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China's Digital Expansion in the Global South: Systematic Literature Review and Future Research Agenda

RICHARD HEEKS, ANGELICA V OSPINA,
CHRISTOPHER FOSTER, PING GAO, XIA
HAN, NICHOLAS JEPSON, SETH SCHINDLER
& QINGNA ZHOU

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Global Development Institute, SEED
University of Manchester, Arthur Lewis Building, Manchester, M13 9PL, UK
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**Richard Heeks¹, Angelica V Ospina¹, Christopher Foster¹, Ping Gao¹, Xia Han²,
Nicholas Jepson¹, Seth Schindler¹ & Qingna Zhou¹**

¹Global Development Institute, University of Manchester, UK

²Alliance Manchester Business School, University of Manchester, UK

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Abstract

At the intersection of China's growing global presence and growing digital power lies its digital expansion in the low- and middle-income countries of the global South. Worth billions of US\$ annually in trade and investment, and having a significant impact on these countries' social and economic development, this phenomenon has been relatively ignored by research to date. However, it has nonetheless now been sufficiently studied to warrant a systematic literature review, the results of which are reported in this paper. The paper has two aims: to identify what is already known about China's digital expansion in the global South and, from this, to outline a future research agenda.

After characterising the features, research design and perspectives within current literature, the paper overviews China's digital expansion. It outlines this expansion's synergies, tensions, strategies, design and implementation approaches, and evidence about development impact on global South countries. The paper explores two domain-specific issues arising in the literature: whether China is exporting "digital authoritarianism", and the implications of China's growing digital presence for digital governance at both global and national levels. The paper ends by laying out a six-part research agenda for future investigation of China's digital expansion in the global South: more Southern voices, updating the scope of research, moving beyond the "Team China" monolith, steering between Chinese exceptionalism and identicalism, evaluating development impact, and local agency in a "digital Cold War".

A. Introduction

China has been engaged in digital initiatives such as telecommunications projects in the low- and middle-income countries of the global South¹ since at least the 1980s (Luo 2019). The extent of this activity has increased significantly during the 21st century with, successively, digital components of the country's "Going Out" globalisation strategy from 1999, the "Belt and Road Initiative" (BRI) infrastructure investment strategy from 2013, and then the "Information Silk Road" which then became the "Digital Silk Road" component of BRI announced from 2015 onwards. In parallel, the remarkable growth of China's own digital economy – forming nine of the world's 20 largest Internet companies in 2022 (Clement 2022) – has partly driven, and to some extent been driven by, the overseas digital expansion of Chinese tech firms, including expansion in countries of the global South.

This expansion is increasing with, for example, ambitious plans to grow China's digital trade (Shen 2021), a greater shift towards digital in China's international cooperation strategy particularly in the wake of Covid-19 (Buckley 2020, Wang 2022), and with some reorientation in Chinese digital investment focus from global North to global South amid China's "turbulent relationships with the major advanced economies" (Tanjungco et al 2020: 6). Such growth arises because China's digital expansion is not just driven by economic considerations but is also a central plank of China's foreign policy and global political ambitions: it is thus important of itself but also as the increasing foundational component of China's whole approach to globalisation and international relations (Cheney 2019, Vila Seoane 2020). Some have therefore talked of China's "digital empire" and its strategies as "digital imperialism" (Chalk 2019, Keane & Yu 2019). Whatever the terminology, China is now a major force in the digital development of global South countries, with important implications for their digital economies, societies, policies, etc, and impacting critical dimensions of development including growth, inequality, sustainability, sovereignty and security.

Yet literature to date on China and its role in the global South has paid limited attention to the digital component of these growing interactions and there are calls for more research to be undertaken on this important issue given its significant development ramifications (see, among others, Shen 2018, Cheney 2019, Hernandez 2019, Ly 2020, Vila Seoane 2020, Erie & Streinz 2021). But what should the agenda be for this future research, based on what is already known? Despite the widespread agreement that the digital component of China's engagement with the global South has been overlooked relative to other dimensions, the literature is growing. The literature has now reached the point where it is sufficient to justify a systematic review in order to understand the current state of knowledge, and to identify gaps that would represent future research priorities.

In this paper, in seeking to achieve these twin aims, we first lay out the methods applied by this systematic literature review, and then present some general characteristics of the literature such as authorship, research design and perspective. The main contribution of the paper then follows. It outlines the different technologies and systems involved in China's

¹ Global South here refers to the low- and middle-income countries of Asia, Africa, Oceania, Central/South America and the Caribbean.

digital expansion. It analyses current understanding of a set of cross-cutting issues emerging from the literature and of importance to global South countries: synergies and tensions between different actors, strategies adopted by both state and business, approaches to design and implementation of digital systems, and the impact of China's digital expansion. In addition, it explicates two particularly contested issues affecting the relationship of global South countries to China and the West: whether China is exporting "digital authoritarianism", and the implications of China's growing digital presence for digital governance at both global and national levels. The paper ends by drawing out a six-part research agenda for future investigation of China's digital expansion in the global South; a research agenda of growing import given the increasing scale and scope of this phenomenon.

B. Methods

In order to perform the literature search, keyword searches were undertaken on Google Scholar, using 20 separate searches based around different combinations of terms extracted from literature known to be relevant including "digital silk road" and "information silk road", together with more general terms such as "China" "digital economy", or "China" "digital trade" in combination with geographic terms "Africa", "Asia" and "Latin America". The search was first conducted in June 2021 and then updated in August 2022 selecting, in each case, the ten most highly-cited items for each of the 20 searches. In total, this produced 219 English-language items. We also contacted 18 scholars whose work appeared among highly-cited items, asking them for recommendations of key literature to include, which led to 22 items. This total of 241 items was reduced to 216 on elimination of duplicates.

The 216 items were then subject to an initial multi-researcher triage with 129 items eliminated due to being insufficiently relevant to the topic or – in a small number of cases – inaccessible, which reduced the number to 87 which were read in full. This step led to 12 items being eliminated on grounds that they were not specifically relevant to China's digital expansion in the global South, with 75 items therefore being included in the full literature review. We do not claim that these 75 items represent the totality of all possible literature relating to the focal topic. However, given the search strategies and the ranking of Google Scholar items by citation, they will likely incorporate the more-influential literature in the field, and given the number of items included, they will likely be significantly representative of overall literature.

An analytical template was drafted based on three domains: the main theme of the paper, characteristics of the paper including authors and research design, and content of the paper including main findings. Initial analysis by the first and second authors was then undertaken for ten items using this template, as a result of which there was some further refinement. The finalised template was then applied the remaining 65 items by one author with cross-check of coding by a second author. The analysed components were then compiled into the findings below.

C. Characterising the Literature on China's Digital Expansion in the Global South

C1. General Features

The identified literature on China's digital expansion in the global South is all quite recent, with the earliest item being published in 2012 and roughly three quarters published in the three most-recent full years of the search, 2019-2021. Just over half of the items were journal articles², 20 were institutional publications with various labels (reports, briefings, working papers, etc), 11 were book chapters, and the remaining six were two books, two short papers, a dissertation and a conference paper.

The literature had a bi-modal distribution of author location with just over a quarter of first authors being US-based, a similar number being China-based, and the remainder drawn in small numbers from 20 different locations. As will be seen below, this bi-modality was also reflected to some extent in the perspectives expressed within the papers. There was a relative lack – 19% – of authors based in the global South. As an instance, there were as many first authors based in Australia as there were in the whole of Africa, and most of the latter were located in South Africa.

Four disciplines dominated, as judged by the department or online profile of the first author. These were international studies including international relations, area / regional studies, business and management particularly international business, and communications and media studies. There were notably few – just five – from development studies despite its overwhelming focus on issues of the global South; and none from information systems despite its overwhelming focus on digital technologies and systems.

C2. Research Design

In terms of the design of research within the literature surveyed, more than three-quarters of the sources used only secondary data. The minority (24%) using primary data split two-thirds:one-third between those including interviews and those undertaking text analysis. Empirical research has thus been a relative rarity. Of research based on text analysis, none of the sources was global South-specific, and the interview-based research was strongly skewed towards interviews with Chinese actors. In total, only eight of the 75 papers including primary evidence from global South sources, and only four drew the majority of their primary evidence from global South sources.

The great majority (more than 85%) of papers made no explicit use of any theory or even conceptual framework. Of the ten that did, the application in four was light touch, meaning that the theory was mentioned within the findings of the paper but it was not used as the basis for the analysis. Two of the other six papers created a basic economic model linking

² Of these, just over one quarter were in journals ranked in the first quartile by the Scimago ranking system; meaning less than 15% of papers in total were refereed in highest-quality journals.

the Internet to economic growth, and only four were in any way systematic in their application of a pre-existing theory or framework to shape the analysis and findings of the paper.

The geographic focus of research design was generally quite broad in scope. Half of the studies covered many dozens of countries; encompassing all countries involved in BRI, for example. Conversely, and consistent with the limited extent of empirical research, there were relatively few studies focused on individual countries. Put another way, there were so far no country-specific studies for the great majority of global South countries in which China is digitally engaged.

Turning to technological focus, about half of the literature was given over to general discussions covering all, or a significant spread, of the different technologies encompassed in China's digital expansion. Within this, the bulk of discussion was given over to the telecommunications infrastructure investments of the Digital Silk Road (DSR) programme. The remaining literature was split roughly evenly between items discussing infrastructure – particularly telecommunications infrastructure – and items discussing specific applications, most notably e-commerce and surveillance systems. Little specific attention was given so far to data other than in terms of data policy, and to emerging technologies such as 5G, internet of things, fintech, artificial intelligence and autonomous vehicles which have been innovation priorities within China for some years (Bu et al 2021). There was also a chronology here that reflects the history of Chinese digital engagement in the global South. Earlier literature focused largely on telecommunications infrastructure, and only latterly have papers expanded beyond this to analyse the impact of platforms and applications like e-commerce and surveillance³.

C3. General Perspective

Interpreting the perspective of a paper is a subjective process but this was undertaken on the basis of the descriptors attached to either China in general or to actions of the Chinese state or Chinese firms. Based on this, it can be argued that there are two contrasting clusters of literature: one Sino-philic, one Sino-phobic. One example of the former is a set of papers on the Digital Silk Road in *China International Studies*; a journal published under the sponsorship of China's Ministry of Foreign Affairs (Huang 2019, Luo 2019, Wang 2020). While analytical, these papers cast DSR in a solely positive light, summed up by one section heading, "China-Latin America Digital Silk Road: A Win-Win and All-Win Choice" (Luo 2019: 51). Others, too, ascribe positive characteristics and are largely uncritical of China and its digital expansion (e.g. Gong et al 2019, Li 2019, Teng 2020, Zhao 2020) being what Wen (2020: 148) describes as "celebratory accounts".

The Sino-philic cluster is particularly – though not solely – associated with China-based authors. Conversely, and particularly emerging from US think-tanks, are accounts that largely characterise DSR and related actions by the Chinese state as part of a geopolitical strategy to maximise Chinese power by fair means or foul, to spread authoritarianism and

³ As an example, the first paper mentioning platforms in its title was published in 2018.

undermine democracy, and to weaken US global power (e.g. Cheney 2019, Polyakova & Meserole 2019, Hemmings 2020, Hillman 2021a). As one example, DSR is described as being used by China “to increase geoeconomic competition and spread political illiberalism” including “the deceptive use of information for hostile purposes” such as “disinformation campaigns using big data” (Cheney 2019: 17-19).

While these two clusters did not form the majority of the literature analysed here, both of these one-sided positions may be influential in setting a narrative. One sees the positions reflected in the media (e.g. Ren 2019, Field & Smith 2021) and they may also interact with policy. Papers published in a Ministry of Foreign Affairs-sponsored journal could conceivably influence policy in China and, in the US, Senate reports have cited the think-tank authors and there are examples of the authors testifying before Congress (US Senate 2020, Hillman 2021b, Meserole 2022).

Whether at the two extremes in their views on China, or taking a more hybrid approach, the majority of the literature has been Sino-centric. That is, almost all papers focussed on Chinese tech firms and/or on the Chinese state to the relative exclusion of global South actors.

D. Overview of China's Digital Expansion

There can be a tendency to associate China's digital activities in the global South with the Belt and Road Initiative; specifically with the Digital Silk Road component of this which was discussed under other terminology from 2015 (PRC 2015) but first explicitly mentioned at the May 2017 Beijing Belt and Road Forum (Xi 2017) and with growing subsequent emphasis within BRI (Shen 2018, Triolo et al 2020). However, as noted in the Introduction, this phenomenon long pre-dates Belt and Road's 2013 launch. Cooperation between China and Brazil on development of an earth resources satellite dates from 1988 (Luo 2019), while Huawei's first foray into the African telecommunications market came in 1998 (Jiang et al 2016). Huawei and other Chinese ICT companies were supported as part of the "Going Out" internationalisation strategy from 1999 (Gagliardone & Geall 2014), and ICT projects and investments continue to occur outside the Belt and Road Initiative (Tang 2020). The situation is therefore summarised stylistically by Figure 1.

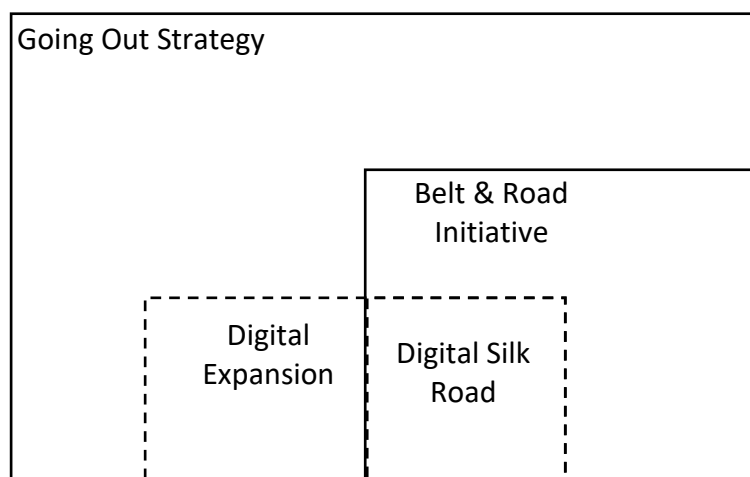


Figure 1: China's digital and global engagements with the global South

China's digital activity in the global South is sizeable, though figures vary widely and can be unclear if they represent actual or intended investments, and just state or state plus private investments. For example, in specific relation to the Digital Silk Road⁴, claims include: US\$200bn overall invested by 2018 (Deeks 2018), US\$17bn invested in projects completed by 2019 (Eder et al 2019), US\$70bn committed in Africa in 2019 (Garcia 2019), US\$8bn committed in Africa in 2021 (Chaudhury 2021). ICT broadly is the sector with the largest Chinese foreign direct investment with, for example, China's ICT investment in Latin America alone by 2017 said to be US\$38bn (Hernandez 2019, Luo 2019). These investments, alongside direct sales, have led to equally huge revenue generation for Chinese tech firms. Again, as an example, "In 2018, Huawei generated \$5.8 billion in revenue in Africa alone, 60 percent of which was through the sale of equipment and services and 40 percent through its phones" (Clemencot 2019). The importance of digital expansion to Chinese businesses varies across sectors: China's e-commerce giants make the great majority of their revenue in

⁴ Noting that Digital Silk Road investments are primarily but not exclusively focused on global South countries, with investments also in, for example, higher-income countries of Eastern Europe and the Middle East.

the Chinese market (albeit their vast size means their overseas operations are still sizeable) (Triolo et al 2020), whereas telecommunications firms Huawei and ZTE make the majority of their revenue overseas (Das 2017, Agbebi et al 2021).

The role of Chinese firms in the digital economies of global South countries has also increased rapidly. Looking at digital infrastructure projects specifically (see Figure 2's location map of major projects), firms such as Huawei and ZTE are dominant providers in a number of countries, with Huawei cited as "the foundation of Africa's telecom infrastructure" including 70% of the continent's 4G network (Djan & Owusu-Ansah 2020: 187; see also Ellis 2013, Wen 2020, van der Lugt 2021). Alongside this, state-owned firms such as China Telecom, China Unicom and China Mobile have typically taken key responsibility for growth in strategic international telecommunications links such as land-based and undersea cables (Shen 2018, Wang 2020).

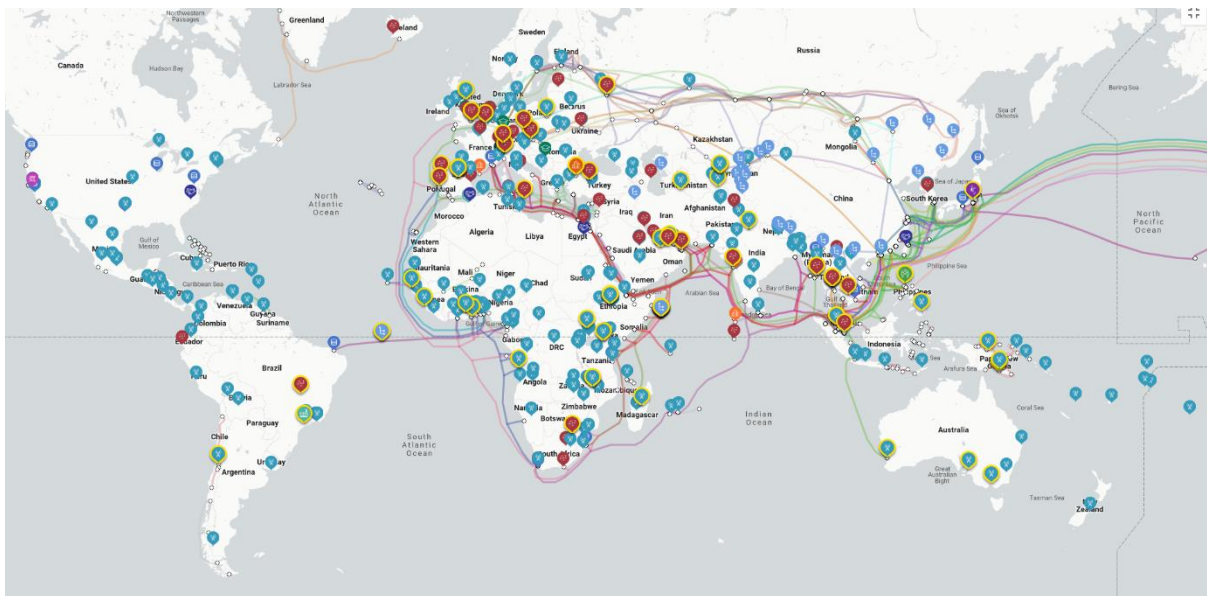


Figure 2: Chinese telecommunications infrastructure projects (ASPI 2023)

In all, Chinese firms and agencies have been involved in five main aspects of digital infrastructure (Shen 2018, Gong & Li 2019, He 2019, Shen 2020): international telecom infrastructure of "submarine, terrestrial, and satellite links" (Shen 2018); national telecom infrastructure such as 4G and 5G; retail digital devices such as modems and phones and tablets; data-oriented web services such as cloud, server and data centre infrastructure; and applications platforms such as e-commerce platforms, smart city (including surveillance) projects and information-and-communication-technology-for-development (ICT4D) systems. These infrastructural layers plus underpinning institutional and physical and human infrastructure (particularly governance which covers standards, laws, norms and policies, discussed separately below) are increasingly being understood as a package – a "Chinese technology stack" (see Figure 3) – that both benefits and requires the cooperation of multiple Chinese firms, and which creates cross-layer dependencies that raise barriers to competitors (Triolo et al 2020).

Application Platforms (e-Commerce, Smart City, Fintech, Social Media, ICT4D)
Web-Based Data Services (Cloud, Server, Data Centre Services)
Retail Digital Devices (Phones, Tablets, PCs, Modems)
National Telecom Infrastructure (3G, 4G, 5G)
International Telecom Infrastructure (Submarine, Terrestrial, Satellite Links)
Institutional, Physical and Human Infrastructure (Governance, Finance, Logistics, Capabilities)

Figure 3: The Chinese technology stack

The chronological shifts in literature noted above reflect a real historical progression in relation to the technology stack. The main focus of China's digital activity during the 1990s and 2000s was telecom infrastructure and then phones, with web services and applications platforms starting to emerge only during the later years of the 2010s (Hernandez 2019, Keane & Yu 2019, van der Lugt 2021). e-Commerce has been a particular concentration of the more-recent activity with one early example, Alibaba's investments in the India-based mobile-payment platform, Paytm, dating from mid-2015 (Gong & Li 2019).

This epitomises two at-least-initial aspects of China's digital economy applications platform expansion that differ from the approach used for digital infrastructure (Das 2017, Naughton 2020, Tang 2020, Triolo et al 2020, Tritto et al 2020, Zhou & Xue 2020, Keane et al 2021, Yang 2022). Expansion has been marked by leading private companies investing in existing players (presumably with the approval of state actors) – Daraz in Pakistan; Ascend Money in Thailand; Flipkart in India; Lazada, Tokopedia, Gojek and Grab across South-East Asia; multiple small fintech platforms in Indonesia – rather than direct expansion. And, as the examples illustrate, there has been a focus on South-East and South Asia more than other locations: by comparison, as shown in Figure 2, digital infrastructure projects have focussed in part on South-East Asia but also on China's borderlands and on Africa's coastal states. This has run in parallel with national and global institutional developments. e-Commerce figured more prominently in the 13th Five-Year Plan, which ran from 2016; within China's overall digital globalisation plans, including Digital Silk Road; and in its 2016 submission to the World Trade Organisation seeking to improve e-commerce for physical goods (Gao 2018, Huang 2019, Majcherczyk & Shuqiang 2019, Wang 2020).

In a pattern seen in a number of more-recent digital initiatives, China's e-commerce expansion has often sought to follow the package approach noted above, for example delivering a full e-commerce stack sufficient to create a "digital common market" (Naughton 2020). This has its technical elements – telecom infrastructure and platforms – but also

financial and institutional components. For example, while not always welcomed by global South governments, the Chinese state and leading digital firms have been keen to promote Chinese currency and financial infrastructure as the basis for cross-border transactions (Shen 2018, Hemmings 2020). Global South countries have been encouraged to join the Cross-Border Inter-Bank Payment System (CIPS), which was set up in 2015 to be an alternative to the West-based SWIFT. e-Commerce platforms from Chinese firms always offer the potential for payments in yuan.⁵

At the maximum, are attempts at what one might call an “ecosystem in a box” approach – multi-dimensional interventions that seek to develop e-commerce in global South countries by simultaneously overcoming barriers of technological, physical, human, financial and institutional infrastructure (Huang 2019, Luo 2019, Majcherczyk & Shuqiang 2019, Wang 2020). This is typified by Alibaba’s Electronic World Trade Platform (eWTP). As well as being a lobbying initiative with a strong development rhetoric of helping small enterprise, eWTP is a trade facilitation initiative based on the company’s own e-commerce platform but then building around that: physical transportation and logistics hubs, digital payment systems such as Alipay, digital and commercial training and advice for local entrepreneurs, and new digitised procedures and rules and norms for e-commerce-based trade (Yean 2018, Hernandez 2019, Huang 2019, Triolo et al 2020, Wang 2020, Johnston 2021). Global South eWTP hubs were first set up in Malaysia’s Digital Free Trade Zone in 2017 – with digital elements implemented particularly by Alibaba subsidiaries Cainiao (logistics) and Lazada (e-commerce) – and then in Rwanda and Ethiopia in succeeding years (Das 2017, Naughton 2020, Johnston 2021).

Of the other digital technologies shown in Figure 3, current literature only covers four in even limited detail: mobiles, use of satellite data, smart cities and social media. Chinese mobile phone brands Xiaomi, Huawei, Oppo, Vivo and Realme (the latter three all owned by BBK Electronics) occupy the third to seventh positions in the worldwide mobile phone market, and along with Transsion brands such as Tecno, Infinix and Itel have roughly half the market in Africa (StatCounter 2023). They have been able to win this market share through low price, customisation of phones to fit local market needs, and in a few cases by opening local assembly plants – for example, that of Transsion in Ethiopia, Huawei in Mexico or ZTE in Brazil – in order to comply with local regulatory requirements (Ellis 2013, Micheli & Carrillo 2016, Hernandez 2019, Djan & Owusu-Ansah 2020).

Cutting across the tech stack, some literature discusses what is sometimes called the “Digital Belt and Road” programme (Jia 2017, Guo 2018, Guo et al 2018) and sometimes the “Big Earth Data Science Plan” (Kassenova & Duprey 2021). Part of a more general category of “digital science” – use of digital technologies to foster greater scientific collaboration between China and global South nations – this refers to international scientific cooperation initiatives to share earth observation data, chiefly supplied by Chinese satellites but also linking to data from international organisations, among a group of countries and particularly those involved in the Belt and Road Initiative. While the initiatives have a relatively broad focus in seeking to use this data for achievement of the SDGs, there is a concentration on

⁵ More nascent is the Digital Currency Electronic Payment (DCEP) system, based around a digital version of China’s own currency, which is currently being rolled out only within China.

delivering environmental sustainability for the global South countries involved. The small handful of papers discussing this are speculative; that is, reporting foreseen goals, success factors and obstacles rather than actual development impacts.

Two application types receive some discussion; one being smart cities. Huawei and ZTE have more than 350 smart city projects in more than 60 countries, with examples such as Manila Bay (Philippines) and Lahore (Pakistan) and Bentong (Malaysia) (Hernandez 2019, Hemmings 2020, Erie & Streinz 2021), with Alibaba's City Brain initiative also present in Malaysia (Naughton 2020). These are starting to include e-government systems to improve public service delivery (Naughton 2020, Shen 2020) but to date these projects are mainly marketed and discussed as "safe cities" in relation to surveillance; an issue picked up separately below.

The other application area is social media and messaging; an element of overall expansion that especially gains attention from media and communications studies scholars (Keane & Wu 2018, Keane et al 2021). Tencent has been active in this domain, pushing WeChat as a messaging app particularly in South-East Asia though with relatively limited success to date here, and even less so in other global South markets (Triolo et al 2020). TikTok has been more widely adopted, with particular success in India, at least until the 2020 ban following Indo-Chinese border clashes (Keane et al 2021). Given the much greater adoption of these social media (as compared with Western services) by Chinese users, they provide a potential channel for learning and interaction between Chinese and global South users (Li 2016), as well as a channel through which Chinese users based in the global South seek to make sense of and share their experiences (Lu & Van Staden 2013).

Gaining even less research attention, the Chinese state and companies have also been active in development of human infrastructure, with actions ranging from donations of computers to schools, through scholarships for students to study digital-related topics in China and specific training programmes such as training for technicians to operate and maintain Chinese systems, to investments in local R&D centres (Gong & Li 2019, Huang 2019, Luo 2019, Wang 2020, Zhou & Xue 2020).

In all, the literature to date appears to be a partial reflection of the realities and trends of China's digital expansion in the global South. This means, as discussed in the final section of this paper, that there are lacunae that new research can usefully fill. Next, though, we review a number of issues that emerge within the literature reflecting commonalities across different types of digital activity.

E. Cross-Cutting Issues

E1. Synergies and Tensions

One Western stereotype of China's activities in the global South is of "Team China" in which all Chinese actors – whether state, business or other – act in concert with a unified aim of advancing Chinese development and interests (Triolo et al 2020, van der Lugt 2021). There is certainly evidence for joined-up activity.

First, between the Chinese state and Chinese tech firms. One aspect of this is finance, with Chinese government grants and state banking institution loans or lines of credit being used by global South actors – typically national governments – to purchase goods and services from Chinese ICT companies (Tugendhat & Voo 2021). The sums are huge: by one estimate, state banks provided US\$100bn of financing up to 2019 to support overseas expansion of Huawei alone (Hemmings 2020). Large specific examples include loans in 2006 and 2011 to Ethiopia totalling US\$3.5bn, and in 2015 to India totalling US\$2.5bn, all of which were used to pay for telecom infrastructure from Huawei and ZTE (Gagliardone & Geall 2014, Lele & Roy 2019). These may not come with the neoliberal or social policy conditionalities of Western loans but they invariably come with the contractual conditionality that the money must be spent via Chinese contractors (Makundi et al 2016, Erie & Streinz 2021).

While Chinese firms are generally happy to take on these contracts, sometimes the state has adopted "a combination of politics and business to encourage Chinese capital to participate" (Shen 2020: 44), leading Chinese tech firms to participate in state-initiated projects in the global South in order to increase their chances of obtaining direct contracts from the state within China, and to obtain state support for other overseas ventures (Shen 2018). This highlights the second main connection between Chinese tech firms and the state, which is political. This relation is direct and overt in the case of state-owned enterprises such as China Mobile, China Unicom, and China Telecom. For others, "while Chinese corporations are not inherently instrumentalities of the Chinese state, they are still embedded within the party-state's systems of control" (Erie & Streinz 2021: 55). This is assisted by opaque ownership structures in the case of two key firms (Huawei, ZTE) that can allow for a measure of party control. That control is also exercised via the CCP cells within all companies, via legal requirements for data access, and via less formal mechanisms of pressure and inducement. As Kelly (2018) notes, these are not so much "private" but rather "less state" than state-owned enterprises (see also Tugendhat & Voo 2021).

There is also evidence for cooperation between Chinese companies, with state oversight. In formal terms, Chinese tech firms cooperate in funded projects; for example, Huawei and ZTE were both part of the US\$1.6bn 3G infrastructure project in Ethiopia (Wen 2020), while Huawei and Hikvision provided complementary elements for a public security system in Brazil (Reis et al 2021). Alongside this more formal and strategic collaboration, there has also been knowledge sharing. In Tanzania, the Chinese government encouraged more experienced firms to share knowledge with those which less experience; both technical expertise but also more informal "guidance on how to deal with local immigration, customs, taxation procedures and local labour laws as well as inter-cultural skills" (Makundi et al

2016: 137). Looking more broadly, digital investments are used to facilitate non-digital investments; for instance, Alibaba's investment in cloud infrastructure in BRI countries "has served the purpose of 'paving the road and building the bridge' ... for other Chinese companies in their overseas operations" (Shen 2018: 2689; see also Lele & Roy 2019). Mirroring this, investments in physical e.g. transport infrastructure in BRI countries have been undertaken to enable movement of goods traded via Chinese e-commerce platforms (Das 2017).

On the other hand, there is some limited evidence of tensions between Chinese digital actors. This may be between companies, especially seen between Huawei and ZTE (Lin 2020), such as the public complaint by ZTE after Huawei won a data services contract in Ecuador despite ZTE being the lowest-cost bidder (Ellis 2013), or Huawei taking over contracts from ZTE in Africa including part of the Ethiopia 3G project (Wen 2020). Or it may be between state and business interests with geopolitical goals unable to completely override economic imperatives (Shen 2020, Wang et al 2020). Shen (*ibid.*) instances this in the case of the Gilgit-Baltistan region of Pakistan. The Chinese state's desire for digital investments here stemmed from the region's adjacency to the politically-sensitive province of Xinjiang, but progress of digital projects stalled because the small, unstable local market did not justify the prioritisation of these projects by China's tech firms. In general, though, evidence for these tensions and others – for example, between national and international digital policy with restrictions within the former hampering the latter, or between different agencies of the Chinese state⁶ – remains largely "speculative" (Shen 2018, Shen 2021).

E2. Strategy

Chinese State Strategy

Publicity for bilateral and multilateral Digital Silk Road initiatives always emphasises the mutual benefits for both China and the recipient countries (e.g. Huang 2019, Luo 2019) and that this "South-South cooperation" is doing development differently (Wen 2020). However, analysis of DSR-related policies and pronouncements within China – i.e. not intended for external consumption – finds little discourse relating to benefits for global South countries (Shen 2018). Deriving from this, there is literature that thus argues the rationale for DSR is: to deal with domestic over-capacity in production of digital goods; to help Chinese firms (digital and other) to expand overseas particularly into new markets and in competition with US firms; to assist internationalisation of the renminbi; to provide a regional and then ultimately international digital ecosystem controlled by China not the US; to promote internet-enabled inclusive globalisation (a rather diffuse notion that could be related to greater inclusion of lower-income nations in globalisation-based development); and more broadly to develop a positive image and political capital for China (Das 2017, Shen 2018, He 2019, Hernandez 2019, Buckley 2020, Triolo et al 2020).

⁶ For the Digital Silk Road, these agencies include: the BRI lead agency, the National Development and Reform Commission; the lead digital governance agency, the Cyberspace Administration of China; and key BRI actors, the Ministries of Science and Technology, and of Industry and Information Technology plus finance-related agencies such as the Ministry of Commerce, Ministry of Finance, Export-Import Bank and China Development Bank (Triolo et al 2020, Wang et al 2020, Tugendhat & Voo 2021). This dispersed responsibility creates the potential for tensions, fragmentation and even incoherence that some have characterised within the wider Belt and Road Initiative (Jones & Zeng 2019).

As one instance, specific analysis of China's ICT-related aid flows to Africa finds that these go to almost every country on the continent but are not correlated with size of the local telecom market; instead going particularly to smaller and poorer countries and to resource-rich countries (Wang et al 2020). The explanation is that Chinese tech firms – at least the major players like Huawei and ZTE – need little help or guidance to themselves invest in large global South markets. In these markets, the existence of Digital Silk Road facilitates but does not determine investment decisions (Vila Seoane 2020). In other markets, though, state-funded projects have been the “entry ticket” through which tech firms then obtain a cascade of further local contracts (Makundi et al 2016). However, ICT aid such as DSR has not just been about opening up new digital markets, it is also linked to a transactional strategy in which funding has been used to build political links and support for China, particularly in countries with primary resources.

Notwithstanding the rhetoric of cooperation, this is largely a “tied aid”/“tied finance” approach (Gagliardone & Geall 2014, Malena 2021). Funding flows from China are used to implement ICT projects by Chinese tech firms and, at least based on the literature reviewed, the idea of helping develop local ICT firms or purchasing from non-Chinese sources is not notable (Luo 2019, Wen 2020, Wang et al 2020). Claims of doing digital development differently to the West – “In contrast to the West, which rather stresses the commercial and enterprise-led side of development, China has been seeking a path that respects the national conditions and autonomy of African countries” (Huang 2019: 19) – may thus not at first sight appear correct. These elements of China's digital development strategy – primacy of domestic economic and political objectives and tied financing, plus others discussed below including asymmetrical trade, limited technology transfer, and retention of higher value-added elements of value chains – are familiar tropes from the West's approach to international development; particularly from the era of modernisation but stretching well beyond that.

Having said this, even if not doing things particularly differently in terms of strategic purpose and methods, China is perceived as providing an alternative to the West. In financial terms, Western development programmes are seen as having “pulled out of infrastructure long ago, and started financing social [*development*] stuff instead” (Hellowell & Wakdok 2021: 51) including relatively limited emphasis on telecom infrastructure (Wang et al 2020). China's approach is thus helping to address developmental priorities of global South governments, particularly the specific favoured plans of heads of state (Triolo et al 2020). In perceptual terms, the Chinese narrative of “mutual benefit” is seen as “more reliable and ... less insulting” than that of the West, given local politicians “like seeing their economies treated as business opportunities rather than places to run randomised trials for foreign aid” (Hellowell & Wakdok 2021: 50, The Economist 2022; see also Wen 2020). At a geo-political level, some countries, such as the socialist regimes of Latin America, have willingly turned to China as an alternative to reliance on US digital infrastructure providers (Wen 2020, Vila Seoane 2021).

That willingness is also an indicator that global South governments should not be cast as powerless dupes (van der Lugt 2021), with a few papers maintaining that decisions around Chinese digital development projects should be seen as more pull than push: driven more by

recipient governments than by the Chinese state (Gagliardone 2020, Malena 2021, Neilson 2022). Additionally, while the process of discussions remains highly centralised to a very small group of high-level actors (Gong & Li 2019), in terms of content, there have been one or two recent signs of willingness of Chinese actors to consider more sourcing of local labour, technology transfer and local data storage which may if realised get a bit closer to a reality of mutual benefits (Carrillo & Micheli 2020, Triolo et al 2020). Such benefits, though, seem only likely to materialise if driven by specific policies of recipient governments: where they are absent, Chinese firms have fewer incentives to localise beyond the minimum necessary to serve local clients.

Chinese Business Strategy

The drivers to global expansion of Chinese tech firms reiterate the points just made: the pull of opportunity for profit, the push of competition and saturation in the Chinese domestic market, alongside the encouragement and facilitation of government initiatives and policies (Lin 2020, Naughton 2020). In some instances, such as fintech, a further driver has been growing regulation of the Chinese market leading to migration of Chinese entrepreneurs to the digital “Wild West” of less-regulated global South locations (Tritto et al 2020).

A whole spectrum of positions within the literature offers explanations for the ability of Chinese tech firms to grow market share in the global South that range from the straight illegality of collusion and corruption and theft of sensitive data, via use of state financing at below-market rates and sales of outdated surplus products, through to providing products that are cheaper and more suited to global South markets, and to which competitors, particularly from the US, have paid insufficient attention (Ellis 2013, Gagliardone & Geall 2014, Djan & Owusu-Ansah 2020, Wen 2020, Erie & Streinz 2021). It is argued that Chinese tech firms are similar to Western counterparts in their capitalist business models but different in their strategic aims that, alongside profits, are politicised and nationalistic in seeking to help the Chinese state build its “political and economic influence” in the global South (Wen 2020: 164). But the difference to Western firms may be overstated given, as one instance, the very tight historical links between economic interests of US multinationals and political interests of US state agencies in Latin America from the late 19th century onwards (Livingstone 2009).

Analysis of international business strategies looks at Huawei particularly and to a lesser degree, ZTE and Alibaba. In Latin America, Huawei and ZTE adopted a “start-small” entry strategy that then progressed via development of local production and R&D facilities (Ellis 2013, Micheli & Carrillo 2016). That pattern has also been followed more broadly across the global South, where these two firms have built on capabilities generated in the Chinese domestic market and focused first on smaller or less-developed overseas markets with relatively lower entry barriers before then moving to more competitive markets (Sun 2009 cited in Djan & Owusu-Ansah 2020, Micheli & Carrillo 2016, Wen 2020).

There are differences though between the state-aligned Huawei and the state-controlled ZTE: the latter brings prior state support and funding to its negotiations, focuses largely on government clients, and is tied more closely to the Chinese state’s foreign policy priorities (Wen 2020). As noted above, the extent of state involvement in Huawei remains strong and a clearer contrast is made with Alibaba’s relatively greater freedom from state control. For

example, while Alibaba has undoubtedly benefitted domestically from state support, its internationalisation strategies seem to have been somewhat more driven by its own global priorities and/or by demand-pull from host country governments than is the case with Huawei (Lin 2020, Naughton 2020, Neilson 2022). The state clampdown on Chinese big tech – Alibaba particularly – from late 2020 may change this but had not yet appeared in the research reviewed here.

E3. Design and Implementation

With a tendency to focus on broad-brush issues and a dominance of social science disciplines that encompass more strategic and geo-political perspectives, there was relatively little focus within the literature on design and implementation of the Chinese technologies that are being diffused into the global South. For instance, there is no clear evidence on whether Chinese tech firms design and implement differently to those of other countries, or on the proportion of products and projects that run into difficulties.

Positive arguments include the one noted above that Chinese firms may be better at designing for global South markets. One strand argues these firms can transfer products and knowledge from serving lower-income (e.g. rural) markets in China, as Huawei did in its early days (Djan & Owusu-Ansah 2020, Wen 2020). Another strand argues for Chinese firms' ability to customise for local markets, though the only example given in the literature related to Chinese phones designed for the African market where, for example, Transsion's various brands, "include features that cater to the needs of local people including multiple SIM slots, long battery life, FM radio, anti-oil fingerprint (to withstand bad weather), camera exposures calibrated to darker skin tones, and ... run in local languages such as Amharic and Swahili" (Hernandez 2019: 22).

On the other hand, there have been reports of implementation problems with Chinese digital projects including: the Bolivian government fining Huawei US\$8m in 2010 for non-completion of a telecom infrastructure project (Ellis 2013); Huawei being fined in Costa Rica for collusion during bidding for a national 3G upgrade contract (Ellis 2013); Huawei and ZTE "ending up providing very poor-quality services that built a bad reputation for themselves" in Ethiopia (Gagliardone & Geall 2014, van der Lugt 2021); the China Unicom China-Myanmar international terrestrial cable launched in 2014 but not activated as of 2019 (Chan & Rawat 2019); the planned BRICS cable which "has not been successfully implemented" (Shen 2018: 2691); and the failure of some Baidu search products in Brazil, Egypt and Thailand (Keane et al 2021).

In terms of approaches to implementation, there have been indications of mismatch between Chinese management practices and local norms and expectations (Neilson 2022), and one instance of Chinese actors taking a techno-centric and top-down approach that involved little beneficiary participation (Hernandez 2019). This would, for example, diverge significantly from the Principles for Digital Development created to guide good practice on digital projects in the global South; a divergence that could explain some of the implementation failures (Heeks 2018). However, the evidenced implementation problems

relate almost entirely only to telecom projects, and these have to be set alongside the many Chinese digital projects that are functioning as intended.

At the more strategic level of implementation, there is a perception among those in some global South countries that Chinese digital firms adhere less closely to the law than Western counterparts (Erie & Streinz 2021); a finding that ties in with the wider estimate that, within BRI projects overall, more than one-third have encountered “major implementation problems—such as corruption scandals, labor violations, environmental hazards, and public protests” (Malik et al 2021: 1). However, the prevalence and impact of these latter issues within digital projects is not known, nor how this compares with the implementation strategies of digital actors from other countries.

E4. Impact

Despite reports of problems, there has been widespread implementation of Chinese digital systems in the global South, and a final cross-cutting issue in some of the literature has been the impact of this activity. As noted above, China’s digital expansion has brought economic benefits for Chinese digital companies, as demonstrated in their earnings from global South markets but also in the knowledge and innovations derived from this engagement (Layton 2020). There are political benefits for the Chinese state though these tend to be assumed or asserted rather than directly evidenced (Shen 2018, Wang et al 2020).

Turning to the nations of the global South, it should be at the core of the intended local impact but there is virtually no specific evidence as yet about the positive local economic impact of Digital Silk Road and other Chinese ICT investment. This, despite the huge size of these investments and the broader evidence of the positive socio-economic impact of both ICT infrastructure and overlying digital systems (Heeks 2018). Instead, literature talks in generalised terms about China’s investments having helped address digital infrastructural deficits and helped enhance the digitalisation of local economies, or it gives very specific vignettes typically derived from news outlets (Das 2017, Gong & Li 2019, Luo 2019, Djan & Owusu-Ansah 2020, Wen 2020). In one of the few cases where more detailed analysis has been undertaken – of the China Telecom/Huawei-installed national ICT backbone in Tanzania – there was a mixed picture (Pazi & Chatwin 2014, Makundi et al 2016). The backbone had enabled significant roll-out of e-banking, e-education and e-government applications in the Tanzanian public sector. However, it was also heavily underutilised, leading to problems for the government in recouping its investment; a problem blamed on the government for pricing and policy constraints, and on the Chinese contractors for lack of local capacity building which “resulted in inadequate local operation and management of the infrastructure” (Agbebi et al 2021: 9). Credible evidence of broader impacts of China’s digital activity in the global South – employment creation, technology transfer and local value-addition, local capability-building, and externalities such as price/quality improvements in local and Western competitors – is rarely found and, where provided, points so far to any benefits being at a level well below potential (Makundi et al 2016, Carrillo & Micheli 2020, Rwehumbiza 2021).

Rather more has been written about negative impacts but the word “concerns” encapsulates the fact that these are often speculative worries rather than evidence-based. Two issues are technical constraints more than disbenefits: concerns about interoperability of Chinese digital systems with those from other countries which are already installed or in future could be, and sustainability in terms of ongoing maintenance and resilience of equipment (Djan & Owusu-Ansah 2020). The more disbenefit-related concerns relate to security, dependency, inequality and environmental impact.

Discussion of cybersecurity includes issues of data sovereignty and surveillance by Chinese actors (Ellis 2013, Das 2017, Cheney 2019, He 2019, Djan & Owusu-Ansah 2020, Hemmings 2020, Shen 2020). Large datasets can be gathered about local populations with claims that they are being illicitly transferred to China though also with claims that weak local regulation means there is nothing illicit about such transfer (Erie & Streinz 2021, Kassenova & Duprey 2021). Perhaps best known was Huawei’s provision of the digital infrastructure for the African Union (AU) headquarters in Addis Ababa and it then being found that server contents were transferred to Shanghai every day for five years (Shahbaz 2018). Although the implications for global South countries are yet to be really explored, the key concern is access to such data by the Chinese state. This arises in a general sense from an issue discussed above: the perceived close relationship between Chinese tech firms and the Chinese state or, at least, the extent of influence and control exercised by the state over Chinese firms. More specifically, this arises from China’s National Intelligence Law that requires ICT companies to support the state in matters of intelligence, and which could enable Chinese authorities to access and use these datasets (Kassenova & Duprey 2021, Malena 2021, Peterson & Hoffman 2022).⁷

The extent to which concerns about data security are widespread in the global South, though, is questionable (Malena 2021). The AU case, for example, seems to have aroused much more interest in the global North than within Africa where the AU soon after signed new and expanded partnership agreements with Huawei (Triolo et al 2020). More generally, US warnings about Huawei have been largely ignored in the global South (Zhang et al 2020). Perhaps more salient is the potential for Chinese state access to data to feed into the wider issue of the projection of “sharp power” – “manipulation of ideas, political perceptions and electoral processes” in order to further China’s political interests (Nye 2018). This and even-sharper practices of cyber-espionage have characterised claimed activities including: use of Chinese-installed safe city projects to track those in neighbouring countries such as Pakistan identified as terrorists by the Chinese government (Shen 2020); use of hacking and online misinformation to interfere in global South elections to favour pro-Beijing candidates (Kliman 2019); and gathering intelligence on Asian geopolitical rivals (Insikt Group 2021).

Related to the security issue, China’s digital expansion has been cast as a form of “digital colonization” (Shen 2020: 25) or “data colonialism” (Lele & Roy 2019: 49) in which China controls critical digital infrastructure and digital systems and data flows and hence the foundations of countries’ digital economies and broader digital society (Ellis 2013, Das 2017,

⁷ It is argued that this could face Chinese tech firms with a “deep versus broad” challenge: the deeper their relation to the Chinese state either out of self-interest or necessity, the greater the jeopardy to breadth of their international expansion (Liu 2021).

Djan & Owusu-Ansah 2020, Gravett 2020, Kassenova & Duprey 2021). Global South countries are seen to therefore be technologically dependent on China for these key underpinnings of economic and social development, and to have enabled the Chinese state to use these as points of leverage or even vulnerability. These countries may also be moving into relations of financial dependency. While debt relating specifically to digital infrastructure was not discussed in the literature, China's international development finance overall runs at a "31-to-1 ratio of loans to grants ... priced at relatively high interest rates" and directed primarily at "state-owned companies, state-owned banks, special purpose vehicles, joint ventures, and private sector institutions" who have debts – largely under-reported – of hundreds of billions of US dollars (Malik et al 2021: 1). Accumulation and servicing of this debt represents a leverage point for China over these global South entities.

Also echoing the notion that China's digital expansion represents a form of economic and political colonialism (Gravett 2020, Shen 2020) are concerns that it is fostering inequality between and within countries. e-Commerce may be something of an exception but, as noted above, in relation to Digital Silk Road and related digital infrastructure projects, it is Chinese firms who implement digital investments rather than these being used as the basis to help develop local companies (e.g. Luo 2019, Wang 2020). Where local partnerships and joint ventures are involved, literature so far gives the sense that these are seen by Chinese actors as a necessary evil – e.g. to fit with local sourcing or financial regulations – with local value-addition and capacity-building being kept to a minimum (Ellis 2013, Makundi et al 2016, Carrillo & Micheli 2020). The track record has been relatively poor on moving local staff into higher-level managerial or technical roles or on transferring technology and know-how to local firms (Makundi et al 2016). So-called "R&D centres" are small and focus mainly on adapting Chinese software to local requirements, while 90% by value of components in assembly operations are from China (Micheli & Carrillo 2016, Carrillo & Micheli 2020).

Where data is captured from local consumers or citizens, it is the Chinese firms who extract the value from this rather than local data sources: a data mining seen as akin to colonial and neo-colonial mining of physical resources (Gravett 2020, Vila Seoane 2020). Similarly, Chinese e-commerce platforms focus largely on exports from China (Ambalov & Heim 2020, Wang 2020). At most, if there is a more general increase in trade, this is an asymmetrical model seen as increasing trade in primary products from the global South countries to China and manufactured goods moving in the opposite direction (Gagliardone & Geall 2014, Wang 2020). If primary products are successfully exported, then Chinese platforms often not only control sales and delivery in China but also take over the upstream in-country and cross-border supply chain, meaning limited value retention within the producer country (Yang 2022). Even where, as in the eWTP initiatives, there are concerted efforts to overcome local barriers to export, the very low level of export and digital capacities of local enterprises, the existence of non-tariff barriers, and asymmetrical import taxes mean imports from China to the country will probably exceed exports from the country (Hernandez 2019). There are thus fears that e-commerce platforms are a "Trojan Horse" for Chinese exports that enable Chinese exporters to drive local competitors out of business, enable Chinese e-commerce platforms to dominate local markets, and fail to enable a significant increase in export value-addition from the global South (Gao 2018, Yean 2018, Hemmings 2020, Neilson 2022).

All of this – lack of development of the local digital economy, data extractivism, and growth in trade asymmetries – can therefore increase economic inequality between China and the recipient countries. As already noted, Chinese-led digital globalisation has been promoted as an alternative to US-led neoliberal globalisation; particularly sold as “inclusive globalisation” that will reduce inequalities and be more recipient-centric than the approach of Western nations (Shen 2018, Hernandez 2019, Neilson 2022). The evidence presented here suggests differences to Western models are questionable. Analysis of Alibaba / eWTP discourse, for example, shows it to promote a business-led, free-trade, small-state approach to development entirely congruent with the tenets of neoliberal globalisation (Vila Seoane 2020). In a “meet the new boss, same as the old boss” scenario, Western digital oligopolies and monopolies and dependencies may simply be replaced by Chinese equivalents, and benefits may flow far more to their country rather than the global South country (Vila Seoane 2020).

There may also be an increase in within-country inequalities. For example, Chinese e-commerce is likely to see a rise in inequality between the relatively few more-capable local enterprises that can make use of China’s digitally-enabled trade, and the majority of local enterprises that cannot; and between those relatively-excluded groups that Chinese inclusivity favours (young people, women) and those which it does not (“ethnic minorities, indigenous communities, the LGBT community, and older people”) (Vila Seoane 2020: 78). BRI more broadly is seen to have sometimes increased inequalities within recipient countries in part because it is negotiated only with local elites, to whom financial and political gains will flow, raising inequalities between them and non-elite groups in the country (Shen 2020). Direct evidence of this in relation to digital is not yet present but DSR is a state-centric model that makes little direct attempt to bring the benefits of digitalisation to other stakeholders such as the private sector, let alone civil society (Gagliardone 2020).

Lastly in relation to concerns, China’s digital expansion is seen to impact environmental sustainability through its carbon footprint and e-waste. In general terms, digital expansion of any kind is directly associated with growing pollution and with other indirect effects (Heeks 2018). For instance, growth in e-commerce will create a larger production- and transportation-related carbon footprint, and an increase in the waste and hazardous chemicals associated with packaging (Hernandez 2019). However, this is true generally of digital rather than being a particular feature of Chinese firms. China’s ICT companies are reported as relatively poor or low-transparency performers in environmental terms but no direct research was found on this topic (Hernandez 2019).

Does all of this matter to those in the global South? Care must be taken to find some middle ground between the assumption that these concerns matter little to lower-income countries concerned to accelerate economic development, and the assumption that all countries and stakeholders value these concerns as much as some global North stakeholders (Triolo et al 2020). Equally, and as discussed already vis-a-vis strategy, care must be taken to avoid the trap of Chinese exceptionalism. Not just in relation to inequality, as already noted, but also in relation to security, dependency and environmental damage, all of these types of impacts have also been associated with the digital activities of Western states and companies (e.g. Kshetri 2015, Kwet 2019).

F. Domain-Specific Issues

F1. Exporting Digital Authoritarianism?

Chinese firms have sold digital systems relating to surveillance either explicitly e.g. video surveillance systems, or implicitly e.g. telecommunications management software that can be used to monitor calls and messages (van der Lugt 2021, Gravett 2022). A key vehicle for the explicit route has been various “safe city” projects around the world utilising digital technologies developed in China including – and particularly – in Xinjiang province (Layton 2020, Shen 2020, Erie & Streinz 2021, van der Lugt 2021). For example, the Lahore safe city system installed by Huawei has a command centre storing big data from sensors around the city and analysing it using artificial intelligence, with the city-wide system involving “some 8000 high-grade CCTV cameras, 4G wireless connectivity, facial recognition, automated vehicle number plate recognition, multiple tracking options, integrated communication platforms, geographic information systems and specialised apps on security personnel’s smartphones” (Layton 2020: 880-881). These can be understood as part of a more general digital surveillance stack for which China is seen as both role model and supplier: firewalls and other technologies to control and block information flows, identification devices including video cameras and fingerprint scanners, surveillance software (including growing use of artificial intelligence) to recognise and analyse populations’ physical and digital actions, with cloud/telecom infrastructure and legal frameworks to underpin this (Cheney 2019, Peterson & Hoffman 2022). Locations of projects using Chinese surveillance technologies are shown in Figure 4.



Figure 4: Chinese surveillance-related digital projects (ASPI 2023)

While the explicit surveillance technologies are promoted as systems to support local authorities in fighting crime, there are concerns about more political applications of the

technology; for example, the Pakistan government potentially using Chinese-supplied digital infrastructure and systems to strengthen its control including over marginalised groups within the country such as ethnic minorities (Shen 2020). Such potential has been seen in practice with instances of use of these systems in Zimbabwe and Zambia and Uganda to block or surveil the communications of political opponents (Gagliardone & Geall 2014, Parkinson et al 2019, Woodhams 2020).

Put together this all crystallises in the concern that China is exporting a “digital authoritarianism” model that threatens rights and freedoms across the global South. This sees China’s digital actions entrenching authoritarian and illiberal regimes, nudging more democratic regimes towards the authoritarian end of the spectrum and, more generally, creating a new undemocratic world order (Kliman 2019, Lele & Roy 2019, Polyakova & Meserole 2019, Hemmings 2020, Gravett 2022):

“A central pillar of China’s Digital Silk Road is using technology to further its model of political illiberalism, which undermines democracy and human rights. ... Through the Digital Silk Road, China aims to export digital authoritarianism to alter the current international order” (Cheney 2019: 11, 16)

Three cautions are required. First, there are a lot of “coulds”, “mays” and “mights” in the writing. As with other aspects of China’s digital expansion, the concerns of Western writers sometimes run ahead of hard evidence, with many assumptions being made about China and political use of ICT in the global South and with claims that: “the perception of Chinese surveillance tech as particularly effective and sophisticated is not matched by the actuality of its chaotic implementation” (Gagliardone 2020: 2, see also Feldstein 2019). In part, this may arise from design-reality gaps: that features of, say, the “Xinjiang model” may not be readily replicable outside China (Layton 2020). Evidence on causal links may also be weak. Looking at just one country, van der Lugt (2021) performs a rare forensic analysis of the potential causal mechanisms that could link sale of Chinese ICT in Ethiopia to greater use of digital systems by the Ethiopian government to control its population. A number of the links – that China is training local officials in surveillance techniques, that the Ethiopian government is requesting surveillance tools specifically from China, that the government is turning to China because other countries will not supply surveillance systems – find little or no evidence. Absence of evidence is not evidence of absence but this work is reminder that it is too easy to fill in gaps in a causal chain without proper evidence.

Second, as elsewhere, it is important to avoid the trap of Chinese exceptionalism – in this case, assuming the Chinese state and Chinese firms are the only ones supporting use of surveillance technology in the global South. They are of course not. Rather than a one-to-few picture of China supplying technology to a few dictatorial regimes, the reality is many-to-many with Chinese and Western firms supplying regimes across the political spectrum (Feldstein 2019, Gagliardone 2020; see Figure 5). There are examples of firms and agencies from the US, UK, Canada, France, Germany, Italy, Switzerland, Israel and other Western nations providing surveillance technology including several examples of it being used for surveillance of political opponents in countries such as Ethiopia and Rwanda (Marczak et al. 2018, Feldstein 2019, Woodhams 2020, van der Lugt 2021, Erie & Streinz 2021, Peterson & Hoffman 2022). Hence, for example in Ethiopia, it is likely that “the outcome would not be so different if the Ethiopian government did not use Chinese ICT” (van der Lugt 2021: 338).

Some Western surveillance companies do also have connections to their national states which gather, analyse and utilise data in their own interests: think of the revelations of Edward Snowden or of the main encryption provider to global South states having been a CIA front for decades during the 20th century (Gagliardone 2020, Miller 2020).

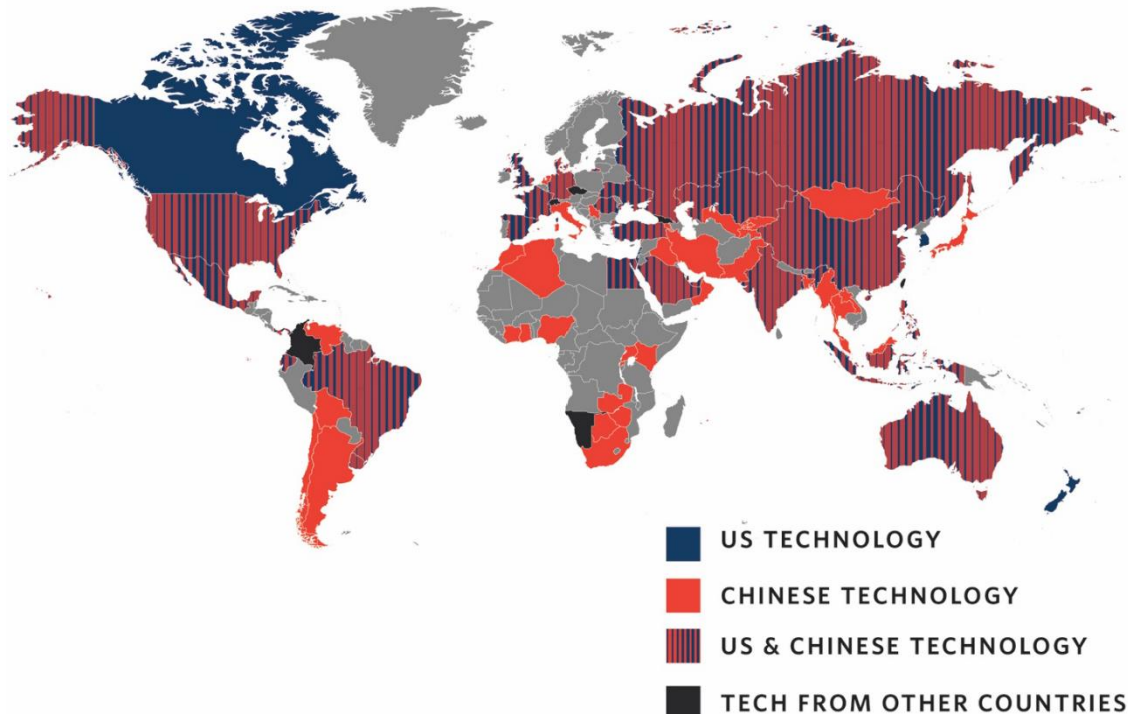


Figure 5: Surveillance technology origin (Feldstein 2019)

Third, even though there may be benefits for the Chinese state, it may not always be the main actor: “It appears that on the Chinese side it is the commercial interests of Chinese firms, rather than the geopolitical interests of the Chinese government, that is driving involvement in Ethiopia ... the main Chinese actor involved in the digitization of Ethiopia does not seem to be the Chinese Communist Party (CCP) or the central state, but commercial and state-owned enterprises. This does not preclude ‘Chinese influence’ (i.e. state influence) but points to the complexity of the reality on the ground” (van der Lugt 2021: 339; see also Gagliardone 2020). Support for innovation is one commercial interest for Chinese tech companies as technologies such as artificial intelligence can be tested and innovated in a broader range of environments and datasets than available within China (Cheney 2019, Layton 2020, Vila Seoane 2021). As a specific example, Chinese artificial intelligence (AI) firm, CloudWalk Technology, is seen as a main beneficiary of its installation of facial recognition systems at key entry/exit points and transport hubs in Zimbabwe; building an ability to recognise darker skin tones that could then be exported to other countries (Hernandez 2019, Reddy 2021).

Local actors and agency must also be recognised: “The focus in Western media on China’s export of surveillance technology to Ethiopia attributes most of the agency to Chinese firms and the Chinese state. However, this study has found that the Ethiopian government has the agency to independently choose what technology it acquires and from where” (van der Lugt 2021: 339). Others too, see the pull of demand from global South governments having as

much or more influence than some concerted attempt to export China's model of digital authoritarianism (Feldstein 2019, Triolo et al 2020, Erie & Streinz 2021). The same recognition of agency should also apply to use of the technology: Chinese firms may have installed systems and shown how to use them, but local agents should be seen as largely responsible for determining how the systems are actually put to use (Gagliardone 2020).

One should not swing too far the other way. Assisted by concessionary state finance, Chinese firms are now far and away the biggest suppliers of surveillance technology in the global South, with Hikvision and Dahua producing around 40% of the world's surveillance cameras, while "Huawei alone is responsible for providing AI surveillance technology to at least fifty countries worldwide" including dozens of BRI countries (Feldstein 2019: 8, Hillman 2021a, Peterson & Hoffman 2022). Chinese firms also differ from Western counterparts in more often implementing and managing systems rather than just selling them, in their greater proximity to the state, and in facing no domestic pressures from state or public to limit who they do business with (Malena 2021, Gravett 2022). Nonetheless, overall, the simple formulation that actions and interests of the Chinese state are fomenting a growth in digital authoritarianism in the global South – and certainly the idea that this would not happen in China's absence – is questionable and remains to be further investigated.

F2. Global Division in Digital Governance and Standards?

As illustrated by the foundational layer of the technology stack (Figure 3), China's digital expansion is not merely technological but also institutional. Digital infrastructure and systems come bound up with at least three institutional components (Hemmings 2020, Erie & Streinz 2021). There are informal norms, for example, relating to everything from management culture to views on human rights. There are more formal norms that constitute mechanisms and processes, such as choice of currency for e-commerce transactions. And there are formal institutions in the form of laws, policies, regulations and standards.

It is the latter that are the main focus here and global South countries are impacted by three main and overlapping domains of Chinese digital governance. Control of the physical foundation of digital infrastructure is undertaken by cyber/internet governance and digital standards. Control over the data flows that move over these physical foundations is covered by data governance. Lastly, service and application layers require their own governance such as digital trade/e-commerce governance or governance of digital surveillance.

As a generalisation, China has increasingly adopted its own position that is different from that of the originally-dominant West, and has sought allies for its position from the global South (Tugendhat & Voo 2021). It has sought to balance control and connection by advocating sovereign national control rather than laissez-faire or solely-international regulation, and locates this within a global system governed by a regime of inter-governmental institutions in which only states are represented rather than a regime of multi-stakeholder institutions that give voice to civil society (Arsene 2012, Shen 2016, Gao 2018, Kassenova & Duprey 2021). Hence, for example, its attempt to have control over

internet resource allocation transferred from the multi-stakeholder Internet Corporation for Assigned Names and Numbers, ICANN, to the inter-governmental International Telecommunication Union.

A key digital governance statement of relevance is “the International Strategy of Cooperation on Cyberspace jointly issued by the Chinese Ministry of Foreign Affairs and the Cyberspace Administration of China in March 2017” (Luo 2019: 56). While containing what could appear to be generic formulations about openness, fairness and cooperation, it also has a particular Chinese perspective on cyber and data sovereignty (van der Lugt 2021). This restricts control of digital governance to the state, asserts the right of individual nation-states to control over the Internet within their own borders, and is quite restrictive in relation to cross-border data transfers (Cheney 2019, Kassenova & Duprey 2021). Some literature has therefore differentiated this from – and even seen it as in conflict with – more open digital policies in the West, while noting that the Chinese position may contain its own tensions. The version of digital sovereignty being promoted by the Chinese state is seen as antipathetic to cross-border data flows at the same time as it supports extraction of value from local data by Chinese companies and, potentially, by the Chinese state (Triolo et al 2020, Liu 2021). A vision advocating national digital control at the same time as growing reliance on Chinese digital infrastructure could mean global South governments are ceding control to China (Erie & Streinz 2021).

Notwithstanding any contradictions, this approach to digital governance is something that China is promoting in global digital advisory forums such the Internet Governance Forum or the UN’s Group of Government Experts on digital development, in digital resource allocation bodies such as ICANN, and in discussions about digital trade and e-commerce in the World Trade Organisation (Liu 2012, Shen 2016, Gao 2018, Erie & Streinz 2021). Alongside these global forums, Chinese officials and official channels offer bilateral training and advice to global South countries on development of local laws and policies based on China’s experience (Huang 2019, Luo 2019). While it is debatable whether this advice seeks to directly promote replication of China’s own national model (Gagliardone 2020), China is using relational, discursive and technological power to promote its approach to digital governance and to generate a support base for that approach within the global South.

In building a network of support for its views across the global South, the Chinese state continues to refer to China as a “developing country” and uses this as the basis for the claim that it can play the lead role to “vigorously represent the opinions of developing countries” in the development of a new regime of global digital governance; one which – not without some validity – it casts as having been shaped to date in the interests of the global North, and the US in particular (Huang 2019, Luo 2019). The narrative of a self-determined alternative to Western domination or even neo-colonialism, and of national governmental control and stability combined with economic growth through Chinese delivery of digital development infrastructure and services is seen as a means to gain support among global South countries for China’s particular views on Internet governance (Kliman 2019, van der Lugt 2021). With China presenting itself as a role model for digital sovereignty with digitally-enabled growth, this narrative does indeed find an appeal, even among democratic governments, and despite the potential costs of more limited global connection, of greater

dependency on China, and of the growing opportunity for China to leverage its “infrastructural power” (Erie & Streinz 2021: 86; Tugendhat & Voo 2021).

Related to this global digital governance agenda has been China’s promotion of its own technical standards, typically in competition with those set by Western actors, following “a popular saying in China ... that third-tier companies make products, second-tier companies make technology, first-tier companies make standards” (Seaman 2020: 3). There has been a literature focus on this – albeit outside the scope of the search undertaken for this paper – including the process of standards development within China (Murphree & Breznitz 2018, Gao et al 2020) and China’s actions in global bodies such as the ITU to promote its standards (Hoffmann et al 2020, Kim et al 2020). This sees China as having first sought to catch-up with standards and standards-setting, for example on 3G and 4G, and now being intent on taking a lead, for example on 5G, artificial intelligence, internet of things, and blockchain.

This and literature arising from the search for this paper makes reference to the perceived role of global South countries, as allies to be enrolled by China into support for its standards (Triolo et al 2020, Tugendhat & Voo 2021). Growing adoption of Chinese standards is seen as happening almost by stealth through the spread of all elements of the Chinese digital stack which embed those standards; something which the Chinese state has facilitated (Kliman 2019, Naughton 2020, Erie & Streinz 2021). But the state has also taken a more direct and proactive role in promotion of Chinese standards, with the Belt and Road Initiative being a key mechanism. In 2015, the Chinese state created a small group of officials to promote Chinese standards in BRI countries and, in 2017, laid out the BRI Connectivity and Standards Action Plan (Lele & Roy 2019, Malena 2021). Dozens of global South countries have now signed standards recognition agreements with China, and information provision and translation facilities about Chinese standards have been a formal part of wider BRI since 2019 (Seaman 2020).

The rapid rise in participation of Chinese actors in standards-setting or -advocating bodies such as the ITU, International Organization for Standardization, Institute of Electrical and Electronics Engineers and the Internet Engineering Task Force has led to some pushback from the US (Liu 2012, Shen 2016, Erie & Streinz 2021). In parallel, and partly in response to institutional resistances it finds in its bid to shape global standards, China has been creating its own digital governance groups, and there are suggestions of China creating its own Asian regional standards outwith the global bodies; something which might create another dimension for conflict between China and the West within the global South (Lele & Roy 2019, Triolo et al 2020).

In positing this potential – or actual – conflict with the West over digital governance, the literature typically seeks to differentiate China’s stance from that of the West along dimensions of market vs. state, civil society vs. state, and the simplistic formulation of freedom vs. sovereignty. Yet, while the content of China’s approach may be different, the underlying driving forces – to promote its own national interests, to promote its own digital multinationals, and to partly remake the global South in its own digital image – are not that different from those seen with Western countries; the US particularly (McCarthy 2015, Gao 2018). Western attempts to point out the contradictions, even hypocrisy, of China’s stance

on digital governance may find their critiques ring a little hollow in the wake of the Snowden revelations or the Cambridge Analytica scandal (Erie & Streinz 2021).

Digital Policy Implications

Echoing the perspectives just outlined, the main narrative running through the literature in relation to digital policy implications is that of the “new digital Cold War”. This and similar terminologies posit the global South as a site of digital competition or even conflict between China and Western powers, with China particularly seen to challenge US digital hegemony; a challenge that extends earlier contention in the material sphere of territory and physical resources into the immaterial sphere of data, governance and standards (Das 2017, Cheney 2019, Kliman 2019, Hemmings 2020, Shen 2020, Triolo et al 2020, Zhao 2020, Malena 2021). While the Cold War narrative is criticised, global South countries do increasingly perceive themselves to be the battleground for superpower conflict (Mukherjee 2020, Namingit & Al-Haddad 2020).

However, to date in the literature, the focus remains the superpowers and where policies are discussed, they are those of China and the West. China’s policies are as outlined previously and are seen as challenged by competing initiatives from the US, EU and Japan (Wang 2020, Zhao 2020). These include the G7’s Build Back Better World and the EU’s Global Gateway, though the scope, actuality and digital content of these remains unclear – responses have sometimes been limited or, in the case of the EU, fractured (Triolo et al 2020). Discussions about global digital governance in the sampled literature focus on the actions of China and, to a lesser degree, the reactions of the US and other Western powers (Liu 2012, Shen 2016, Polyakova & Meserole 2019, Negro 2020, Peterson & Hoffman 2022). Barring one exception that analyses an instance of African country support within ITU for Chinese “new internet protocol” proposals (Tugendhat & Voo, 2021), these discussions cast global South countries, if mentioned at all, in a reactive role that is subservient to Chinese or Western interests. Other accounts treat the global South as something akin to a blank, undifferentiated *terra nullius* on which the new digital Great Game will be played out: “in developing nations where digital connectivity is essentially absent” (Cheney 2019: 12), “Several underdeveloped states ... are in the pre-steam period” (Ly 2020: 12). Such views are quite wrong given the majority of the world’s Internet users are now in the global South, and given the role – acknowledged above – of local agency.

Yet recommendations for programmes and policies in light of China’s digital expansion, at least in the English-language literature surveyed here, also give limited consideration to the global South; instead mainly addressing policy of the Western powers even though this may mean the global South is thereby under-represented or marginalised (Naughton 2020, Zhao 2020, Peterson & Hoffman 2022). An example, in relation to digital surveillance exports from China, is recommendations for the US-led Western powers to counteract China’s global plan for change: through much greater financing for digital infrastructure in the global South, controls on exports of surveillance technologies, and a competing democratic model for use of surveillance technology (Polyakova & Meserole 2019, Woodhams 2020).

There were three limited exceptions to this side-lining of global South policy recommendations. Two papers discuss the policy implications for India’s own digital

expansion of China's global South activities (Rawat & Chan 2018, Lele & Roy 2019). These recommend that India should go deeper rather than broader: building a digital cooperation model that focuses on regional neighbours rather than all of the global South, concentrating on technological niches where it can have an advantage, and adopting a transparent approach of mutual benefit in order to distinguish itself from China's approach. Three papers from pro-China writers took a paternalistic approach that called for DSR-recipient countries to simply align their digital policies with those of China especially on issues such as data/digital security and technical standards (Luo 2019, Wang 2020, Zhou & Xue 2020). Three papers, and without specifics, advocate global South countries should adopt an approach of balance: balancing the benefits of low-cost technologies against security and other risks by seeking to minimise the latter; balancing the benefits of immediate access to technology against longer-term benefits of building local capacity; setting Western and Chinese firms to compete against each other to offer the best deal; developing EU links and regional and multilateral digital governance institutions as a bulwark against Sino-US techno-nationalism; and, more generally, "hedging" to avoid a one-sided pro-China or pro-US position that would risk antagonising the other side (Lele & Roy 2019, Mukherjee 2020, Vila Seoane 2021).

As yet, though, all of the needed governance elements identified here that arise with China's growing digital presence – the geopolitical steer between major digital powers, the formation of digital policy, the passage of digital/data laws, etc – remain under-developed in the global South, as do related recommendations in the literature (Gravett 2020, Erie & Streinz 2021).

G. The Future Research Agenda

Given the limited extent of systematic research so far undertaken on China's digital expansion in the global South, below, six specific directions for future research are drawn out from the literature review. These specifics, though, sit within a general requirement for more research on this topic (Gagliardone & Geall 2014, Hillman 2021a). Calls in the literature for additional research are most-pronounced in relation to the Digital Silk Road component of the Belt and Road Initiative. Even foundational details of DSR – investments, companies, timescale, geographical scope, mapping of projects and countries involved – are incomplete (Hernandez 2019, Tugendhat & Voo 2021); something hampered by the fact that "The DSR ... shows a flurry of discourse production that can often obscure the actual operative mechanisms and reality on the ground" (Erie & Streinz 2021: 48) which "make it difficult to assess on its own terms how successfully the Chinese government's program has been implemented" (Tugendhat & Voo 2021: 4-5).

G1. More Southern Voices

Our above analysis of the literature showed an absence of Southern voices in a number of ways that future research will need to address. Authors from the global South need to form a greater presence within the literature. This, in turn, may help address two other necessities: more primary research that draws evidence directly from global South

stakeholders, and more research on individual countries, particularly those in Africa. The local stakeholders who need to be heard from include the government policy-makers seeking to regulate digital, the officials signing deals with Chinese actors, those working for Chinese digital companies and for local firms competing or collaborating with Chinese digital companies, those consuming Chinese digital goods and services, and contextual stakeholders including local universities and NGOs. Within these groups, those who traditionally benefit less from digital and who so far do not figure in the literature particularly need to be heard from: women, older people, those with disabilities, ethnic minorities, etc. While the principal focus will be on policy, practice and impact within individual global South countries, growth in China's digital-related activity in international organisations and forums means global South representatives in these milieu will also need to be included in research. There can also be an investigation of Chinese-heritage diaspora in the global South. While sometimes a target market for Chinese platforms, there remains a gap around understanding the role of the diaspora not just as consumers but also as producers, investors and/or facilitators in relation to China's digital expansion.

G2. Updating the Scope of Research

Looking at the layers of the Chinese technology stack (Figure 3), there has been – reflecting the historical focus of investment – a significant concentration of research to date on national telecommunications infrastructure. The layer below this had received limited attention in the literature surveyed, thus leaving a gap for more work on international telecommunications: submarine, terrestrial and satellite. However, the main gap relates to research to catch up with the higher levels of the stack which in many cases have been the locus for relatively more-recent investments and projects. This applies to all devices, though perhaps particularly to those other than phones – tablets, PCs, modems, etc – which were not discussed at all in the reviewed literature. And it applies to all types of web-based data services: cloud, server farms and data centres.

In relation to applications, e-commerce has been investigated to some extent but fintech and social media much less so. The surveillance aspects of smart or safe cities have attracted some attention but other application areas need to be researched such as traffic and pollution management, and e-governance systems. This overlaps with a requirement for research on what can be called Chinese ICT4D projects – application of information and communication technologies for development goals including health, education, public service delivery and agricultural development which themselves represent an under-developed opportunity area for China to make a clear and positive contribution to development of lower-income nations.

Research will also be needed to address emerging technologies that have been prioritised by the Chinese state (Naughton 2020, Triolo et al 2020) but which are not yet adequately represented in the literature including artificial intelligence, blockchain, internet of things and autonomous vehicles. The same applies to the non-technological elements that are integral to formation of the Chinese tech stack. The role of data in China's digital expansion must be studied further given its much greater salience within all digital systems in recent years, particularly analysing issues of ownership, sovereignty and value extraction from data gathered in global South countries. Other elements warranting further work are the

development of human infrastructure in the form of skills and other capabilities, and the financial and institutional foundations for the tech stack.

Finally, there are broader trends that warrant research given they have more-recently started to impact China's digital expansion in the global South. These include the impetus to digitalisation arising from Covid and any outrun from this as the world moves towards post-Covid; the impact on global South activities of Chinese tech firms following the Chinese government clampdown on big tech that began in late 2020; the implications for global South countries of the responses to China's digital activities from the US, Europe, Japan and others; the collective impact of the tech stack, from the realities of technical interoperability through to the exact nature of any lock-in that occurs for global South users; and growing tensions around underlying digital technologies not yet explicitly discussed within the tech stack such as semiconductors and operating systems.

G3. Beyond the 'Team China' Monolith

There are calls for research to move beyond speculation to understand the actual coherence, collaboration, competition and conflict between different Chinese state agencies, between Chinese state and tech firms, between Chinese tech firms, and between Chinese ICT and non-ICT businesses (Gagliardone 2020, Hong & Harwit 2020, Wang et al 2020). This can include the political economy and coherence of vision for China's digital expansion and digital governance/standards over time given this has been "a contingent historically unfolding process" (Shen 2016: 307) involving different state agencies, Chinese big tech and a fluctuating relation between state and capital.

The "usual suspects" recur in the literature in terms of tech firms and projects: Huawei, Alibaba and to a lesser extent ZTE as firms; CloudWalk in Zimbabwe and Huawei in the African Union headquarters as projects. There is a strong need to broaden the empirical base to a wider range of examples including state-owned firms like China Telecom and China Mobile, and other large tech firms like Tencent, Baidu, Xiaomi, Transsion and BBK. At least these firms receive a mention in the current literature but there is a wide range of smaller Chinese ICT firms operating in global South countries whose activities have yet to be studied. The focus of literature has also been on the legitimate digital economy, leaving a research gap in relation to a penumbra of activity that is either quasi- or actually illegal – such as unethical peer-to-peer lending platforms in Indonesia (Tritto et al 2020) or illicit online gambling and money laundering in Pacific Island states (Hayakawa & Anson 2021) – often set up by those escaping tighter regulation within China.

G4. Steering Between Chinese Exceptionalism and Identicalism

Future research needs to steer between the extreme positions that China is unique in its digital interactions with global South countries, and that China is no different; in particular, no different to Western nations. Rather than a specific research topic, this would be more of a thread that runs through the other topics identified here, asking especially to what extent China is similar or different to the West – the US above all. Focal points for this arising from the literature review would include: whether aid and funding strategies for digital development differ from those of Western counterparts; comparative analysis of

Chinese tech firms' internationalisation strategies; whether Chinese digital design and implementation is better able to match global South realities and the extent to which its approach adopts the Principles for Digital Development; relative success and failure rates of Chinese and Western digital projects; and similarities and differences in relation to development-related impacts across the whole range of technology stack applications including the four key concerns of security, dependency, inequality and environmental impact.

A main interest would be the implications of any similarities and differences for global South actors in planning their response. However, evidence-based advice also seems lacking for Chinese actors in relation to good practice for policy, strategy, design and implementation for digital development in the global South that learns from these similarities and differences.

G5. Evaluating Development Impact

Moving beyond the positive and negative hypothesising and speculation that has tended to dominate the literature to date, the broadest question in relation to China's digital expansion in the global South is *cui bono* – who benefits from it? In more detail, what is the distribution of benefits and disbenefits from China's digital expansion? Reflecting the previous research gap, it would be especially valuable to assess this in comparison with global South digitalisation supported by other countries.

This can be approached via more systematic analysis of the costs and benefits of engagement with China in the digital sphere, either generically, or considering the parallel spheres of economic, social and political development, or addressing particular Sustainable Development Goals. Such evaluation could focus on different levels – at the micro-level of the business and individual consumers of Chinese digital products and services, at the mid-level of individual systems (data centres, e-commerce platforms, smart city systems, etc), at the meso-level of sectors, and at the macro-level of nations and regions. Evaluation could also address particular research gaps. One is the delivery of Chinese tech firms against emerging environmental, social and governance agendas in the global South given some recent signs of responsiveness. Another is employment: both the broad impacts in terms of the quantum and quality of jobs created or destroyed by China's digital expansion, and the micro-level of pay, conditions and management of local workers employed by Chinese stakeholders. Another is the formation and geography of new economic and political digital value chains; particularly the implications of growing China—local bilateral links for internal, regional and West—local connections. Lastly, spillover effects must be better understood given the potential for significant positive impact in relation to upgrading skills, knowledge and technology and demonstrator effects; but also negative impacts of crowding out local firms.

At both individual project and aggregate level, more empirical research is required in relation to the four concerns raised in the literature. How is cyber security including data sovereignty and locus of control and storage of data strengthened or weakened by involvement of Chinese tech firms? How dependent are global South countries becoming

on Chinese digital technologies and capabilities? Are between-country and within-country inequalities being reduced or exacerbated by China's digital expansion; especially dimensions of inequality on which the literature has so far been silent – gender, ethnicity, age, disability, etc? What positive and negative impacts on environmental sustainability are Chinese digital systems having? Across all of these, how concerned should global South governments be about this, and how concerned are they?

At the overall macro-level, we need to know what the broader implications are of global South engagement with Chinese state and private digital actors: especially political and geo-political and macro-financial impacts around contested issues such as realignments in regional and national markets and politics.

G6. Local Agency in a “Digital Cold War”

Future research can challenge the notion of China's digital imperialism and of a digital Cold War. To what extent does China's use of telecommunications and related technologies echo that of the British Empire during the 19th century, and US neoimperialism during the 20th century? To what extent does the relationship between the US and China in the global South echo earlier imperial confrontations in the same locations, from the UK—Russia Great Game of the 19th century to the US—USSR Cold War of the 20th century? What lessons can be learned from similarities and differences? Beyond the rhetoric of conflict, what evidence is there of collaborations between Chinese and Western stakeholders in global South markets?

Whatever the terminology ultimately used, the current superpower focus tends to assume that they are the locus of agency, with some literature appearing neocolonial, marginalising and even disrespectful in characterising the global South merely as the background landscape for conflict and global South stakeholders as passive ciphers or pawns in the game between the US and China. Research is therefore required that puts local actors and agency centre stage and understands the balance of demand-pull vs. supply-push in procurement of Chinese technology. Such research would analyse the role of local officials in negotiating deals, for example, the extent of their ability to play off and select between Western and Chinese actors, and their ability through negotiation and policy to improve the outcomes of China's digital projects including the impact of recipient government policies on the decisions of Chinese companies and the Chinese state. It can also: analyse the role in US—China tensions of global South members within international forums from the ITU to ICANN to the Internet Governance Forum; investigate the role and strategy of local digital companies when Chinese big tech rolls into town; and understand the balance of operational responsibilities and control between local and Chinese staff for implemented digital systems.

From this should come some practice and policy lessons, perhaps including role model examples that can be shared across the global South, to provide guidance on how best to maximise the benefits and minimise the risks of interactions with China's digital expansion, e.g. via local participation in digital design and implementation; development and localisation of digital skills and control and value; cyber-security and cyber-sustainability and

digital inclusion plans; national policies on other aspects of digital governance; etc. This would also look at the role of international agencies (UN, other multilateral and bilateral, INGOs) in supporting policy / strategy design and implementation, and at the role of Chinese state and business actors in influencing local policies and strategies.

While the main focus of this will be national policy, there will be three other domains of implication. One is strategy for other local stakeholders, particularly local digital firms seeking to either compete or collaborate with Chinese big tech, and other firms seeking to respond to growth of import threats and export opportunities via Chinese e-commerce platforms. The second arises because many global South countries – India, Indonesia, Pakistan, South Africa, Mexico, Brazil to name but a few – have regional political interests and host digital companies that export into their regions. Research can investigate the implications of China's digital expansion on these countries' regional political and economic policy. The third would be to provide guidance for global South countries on both strategy and content in navigating US–China tensions in global digital governance and standards forums, and in formulating and promoting their own position.

Finally, local agency involves recognition of global South countries as repositories of knowledge or, at least, as sites of knowledge creation. In the literature, Chinese actors appear to make little explicit provision for learning from the global South. However, this may not be the case in practice, and research can usefully analyse: whether and what Chinese policy-makers are learning from China's digital expansion; what Chinese tech firms are learning from their engagement in the global South including any signs of reverse innovation from the South into China; and whether learning from experience is creating any move among Chinese implementers towards a more locally-customised approach that includes genuine inputs from local stakeholders or at least advances beyond a one-size-fits-all approach to digital system design and implementation.

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* - Denotes items from the systematic literature review

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