness-companies-rush-to-patent-ai-tech/

really 'open AI' only when AI technologies and tools, data, and computing power, are all openly shared, or at least equitably accessible. This is the basis of our earlier arguments for regulating the data collection/provisioning and computing layers; and perhaps their structural separation from the AI layer being the only effective way to ensure open and equitable access to these key inputs for AI. Second, as much as openness on the input side of AI, or perhaps even more, attention needs to be devoted to openness and fairness on the output side of AI, which is what has direct economic and social impacts.

On the output side of AI, openness discussions are mostly about bias in AI and explainability and auditability of AI. We are still in the 'harm prevention' phase of AI governance, as it was earlier with data governance (privacy and security). It is only lately that economic governance of data has begun to be considered. Even dominant digital corporations appear keen on 'harm prevention' based regulation of AI.[167] What has not appeared on the radar is how the gains of AI or digital intelligence get distributed, and who controls such distribution.[168] The policy and regulatory question that arises is who governs those who control the distribution of benefits from AI or digital intelligence, and how? It is time for economic regulation of digital intelligence to begin moving centre-stage.

What is economically most valuable are not AI software tools, but trained AI models, that have crunched enough data, employing huge computing power, to actually be making intelligent predictions and 'decisions', acting in relation to real world socio-physical systems. It is to denote such systemic operational form, function and impact of AI that we employ the socio-economic term of digital intelligence as being the real resource and factor of production in a given economic context.

OpenAI is an organization committed to ensuring safe and beneficial AI that is made available to all of humanity.[169] It is such distributional aspect of the output side of 'AI

167 Why Google thinks we need to regulate AI. *Financial Times*. https://www.ft.com/content/3467659a-386d-11ea-ac3c-f68c10993b04

168 The concentration of economic power in the hands of whoever emerges the winner in the AI race is feared to be so high that there is a proposal for a windfall clause binding such a winner to donate a portion of their profits O'Keefe, C., Cihon, P., Flynn, C., Garfinkel, B., Leung, J., and Dafoe, A. (2020). The Windfall Clause: Distributing the Benefits of AI. Centre for the Governance of AI Research Report. Future of Humanity Institute, University of Oxford. https://www.fhi.ox.ac.uk/windfallclause/

169 *About Open AI*. Open AI. https://openai.com/about/

openness' that requires urgent focus. When pressed to answer how this will actually be ensured in practice, the CEO of OpenAI said, "a utility is the best analogy for the vision that we have".[170] This a remarkable approach, as is the overall OpenAI initiative. However, AI is not a kind of resource that an philanthropic initiative can just put on a free pipe or wire to be consumed directly like water or electricity. AI is a variegated, systems-embedded resource operating in complex contextual combinations, differently for various elements of the digital society and economy. In general, though, AI is indeed the single most valuable resource whose possession enables considerable control over one's physical and social environment. Some kind of utility model for generic AI services is certainly needed, but also required is to build downstream capacities for their systemic adoption and use.

Any AI utility model throws up important issues of governance of AI or digital intelligence, both harms related[171] and distributional. Is AI more like software, and should be distributed on the model of free and open source software, requiring all further derived products to also be shared on a similar basis? Or, is it more like open content, whereby protective discriminations may be applied, for instance, between commercial and non-commercial uses, or among different kinds of users? (Many utilities adopt protective discrimination, like pricing and distribution of electricity in India.) Or, do we need entirely new concepts and models for distributing AI in ways that are most beneficial and just? What are the rights in this regard of sources and subjects of data on which AI is built? Who decides such issues? And very importantly, who decides which kind of AI to spend effort on and which not?

Can a philanthropic approach to managing distribution of AI and its benefits be good enough and sustainable? OpenAI has already run into many problems that point to the need for larger public governance of AI and its outputs.[172] OpenAI realized that being

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170 Hao, K. (2020, February 17). The messy, secretive reality behind OpenAI's bid to save the world. *MIT Tech Review*. https://www.technologyreview.com/s/615181/ai-openai-moonshot-elon-musk-sam-altman-greg-brockman-messy-secretive-reality/

171 Having committed to open source its outputs, OpenAI got so concerned about 'fake news' related harm potential of its natural language processing AI, that it initially refused to open source it. Hopping, C. (2019, February 18). OpenAI refuses to make its AI writer open source over fake news fears. *IT Pro*. https://www.itpro.co.uk/technology/33017/openai-refuses-to-make-its-ai-writer-open-source-over-fake-news-fears

172 Ibid

on the AI vanguard requires mind-boggling amounts of computing power, which is very expensive.[173] This made OpenAI go back on its plans to be fully a non-profit; it has now established a for-profit arm. This move expectedly encountered much criticism. OpenAI has also taken in a billion dollar investment from Microsoft, part of which is as service from Microsoft's cloud computing platform, Azure. We discussed earlier the problems with such vertical integration.

OpenAI does not seem to consider that appropriate distribution of an important socio-economic resource like AI or digital intelligence requires participatory decision-making. OpenAI is in fact a very secretive and closed organization.[174] Such depoliticization of what are mistakenly taken to be just neutral technical resources (not that technology is apolitical) is commonplace in the digital arena. It is perhaps no wonder that OpenAI is trying to develop Artificial General Intelligence, as a kind of all-problems solving panacea. This underplays context and variability, and is a relatively centralized solution to digital intelligence needs of the economy and society. Both technical as well as socio-economic feasibility of such an all-encompassing digital intelligence approach is suspect.

OpenAI is a commendable initiative, especially in highlighting the distributional issues relating to digital era's most important resource. But its limitations underscore the urgent need for public initiatives and economic governance frameworks in this area. Section 9 of this paper on data governance discussed how federated learning can enable, say, hospitals to retain their data but share periodic insights from it to build the required AI.[175] To extend this illustration; the AI generated from such federated datasets can be collaboratively owned by the hospitals concerned, and independently applied by each as per its needs. In such a model, not just data-based learning is federated for developing AI, but also the resultant AI is jointly owned by the distributed sources of learning. This may require a third party AI trust, on the lines of data trusts. Such an AI trust will employ the needed processes to develop, curate and provide contextual AI services, entirely as per the respective needs and demands of the subscribing hospitals.

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173   Computing power used in the largest AI training runs has been increasing exponentially with a 3.4-month doubling time (by comparison, Moore's Law had a 2-year doubling period, Amodei, D. & Hernandez, D. (2018, May 16). AI and Compute. *Open AI*. https://openai.com/blog/ai-and-compute/

174   Supra n 169

175   Supra n 142

This represents an important structural separation between development of digital intelligence and its distributed self-determined use. Traditional sectoral actors – hospitals in this case – will thereby be able to retain considerable independence and power in the new digital context rather than being dictated by a monopoly digital intelligence owner, as is the case with existing digital economy models.

In the above illustration, a co-owned institution received periodic data-based insights from, and provided the required AI or digital intelligence to, a set of organizations undertaking similar economic and social functions. It is possible for the AI developing organization to be an independent private business providing highly contextual AI as a service. Its sources of data/insights could be the client AI users, as well as others. The only regulatory bar on such a core AI business has to be that it cannot enter into downstream sectoral services having a direct interface with consumers (like hospitals, trading, cab services, etc.). What is being proposed here is a structural separation between the AI development layer and AI application (to real world systems) layer – with or without co-ownership of sector-related AI by the actors who run the real world socio-physical systems in a given sector.

Such a separation between AI development and application may not be absolute so as to completely bar a direct sectoral service provider from developing any AI at all. With edge computing, even IoT devices can create and work on their own local AI. Sectoral service providers can develop local AI for their operations, but retain it internally. Or, they can provide it for a consideration to upstream specialized intelligence businesses – in a transparent and non-discriminating manner. The bar would be against such a sectoral business itself entering into the business of specialized AI provider for its own sector, or to any other.

It may be useful to illustrate the practical implications of these discussions: Consider Google to be a developer of generic mobility AI; employing the extensive location-based mobility data with it, collecting driving data directly or through partners with vehicles on the roads, developing and integrating various mobility related general AI like those in the areas of vision, sound, etc., and so on. It would provide such mobility AI services to car manufacturers and car fleet operators (like Uber) – on a

facilitated, non-discriminatory open access model,[176] but it cannot itself enter these businesses. Uber, on the other hand, can develop such AI as may be needed internally for managing its business of urban transportation (perhaps in a city or region specific manner). But it cannot itself become a specialized AI provider to other ride-hailing companies, or to car manufacturers. Although it may supply data/insights/AI to upstream specialized AI providers, working in its own sector or others. (There may be a separate bar on a sectoral service provider like Uber employing its data/AI to expand into another sectoral service,[177] but our focus here is on vertical separation between AI development and sector-based AI application layers.)

Putting in such circuit-breakers against intelligence power consolidation will be key for a competitive, fair and just digital economy and society. Some may argue that such measures will reduce the overall AI potency and availability in the society. This may even be true to some extent (although an open, competitive ecology may actually be more productive of various forms of 'socially needed intelligence' than a closed on). Society has to make the required efficiency versus distribution trade-offs, much more so for such an extremely powerful and inherently centralising resource like AI and digital intelligence. Highly concentrated AI power is in any case unsustainable, and potentially destructive for all.[178]

In fact, in the presented model of separating AI development from its application, it is feared that specialized AI service providers may still become too powerful, and monopolistic, in owning everyone's intelligence; even if they are prevented from being able to directly apply such intelligence to various social-economic contexts and are obliged to

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176 Employed in telecommunication regulation, also called unbundled access. In telecommunication regulation, both the backhaul provider and local competitors can provide consumer services. But here we are proposing that the 'backhaul' AI provider is barred from offering consumers services due to the unique nature of how AI operates.

177 Using its expertise to manage drivers, Uber has expanded into on-demand staffing. Sawers, P. (2019, October 3). Uber's push into on-demand recruitment is a natural progression for the gig economy. *Venture Beat*. https://venturebeat.com/2019/10/03/ubers-push-into-on-demand-recruitment-is-a-natural-progression-for-the-gig-economy/

178 People as diverse as Late Stephan Hawking and Elon Musk have feared such annihilating destruction. Jones, R> (2014, December 2). Stephen Hawking warns artificial intelligence could end mankind. *BBC News*. https://www.bbc.com/news/technology-30290540; Kettley, S. (2019, November 14). Elon Musk's AI warning: Artificial Intelligence is a 'potential danger to the public'. *Express*. https://www.express.co.uk/news/science/1204119/Elon-Musk-AI-warning-Artificial-Intelligence-danger-Neuralink-Elon-Musk-latest

provide it instead to intermediary sectoral businesses.[179] To that extent, we may have to move to the model of co-owing of such specialized sector AI business through a third party trust by sectoral businesses on the ground (the hospitals example above). Or, to provide such sectoral (and general) AI through a public utility like arrangement, as was suggested by the CEO of OpenAI, but with an appropriate, context sensitive, public governance model, that takes into consideration all the complexities of AI provisioning.

How structural separations are actually sought, for digital intelligence and other layers, will depend on the context and need of the specific sector, and perhaps also on the nature (including size) of particular businesses. Some kinds of structural separations along with behavioural remedies may be preferred in one context, and others in a different one. It is also possible to design partial structural separations.

The idea is to have a socio-economic model where a society's digital intelligence is adequately distributed, in space and ownership. Such distributed digital intelligence can, however, be contextually joined-up and organized through suitable techno-economic means to address specific economic and social needs. The system has to ensure sufficiently high productivity, as well as fair distribution. Digital businesses have to be ordered within such a framework. The system will be designed to have adequate interface with regulators, and levers of intervention for them. This will ensure keeping it to the canons of public interest, as determined from time to time through democratic political processes at different places. This is an entirely different design for digital ecosystems than what exists today. (Although one can see considerable shades of it in the discussed European GAIA-X and the Indian NODE models of digital ecosystems.)

Market forces by themselves will not take the world towards such a distributed AI or digital intelligence model, with diffused digital power; rather the exact opposite.[180] Taking comfort simply from many key actors embracing openness in the lower layers of

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179 Their key disadvantage in this of course is of losing the data mining interface, which problem though effective data infrastructures can remedy for them to some extent. This shows the complexity of digital regulation, and ineffectiveness of tunnel-view measures.

180 A distributed AI and digital economy model also best addresses some wicked problems in non-economic areas. For instance only a federated social media architecture may be able to suitably address issues of freedom of expression, media concentration and political interference, escaping the tyranny of both state's overlordship and private censorship.

digital value chains, like net neutrality in the telecom layer, open source software, and open AI tools, is based on an inadequate understanding of the digital economy. Such openness in lower layers is actually useful for top-of-the-value-chain digital corporations, whereas seeking open access to their main resource of digital intelligence hits at the very heart of their digital power. Although currently opposed by major digital corporations, even open sharing of society's data will eventually be most beneficial to them once they establish a good enough worldwide lead in various kinds of AI. They will ravenously feed on data from all sources – closed and open (more data the better), to become ever more intelligent, powerful, and in control. The formidable advantage of their large AI lead, and the ever increasingly requirement of computing power for data/AI processing,[181] would be sufficient entry barriers for any new competitors, even if the latter had all the access to required data. On another count, edge computing, which is commended for its distributed data and computing architecture, may in fact substantially increase the extent of incursion by dominant digital corporations into our personal, work and social spaces.[182] All this testifies to the need for adopting a holistic view for effective regulation of digital economy, which can ensure mutual compatibility and reinforcement between different regulatory measures.

12. Separate regulator for digital economy

Being based on industrial economy perspectives, current economic governance and regulatory frameworks are unlikely to suffice for effective regulation of a digital economy. New analyses, concepts, legislations and regulations are needed, and also a new body devoted to understanding and regulating the digital economy.

Backgrounded against an analysis of what a digital economy is, how it functions, and how digital economic power gets concentrated, this paper described four main functional layers of a typical digital economy value chain. These pertain to (1) data

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181 Supra n 173
182 Miller, P. (2018, May 7). What is edge computing?. *The Verge.* https://www.theverge.com/circuitbreaker /2018/5/7/17327584/edge-computing-cloud-google-microsoft-apple-amazon

collection and provisioning, (2) cloud computing infrastructure for data processing, (3) development of digital intelligence, and its centralization or networking, and (4) application of such intelligence to socio-physical activities and actors in any sector. Checking concentration of digital economic power requires adequate openness and competition at every interface between these four layers. It is understood that, at times, vertical integration can have some efficiency benefits, and reducing integration would result in losing them. Firstly, such gains of integration may be short term and out-weighed by losses even of efficiency in the long term as digital competition, and thus possibly innovation, get foreclosed.[183] Second, digital intelligence contributes such hyper efficiencies that it may be reasonable to sacrifice some parts of them for the sake of mitigating major harms that digital power concentration is causing all around us, in economic, social, political and cultural terms. This is an important political decision for our societies to make.

The model developed in this paper of four key functional layers of a digital econ-omy can help shape appropriate political responses to undue digital domination. Some of these responses may be at a policy level, for instance, making public invest-ments in all these layers of important digital economy functions and activities, and helping develop domestic competencies in them. Openness in each layer can be improved by appropriate policies and programs; like supporting data and computing infrastructures, ensuring open standards and interoperability frameworks, and public provisioning of important or essential services in each layer.

This paper is more concerned about regulatory frameworks and measures. At the first level, behavioural remedies can be developed and enforced for fostering openness and competition in each of the four layers. Many current regulatory proposals and efforts discussed in this paper can be subsumed and reinterpreted in this four layers approach. Developing additional ones based on this framework will also be required.

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183 Stifling innovation by acquiring or killing start-ups is a pronounced feature of dominant digital corporations. American tech giants are making life tough for startups. (2018, June 2). *The Economist.* https://www.economist.com/business/2018/06/02/american-tech-giants-are-making-life-tough-for-startups

We remain of the opinion however that behavioural remedies may not suffice and regulators will have to move towards enforcing some kinds of structural separations along these four functional layers. Mandating data sharing, being contemplated in many places, is partly in the nature of a structural intervention since it modifies property regimes around the key resource of data. It can be interpreted in the four layers framework as structural separation of the data collection and provisioning layer from the higher layers. Different kinds of structural seperations across other layers must also be considered.

A new body is required, in our view, for effective digital economy regulation. It should be able to manage the relatively specialized tasks of gathering the needed knowledge about a digital economy, helping develop a new regulatory framework for it, and undertaking digital economy regulation. Appropriate institutional developments for regulating the digital economy are increasingly being recommended. Quoting the final report of University of Chicago's Stigler Committee on Digital Platforms:

> "The strongest indication emerging from the four (sub-)reports is the importance of having a single powerful regulator capable of overseeing all aspects of digital platforms. Digital platforms generate several concerns across different fields, all linked to the power of data. To address these concerns in a holistic way, there needs to be a single regulator able to impose open standards, to mandate portability of and accessibility to data, to monitor the use of dark patterns and the risks of addiction, and to complement the FTC and the DoJ in merger reviews. Countries like the UK are considering the set-up of a Digital Markets Unit. The United States and other nations should follow their example."[184]

A Digital Markets Unit for the UK is among the recommendations of the earlier referred UK's Digital Competition Expert Panel. This new Unit is to be "given a remit to use tools and frameworks that will support greater competition and consumer choice in digital markets, and backed by new powers in legislation to ensure they are effective".

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184 Stigler Committee on Digital Platforms. *Stigler Centre for the Study of the Economy and the State.* Final Report. (September 2019). University of Chicago. https://research.chicagobooth.edu/stigler/media/news/committee-on-digital-platforms-final-report

Legislation to enable the required new kinds of digital economy regulation is certainly needed. Many of the envisaged regulations in this area will not be possible to undertake under existing laws, rooted that they are in the industrial economy paradigm.[185] The earlier referred EU report on 'Competition policy for the digital era' also suggests, in context of data governance, the need for new legislation, regulatory regime, and regulatory mechanisms:

> "This, and the concomitant necessity to monitor, may be feasible when dealing with a setting in which (data) access requests are of a relatively standardized kind and where the conditions of access are relatively stable. Where this is not the case, a regulatory regime may be required. This may be true in particular where a dominant firm is required to grant access to continuous data, i.e. to ensure data interoperability. … A competition authority's oversight will not suffice in such a case."

> "… A good legal framework will take much of the pressure away from competition law."

In addition to cross-cutting regulation, like competition law, some sectors also get subject to sector-specific regulatory regimes. This happens for sectors considered to be of particular socio-economic importance – like transportation, telecommunication, health and education. The sector-specific regulation addresses a sector's peculiar public interest context and requirements. Though the digital sector is a cross-cutting one, it is also very special in the way digital power strongly impacts most economic, social, political and cultural activities. It is for the reason of such extra-ordinary socio-economic significance that the digital sector requires a sector-specific regulatory regime – with separate legislation and regulator.

Calls for new legislation and regulatory body currently come from analyses that have only considered platforms and data related issues in a digital economy. They have not yet gone into governance of society's digital intelligence. Recognition of latter's singular importance is, however, beginning to come about. In such a context,

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185 It is unclear for instance whether mandating of data sharing will be possible without laws defining economic rights around data.

new legislation[186] and a separate body for digital economy regulation become even more necessary.

For the proposed Digital Markets Unit, the UK Expert Panel suggests:

> "The role of the unit would have important links to functions and expert skills within the Competition and Markets Authority (CMA) and The Office of Communications (Ofcom). The unit could be an independent body linking to both, or it could be a function of either."

An independent digital economy regulator is preferable, linking suitably to the traditional competition regulator, on one side, and communication/IT regulators or departments, on the other. Both these sides undertake vital functions, and contribute important governance perspectives, that are required for regulating a digital economy. These agencies currently tend to operate in silos, addressing digital dominance in quite different and unconnected ways. One side focuses on market power, structures and bottlenecks in the new digital context, and employs sanctions and prohibitions against market players as required. The other side concerns itself with openness, interoperability, protocols for separating key technology function layers, open licensing for sharing software and building applications, and technology infrastructures like for computing, data, enabling digital services, etc. Market regulation is based on strong legal enforcement whereas technology governance has hitherto mostly depended on standards development, soft law, and practice. Combining these two approaches under a composite new framework for digital economy regulation will provide much synergy. It should be the first step towards an effective response to digital power concentration, and thus taming the Big Tech. This paper contributes some efforts in this direction.

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186 Due to the evolving nature of digital economy, such legislation can be in the form of a 'framework law'. The term 'framework law' refers to a legislative technique used to address cross-sectoral issues; framework legislation lays down general principles and obligations, and leaves it to implementing legislation and competent authorities to determine specific measures to be taken to realize such obligations. Guide on Legislating for the Right to Food. (2009). Food and Agricultural Organisation. http://www.fao.org/fileadmin/templates/righttofood/documents/RTF_publications/EN/1_toolbox_Guide_on_Legislating.pdf

Acknowledgements

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