Trust is good, control is better: technopolitical visions and realities in China's social credit system

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I M A G I N A T I O N

Chapter One

Engineering Nation

On 11th September 2020, Xi Jinping took to the floor of the *Scientists' Forum* in Beijing. Capping off a day of presentations covering topics from palaeoanthropology to artificial intelligence, it fell to him to bring the symposium to a close with some final reflections.[1] He began by thanking China's scientific community for its response to the COVID-19 pandemic; their contributions to the safeguarding of public health and social development would never be forgotten. He then went on to laud the role of technology in China's "great rejuvenation" (伟大复兴) and its potential for the future of society. The country was transitioning from a period of "quantitative accumulation", in which the 'hardware' of technical systems, infrastructure and informatisation had been built, towards a "qualitative leap" in the application of such methods to create a new 'software' for governance reform.

The speech was symbolically important; Deng Xiaoping had addressed a similar audience in the same venue some four decades earlier in an attempt to draw a line under the excesses of the late Mao era and forge a new technology-driven path forward to modernisation that would shore up the legitimacy of both him personally and the Party.[2] Both speeches made an explicit link between scientism and nationalism, underscoring the role of technology in economic innovation, social stability and the mediation of tensions between Party, state and society. Both highlighted the potential for data-driven decision-making to imbue governance with greater efficacy and "scientific objectivity". Both spoke of the importance of human capital and the duty of scientists and technologists to assist in the state's reform agenda. There were also differences, however. The two men were speaking in very different material circumstances; Deng at the PRC's economic nadir, Xi atop the world's second-largest economy, the only major country to achieve growth that year.[3] Deng's speech therefore focused on the immediate challenge of kickstarting agricultural and industrial production. Xi's embraced a much more holistic view on energy transformation,

[1] Xi Jinping, 'Speech at the Scientists' Forum'.

[2] DigiChina, 'Experts: Xi's Science and Technology Speech Echoes and Updates Deng Xiaoping'.

[3] Marquis and Qiao, *Mao and Markets*.

environmental protection, public health and social development. Shepherding China into a world beyond Mao, Deng engaged in ideological contortionism to justify the role of market forces and elite experts. Xi conversely signalled a return to greater state intervention in the country's blossoming technology sector.

As revolutionary as Deng's speech was in 1978, it too was the inheritor of previous attempts to redefine the relationship between state and technology. Two decades earlier, the CCP published its *Long-Term Plan for the Development of Science and Technology*, charting a path to industrialisation and nuclearisation in the 1950s. The document was itself a legacy of Soviet-style planning and institutions imported and adapted during the Republican Era. This chapter charts the development of this relationship and its influence on China's pursuit of modernisation across three broadly chronological sections. The first sweeps through the twilight years of the Qing, the roots of the modern state under the Nationalists, and early attempts to introduce information technologies to governance in the first years of the PRC. The second explores the excitement of the "new technological revolution" and the rise of China's new technocratic class following Mao's death in 1976. The third charts the process of informatisation since the 1990s and, in particular, its influence on the New Era and the "modernisation of governance capacity". This narrative is told through the lens of key policies and people across the period, from the cybernetic vision of Qian Xuesen to the futurism of Zhao Ziyang and techno-optimism of Li Keqiang 李克强.

In so doing, in this chapter I highlight several themes of importance to the wider story of social credit. First, while distinct periods emerge, the dividing lines of 1949, 1978 or 2012 are problematic in the study of Chinese governance.[4] These dates do of course denote moments of great historical import; but the continuities between the 'eras' they supposedly separate are far stronger than we often assume.[5] Second, the evolution of the state's relationship with technology has been influenced by a vast range of actors and contradictions, from debates on the value of "red vs expert" advice, to the precedence of military over civilian priorities, to the perennial concern over the balance between foreign imports and the protection of indigenous industry and politics. Each of these tensions has left an indelible mark on the CCP's view of technology. Third, this process of adoption and adaptation illustrates China's role not as passive observer, but active participant in a global discourse on the role of technology in governance throughout the 20th century. Since the turn of the millennium, China has increasingly led these debates, offering a counterpoint to what it sees as US "digital hegemony". Fourth – and of relevance to Chapter Two – for all the talk of technology's potential for "scientific objectivity", ideology continues to matter above all else.

[4] Chinese political historiography has itself embraced such periodisation. See Dirlik, 'Reversals, Ironies, Hegemonies'; Dirlik, 'Mao Zedong in Contemporary Chinese Official Discourse and History'; Cohen, *China Unbound*; Unger, *Using the Past to Serve the Present*.

[5] Cohen, *China Unbound*; Marquis and Qiao, *Mao and Markets*.

ENGINEERING REVOLUTION

Chinese debates on the role of scientific, information-based or tech-enabled methods in the governance of society date back to at least the turn of the 20th century, as a series of internal and external crises triggered a concerted search for both the causes of and countermeasures against the country's relative political, economic, military – and in some eyes, moral – weakness.[6] Many of these debates hinged on the balance between Chinese "essence", or *ti* (体) and Western "usefulness", *yong* (用) – an assumption that foreign powers held the key to a scientific understanding of society and its administration – in implementing a reform agenda.[7] This discussion on the merits of indigenous vs imported technology and thinking represents the start of a thread we can trace throughout the timeline covered by this Chapter and on to the present day (see also Chapter Two).

The selective borrowing and interpretation of 'Western' ideas, often transferred through Japan, had significant influence on the development of emerging intellectual movements in the final years of the Qing dynasty. Reformers broadly fitted into two camps; those who saw some role for 'traditional' Chinese ethics and the "rule of virtue" (以德治国), and those who advocated for their complete abandonment in favour of a Western developmental path. Intellectuals such as Liang Qichao 梁启超 led the call for social and political reform without a wholesale revolution of Chinese culture.[8] His unfinished 1902 novel *The Future of New China* imagined a utopian, wealthy, Confucian Chinese constitutional monarchy in 1962.[9] This sparked a new genre of Sinofuturist writing that envisioned China as a dominant force in a world yet-to-come.[10] Others – most notably four-time-failer of the civil service exams, Yan Fu 严复 – proposed a deeper assimilation of 'Western' intellectual traditions as a way of "saving the nation" (救国).[11] Yan was an avid translator of classic philosophical enquiry; according to Benjamin Schwartz, his translations presented his fellow countrymen not only with a description of society, but a prescription for how China could achieve wealth and power.[12] Chief among concepts to take root during this period was the

[6] For studies on early attempts to introduce foreign technologies in the pursuit of modernisation, see Chu and Liu, *Li Hung-Chang and China's Early Modernization*; Waley-Cohen, 'China and Western Technology in the Late Eighteenth Century'; Elman, *On Their Own Terms*; Tsu and Elman, *Science and Technology in Modern China, 1880s-1940s*.

[7] The language of *ti* and *yong* has it roots in both Buddhist and Confucian traditions, dating back as far as the pre-Qin period (770-221 BC). See Kwon and Woo, 'On the Origin and Conceptual Development of "Essence-Function" (Ti-Yong)'.

[8] Tang, *Global Space and the Nationalist Discourse of Modernity*; Mishra, *From the Ruins of Empire*.

[9] Wang, 'Geopolitics, Moral Reform, and Poetic Internationalism'.

[10] Conn, 'Sinofuturism and Chinese Science Fiction'; Wang, *Fin-de-Siècle Splendor*.

[11] Shen, 'Science in Translation'; Huang, *The Meaning of Freedom*.

[12] Schwartz, *In Search of Wealth and Power*; Schell and Delury, *Wealth and Power*.

notion of social Darwinism and "survival of the fittest" among nations and ethnicities, what we in the current world might now describe as "Great Power Competition".[13]

The debacle of the Boxer Rebellion and the eventual collapse of the Qing a decade later accelerated the spread of Western social scientific principles, as well as attempts at new forms of governance and nation-building. This manifested itself in the New Culture Movement of the 1910s and 1920s, during which period an increasing number of Chinese nationals headed overseas to the US, Europe or Japan for study.[14] Inspired not least by Yan's translations, many studied subjects such as sociology, anthropology, economics, ethnography, demography and other social sciences with a view to understanding and resolving China's developmental challenges.[15] The return of these scholars in the 1920s and 1930s drove the professionalisation of social scientific study in the Republic of China (ROC). Many had been exposed to cutting-edge theories and methods that saw the sociohistorical world as a realm of natural process that could be observed and modelled through quantitative methods, systems analysis, functionalism, and behavioural science.[16] Yung-chen Chiang has argued that whereas the previous generation of polymath scholars and reformers such as Liang Qichao or Yan Fu had achieved their status as cultural transmitters through their language abilities, this new wave of students returned as area specialists who saw their respective disciplines as a distinct set of methods and approaches to apply to the question of national regeneration.[17] This was further underscored by the reform of official vocabulary to reflect subject area proficiency and the incorporation of graduates and professional associations in policy formulation.[18] Recent scholarship points to the hybridity of their work, applying their Western educations to local realities in a range of innovative ways.[19]

The Nationalist Party (KMT) achieved full power over a reunified China in 1928 with the conclusion of the Northern Expedition, promising rapid industrialisation through science and technology as a path to Chinese political and economic sovereignty.[20] Building on a theoretical blueprint for China's development written by Sun-Yatsen 孙中山, the KMT

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[13] Dikötter, *The Discourse of Race in Modern China*; Pusey, *China and Charles Darwin*; Chung, 'Better Science and Better Race?'; Jin, 'The Evolution of Social Darwinism in China, 1895–1930'.

[14] Chow, *The May Fourth Movement*; Schwarcz, *The Chinese Enlightenment*; Lee, 'Tears That Crumbled the Great Wall'; Mitter, *A Bitter Revolution*; Zarrow, *China in War and Revolution, 1895-1949*.

[15] For a fascinating edited volume on the introduction, localisation and expansion of human and social sciences in China, see Chiang, *The Making of the Human Sciences in China*.

[16] Rooted in a German academic tradition, Dorothy Ross describes how this new wave of social science enquiry evolved primarily in American institutions in the first half of the 20th century. See Ross, *The Origins of American Social Science*.

[17] Chiang, *Social Engineering and the Social Sciences in China, 1919–1949*; Wang, *Chinese Intellectuals and the West, 1872-1949*.

[18] Kirby, 'Engineering China'; Godley, 'Socialism with Chinese Characteristics'.

[19] Schmalzer, 'The Global Comrades of Mr. Democracy and Mr. Science'; Schneider, *Biology and Revolution in Twentieth-Century China*; Chiang, *Social Engineering and the Social Sciences in China, 1919–1949*; Ghosh, *Making It Count*.

[20] Wang, 'Saving China through Science'.

looked overseas for models of state-planned science, namely the Soviet Union and Great Britain, as a way of mobilising and integrating the country's Western-trained returnees.[21] Support for such an initiative was not universal, however, even in the face of Japanese invasion in 1931. 'Blue' (the colour of the KMT) vs 'expert' attacks by party 'renovationists' who resented their replacement by non-party specialists were not uncommon.[22]

Nevertheless, the KMT oversaw the creation of China's first technocratic civil service institutions, most importantly the *National Defence Planning Commission*, which in 1935 would be renamed the *National Resources Commission* (国家资源委员会) (NRC). The NRC quickly grew to become one of the largest bureaucratic bodies in the country, employing as many as 33,000 engineers and technicians and controlling as much as 70 per cent of Chinese industry by the late 1940s.[23] Its leaders gained significant standing within the government more broadly, with its head, Weng Wenhao 翁文灏, later appointed as the country's first Premier in 1948.[24] The period also saw significant engagement with a range of foreign institutions and experts, including Norbert Wiener – founder of an exciting new discipline called cybernetics – who arrived at Tsinghua University from MIT in 1935.[25] In doing so, the Nationalists created a legacy of approaches and institutions that would go on to influence governance beyond the Civil War and into the Communist period.

Revolutionary Engineering

The Maoist era of China's contemporary history is not typically synonymous with data-driven innovation in governance. Yet despite the anti-rational, anti-scientific tyranny of the later period, the first half of the 1950s established an important legacy for years to come. The decade began with what Arunabh Ghosh has termed a "crisis in counting".[26] Effective policymaking requires reliable data on the size and internal features of a population; yet after years of war – first anti-Japanese and then civil – the CCP knew effectively nothing about the nation it had inherited, leaving it unable to enact its most ambitious commitments to socialist reengineering. Yet the PRC also inherited a solution in the form of research infrastructures such as the NRC, as well as a scientific community dominated by a Western-educated elite who had chosen to remain on the mainland out of a commitment to planned science and/or the communist cause.[27] Among those that stayed, most notably, was

[21] Kirby, 'Engineering China'; Helleiner, 'Sun Yat-Sen as a Pioneer of International Development'.

[22] Wakeman, 'A Revisionist View of the Nanjing Decade'; Eastman, *The Abortive Revolution*; Kirby, 'Engineering China'.

[23] Cheng, 'The Industrial Activities of the National Resources Commission and Their Legacies in Communist China'; Kirby et al., *State and Economy in Republican China*.

[24] Born in 1889, Weng was the first Chinese national to gain a Western doctoral degree in geology, graduating from the Catholic University of Leuven in 1912. See Shen, *Unearthing the Nation*.

[25] For a first-hand account of Wiener's time in China, see Wiener, *Norbert Wiener: A Life in Cybernetics*.

[26] Ghosh, *Making It Count*.

[27] Cheng, 'The Industrial Activities of the National Resources Commission and Their Legacies in Communist China'.

President of the NRC and Premier of the ROC, Weng Wenhao. These KMT-era institutions were blended with Soviet models of centralised science and technology planning, imported through a series of delegations to and from the USSR in the earliest years of the PRC, mirroring broader nationalisation and centralisation in the Chinese economy.[28]

Building on the foundations of the Republican period, the 1950s saw important progress in the establishment of modern Chinese statistical and information-gathering systems. Many of the PRC's early flagship policies, including land reform and later collectivisation required an accurate picture of society and its make up. Mao himself knew the value of such studies, having conducted several of his own between 1929-33 in rural areas.[29] A no-frills census was carried out in 1953, collecting respondents' names, age, sex, nationality, relationship to the head of household, and whether they lived in an urban or rural community.[30] A year later, the 1954 Ethnic Classification Project (民族识别) was launched to identify, classify and count the country's distinct ethnic communities. Thomas Mullaney has shown how non-Party-member Chinese ethnologists drew on Republican-era scholarship for conceptual and methodological inspiration in the production of a "scientific" survey that concluded with the identification of 56 "ethnic minorities" (少数民族) that continues to form the basis for policy to this day.[31] Chinese scientists similarly took inspiration from abroad. Gordon Barrett has documented how even during its most internationally-isolated years, the PRC continued to participate in transnational scientific activities and debates from the side lines, drawing on prevailing trends in the US and USSR for its own developmental programme.[32]

One field to gain early attention among a small group of researchers was the study of complex systems known as cybernetics. Beginning with Norbert Wiener's 1948 work *Cybernetics: Or Control and Communication in the Animal and the Machine*, the subject had its origins in inter-disciplinary exchanges between mathematicians, anthropologists, neuroscientists, psychologists and engineers at a series of meetings known as the Macy Conferences.[33] A precursor to the study of artificial intelligence, cognitive science and advanced computing, cybernetics was concerned with feedback processes in ecological and biological environments, as well as how these could be used to better understand and manage complex technological and social systems. Taking their lead from the USSR, who initially dismissed cybernetics as a bourgeois Western pseudoscience (alongside a wide

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[28] For detail on scientific exchange between the USSR and PRC before the Sino-Soviet Split, see Zhang, Zhang, and Yao, 'Technology Transfer from the Soviet Union to the People's Republic of China'; Shen and Xia, 'Between Aid and Restriction'.

[29] Womack, 'From Urban Radical to Rural Revolutionary'.

[30] Wu and He, 'The Evolution of Population Census Undertakings in China, 1953–2010'; Greenhalgh and Winckler, *Governing China's Population*; Ghosh, *Making It Count*.

[31] Mullaney, *Coming to Terms with the Nation*.

[32] Barrett, *China's Cold War Science Diplomacy*.

[33] Wiener, *Cybernetics*. For a history of cybernetics, see Rid, *Rise of the Machines*; Kline, *The Cybernetics Moment*; Pias, *Cybernetics: The Macy Conferences 1946-1953*; Heims, *Constructing a Social Science for Postwar America*. For studies on Norbert Wiener, see Heims, *John Von Neumann and Norbert Weiner*; Conway and Siegelman, *Dark Hero of the Information Age*.

range of other scientific fields, including genetics), China had no official interest in the topic in the earliest years of the PRC.[34] With de-Stalinisation came a re-examination of the subject, however, with Khrushchev even mentioning cybernetics in his Secret Speech of 1955.[35] A flurry of Soviet publications shortly thereafter paved the way for a reassessment of its applicability in the Chinese context.[36]

This shift coincided with the return to China of leading aerospace engineer, Qian Xuesen, in September 1955. Qian had moved to the US in 1935 to study at MIT on a Boxer Indemnity Scholarship (the same year that Norbert Wiener conversely left MIT to teach at Tsinghua).[37] After graduating in mechanical engineering, he joined Theodore von Kármán's Guggenheim Aeronautical Laboratory at Caltech, where – as a member of the US military's Science Advisory Board – he participated in some of America's most secretive and advanced intelligence and weapons programmes, including the Manhattan Project. There, he learned the potential of cybernetic "operational research", the application of wide-ranging problem-solving techniques in the pursuit of improved decision-making and efficiency. Unlike Soviet cybernetics, which focused explicitly on abstracted data-driven models, the American school incorporated a degree of pragmatism that emphasised the function of "man" in decision-making. This integration of quantitative and qualitative prediction deeply influenced Qian's theories on systems later in life.[38]

Despite Qian's significant contributions to American wartime science, he suffered great persecution under the McCarthyist fever that swept the country in the 1950s. He was accused of harbouring communist sympathies during the Second Red Scare and – to the fury of his academic colleagues – was stripped of his security clearance. Qian attempted to return to China but was detained by the authorities before he could leave on the pretence that he had supposedly joined the US Communist Party in 1938 and might share his intimate knowledge of American ballistic missile systems with the USSR or China. He spent the next five years under partial house arrest and constant surveillance, though he was allowed to

[34] A small number of Chinese intellectuals based in the US did participate in early cybernetic research. Yuen Ren Chao, one of China's most famous translators and language reformers of the 20th century is known to have attended at least one of the Macy Conferences. See Yeang, 'From Modernizing the Chinese Language to Information Science'.

[35] For two excellent book-length studies of Soviet cybernetics, see Gerovitch, *From Newspeak to Cyberspeak: A History of Soviet Cybernetics* and Peters, *How Not to Network a Nation*.

[36] No comprehensive survey of Chinese cybernetics has been written yet in English, though several interesting first studies have been completed. See Greenhalgh, 'Missile Science, Population Science'; Hoffman, 'Programming China'; King, 'The Genealogy of Chinese Cybernetics'; Bratton, Greenspan, and Konior, *Machine Decision Is Not Final*.

[37] Qian Xuesen is often Romanised to Hsue-shen Tsien**.** No definitive English-language biography of Qian exists, though Chang, *Thread of the Silkworm* tells a popularised story of his life. Official Chinese-language biographies include two written by Qian's secretaries, Wang Shouyun and Tu Yuanji. See Wang Shouyun, 'Biography of Qian Xuesen'; Tu Yuanji, *The People's Scientist: Qian Xuesen*.

[38] Wang and Jiang, 'Seeking for a Cybernetic Socialism'.

continue teaching. It was during this time that he developed Wiener's *Cybernetics* into his own magnum opus, *Engineering Cybernetics*.[39]

Qian broadened Wiener's comparatively narrow application of cybernetics to engineering to create a more holistic "systems engineering" that subsumed control theory altogether. The book was an instant hit among peers and translated from its original English into multiple other languages. A contemporary scholar of engineering and statistics wrote at the time "it is difficult to overstate the value of Qian's book to those interested in the overall theory of complex control systems".[40] In the Autumn of 1955, restrictions on Qian's movements were lifted and he was allowed to return to China upon personal agreement from President Eisenhower, reportedly in exchange for 11 American pilots detained in the Korean War.[41]

Whatever Qian's political sympathies were prior to his confinement, official narratives in the US and China portray his years of relative isolation and ostracisation as having sharpened his focus on assisting the Communist cause.[42] Years later, Qian's former student Zheng Zhemin 郑哲敏 would write that it was during his house arrest that Qian became interested in how operational research principles could be applied within the socialist context, believing such political conditions to be more conducive to cybernetic methods than a capitalist setting.[43] For Qian, cybernetics had potential beyond a military context. Upon his return to China, he began to put pen to paper, proposing a "three thirds system" of cybernetic research that gave equal weighting to the disciplines of science, engineering and social science in the development of cybernetic methods. He further advocated for the application of cybernetics to the national economy and public administration, making "social science more accurate from the quantitative perspective".[44] Qian was responsible for not only sinicising cybernetic theories, but also building the institutional networks and foundations required to develop and apply them. On board the ship back to China in 1955, Qian met Xu Guozhi 许国志 who would go on to cofound the country's first operational research group at the Institute of Mechanics in the Chinese Academy of Sciences (CAS). Throughout his lifetime, Qian and his patronage network commanded almost all of China's science and research bodies.[45]

Qian spearheaded a golden era of scientific and political consensus in the PRC, with broad agreement on the need for centralised technological development as part of a nation-building agenda. The crowning achievement of these early efforts came with the publication

[39] Tsien, *Engineering Cybernetics*.

[40] Krendel, 'Review of Engineering Cybernetics'.

[41] Chin and Lin, 'The American-Trained Rocket Scientist Who Shaped China's Surveillance System'.

[42] A 1999 report by the US Army War College describes Qian as "bent on exacting revenge on the United States". See "Appendix II: The Legend of Qian Xuesen" in Stokes, 'China's Strategic Modernization'.

[43] Wang and Jiang, 'Seeking for a Cybernetic Socialism'.

[44] Wang and Jiang.

[45] Greenhalgh, 'Missile Science, Population Science'.

of the *Long-Term Plan for the Development of Science and Technology, 1956-1967*, a twelve-year blueprint for China's industrialisation and nuclearisation that paved the way for large-scale Soviet technological aid and the creation of the State Science and Technology Commission (later renamed to the Ministry of Science and Technology).[46] Qian advocated an ambitious agenda far beyond the more modest suggestions of his counterparts in China and the USSR. He Is said to have had a direct hand in ensuring that electronic computers, semiconductors, ballistic missiles, wireless control systems, automation, and atomic energy were all written into the plan.[47]

Despite Qian's efforts, this period of consensus proved very brief. As Wang Zuoyue has argued, the *Long-Term Plan* was not the manifestation of a unified nor visionary national leadership – as is often portrayed in Chinese scholarship – but rather the result of contestation and compromises between clashing ideological undercurrents.[48] The tensions that the *Plan* masked would soon resurface with a vengeance, fracturing the uneasy coalition that had drafted it.

Down with the Engineers?

Science and technology were far from immune to the ideological and political turmoil of the two decades that followed the publication of the *Long-Term Plan* in 1956. By the mid-1950s, two broad camps had emerged at the top of Chinese politics regarding the most appropriate developmental path for the nation. On the one hand, Zhou Enlai 周恩来 and his close allies, Marshals Chen Yi 陈毅 and Nie Rongzhen 聂荣臻, advocated for the inclusion of technocratic methods and expertise in policymaking.[49] On the other hand, Mao favoured mass participation and the total subordination of science to ideology. At the heart of this debate was an inherent tension between the state and scientists, often Western-trained. Political paranoia set in, as the loyalties of such experts began to be questioned. In many ways, this was a mirror image of Qian's treatment during the Red Scare; could scientists with roots and experiences overseas be trusted not to undermine the national interest?

Mao did of course see some use for science, namely military research, in the pursuit of his goals.[50] Under his instruction all other disciplines were to be subsumed under this agenda for both practical and ideological reasons. The nascent PRC faced, at the time, very real strategic and military threats from both the US and then the USSR as the Sino-Soviet

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[46] State Council, 'Long-Term Plan for the Development of Science and Technology, 1956-1967'; Wang, 'The Chinese Developmental State during the Cold War'.

[47] He Zuoxiu, 'Qian Xuesen and the Twelve-Year Science Plan'.

[48] Wang, 'The Chinese Developmental State during the Cold War'.

[49] For biographies of Zhou Enlai and his political allies, see Chen, 'Zhou Enlai and China's "Prolonged Rise"'; Gao, *Zhou Enlai*. See also Nie, *Inside the Red Star*.

[50] For studies on science and technology, see the work of Sigrid Schmalzer in particular. Schmalzer, *The People's Peking Man*; Schmalzer, *Red Revolution, Green Revolution*; Rui and Matten, *Knowledge Production in Mao-Era China*; Wei and Brock, *Mr. Science and Chairman Mao's Cultural Revolution*; Shapiro, *Mao's War against Nature*; Greenhalgh and Winckler, *Governing China's Population*.

Split unfurled in the late 1950s.[51] Ideologically, following the Marxist tradition, Mao's CCP believed there to be two kinds of knowledge and thereby science in a class society: Natural sciences were seen as a progressive, illuminating force, liberating society from nature and traditional culture. Conversely, social sciences were deemed superfluous as Marxism already had a full and correct understanding of the social world. Under this worldview, priority was to be given to natural sciences and engineering, whereas social sciences would be stripped of its status and deployed to rationalise the Party line.[52] This led to a military-industrial complex in which all engineers and scientists were co-opted into the People's Liberation Army. Most favoured among scientists were those researching strategic weaponry such as nuclear and missile technology.[53] Cyberneticians such as Qian Xuesen were tasked with military research, regardless of their interests in the broader application of their theories and methods. As Evan Feigenbaum has argued, this process resulted in more than just better weapons; it fashioned a powerful set of ideas about the relationship between the state, technology, security and national power, nurturing novel public management solutions and logics that continue to this day.[54]

Their status as military scientists afforded Chinese cyberneticians continued funding and – more importantly – physical protection during the campaigns of the 1960s and 1970s that sought to subordinate and, to an extent, decimate scientific inquiry. Mao's first move to squeeze out the more technocratically-minded faction of the Party was to launch the Anti-Rightist Campaign (1957-59) just a few months after the publication of the *Long-Term Plan*. Many prominent scientists were silenced, either through direct imprisonment, intimidation or through professional transfers.[55] These included many of those who had worked for the KMT's NRC, but who had stayed on the mainland after 1949 to support the Communist project.[56] The Great Leap Forward (1958-62) saw widespread statistical abuses and the systematic dismantling of data-gathering tools and methods.[57] Cascading misreports of record grain yields claimed non-existent surpluses while tens of millions died of starvation. The conditions for famine were exacerbated by anti-scientific rationales such as the Four Pests Campaign, as well as the application of Soviet-inspired, ideologically-correct though vocationally-useless techniques such as animal husbandry rooted in a rejection of Mendelian

[51] Lüthi, *The Sino-Soviet Split: Cold War in the Communist World*; Chen, *Mao's China and the Cold War*.

[52] Suttmeier, *Science, Technology, and China's Drive for Modernization*; Greenhalgh and Winckler, *Governing China's Population*.

[53] Lewis and Xue, *China Builds the Bomb*.

[54] Feigenbaum, *China's Techno-Warriors*.

[55] Zeng and Eisenman, 'The Price of Persecution'.

[56] Conversely, in a cruel twist of fate, many of those NRC engineers who left for Taiwan went on to wield great influence and respect in the ROC, with several later rising to senior positions in government, including one premier (Sun Yun-suan) and eight ministers of economic affairs.

[57] Bachman, *Bureaucracy, Economy, and Leadership in China*; Yang, *Calamity and Reform in China*; Shen and Xia, 'The Great Leap Forward, the People's Commune and the Sino-Soviet Split'.

genetics as proposed by Trofim Lysenko, or "deep ploughing" inspired by Terentiy Maltsev.[58]

Statistics became highly politicised to be manipulated for ideological ends, the legacy of which would extend well beyond Mao's death; the results of the 1964 census remained sealed for 18 years, secret even to those trying to work on central policy.[59] The Socialist Education Movement (1963-66) further undermined any remaining intellectual tradition in a precursor to the terror of the Great Proletarian Cultural Revolution (1966-76). Mao's commitment to mass participation, self-reliance and the development of indigenous, ideologically-correct technology led to a scientific nihilism that saw Party cadres installed as researchers while professional scientists were sent down the countryside for re-education or worse. Very few scientists escaped the period unscathed; and even then it was only elite intervention that insulated them. Zhou Enlai is known to have personally stepped in to protect 100 or so scientists, including Qian Xuesen and former NRC president Weng Wenhao.[60]

To paint this period as a scientific wasteland – as many English-language scholars do – is to gloss over some of the progress made during this time, however. These include, most notably of course, a successful nuclear test in October 1964.[61] The first computers had arrived in China from the Soviet Union in the late 1950s, with several attempts to integrate their use into policy-making.[62] Even during the scientifically-darkest periods of the mid 20th century, pockets of progress were being made. The Great Leap Forward drew on scientific theories – however flawed – to achieve statist goals of agronomic progress and optimisation. Qian and others were co-opted in 1958 to propose a programme of agricultural reforms that included artificial weather modification, algae farming as a solution to healthier diets, and the introduction of biomass and solar energy capabilities.[63]

There is also evidence of some attempts to introduce data-driven methods into governance among local officials working with cyberneticians and statisticians as a way of driving efficiency. In 1958, engineers working side-by-side with what appear to be ideological chaperones were despatched to apply "operational research" (运筹学) principles in agricultural production across the country.[64] This campaign was led by mathematician Hua

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[58] Zhu, Ding, and Hu, 'The Deep Plowing Movement of the "Great Leap Forward"'; Schneider, *Biology and Revolution in Twentieth-Century China*; Schmalzer, *Red Revolution, Green Revolution*; Shapiro, *Mao's War against Nature*. For more detail on Soviet-era science, see Soyfer, *Lysenko and the Tragedy of Soviet Science*; Roll-Hansen, *The Lysenko Effect*; Pollack, *Stalin and the Soviet Science Wars*.

[59] Greenhalgh and Winckler, *Governing China's Population*.

[60] Weng did not escape the torment of the period entirely; his son, famous petroleum engineer Weng Xinyuan 翁心源, was tortured and killed in 1970 by Red Guards. For more information on the role of Zhou Enlai in protecting scientists, see Gao, *Zhou Enlai*.

[61] Lewis and Xue, *China Builds the Bomb*.

[62] Negro and Wang, 'Computing the New China'; Mullaney, *The Chinese Computer*.

[63] Audette, 'Computer Technology in Communist China, 1956-1965'; King, 'The Genealogy of Chinese Cybernetics'.

[64] Wang and Jiang, 'Seeking for a Cybernetic Socialism'.

Luogeng 华罗庚, who having met Norbert Wiener at Tsinghua in 1935 secured a place to study at Cambridge University before going on to work as a visiting researcher at the Princeton Institute of Advanced Studies under the supervision of John von Neumann.[65] Upon his return to China, Hua set up and led a number of new research bodies, including the Institute of Computing Technology and Institute of Automation. In response to attacks on pure mathematics during the Anti-Rightist Movement, Hua pivoted to applied mathematics and the use of linear programming in industrial development.[66] Throughout 1960, he published a series of op-eds in a variety of state media on mathematical and operational research solutions in agriculture, field design and reservoir management.[67] Hua personally experimented and applied these methods, leading a team of technicians to over 20 provinces to promote the use of data-driven operational research in industry and farming through workshops in factories and open-air study sessions.[68] For his work, Hua received a letter of commendation from Mao personally, a document that granted him safe passage during the Cultural Revolution to come.

The story of Hua Luogeng reinforces a growing body of English-language literature that argues that to write-off scientific development in the Mao era as nothing more than a "ten year gap" is too simplistic. Scholars such as Chunjuan Nancy Wei and Darryl Brock posit that "despite the difficulties and denunciations many suffered during the Cultural Revolution, there were important areas of science and technology that nevertheless continued to receive support and in fact achieved substantial results".[69] Others such as Sigrid Schmalzer argue that while theoretical advances may have been hindered, the period saw important progress in the popularisation and application of scientific methods.[70] This has led some to even argue that the late Mao period went some way to laying the groundwork for the rollout of technological development in the Reform Era.[71]

RE-ENGINEERING REVOLUTION

The question of scientific method in policy and ideology intensified as the struggle for political succession accelerated with the death of Lin Biao 林彪 in 1971. The Gang of Four stepped up their attacks on the sciences, railing against cybernetics, genetics, and the

[65] Hua Luogeng is sometimes Romanised to Hua Loo-Keng.

[66] Chinese Academy of Sciences, 'Remembering Hua Luogeng's "Dual Methods"'; Hudeček, 'Hua Loo-Keng's Popularization of Mathematics and the Cultural Revolution'.

[67] Xu Kang and He Chao, 'Wu Wen-tsun and Origin of Chinese Operations Research and Quantitative Economics'.

[68] Hudeček, 'Hua Loo-Keng's Popularization of Mathematics and the Cultural Revolution'.

[69] Wei and Brock, *Mr. Science and Chairman Mao's Cultural Revolution*.

[70] Schmalzer, 'On the Appropriate Use of Rose-Colored Glasses'.

[71] Hu, 'Despite or Due to the Cultural Revolution'.

theories of relativity and the Big Bang among other things.[72] They positioned themselves most starkly against the faction led by Zhou Enlai, Ye Jianying 叶剑英 and Deng Xiaoping, whom Zhou had managed to rehabilitate from political exile at the 10th Party Congress in 1973.[73] One of Zhou's final acts before his withdrawal from active politics in January 1975 (followed by his death just twelve months later) was to resurrect the until-then fringe doctrine of the "Four Modernisations" (四个现代化) that had first been proposed at the 4th National People's Congress in 1963 alongside Nie Rongzhen. The policy called for the comprehensive modernisation of agriculture, industry, defence, and science and technology as the path to national rejuvenation. The following 22 months saw an intense battle for control of the Party's – and therefore the country's – future, ending with Mao's death and subsequent arrest of the Gang of Four in October 1976. Deng Xiaoping took up Zhou's cause and spearheaded a consensus that the Four Modernisations were not only desirable, but that science and technology would be crucial in achieving the other three pillars of this vision.[74] The 11th Party Congress in August 1977 set the stage for a significant policy shift, with the Four Modernisations written into the Party Constitution and the issuing of a *Circular on Holding a National Science Conference* to be scheduled for the Spring of 1978.

Deng's speech at the opening ceremony of that event – the speech referenced at the start of this chapter – marked a Thermidorian rewriting of the state's relationship with technology and technologists.[75] As detailed above, however, China's "engineer-in-chief" (总工程师) had to walk a fine line, balancing Marxist ideology with a new commitment to "scientific objectivity" as part of a technocratic pivot that marked a conspicuous and deliberate step away from the ideological excesses of the Maoist period. It was in this speech that Deng famously stated that science, not the revolutionary subject, was the "primary productive force" and – in stark contrast to their standing under Mao – that scientists constituted an important component of the working class. Deng's vision was one of a modern, prosperous society underpinned by scientific advancement, one that would rely on the rehabilitation and exaltation of experts whose relative freedom and status had been denied in previous decades. In an echo of Sun Yat-sen's dream of modernity through technological transformation, Deng sought to legitimise his economic reforms by linking the national interest with a deeply scientistic narrative that positioned technology – not class struggle – as the solution to all of China's ills.[76] This momentous conference concluded with the publication of the 1978-85 *Science and Technology Development Plan*, in which an agenda for China's path to industrial modernisation was laid out.[77] Cybernetics received a mention

[72] Hu, 'Organized Criticism of Einstein and Relativity in China, 1968–1976'. For a wider look at the treatment of Einstein across the 20th century in China, see Sato, 'Criticising Einstein'; Hu, *China and Albert Einstein*.

[73] Vogel, *Deng Xiaoping and the Transformation of China*; Baum, *Burying Mao*.

[74] Suttmeier, *Science, Technology, and China's Drive for Modernization*.

[75] Deng Xiaoping, 'Speech at the Opening Ceremony of the National Science Conference'.

[76] For more detail on Deng's technological pivot, see Vogel, *Deng Xiaoping and the Transformation of China*.

[77] Ministry of Science and Technology, 'National Science and Technology Development Plan 1978-1985 (Draft)'.

among the 108 research projects put forward, with an emphasis on quantitative, computer-driven, prediction-based technologies in economic planning and decision-making.

One of the fundamental questions facing the Deng administration, however, was who was going to carry out this ambitious plan. Despite some gains in the popularisation of science, the Maoist period had on the whole devalued scientific expertise, persecuted highly-skilled individuals, bulldozed institutions, and decimated the country's talent pipeline. Scientifically-trained returnees would play their part, as Deng attempted to lure back overseas Chinese researchers and roll back decades of brain drain.[78] To lead the state's efforts, however, Deng would need to redeploy the country's only remaining scientific community; the military. Missile scientists such as Qian Xuesen and his colleagues, protected throughout the Cultural Revolution, were among the only experts left to respond rapidly and effectively to Deng's call for modernisation.[79] Qian's status as advisor to both Mao and Zhou made him perhaps the most prominent scientist in the country. He and his closest collaborators were part of a small elite whose standing allowed them to transcend fields with great authority.[80] Deng invited these cyberneticians and engineers to apply their knowledge and methods to broader questions of modernisation. For Qian, it must have been a welcome return to the kind of project he had initially hoped to work on when returning from the US in 1955. He began to host regular inter-disciplinary workshops in a nod to the Macy Conferences, bringing economists and other social scientists together with weapons experts to discuss the role of systems theory and engineering in China's economic transition and socialist construction.[81]

The reapplication of this engineering expertise in the pursuit of broader policy goals had a profound impact on the very logic of government and the way that it saw and thought about society. The best documented example of this can be seen in debates on population control in the late 1970s. In spite of the hardship, violence and famine of the preceding decades, China's population had swelled from an estimated 540 million to some 940 million between 1949-79. Susan Greenhalgh has documented how Song Jian 宋健, one of Qian Xuesen's closest protégés, led a research team to apply cybernetic methods to this perceived population problem.[82] They were influenced by a global debate on the risks of over-population promulgated by the neo-Malthusian Club of Rome, an organisation that while deeply controversial in the West was of great appeal to Song.[83] Song recast the

[78] Cao et al., 'Returning Scientists and the Emergence of China's Science System'; Wang, 'Transnational Science during the Cold War'.

[79] Feigenbaum, 'Who's Behind China's High-Technology "Revolution"?'

[80] Greenhalgh, *Just One Child*; Feigenbaum, *China's Techno-Warriors*.

[81] Several participants in these events later penned eulogies on their experiences. See Zheng Chengliang, *Soul of a Nation: The Spirit of Qian Xuesen, a Scientist of the People*.

[82] Greenhalgh, 'Missile Science, Population Science'.

[83] In 1972, the Club of Rome published its seminal report detailing the dangers of exponential population growth on a planet with finite resources, based on extensive computer modelling. See Meadows et al., 'The Limits to Growth'. For a history of such views in the field of international development and politics, see

population problem using Club of Rome arguments, redefining the issue away from the social sciences to one that could be framed in natural science terms, subject to natural laws and methods, much like the systems theories of cybernetics. These were blended further with Chinese strategic military doctrine that perceived unchecked population growth as an existential threat to China's goals of wealth and power in the future 21st century. Song's research led directly to the creation of China's infamous "One Child Policy", one of the most personally invasive and violent policies of the last century, with far-reaching and direct consequences for hundreds of millions of women, as well as indirect impacts such as persistent imbalances in the country's sex ratio.[84]

Engineering Utopia

The application of cybernetic principles outside of the field of missile technology generated new visions of a technocratic state and society, as well as the relationship between the two. Cyberneticians portrayed the nation as a machine, ready to be tweaked, upgraded, and controlled. This optimism in the revolutionary potential for information technologies blossomed in the 1980s, buoyed on by statements from Deng Xiaoping such as "there are no limits to the development of science and technology or the effect they can have", or moon-shot goals such as "quadrupling the gross annual value of industrial and agricultural output by the year 2000".[85] Despite this optimism, China still lacked a clear roadmap of how to achieve its strategic aims; the 1978-85 plan had focused primarily on heavy industry and agriculture. Deng and his cybernetic entourage dreamt of something bigger, however, of a "New Technological Revolution" (新技术革命).

The 1980s were a uniquely curious time in Chinese politics and society.[86] An infectious optimism gripped the nation as the Party introduced sweeping reforms with the goal of establishing an urban, commodity-based economy.[87] Government officials and citizens alike used their newfound relative freedoms to experiment in policy and personal milieu previously reserved for Marxist thought. A wide range of fads and fevers (热) swept through the nation, some intellectual, some spiritual – and some a blend of the two. Cults and sects

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Fletcher, Breitling, and Puleo, 'Barbarian Hordes'. For a study of these debates in the Japanese context, see Homei, *Science for Governing Japan's Population*.

[84] Fong, *One Child*; Johnson, *China's Hidden Children*; Jin et al., "'Bare Branches" and the Marriage Market in Rural China'.

[85] Deng Xiaoping, 'In the First Decade, Prepare For the Second'.

[86] On the political and social culture of 1980s China, see Gewirtz, *Never Turn Back*; Wang, *High Culture Fever*; Goldman, *Sowing the Seeds of Democracy in China*; Gu, 'Cultural Intellectuals and the Politics of the Cultural Public Space in Communist China (1979-1989)'; Cheek, 'The New Chinese Intellectual: Globalized, Disoriented, Reoriented'; Zhang, 'On Some Motifs in the Chinese "Cultural Fever" of the Late 1980s'; Barmé and Jaivin, *New Ghosts, Old Dreams*; White, 'Chinese Studies of Bukharin'; Chen and Jin, *From Youthful Manuscripts to River Elegy*.

[87] On the economic transformation of 1980s China, see Shirk, *The Political Logic of Economic Reform in China*; deLisle and Goldstein, *To Get Rich Is Glorious*; Huang, *Capitalism with Chinese Characteristics*; Naughton, *Growing Out of the Plan*; Naughton, *The Chinese Economy*.

sprung up across the country, with an estimated 20 per cent of China's urban population drawn into some form of non-mainstream religious practice.[88] Qigong – taught and encouraged as an official medical practice throughout the 1950s before being labelled a superstition and suppressed in the Cultural Revolution – made a remarkable comeback as a means of advancing individual empowerment and physical health after years of collectivism and limited self-expression. Popular trends were co-opted and reframed as part of broader policy objectives; qigong was designated a "bodily science" that spoke to the superiority of Chinese medicine, with the power to lead a quasi-scientific revolution inspired by utopian visions of the paranormal.[89] These efforts were advocated by none other than Qian Xuesen. Following a flurry of local newspaper reports on children able to "read with their ears" in the late 1970s and early 1980s, Qian encouraged the study of so-called "extra-sensory perception" (ESP) and its application to China's modernisation.[90] Between 1979-82, dozens of research articles on ESP were published by China's top universities and in May 1981, China's "Second Symposium on Human Body ESP" was held in Chongqing with Chinese government support. Qian would go on to publish a book, *On Human Science and Modern Technology*, in 1988, in which he wrote that ESP "may lead to a new scientific revolution in the 21st century, perhaps even greater than the early 20th century scientific revolution led by quantum mechanics and relativity theory".[91]

Clearly, policy inspiration came in many forms during this period. One source of great influence came in the import of foreign futurist visions and literature. Julian Gewirtz tells the remarkable story of Alvin Toffler and his impact on senior policymaking circles of the 1980s.[92] Toffler's book, *The Third Wave*, tells of three phases of human development; "first wave" agricultural states – such as China – stand in contrast to "second wave" industrialised nations. A "third wave" of development would see wholesale institutional and social transformation, with "emerging civilisations" able to consolidate their global standing through new energy sources, methods of production, family structures, educational models, and corporate organisations. Toffler visited Beijing at the start of 1983, meeting a range of officials and even giving a speech at CASS. Two months later, *The Third Wave* was published in Chinese for 'internal' circulation among political and intellectual elites. The work was discussed at length, with many agreeing that while China had missed out on the second wave, it may be able to skip "some of the stage of traditional industrial development" and move straight to "utilising more advanced scientific and technological achievements".[93] This

[88] Palmer, *Qigong Fever*; Ownby, *Falun Gong and the Future of China*.

[89] Liu, 'Information Fantasies'.

[90] Li and Fu, 'The Craziness for Extra-Sensory Perception'.

[91] Palmer, *Qigong Fever*.

[92] The importance of Toffler has been noted by a number of other scholars, including Fewsmith, *Dilemmas of Reform in China*; Pye, 'On Chinese Pragmatism in the 1980s'; Goldman, 'Politically-Engaged Intellectuals in the Deng-Jiang Era'; Baum, *Burying Mao*. Through a careful analysis of previously unseen government documents, Gewirtz has carefully reconstructed and underscored Toffler's influence on a much more comprehensive level. See Gewirtz, 'The Futurists of Beijing'.

[93] Gewirtz, 'The Futurists of Beijing'.

triggered a "Third Wave Fever" (第三次浪潮热) with broad intellectual and cultural influence. Writers found popular reception for futurist titles, both educational and fictional, inspiring a fascination for new ideas and international trends, such as the book series *Towards the Future* (走向未来), which included editions dedicated to systems theory, cybernetics, and socio-biology.[94]

Crucially, Gewirtz argues, this interest in futurism was not some fad, but central to the worldview of Zhao Ziyang and other reformers of the time who deployed ideas about a "new technological revolution" in their push for a distinctive set of major and far-reaching policies that blended technology, science, and economic development. The most prominent example of this was the *863 Programme* (863 计划), so-named due to its publication date of March 1986.[95] Taking inspiration from major state-led projects such as the 1983 US Strategic Defense Initiative, the *Programme* was proposed to Deng by a group of four elite scientists with the goal of investing in indigenous scientific research and development as a way of reducing China's dependency on foreign technology, as well as its competitiveness with the US, USSR, and Western Europe.[96] Their proposal was approved in a matter of days, with Zhao Ziyang and Song Jian – now Director of the State Science and Technology Commission – appointed as leads over a budget totalling some 5 per cent of government spending that year. With a focus on space, information, energy, and bio-technologies, among other fields, the *863* was "China's premier industrial R&D programme".[97] Many of China's biggest domestic scientific achievements – the Tianhe supercomputer, Shenzhou spacecraft and Loongson processors – can be traced to its patronage.

The Engineering Class

This shift in tone could not have stood in starker contrast with the Maoist period. The government embarked on a process of popularising science across the Chinese education and media systems.[98] Scientists and technologists, after years of demonisation, were suddenly venerated throughout China's cultural discourse as a tool for inspiring further advancement in these fields. At the top of the hierarchy of scientific heroes came Qian Xuesen, who since the early 1980s had found himself thrust more and more into the public eye.[99] When China Central Television (CCTV) broadcast a series of lectures on systems engineering in 1980, Qian was personally responsible for its first course, "Systems Engineering and Thinking", the first of many media engagements. Throughout the 1990s and

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[94] Chen and Jin, *From Youthful Manuscripts to River Elegy*; Gu, 'Cultural Intellectuals and the Politics of the Cultural Public Space in Communist China (1979-1989)'.

[95] The programme's official name was the *National High Tech Research and Development Plan*. See Ministry of Science and Technology, 'National High Tech Research and Development Plan'.

[96] "Dependency theory" was hugely influential on Chinese policymakers, just as it was elsewhere in the developing world.

[97] Feigenbaum, *China's Techno-Warriors*.

[98] Wu and Qiu, 'Popular Science Publishing in Contemporary China'.

[99] Wang, 'The Making of an Intellectual Hero'.

2000s, Qian was showered with an array of honorific titles and positions, including his designation as a "State Scientist of Outstanding Contribution", "National Hero" and "Pillar of the State". Numerous activities – conferences, symposiums, exhibitions and ceremonies – were organised in his honour, while television and print media told of his rags-to-riches story. This idolisation snowballed into an avalanche of "Qian Xuesen fever" in 2001 when he celebrated his 90th birthday. Crowned the "People's Scientist", Jiang Zemin personally penned a calligraphic inscription in tribute. Upon his death in 2009, Qian's eulogisation was second only to Deng Xiaoping's.[100] A museum and library were built in his honour, while a film biopic celebrating his life was released in 2012.[101]

This elevation of key scientific figures was a carefully stage-managed political exercise.[102] Ning Wang has argued that at least part of the reason Qian was singled out over others were his undeniably "red" credentials.[103] Immediately after the Tiananmen crackdown, political pressure was strongly felt by educated elites. However, while rejecting Western values and ideology, Party leaders continuously stressed the importance of intellectuals in modernising China, and the need to rekindle their enthusiasm. Picking out an individual from the intellectual community to praise and reward was helpful to the Party as it sought to improve its relations with the intelligentsia and prevent their further alienation from the state. Giving priority to scientific circles could align with the state policy of "national rejuvenation through science and technology" (科技兴国). Qian and others were held up as incorruptible examples of "red experts", inspiring a new generation of technocratically-minded, ideologically-loyal "red engineers". Joel Andreas has studied the importance of elite institutions such as Tsinghua and Peking universities as cradles of learning for Party technocrats, who came to see themselves as a new elite "vanguard class" whose tutelage would guide the nation's development.[104]

One such individual to come out of this system was future Premier Li Keqiang. Li studied law as an undergraduate before returning to Peking University to complete a masters and then doctoral degree in economics, winning the Sun Yefang award - China's highest prize for the subject – upon graduation in 1996. While a student, Li wrote several articles on the application of cybernetics and information to China's developmental context. In his view – widely shared by other members of this new intellectual class – cybernetics offered a scientific route to rapid modernisation, translating the country's emerging and highly complex governance challenges into technical questions that could be answered using rational, informational solutions.[105] Li argued that institutions had the potential to create a

[100] Wang.

[101] The Qian Xuesen Library & Museum is situated within Shanghai Jiaotong University. See 'Qian Xuesen Library & Museum'.

[102] Unger, *Using the Past to Serve the Present*.

[103] Wang, 'The Making of an Intellectual Hero'.

[104] Andreas, *Rise of the Red Engineers*; Lee, *From Revolutionary Cadres to Party Technocrats in Socialist China*; Cheng and White, 'The Fifteenth Central Committee of the Chinese Communist Party'.

[105] Fang, 'Li Keqiang and Cybernetics, a Short Thread'.

"rule of law machine", which "along with the society it controls, constitutes an artificial open system".

This computational approach to policy-making was typical of a new generation of technocratic officials who began to take office in the 1980s and 1990s as the old revolutionary guard of Party cadres died, retired or were otherwise forced out.[106] Some political needs stayed the same, however, with the relative openness of the 1980s followed by a renewed urgency to securitise the state in the post-Tiananmen years. The new class of "red engineers" were keen, however, to also explore novel models of governance and organisation in response to Deng's call for economic modernisation, as well as the rise of political and religious unrest. A new concept of "social management" (社会管理) emerged, taking direct inspiration from the work of Song Jian and Qian Xuesen, who in the mid-1980s had begun to theorise broader applications of systems theories found in the military to the civilian sector.[107] Their strategic doctrine of rigid statist approaches to threat minimisation, honed in the military, resonated with a Party leadership reeling from the turbulence of 1989.

The search for new organisational techniques began in 1988 with a communiqué issued alongside the *State Council Agency Reform Plan* that signalled a shift away from government control of the minutiae of day-to-day life, stating "government cannot and need not take on all social affairs itself" and that it should instead rely on companies, associations, and social groups. The focus was on a tentative exploration of channels outside the structures of government to attend to social matters.[108] The term "social management" was introduced formally in November 1993. The 14th Central Committee's Third Plenary Session Resolution called for government's "social management" functions to be strengthened to ensure the "normal running of the economy and decent social order".[109] "Social management" principles gave rise to a variety of new tools and techniques in the mediation of state-society relations. Officially, the term appeared only sporadically in following years, but the period was marked by a re-imagination of the government's capacity now that it was pulling back from direct economic management.[110] The state began to rely on an ever more diverse range of actors, primarily across civil society, from business groups, to lineage associations, community groups, and local Party organisations in the co-management of society.[111]

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[106] For more on the handover of generational power, see Chen et al., 'Dethroning the Mao-Era Elite, Clearing the Way for Reform'. For more on the technocratic proclivities of this new generation, see Wallace, *Seeking Truth and Hiding Facts*. For more on the training of these officials, see Pieke, *The Good Communist*.

[107] Pieke, 'The Communist Party and Social Management in China'; Hoffman, 'Programming China'.

[108] For an overview of this transition in governance style, see Snape, 'Social Management of Social Governance'.

[109] Central Committee, 'Communique of the Third Plenary Session of the 14th Central Committee of the Chinese Communist Party'.

[110] Snape, 'Social Management of Social Governance'.

[111] Mattingly, *The Art of Political Control in China*; Tsai, *Accountability without Democracy*; Huang, 'Rethinking "the Third Sphere"'; Tsai, *Capitalism without Democracy*.

INFORMATION REVOLUTION

This exploration of new governing styles and mechanisms in an attempt to rework the relationship between state and society fused with a new global idealism around the revolutionary power of technology. The 1990s were a time of huge change across the world. Sandwiched between the "end of history" and 9/11, in Europe and the US the decade was marked by the increasingly free movement of goods and capital, the deregulation of finance and telecommunications, and the creation of the World Wide Web.[112] Neo-liberal optimism superseded neo-Malthusian pessimism on the limits of growth.[113] The building of an "information society" in which the creation, distribution and integration of ICTs had the power to deliver near-limitless improvements across social organisation, security, health and welfare, food production, environmental protection and energy, even as populations soared, became the driving logic of global governance.[114] A fever of excitement culminated in the United Nations' *World Summit on the Information Society* (WSIS), hosted in 2003 and again in 2005, defining this new ideal as one in which "everyone can create, access, utilise and share information and knowledge to achieve their full potential in improving their quality of life".[115]

The rise of the information society was seen as both an opportunity and a threat to China's development. On the one hand, it offered a path to non-linear, leapfrog-style growth, allowing the country to break free of its underlying structural constraints. On the other hand, if China did not seize this chance, it risked being left behind once again just as it was starting to catch up through industrialisation. The purportedly "liberating" potential of new information technologies raised further eyebrows.[116] As early as the 1980s, the Party Central Committee remarked on the importance of "informatisation" (信息化) as corollary to the country's technological development.[117] It was around this time that Xi Jinping, then Party Secretary of Zhengding County in Hebei, reportedly stated:

> "If technology is the key, information is the soul. A failure to pay attention to information work is like a 'blind man riding a blind horse entering a deep pool in the middle of the night' [poor decisions with dangerous consequences]. We must build a

[112] Gerstle, *The Rise and Fall of the Neoliberal Order*.

[113] After decades of viewing its vast population as a hindrance to modernisation, the CCP began to positively equate it with the human capital that would allow the country to transition to a "knowledge economy". See Greenhalgh, *Cultivating Global Citizens*.

[114] For a discussion on theories of the information society, see Webster, *Theories of the Information Society*. For classic works of techno-optimism, see Simon, *The Ultimate Resource 2*; Lomborg, *The Skeptical Environmentalist*.

[115] Mueller, *Networks and States: The Global Politics of Internet Governance*; Negro, 'A History of Chinese Global Internet Governance and Its Relations with ITU and ICANN'.

[116] For studies on early attempts to regulate the internet, see Tai, *The Internet in China*; Hughes and Wacker, *China and the Internet*; Shao, *Internet Law in China*; Lagerkvist, *After the Internet, Before Democracy*; Austin, *Cyber Policy in China*; Gallagher, *Censored*.

[117] Guo Chengzhong, 'The Development History and Basic Ideas of China's Informatisation'.

> 'cobweb-shaped' information network to act as our eyes and ears as soon as possible".[118]

At a symposium in 1983, Premier Zhao Ziyang evoked Alvin Toffler's "three waves", John Naisbitt's "megatrends" and Walt Rostow's "stages of growth" to explain that the shift from industrial to information society presented an opportunity for China to skip the traditional developmental trajectory, announcing the setup of two "small groups" (小组) – one led by the State Council, one located within the Shanghai municipal government – to study the example of the US and propose countermeasures for China's own information revolution.[119]

Mainstream political consensus on the power and value of ICTs in Chinese economic and social development has strengthened *ad infinitum* ever since, with information technology viewed as a vanguard of the country's modernisation. While the 1990s represented a period of great optimism in China as elsewhere, it was also a time of significant upheaval.[120] Market liberalisation and the dismantling of the "iron rice bowl" of labour and welfare security was creating big winners but also big losers.[121] The individual "pursuit of profit" combined with lax regulatory enforcement saw a blossoming of marketplace malfeasance (see Chapter Two). Politically, the central leadership was still reeling from the fallout of the 1989 Democracy Movement.[122] Scarred by the turmoil of the Cultural Revolution and with its roots in the strategic military threat discourse of the 1950s, a stability-above-all-else mentality set in.[123] From this emerged a belief – or hope – that informatisation could offer a silver bullet solution to the many challenges facing the CCP. Data-driven techniques would provide the "stability" (稳定) needed for market activity, while also allowing for new ways of seeing and organising society.[124]

Leading Latecomer

China's drive for informatisation faced an uphill struggle, however. As a relative latecomer to industrialisation in general, it lacked much of the infrastructure to facilitate the information revolution it desired. By 1985, for example, China had just one computer for

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[118] Communist Party Members Online, 'One "Network" with Deep Love, One Heart for the People'.

[119] Liu Hong, 'Common Sense Overcomes Ignorance'.

[120] Barmé, *In the Red*; Xu, 'Chapter 8 – 1990s'; Dai and Zhang, 'Invisible Writing'; Ownby, 'Fu Yu and Gui Yong on China's 1990s Generation'; Clark, *Youth Culture in China*.

[121] Leung, 'Dismantling the "Iron Rice Bowl"'; Hughes, 'Smashing the Iron Rice Bowl'.

[122] Shambaugh, 'China in 1990'.

[123] On the legacy of military thinking on policy-making, see Feigenbaum, *China's Techno-Warriors*; Feigenbaum, 'Who's Behind China's High-Technology "Revolution"?'

[124] For an overview of the importance of "stability preservation" in Chinese political thought, see Bandurski, 'Preserving Stability'; Khan, *Haunted by Chaos*.

every 20 in the US.[125] Despite early enthusiasm, the political push for informatisation picked up pace only in the mid-1990s, with the setup of the *National Informatisation Expert Group* and then *State Council Information Work Leading Small Group* headed up by Vice Premier Zou Jiahua 邹家华 as primary decision-making and advisory bodies for the project. In 1997, the first national conference on the topic was held in Shenzhen, defining informatisation as the "historical process of cultivating and developing new productive forces" through the "application of modern information technologies in all aspects of agriculture, industry, science, national defence and social life" to create "smart tools" that accelerate national modernisation.[126]

The first fruits of these efforts came with the launch of the "three golden projects" (三金工程) throughout the mid-90s. "Golden Bridge" (金桥) focused primarily on infrastructure, building the technical connectors and standards that would facilitate cross-departmental and cross-regional communication and information exchange. Over the years, this has included the construction of backbone networks and wireless mobile access points, the installation of fibre optic cables, and the launch of communications satellites. "Golden Customs" (金关) was launched to digitise and automate customs clearance, licensing, quota management, and tax rebate processes for international trade. "Golden Card" (金卡) related to the digitisation of finance, both in terms of electronic currency transactions and the promotion of bank card usage. Inspired by the language and goals of America's "information superhighway", these projects collectively aimed to radically reform the ways in which state and non-state actors connected and made decisions. By the Fifth Plenum of the 15th Party Congress in 2000, official Party-speak was making an explicit link between informatisation, industrialisation and modernisation, spurring officials to take advantage of its status as a "latecomer" (后来者) to achieve leap-frog developments in social productivity.[127]

With the turn of the millennium came an attempt to leverage informatisation to reform not only the economy but "social management" techniques also. In September 2000, Premier Zhu Rongji 朱镕基 urged officials at all levels to explore and accelerate the deployment of information technologies in their administrative duties.[128] This process had begun some months earlier, with 40 central ministries joining a new E-Government Project which had the aim of connecting 80 per cent of departments to a state-run intranet by the end of the year 2000. These institutions would then be encouraged to set up their own websites and platforms for individuals to complete administrative tasks from home. A network of *Informatisation Offices* at the local level for the coordination and implementation of e-government services grew under the control of the State Council.[129] The broader

[125] Simon, 'China's Drive to Close the Technological Gap'.

[126] Li Juan, 'On the Development and Achievements of Informatisation in Commercial Banks'.

[127] Central Committee, 'Recommendations of the CCP Central Committee on Formulating the Tenth Five-Year Plan for National Economic and Social Development'.

[128] Guo Chengzhong, 'The Development History and Basic Ideas of China's Informatisation'.

[129] Schlæger, *E-Government in China*.

application of ICTs across government services and processes is most clearly evidenced by the expansion of the "golden projects" from three to 12 by 2002.[130]

Perhaps the most infamous of these projects has been the development of the "Golden Shield" (金盾). Launched in 1998, Golden Shield entailed the informatisation of China's public security apparatus in order to increase operational efficiency and response times, coordinate cross-regional and cross-departmental efforts under a unified command system, and innovate new forms of risk detection and crime prevention.[131] With a new *National Crime Information Centre* at its core, the Ministry of Public Security has over the years invested significant amounts of resource in modernising its data-driven capacities, from content filtering systems, to facial recognition-enabled cameras and – more recently – AI-driven networking capabilities, emotional recognition software and big data processing.[132] These systems are often trained on the supervision of "target populations" (重点人口), including those with mental illnesses, convicted criminals, fugitives, drug users, petitioners, suspected terrorists, political agitators, migrant workers, idle youths, ethnic minorities, those infected with H.I.V., and other potential threats to all-important social stability.[133] Golden Shield's first phase was completed in 2006, achieving "vertical and horizontal integration and interconnection" across 90 per cent of the country's grassroots public security organisations.[134]

The 2010s saw a rapid acceleration of informatisation across the economy, government and society, concomitant with the explosion of (predominantly mobile) internet-connected devices. The 18th Party Congress brought a change in leadership even more committed to ICT-driven development than their predecessors.[135] As Party boss in Zhejiang province during the early 2000s, Xi Jinping had witnessed first-hand the inception of China's earliest tech giants, stating at the time that "there will be no modernisation without informatisation".[136] Erstwhile advocate of cybernetic solutions, Li Keqiang, became Premier in 2013 and wasted no time in setting out his agenda for information-driven reform. Li launched his flagship "Internet Plus" (互联网+) programme in 2015 to much fanfare, describing the potential of internet-connected technologies in government, the economy

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[130] Of the original three "golden projects", Golden Bridge was dropped, while a further 10 were gradually introduced, covering Golden-Finance, -Agriculture, -Shield, -Insurance, -Taxation, -Customs, -Water, -Quality, -Inspections, -Card, -Trade, and -Business. See Central Committee and State Council, 'Guiding Opinions of the National Informatisation Leading Small Group on the Construction of China's E-Government'.

[131] 'Introduction to the Golden Shield Project'.

[132] The study of China's surveillance apparatus is often guilty of many of the critical issues outlined in the Introduction. Ignoring their overall framing, the following works include useful examples and anecdotes: Chin and Lin, *Surveillance State*; Pei, *The Sentinel State*; Strittmatter, *We Have Been Harmonized*.

[133] Mozur, Xiao, and Liu, 'An Invisible Cage: How China Is Policing the Future'. For more on the CCP's management of "vulnerable groups", see Thornton, 'A New Urban Underclass?'

[134] State Council, 'Public Security Informatisation Construction has Achieved Significant Results'.

[135] Segal, 'The 18th Party Congress and Chinese Cyberpower'.

[136] Zhejiang's provincial capital Hangzhou is home to the headquarters of several of China's largest technology companies, including behemoth Alibaba (founded 1999), gaming and social media group NetEase (founded 1997), and video surveillance manufacturer Hikvision (founded 2001).

and social management as "a new driving force for development".[137] Internet Plus refers to the application of big data technologies such as mobile connectivity, internet-of-things and cloud computing to traditional industries and government processes as a way of improving efficiency, regulation and management. Typical of "top-level" governance design, the policy has been referenced and echoed across all levels of the state, as well as in almost all major economic programmes of the last decade, from Made in China 2025, to the Belt and Road Initiative and numerous State Council plans.[138] China's digital economy has in the intervening years become the world's largest and most dynamic, leading the adoption and innovation of industrial and consumer technologies from the sharing economy, to mobile payments, live-streamed ecommerce and artificial intelligence. Minister of Science and Technology, Wang Zhigang 王志刚 in 2023 heralded a "leapfrog decade" in Chinese informatisation in celebration of the country's status as global-leader across an increasing variety of technology sectors.[139]

Engineering a New China

According to Xi Jinping, however, size isn't everything. Speaking in February 2014 to mark the launch of the new *Central Leading Group for Cybersecurity and Informatisation* as coordinator for all-things digital, he put forward a striking yet simple observation: China was already a "large network nation" (网络大国); now it must become a "strong network nation" (网络强国).[140] These four characters, often translated as "strong cyber power", have become synonymous with the official discourse of Xi Jinping Thought as a "flagship phrase" (旗帜语) for the New Era.[141] In short, it calls for the ever-deeper integration of information technologies with the full range of market and state practices and processes, reducing direct government intervention and giving greater play to a wider variety of non-state actors in the regulation and management of society, all without ever ceding the Party's political "leadership over everything" as it charts the course for new developmental paths under Chinese-style modernisation.[142] In this sense, informatisation has become inextricably linked with the CCP's ideological goals. As Xi Jinping is often quoted as having said, "the great rejuvenation of the Chinese nation cannot be achieved with the simple beating of gongs and drums"; it needs real teeth.[143]

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[137] State Council, 'Guiding Opinions on Actively Promoting the "Internet Plus" Programme'.

[138] Central Committee and State Council, 'National Informatisation Development Strategy Outline'.

[139] State Council Information Office, 'SCIO Press Conference on "In-Depth Implementation of Innovation-Driven Development Strategies to Accelerate the Construction of a Scientific and Technological Power"'.

[140] Xinhua, 'Xi Jinping: Turn China from Large Network Nation to a Strong Network Nation'; Creemers, Papagianneas, and Knight, *The Emergence of China's Smart State*, 1.

[141] China Media Project, 'Strong Cyber Power'.

[142] Xinhua, 'Xi Jinping Delivers an Important Speech at the National Cybersecurity and Informatisation Work Conference'.

[143] Song Xinrui and Bai Yu, 'Flowing through the World to the East: A Report on General Secretary Xi Jinping's Leadership of China's Informatisation'.

On the international stage, this has been articulated as a greater assertiveness of China's right to control its borders. Central to this has been a broad definition of cybersecurity (网络安全) encompassing not only data protection and network resilience, but technological independence, human capital, public opinion guidance and ideological strength.[144] This security-above-all mentality has evolved into the concept of "cyber sovereignty" (网络主权), under which China maintains the right to limit the flow of information across and within the "Great Firewall" to ensure social and regime stability, while also giving it a seat at the table on issues of global internet governance.[145] As early as the WSIS in 2003, China has stood apart from mainstream, American-led discourse on the open nature of the internet, emphasising the technocratic characteristics of the information society over its potential for individual liberation.[146] This careful balancing of imported technologies with indigenous innovation has, in recent years, led China to challenge not only global norms on internet governance, but the technical standards that underpin it, in an attempt to provide a counterpoint to what it perceives as US "digital hegemony" (数字霸权).[147]

On a domestic level, informatisation in the New Era has been central to the "modernisation of governance capacity" (治理能力现代化). Receiving its first mention at the Third Plenum of the 18th Party Congress in November 2013, the term represents the bleeding edge of the CCP's wider push for Chinese-style modernisation.[148] Some scholars have referred to it as a new "fifth modernisation" to sit alongside the first four that marked the launch of Reform and Opening.[149] For his part, Xi Jinping has described the policy as such:

> The modernisation of the national governance system and its governance capabilities means adapting to the changing times, not only reforming the institutions, mechanisms, laws and regulations that no longer meet the requirements of practical development, but also constantly building new ones to make all aspects of the system more scientific

[144] Creemers, 'Cybersecurity Law and Regulation in China'; Creemers, 'China's Emerging Data Protection Framework'; Lindsay, Cheung, and Reveron, *China and Cybersecurity*; Austin, *Cyber Policy in China*; Inkster, *China's Cyber Power*.

[145] Creemers, 'China's Conception of Cyber Sovereignty'; Zeng, Stevens, and Chen, 'China's Solution to Global Cyber Governance'.

[146] For more on China's relationship with global multilateral internet governance organisations, see Negro, 'China and Global Internet Governance: ITU, ICANN, and the World Internet Conference'; Arsène, 'Global Internet Governance in Chinese Academic Literature'; Arsène, 'Internet Domain Names in China'; Hong and Harwit, *China's Globalizing Internet*; Mueller, *Networks and States: The Global Politics of Internet Governance*.

[147] Chen, 'Digital Hegemony'; Rühlig, 'China: A Technical Standardisation Power?'

[148] Central Committee, 'Decision of the CCP Central Committee on Several Major Issues Concerning Comprehensively Deepening Reform'.

[149] Li Jingpeng, 'Promote the Modernisation of the National Governance System and Governance Capacity'.

> and complete, so as to further the institutionalisation, standardisation and proceduralisation of Party, state and society governance.[150]

Adopted as the main theme of the Fourth Plenum of the 19th Party Congress in 2019, the "modernisation of governance capacity" is about the application of information technologies such as big data, cloud computing and artificial intelligence to the reform of state-society management. Its fusion of "social governance" principles with a process of informatisation is often referred to as "smart governance" (智治), a catch-all term for the scaffolding of data platforms, regulations and surveillance tools at the state's disposal.[151]

"Smart governance" is about more than just digitised processes and e-government services. It is a continuation of a long-held belief in the power of technology to radically reform and upgrade the state's ability to forge new, non-linear paths for break-through development. Its most visible application has been the creation of so-called "smart cities" (智能城市) in which surveillance technologies and advanced data-processing techniques are deployed in the innovation of urban planning and administration.[152] Pioneered by projects such as Hangzhou's "City Brain" (城市大脑), "smart" systems are currently under construction in some 500 municipalities nationwide, connecting facial recognition cameras, sensors, and artificial intelligence processing to monitor and optimise everything from transportation to manufacturing, pollution, agriculture and public utilities.[153] At the grassroots level, information technologies have fused with older methods of neighbourhood governance to create systems of "networked management" (网络化管理), often translated as "grid management".[154] First piloted in 2004, residents living within "grids" of approximately 10 square kilometres are monitored by both human "grid managers" (网络员) and information platforms drawing on the deployment of surveillance technologies. Grids use mapping and geo-coding technology to compile information on the urban landscape and population, with information shared with relevant agencies at the municipal level as problems arise.

Where these systems intersect with public security, policies such as "Internet Plus Supervision" (互联网+监管) have emerged as inheritors of the Golden Shield's aims.[155] At the forefront of these efforts has been the development of "Project Dazzling Snow" (雪亮

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[150] Zhu Shuyuan and Yan Yan, 'Xi Jinping: Effectively Unify our Thinking into the Spirit of the Third Plenary Session of the 18th CCP Central Committee'.

[151] Bernot and Trevaskes, 'Smart Governance, Smarter Surveillance'.

[152] Große-Bley and Kostka, 'Big Data Dreams and Reality in Shenzhen'.

[153] Chen, 'Across China, AI "City Brains" Are Changing How the Government Runs'; Zhang et al., 'City Brain'.

[154] Mittelstaedt, 'The Grid Management System in Contemporary China'; Zhu, 'Grid Managers, the Moral Logic of Guan, and State–Society Dynamics in China'; Xu and He, 'Can Grid Governance Fix the Party-State's Broken Windows?'

[155] Batke and Ohlberg, 'State of Surveillance'.

工程), an attempt to develop a comprehensive video surveillance network with 100 per cent coverage over communities right down to the village level – a "thousand-mile eye" (千里眼) protecting the security of the people.[156] Media reporting describes a system, piloted in several dozen cities, in which individuals engaging in socially negative behaviours such as smoking in public places, jay-walking or spitting are recognised by a network of facial recognition cameras and automatically reprimanded by-name through loudspeakers.[157] More widely, data are collected and made available to the authorities, with the goal of "raising the digitisation of law and order and prevention in society," so as to "efficiently protect the life and property of the masses".[158]

The state's informational capacity has expanded hand-in-hand with campaign-style mobilisation around specific governance priorities or challenges. Since 2017, a policy of ethnic suppression and mass incarceration through "vocational training camps" in Xinjiang has seen the creation of a "high tech penal colony", in which a vast network of private sector technologies, including facial and voice recognition, and smartphone tracking, have seen countless Uyghurs black-listed and detained because of their religious and cultural practice.[159] During the COVID-19 pandemic, existing systems such as "grid management" were retooled for the purpose of contact-tracing, supplemented by huge new data-driven projects such as "health codes" (健康码) to track and contain the virus.[160]

CONCLUSION

The technology of governance in China is the product – over a century in the making – of a constant balancing and rebalancing of priorities, contradictions and influences. Technical expertise against ideological purity; market forces against state intervention; military modernisation against industrial development. Foremost among these dichotomies has been an ongoing debate on the role of foreign technologies and organisational principles, carefully imported in a manner that guards against wider political influence. In the early 20th century, the question of Chinese "essence" (*ti*) and Western "usefulness" (*yong*) split reform camps. Under Mao, suspicion of foreign influence became all-consuming, to the detriment of major scientific progress and industrialisation. Even during the reform period, Deng recognised the

[156] As described by the China Media Project, "in Chinese, the phrase 'dazzling snow' refers to brightness and clarity. In the 1940s, the phrase was most usually associated in discourse of the Chinese Communist Party with words like 'sword' (刀剑) and 'eyes' (眼睛). For example, there were phrases like, 'sword as dazzling as snow' (雪亮的战刀), and 'the eyes of the people are as dazzling as snow' — the latter phrase meaning that China's masses are discerning, or penetrating." See Bandurski, 'Dazzling Surveillance'.

[157] For a collection of stories on the topic, see China Digital Times, 'Sharper Eyes'.

[158] Bandurski, 'Dazzling Surveillance'.

[159] Byler, 'In the Camps'; Byler, *Terror Capitalism*; Byler, Franceschini, and Loubere, *Xinjiang Year Zero*.

[160] Liu, 'Seeing Like a State, Enacting Like an Algorithm'; Mittelstaedt, 'The Grid Management System in Contemporary China'.

need for technological independence, investing in the development of indigenous approaches rather than a wholesale opening up. In the 21st century, concern for the "liberating" potential of the internet and its impact on social stability gave rise to China-specific definitions of cyber-security and -sovereignty, allowing for the introduction of foreign techniques of informatisation while securing the Party's continued leadership over the political realm.

One constant since at least the founding of the PRC has been the importance of ideology. The Party's Marxist-Leninist desire to guide and engineer a society it sees as malleable has fused with cybernetic visions of the technocratic means to achieve this. In the 1950s and 1960s, the focus was on military and then industrial reform, with "operational research" teams popularising computational principles to increase production capacity. By the late 1970s, cybernetics was being applied in population forecasting and planning, as the state re-imagined its ideological relationship with technology as the "primary productive force". By the 1980s and 1990s, informatisation was positioned as precursor to new forms of social management, as the state delegated more and more of its administrative capacity to technology in the pursuit of new ways of seeing and organising the economy and society. These final two decades of the millennium left a deep impression on the technocratic officials that came of age during the period. Wang Huning – long-time senior advisor to Xi Jinping, as well as his predecessors Hu Jintao and Jiang Zemin whose influence will be explored further in Chapter Two – repeatedly references the works of Alvin Toffler in championing the role of technology in national development.[161] In the New Era, a push for the "modernisation of governance capacity" – the fifth modernisation to accompany Deng's four – has seen the emergence of "smart governance" as both method and aim, with the CCP upgrading its ability to respond to the increasingly complex challenges of the 21st century. The goal; to apply informatisation to the concept of "social governance" to allow the state to step back from the minutiae of quotidian administration, delegating its functions to technology without compromising its continued ideological integrity.

This fundamentalist belief in the revolutionary power of information to achieve governance goals is central to the conceptualisation of social credit. As I will explore in Chapter Two, the system is itself the product of many of the same trends, influences and debates. It too draws on imported tools, innovated by expert-led groups of technocrats on the hunt for new paths of non-linear, break-through development, while also responding to shifting ideological priorities. As Chapters Three and Four will show, its creation has additionally been subject to the inherent tensions – sometimes productive, sometimes not – built into China's system of central-local organisation.

[161] Wang Huning, 'China's Village Family Culture'; Wang Huning, 'China's Strategic Choices for the Nineties'; Wang Huning, *Life in Politics*. Cited in Gewirtz, 'The Futurists of Beijing'.