

Huawei and Telefunken

Communications enterprises and rising power strategies

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Rick Umback

Introduction

In January 2019, amid an unfolding discussion on Europe's fifth-generation (5G) mobile infrastructure, the head of Huawei's UK division addressed a meeting of telecommunications executives in London. 'The open attitude of the UK and its support of free markets and enterprise', he declared, 'are admired by us at Huawei. In these uncertain times, we trust Britain to maintain its openness and inclusiveness and make the wise choices that serve the interests of UK citizens.'¹

The implication is that Huawei is a commercial enterprise like any other, and that nations should welcome its proposals or risk betraying their commitment to free markets and openness.

However, sometimes a company is more than simply a commercial enterprise that seeks profit for its owners. While Huawei is a privately owned, profit-seeking organisation (and a very successful one at that), those are only two of its aspects. Huawei has another key function that goes beyond commercial concerns: to develop China's capacity to produce advanced communications hardware. Its representatives may give rhetorical commitments to free markets, but the support of the Chinese party-state has been instrumental to Huawei's emergence as one of China's 'national



Antique radio face: Flickr/Tim Reckmann

champions'. The company's executives have longstanding ties to China's security apparatuses. Furthermore, since its formation in 1987, Huawei has benefited from Chinese government contracts, a protected domestic market, financial support from state-owned banks, and diplomatic support for its overseas expansion. Today it has prominent roles in a number of state-directed industrial policy initiatives to develop China's national communications capabilities. Huawei has a dual function: it is both a profit-seeking enterprise and an instrument of Chinese national strategy.

The dual nature of Huawei can be illuminated through historical comparison. By examining a past precedent of a rising power using state support to nurture a 'national champion' in communications, it is possible to better understand such an organisation. This Strategic Insight outlines the early 20th century history of Germany's pioneering wireless communication firm, Telefunken, in order to identify commonalities between its role as an instrument of German strategic policy and the contemporary case of Huawei.

Huawei's prominence as a global provider of communications hardware has grown steadily since the turn of this century. By the end of 2018, however, it was evident that Huawei had become one of the world's most important companies. That was not because of its commercial success, even though it had recently surpassed Apple as the world's second biggest smartphone vendor. The interest in Huawei came from growing awareness of its political significance.

Huawei was at the centre of major international political developments in 2018, including decisions made by Australia and other nations to effectively bar the company from participation in their national 5G mobile networks. In December, even more sensationally, Huawei Chief Financial Officer Meng Wanzhou was arrested in Canada at the behest of the US. Washington's interest in prosecuting one of Huawei's executives, and the sternness of China's response, demonstrate that Huawei is no ordinary company. It remains at the centre of a major international dispute because of its function in the strategic competition between the US and China, within which advanced technology has become a fulcrum.

We are returning to a world in which communications networks are not exclusively commercial concerns, but also arenas for great-power strategic competition. Within this environment, the national origins of communication companies, and their relationships with host governments, are of supreme importance. Communications technologies are not only connective tools—they are fundamentally also instruments of power. Controlling communications means controlling flows of information, with enormous consequences for coordination, propaganda, intelligence and espionage.²

Governments have always had a strong interest in building and controlling communications networks because of the power inherent in those networks. This paper focuses on two strategic motivations for that interest. The first is geostrategic—using communications as an instrument of control over particular geographical locations. The second is capacity building—developing a national capability to produce and operate advanced communications equipment.

Within these spheres of geostrategy and capacity building, the unfolding communications rivalry between the US and China resembles the competition between Britain and Germany before World War I. In both cases, a rising power introduced targeted policies to promote the global competitiveness of a domestic communications firm, entangling communications companies in great-power strategic competition. China's efforts to establish itself as a technological powerhouse in developing fields of communication such as 5G mobile through its 'national champion', Huawei, bear a strong resemblance to Germany's policy in relation to wireless telegraphy when radio was an emerging technology in the early 20th century. Like Germany's before it, China's communications aspirations also follow a geostrategic logic.

Telefunken: Wilhelmine Germany's 'national champion' in communications

Britain was the world's communications superpower at the turn of the 20th century. Its companies had built most of the world's submarine telegraph cable network, and a British commercial firm, Marconi, was leading the development of wireless telegraphy. For Germany, Britain's communications dominance represented a major strategic challenge. British control of the submarine cable network, combined with the Royal Navy's supremacy at sea, meant that Germany was vulnerable to a communications blockade in any future confrontation. In the Spanish–American War, the Fashoda Incident and the Boer War, Britain had demonstrated that it was willing to deny other powers access to its communications networks for political purposes.³ Until that point, commercial enterprise had been the principal driver of development in the sector, but the growing strategic significance of communications spurred greater government interest in communications development among Britain's rivals.

The emerging technology of wireless telegraphy offered two key capabilities. One was the completely new possibility of communicating with ships at sea. The other was the potential to transmit messages across the seas, providing an alternative to submarine cables for transoceanic communication. Marconi's pioneering moves into wireless threatened to further cement British pre-eminence in international communications—although Marconi's relationship with the British Government was often poor, the company was seen as an instrument of British power. Motivated by the fear of Marconi attaining a global monopoly over wireless, which would complement Britain's existing stranglehold over submarine cables, the German state sought to challenge Britain's primacy by cultivating a domestic wireless firm.

Soon after Marconi first demonstrated the system of wireless messaging, teams of scientists and engineers in German universities and electrical firms began research in the area, probably with military encouragement. Adolf Slaby, a professor of mechanical and electrical engineering (and adviser to the German Government and military) attended an early public demonstration of wireless in Britain. After reporting the potential of the new technology to Berlin, Slaby was directed by Kaiser Wilhelm II to develop an indigenous German system of wireless.⁴

Government support was instrumental to the development of German wireless. Slaby's early experiments not only were ordered by the Kaiser, but received practical assistance from the Imperial German Navy. Once its potential had been demonstrated, Slaby's wireless system was brought into the electrical giant AEG (*Allgemeine Elektrizitäts-Gesellschaft*) for further development, with continued naval support. Another hub of German wireless development also emerged within Siemens & Halske, in this case with army backing. In 1903, the Kaiser directed the creation of a new firm, Telefunken, to further progress German wireless under the banner of a single organisation. Telefunken consolidated the wireless activities of Siemens & Halske and AEG into a single integrated national organisation tasked with solving technical problems, developing new wireless technology and providing wireless hardware and services to clients. The goal was to build German capacity in the field: 'a uniform wireless telegraphy system that was developed and manufactured independently by German firms'.⁵

Research and development was a priority of Telefunken's operations. From its formation, it was designated an 'invention company' (*Erfindergesellschaft*).⁶ Telefunken's focus on innovation was vital for its competitiveness in a rapidly changing technological field. It pioneered a number of important innovations in wireless communication, including the quenched spark,⁷ a musical-frequency transmitter and, most importantly, an alternator that could produce continuous waves.⁸ Telefunken's innovation capacity was enhanced by access to world-class research institutions, financed and coordinated by the state. Through networks connecting university researchers with the industrial sector, Telefunken's engineers were able to incorporate technological breakthroughs into the company's operations. That advantage was not available to Marconi, which was dependent on private capital and individual ingenuity for R&D work. Telefunken was incorporated into a national network of R&D, whereas Marconi was left to its own devices and resources.

Telefunken's access to a national pool of expertise and funding to promote innovation was a major contributor to its success. Though Marconi was the first adopter of wireless, Telefunken's R&D capacity allowed it to surpass the British firm in technological sophistication within a decade. By 1912, Telefunken had technologically overtaken Marconi, through its adoption of the continuous wave, which greatly increased the range and reliability of wireless signalling. Telefunken's station at Nauen, on Berlin's outskirts, became the world's most powerful station and the centrepiece of German wireless infrastructure.

German policy also promoted the competitiveness of its 'national champion' in other ways. German military wireless stations were required to use Telefunken equipment, and the company was guaranteed military orders; until 1908, more than 70% of Telefunken's sales were to the military. That gave the company a vital early market and revenue stream, as well as opportunities to test, refine and further develop its technology and commercial operations. In 1911, other markets were opened for the company when the German Government pressured its domestic shipping lines—the largest of which had previously installed Marconi equipment—to equip their vessels with Telefunken sets. The subsequent increase in Telefunken's share of the German maritime market allowed the company to turn a profit for the first time.⁹

Telefunken expanded into commercial markets not yet controlled by Marconi in Europe, Latin America and the Asia-Pacific as well. It was aided in its efforts by diplomatic and financial support. Financial support allowed Telefunken to forgo short-term profitability in favour of capturing markets by undercutting competitors' prices. Even Australia, a British dominion, awarded the tender for its first wireless stations to Telefunken, which asked for a fraction of Marconi's price.¹⁰

The German state's assistance for Telefunken proved a huge challenge for Marconi, which could not rely on government support for its operations. In the words of the official Marconi historian:

The situation was particularly difficult for the Marconi Company for, whereas it was only backed by strictly limited private capital and no sort of government aid, its rival had, in addition to a substantial state subsidy, the resources of the German banks behind it; and used these powerful weapons to the very best advantage. As a consequence, wherever a Marconi representative went in an attempt to interest a foreign government in wireless communication, it was found that German high-power salesmanship and diplomatic support had already been hard at work, usually to good effect.¹¹

German industrial policy was instrumental in transforming Telefunken from a fledgling enterprise into a cutting-edge company with a growing share of the world market. Without the assistance of the government, Telefunken would have struggled to overcome initial challenges and become a viable enterprise. From its very foundation, the company's fate was bound to the German state.

Telefunken's international expansion was not only aimed at capturing overseas markets for commercial gain, but also directed towards Germany's geostrategic goals—the principal one of which was to establish communication links between Germany's far-flung colonial territories, allowing Germany to escape its dependence on the British-dominated cable network for its overseas communications. As early as 1906, while Telefunken was still a fledgling enterprise and wireless was in its infancy as a medium, the German Government conceived of a global communications network, patching together state-financed submarine cables and wireless stations, to connect its imperial possessions.¹² From 1911, by which time Telefunken's capabilities had progressed considerably, wireless became the central focus of Germany's global communications strategy.¹³

As its capacity grew, along with wireless's technical capabilities, Telefunken erected long-range stations in Germany's colonial possessions in West and Southwest Africa and the Asia-Pacific. Those assets were complemented by other stations in the US and South America.¹⁴ By the outbreak of war in 1914, Germany was the only power with a global wireless network, centred on the long-distance station at Nauen. Telefunken's ability to construct a global telecommunications network (albeit one that would prove vulnerable to Allied interdiction upon the outbreak of war) led one German expert to crow that 'the British cable monopoly is now a thing of the past'.¹⁵

This provided a partial solution to a key strategic problem facing Germany: Britain's domination of global communications, stemming from its control of the principal cable routes. For the German Government, the costs of support to Telefunken were far outweighed by the strategic benefits gained by developing a national wireless organisation, freeing Germany from dependence on British beneficence for its international communications.

Between 1903, when Telefunken was formed, and 1914, Germany adopted an industrial policy tailored to build its national capacity in the emerging field of wireless communication. Its efforts, designed to promote technological innovation and grow Germany's share of the world market, were tremendously successful. Even though the company began life as a laggard, within a few years it was able to compete effectively with the world leaders because of the rapid pace of technological change, of which it became a major driver. Its ability to propel technological progress came from its ability to access a world-class research base—the German university system and the research departments of AEG and Siemens—paired with an internal company emphasis on innovation. By the outbreak of war in 1914, Telefunken had emerged as a world leader in wireless.

Telefunken in World War I

Before 1914, one of Telefunken's focuses was building infrastructure for the advancement of Germany's geostrategic aims, playing a leading role in the construction of a rudimentary global communications network to connect Germany's colonial territories. Neither Germany's network of wireless stations nor its colonial possessions long survived the outbreak of hostilities. However, the capacity developed by Telefunken in the pre-war years proved a major asset for Germany in the conflict. When war broke out, Germany could produce advanced wireless hardware without any need to rely on the outside world. The capabilities Telefunken had developed in its commercial operations were redirected to military applications.

The outbreak of war realised Germany's worst fears about the vulnerability of its communications as Britain acted to isolate it from the rest of the world. The Royal Navy's first action after the declaration of war was to sever Germany's submarine cables in the North Sea. German wireless stations in its African and Pacific colonial territories—which gave the potential to coordinate German naval forces on the open seas—were also early targets of Allied operations. Australia's first wartime action was an expedition to capture the German wireless stations at Rabaul and Nauru undertaken at the behest of the British Colonial Secretary.¹⁶ By early 1915, Allied forces had captured all wireless stations in Germany's colonies.¹⁷

Germany also operated wireless stations in neutral countries for as long as possible, but they too were eventually shut down. A powerful Telefunken transmitter at Sayville, New York, erected in 1914, had placed Nauen in direct communication with North America. However, the Sayville station was seized by the US Navy in July 1915, as the Wilson administration, under British pressure, sought to uphold its neutrality commitments. By late 1916, Germany had plans to construct a network of new stations in other neutral countries such as China, Mexico and Argentina, but that ambition was stymied by British (and later American) diplomatic pressure and sabotage.¹⁸

With the exception of the Nauen station, to which wartime upgrades gave the capacity to transmit information to the ends of the Earth directly from Germany, the Allies effectively shut down Germany's international communications network soon after the outbreak of war. This brought tremendous strategic advantages, as Germany was forced to use channels of communication that could be monitored by the British. For example, the famous Zimmermann telegram, critical to bringing the US into the war, was sent along a cable route that made landing in Britain, allowing British intelligence to capture its contents.¹⁹ Britain also used information gleaned from cable intercepts to cut off German access to neutral sources of finance, particularly from American banks.²⁰ Although the Nauen station transmitted German propaganda, its operations made little difference to perceptions of Germany abroad.²¹ Allied measures against German international communications networks brought considerable geostrategic advantages, demonstrating the vital importance of communications networks to modern warfare.

Germany was unable to maintain its international network in a shooting war, with consequences for its ability to gain external diplomatic, financial and logistical support for its war effort. However, its pre-war investment in wireless brought other advantages. Capacity developed by Telefunken in its commercial operations was directed towards military ends, as wireless's unique capabilities were put to use on the battlefield.

It proved critical that Telefunken had established itself as a technological leader by the time war broke out in 1914. Germany's isolation from other centres of technological innovation, principally Britain and the US, did not affect its capacity to produce advanced wireless equipment for the war effort—it possessed sufficient domestic capacity to produce and continue to improve its own hardware.

Germany's success in developing technical and industrial capacity complemented its innovative adoption of wireless in operations. While the surface vessels of the Imperial German Navy were already fitted with Telefunken equipment, the war also saw the adoption of wireless in U-boat operations. U-boats were fitted with equipment allowing them to receive operational orders from land stations, such as Nauen, and to transmit signals sometimes over more than 1,000 kilometres. Germany far surpassed the Allies in its use of wireless in this domain.²² But, while wireless had always been conceived of as a maritime medium, during the war it was also introduced at considerable scale on land and in the air. Trench warfare, characterised by static front lines and the concentrated deployment of artillery, exposed the fragility of wired communications such as field telephones. As an alternative means to maintain communication between headquarters and the front line, Telefunken produced portable wireless sets *en masse* for the Imperial German Army. Furthermore, Telefunken equipment was provided to the Imperial German Air Service, where it was principally used for artillery spotting.²³ Telefunken also pioneered wireless direction-finding, which was of particular usefulness for nocturnal zeppelin raids.²⁴

None of Germany's wartime wireless innovations would have been possible without the capacity developed by Telefunken in the pre-war years with the encouragement of the state. The development of a domestic innovation and manufacturing capacity meant that Germany's isolation did not prevent it from producing advanced communications hardware for military purposes. For instance, the electron tube—the foundation of the mobile wireless equipment produced by Telefunken during the war—was first developed by Telefunken in 1912. As early as 1915, Germany was producing more than 2,000 tubes a week for the war effort.²⁵ Had Germany been dependent on the outside world for its hardware, its armed forces would not have been able to adopt wireless in their operations to anywhere near the same extent, which would have disadvantaged them on the battlefield.

German capacity building in peace had major consequences upon the outbreak of war. Although Germany was never able to compete with the Allies in its international communications capabilities, it was able to match or even surpass them in its operational capabilities. This can be attributed to its effective industrial policy, which had allowed it to rapidly close the technological gap between it and Britain, and to build its own national capacity.

Huawei: China's 'national champion' in communications

Huawei's rise parallels that of Telefunken in the early 20th century. Although nominally a private company, it has benefited from state policies introduced to promote a 'national champion' in communications. Huawei has received strong political support from the Chinese party-state since its infancy, and that support proved instrumental in its initial survival and subsequent global expansion. Today, it occupies a key position in major initiatives of the party-state, including the 'Digital Silk Road' component of the Belt and Road Initiative and the strategy of 'civil-military fusion'. These facts suggest that, like German policy in the early 20th century, Chinese policy towards its 'national champion' is motivated by strategic concerns relating to the control of advanced communication technology and a desire to escape dependence on other nations in this vital area.

Huawei's origins lay in measures introduced to modernise China's communications infrastructure during the 'opening up' period under Deng Xiaoping. Although the desire to break China's dependence on the outside world for its communications dated back to the Mao era, the task was initially given to a state bureaucracy—the Ministry of Posts and Telecommunications. In the mid-1980s, however, the party-state encouraged the creation of privately owned communications enterprises and relaxed restrictions on imported technology to promote the sector's development.²⁶

Huawei was one of many private communication companies established in that period. Much remains unknown about Huawei's foundation, although from its very beginning it has had ties with the People's Liberation Army (PLA) and other security apparatuses of the Chinese party-state. Its founder, Ren Zhengfei, was a PLA military technologist prior to creating the company. To this day, Huawei's corporate culture remains militaristic: it expects stern discipline and sacrifice from its employees, and martial metaphors are common in its internal discourse.²⁷ Sun Yafang, Ren's 'most trusted deputy' and Huawei's chairwoman until 2018, joined Huawei in its infancy after working for the Communications Department of the Ministry of State Security.²⁸ The personal connections of Huawei's senior executives with China's security apparatuses are highly significant when it comes to understanding the company's emergence as a 'national champion' supported by the party-state, and its pursuit of national strategic goals along with profitability.

Unlike most other Chinese private companies formed to take advantage of new opportunities presented by 'opening up' China's communications sector, Huawei did not seek joint ventures with foreign firms. Recognising the unlikelihood of foreign partners supplying China with their most advanced technology, Ren sought to build the capacity for Huawei to produce technology itself and invested an atypically high proportion of the company's initial capital in R&D.²⁹ Critically, Huawei was kept afloat through its infancy, during which so much of its capital was invested in R&D, by leveraging Sun's 'connections' at the Ministry of State Security.³⁰ Huawei has been nurtured by the Chinese party-state from the very beginning.

State bodies were the first customers for the telephone exchange switches that Huawei produced in its earliest operations. Switches were vital to expanding and modernising China's domestic communications network.³¹ Huawei initially imported them from Hong Kong, but soon progressed to 're-engineering' simple switches, and then developing higher capacity models of its own. By 1993, Huawei had engineered a large-scale switch with a capacity far beyond anything else produced in China.³² Huawei's technical capabilities, which had already surpassed those of domestic rivals, led to its engagement by local governments to install its equipment.

Ren's ambitions for Huawei were both commercial and nationalistic: 'to develop national industry, keep pace with advanced technology, develop based on its own research; the goal is to capture the China market, open overseas markets, and compete with foreign counterparts'.³³ He believed that China's dependence on the outside world for its communication technology was akin to foreign occupation, and that continued reliance on imported technology would lock China into a position of dependence on other nations and prevent it gaining its own capacity for innovation and development. 'Without our own core technology the independence of our industry would be only an empty slogan', Ren declared in 1995, and 'Without an independent national industry there would be no independence of a nation.'³⁴ Building a capable Chinese communications technology company was therefore a means to break foreign domination of China.³⁵

Developing a 'national champion' that could compete with the rest of the world in communications also aligned with the changing strategic priorities of the Chinese party-state after the 1989 Tiananmen Square incident. The embargo imposed by the West demonstrated to the central authorities the need for China to break free of its external dependence for key technologies.³⁶ Huawei's links to the PLA and Ministry of State Security, along with its growing technical capabilities, made it ideally positioned to capitalise on the opportunity.

Throughout the 1990s, Huawei deepened its relationships with the party-state, unlocking new business opportunities and a greater level of official support. At the beginning of the decade, it won a contract to supply the PLA with equipment for a new national communications network, described by one company official as 'small in terms of our overall business, but large in terms of our relationships'.³⁷ Military orders for Huawei equipment were followed by other large government contracts, including from the national rail network and major cities such as Beijing and Guangdong. The state-owned China Construction Bank also began to assist Huawei indirectly, extending credit to purchasers of Huawei products.³⁸ By 1994, Huawei's status as a 'national champion' was cemented when Ren met with Premier Jiang Zemin. Ren is reported to have told the Premier that 'switching equipment technology was related to international security, and that a nation that did not have its own switching equipment was like one that lacked its own military'; 'Well said,' Jiang replied.³⁹

Official support allowed Huawei to make massive inroads into the Chinese domestic market for switches, and the company's rapidly growing revenue stream enabled it to invest in other product lines, principally routers and mobile communications equipment.

Further assistance was forthcoming from the party-state. The Vice Premier in charge of industrial policy offered large loans to assist Huawei to develop GSM⁴⁰ technology in order to break the foreign monopoly in the field. Huawei began producing mobile equipment on a huge scale for the Chinese domestic market, becoming the vendor of choice for the largest network providers.⁴¹ Along with the loans, protectionist measures were instituted to encourage Chinese mobile companies to buy domestic equipment—'Good news for us', according to one company official.⁴²

State protection proved crucial to Huawei's success in China's domestic communications equipment market, assuring the company's viability after an uncertain beginning. As Ren later confessed, 'If there had been no government policy to protect [Chinese enterprise], Huawei would no longer exist.'⁴³ By the turn of the century, its share of the domestic market had brought great profits for the company, amounting to ¥1.7 billion (US\$208 million) in 1999.⁴⁴ This provided the foundation for Huawei's continued growth in the 21st century, when it expanded dramatically into new technologies and international markets.

Huawei became a major player in China's 'going out' strategy at the turn of the century. Supported by Chinese diplomacy and finance, it was able to enter many emerging markets in the early 21st century, particularly in the former Soviet Union, Southeast Asia, the Middle East and Africa. The 'fertile lands have been occupied by Western companies', Ren said. 'Only in those remote, turbulent regions ... did we have a window of opportunity.'⁴⁵

The support of the party-state was vital to Huawei's international growth. Diplomatic overtures and bilateral agreements enabled it to expand into the former Soviet Union. Ren accompanied Foreign Minister Wu Bangguo on a high-profile visit to Africa in 2000, after which Huawei secured numerous contracts to provide communications infrastructure in different countries.

Financial backing accompanied diplomatic support. Institutions such as the China–Africa Development Fund, the China Development Bank and the Export–Import Bank of China provided large, low-interest loans to the purchasers of Huawei equipment. This enabled the company to undercut competitors' prices and also placed the financial risk on borrowers, not the company—ensuring that Huawei would profit from its rapid international expansion.⁴⁶ The strategy of aggressive price undercutting was later replicated in the developed markets of Europe, allowing Huawei to secure contracts to provide 3G and 4G mobile infrastructure across the continent.⁴⁷

Huawei's growing commercial success, both in China and internationally, was intertwined with expanding technical capabilities. By the turn of the century, Huawei had begun a major transition from telephone exchange switches to a wider range of more advanced technologies centred on internet and mobile phone use.⁴⁸ Since then, its expansion into new technologies has continued apace: the company is now a major producer of smartphones, fibre-optic cables and cloud platforms, and is also developing future technologies, including 5G mobile. Today, Huawei is one of the world's largest companies, sitting at number 72 on 2018's *Fortune* 500 list, and increasingly recognised as a technological leader.

Huawei's commitment to technological progress has been a constant feature since its foundation, and its large initial investment in R&D has continued to increase as the company has grown. It now commands the world's fifth largest corporate R&D budget, announcing a minimum spend of US\$15 billion in 2018.⁴⁹ It spends more money on R&D than Ericsson and Nokia—its two principal international competitors in communications hardware—combined.⁵⁰

Huawei's R&D operations have benefited not only from lavish funding, but also from the openness of Western countries, particularly in Europe. Since entering Europe in the early 21st century, it has established extensive R&D networks to capitalise on the continent's scientific and technological expertise. Huawei operates 18 R&D institutions in eight European countries, employing more than 1,200 R&D staff.⁵¹ Its European R&D assets, into which the company has invested billions of euros, are integral to its growing technological capabilities.⁵²

However, Huawei's increasing technological sophistication may not be only a result of its R&D operations. Like many other Chinese firms, it has been accused of stealing intellectual property from foreign competitors. In the first decade of the 21st century, it was sued by Cisco and Motorola for the theft of trade secrets; both cases were settled out of court.⁵³ More recently, the US Department of Justice indictment against Huawei issued in January 2019 alleges a 'company-wide effort' within Huawei to steal secrets from the American company T-Mobile, including through a formal incentive scheme for employees to acquire intellectual property from other organisations.⁵⁴ If the allegations are true, it would suggest that illicit practices have also contributed to Huawei's growing technological sophistication.

Huawei's strategic functions

Although historically Telefunken's operations accorded with Germany's strategic goals, supported by other national institutions such as universities and banks, the company was not embedded within a unified, party-centred system of national coordination such as exists in China today. Huawei, in contrast, operates within a sophisticated system of control, centred on the party-state, that works towards China's strategic priorities. The state support associated with 'national champion' status also brings obligations. One increasingly recognised in the West is Beijing's National Intelligence Law, which mandates all Chinese organisations to 'support, cooperate with, and collaborate in national intelligence work'.⁵⁵ The nationalistic sentiment that has pervaded Huawei's corporate culture from its very inception is thus reinforced by a legal mechanism to compel the company to comply with Beijing's directions.

However, the system of national coordination within which Huawei operates is more than just the National Intelligence Law. Another important component is 'civil-military fusion', which is designed to promote cooperation and the transfer of technology between commercial and military organisations. Civil-military fusion is a centrepiece of Xi Jinping's push to modernise China's military; it is an effort 'to translate the significant progress that has been made in China's private high-technology sector into military gains, through the strategic application of industrial policy'.⁵⁶ Huawei, as a 'national champion' involved in developing dual-use technologies, and with longstanding ties to the PLA, is deeply involved in civil-military fusion.

Huawei is so bound up with the party-state that it is difficult to draw distinct boundaries between them. It has been cultivated and supported by the state to offer 'a private sector solution to a Chinese government need'.⁵⁷ Its major priorities—including 'going out' to provide communications hardware outside of China and developing a suite of advanced technologies—are decided by national strategic concerns relating to geostrategy and capacity building.

Geostrategy

Huawei is a key participant in the 'Digital Silk Road', which is the communications arm of the Belt and Road Initiative. The Belt and Road is China's grand strategy: 'a mobilisation of various instruments of national power, both hard and soft, linking internal and external dimensions to achieve an overarching vision' of establishing an integrated, China-centred global infrastructure network.⁵⁸ The Digital Silk Road aspires to build communications infrastructure within China's emerging sphere of influence centred on the Eurasian landmass and Indian Ocean.

Establishing new communications infrastructure along the Belt and Road was identified as a priority in a 2015 White Paper from the National Development and Reform Commission. Aiming to 'promote the connectivity of Asian, European and African continents and their adjacent seas', the White Paper calls for China to:

Advance the construction of cross-border optical cables and other communications trunk line networks, improve international communications connectivity, and create an Information Silk Road. We should build bilateral cross-border optical cable networks at a quicker pace, plan transcontinental submarine optical cable projects, and improve spatial (satellite) information passageways.⁵⁹

This was later affirmed in China's 13th Five-Year Plan, which called for new communications links along the Belt and Road signatories, stressing the creation of overland and submarine internet cable links.⁶⁰ A 2018 White Paper from the China Academy of Information and Communications Technology outlines the importance of building additional overland and submarine internet cables as part of the Belt and Road Initiative and identifies Huawei's 'strong capabilities and experience' in the field.⁶¹

Huawei is involved in many communications infrastructure projects throughout China's emerging sphere of influence. As part of the China–Pakistan Economic Corridor, it is constructing an overland fibre-optic cable running from Xinjiang Province to the port of Gwadar, which has been leased to China until mid-century and is undergoing major upgrades.⁶² It has a growing presence in Central Asia, where it has won contracts to build fibre-optic cables in Turkmenistan and Kyrgyzstan, established a technical academy in Kazakhstan and staged a 'Central Asia Innovation Day' in Uzbekistan attended by senior Uzbek, Kazakh and Tajik officials.⁶³ Huawei is also involved in a large, ambitious project to lay an overland fibre-optic cable from China to Europe via Russia—the DREAM cable.⁶⁴

The DREAM cable is not the only Huawei infrastructure project stretching into Europe. In 2016, the company partnered with Finnish firm Cinia to lay a fibre-optic cable under the Baltic between Germany and Finland as part of 'a low-latency route between Europe and Asia via the so-called northern Silk Road route connecting Europe to China via Finland and Russia'.⁶⁵ In 2018, it was contracted to upgrade the communications infrastructure at Greece's largest port, Piraeus, in which the state-owned China Ocean Shipping Company has a majority stake.⁶⁶ It has also been very active cultivating support within the former Eastern bloc, where it aspires to develop national 5G networks in nations such as Poland, Hungary and the Czech Republic—though it is encountering resistance from intelligence services in that region.⁶⁷

Along with overland cables, Huawei's maritime division is heavily involved in submarine fibre-optic cable projects in the Indian and Pacific oceans. It is constructing the ambitious PEACE cable, the first stage of which will connect Xinjiang, via the overland connection through Pakistan to Gwadar, with Djibouti (where China has established its first overseas military base), Somalia, Kenya and Seychelles.⁶⁸ A planned second phase of the project aspires to extend the cable south, to South Africa, and north, to Egypt via the Red Sea, and then under the Mediterranean to southern France. Along with this major project, Huawei is also laying smaller submarine cables in the Indian Ocean, connecting the Maldives, the Comoros Islands and Mauritius.⁶⁹

Huawei also has a growing presence in Pacific submarine cable projects. In 2018, it was engaged to lay a fibre-optic cable for Papua New Guinea in a project funded by the Exim Bank of China.⁷⁰ It had previously, in 2016, been contracted to establish a cable between Australia and Solomon Islands before intervention from the Australian Government saw the project, which could have granted Huawei access to a broadband hub in Sydney, scrapped due to security concerns.⁷¹ Huawei is also engaged in an ambitious project to establish a direct submarine cable connection between China and Chile—the first direct link of its kind between Asia and South America.⁷² These are not the company's only Pacific projects. It is providing cable connections between Thailand, Cambodia and Malaysia,⁷³ and in 2017 announced a \$400 million investment in research and cloud computing data centres in New Zealand.⁷⁴

In isolation, most of the aforementioned Huawei projects would not stand out as particularly notable. However, when viewed as a pattern of expansion in particular geographical areas, within the context of an initiative to establish transport, energy and communications infrastructure under the Belt and Road framework, and in light of the company's close ties with the Chinese party-state, Huawei's operations take on greater significance. They represent an important component of a concerted Chinese effort to establish a sphere of influence through the provision of infrastructure networks. Huawei's international operations are more than simple profit-seeking measures—they are also geostrategic initiatives that harmonise with China's foreign policy ambitions. Huawei's international operations function as part of an integrated strategic policy designed to establish influence and control over particular regions of the globe through the control of communications infrastructure.

Capacity building

Along with the geostrategic dimensions of its activities, Huawei's strategic significance comes from its demonstrated success in building capacity in advanced communications. In the historical case of Telefunken, the company was formed to address a strategic challenge—Germany's dependence on other nations for its electrical communications—and supported by the state to build the nation's capacity in that area. By the outbreak of war in 1914, Germany had caught up with, and in some senses surpassed, its international rivals in wireless communication. Telefunken's capacity building prior to 1914 proved vital—it ensured that Germany could produce its own advanced communications hardware, despite being largely cut off from trade with the rest of the world by the Allied wartime blockade.

Telefunken may have had ties to the German armed forces throughout its rise, and those ties provided an important initial customer base for the company, but producing wireless for the armed forces was not its principal focus in peacetime. However, the capabilities developed by Telefunken for commercial purposes were easily *convertible* to military uses when the need arose. The development of Germany's communications capacity in peacetime also meant the latent development of military communications capacity.

In the German experience, it came to be that technology developed during peacetime was directed towards military applications after the outbreak of war. China's policy of civil–military fusion, in contrast, is a mechanism to promote technology transfer between the sectors even in peacetime. In a future crisis, it would accelerate the transition of productive capacity to military ends.

One major aspect of Huawei's capacity building is working towards China's self-sufficiency in communications hardware production. Despite the technological progress of recent years, the country remains largely dependent on certain imported components, particularly semiconductors. Huawei is working to break its import dependence, particularly in the light of US restrictions on advanced technology exports introduced by the Trump administration.⁷⁵ It appears to be making progress in this field, unveiling a new, domestically produced, line of advanced chips and servers in January 2019.⁷⁶

However, Huawei's capacity building is about more than developing import substitutes—it is also about producing cutting-edge technologies, in which it is assisted by sophisticated policy initiatives. In the vital field of 5G development, for example, Huawei is one participant (alongside major research institutes and network operators) in a body called the IMT-2020 5G Promotion Group—an initiative of the Ministry of Industry and Information Technology, the National Development and Reform Commission and the Ministry of Science and Technology. The IMT-2020 5G Promotion Group exists to promote an 'all-government all-industry alliance on 5G', bringing together different sectors of Chinese society to work towards a national strategic priority.⁷⁷

5G mobile is often touted as a breakthrough technology that will benefit consumers, such as smartphone users who want higher quality streaming videos. However, it will also bring substantial military applications. The high capacity and low latency qualities of 5G will enable industrial-scale machine-to-machine communication for the first time. This is often discussed in relation to civilian applications such as driverless cars, but it also has implications for other autonomous vehicles, such as military drones.⁷⁸ 5G's capacity to integrate large numbers of devices, allowing them to communicate with each other reliably and with minimal latency, could offer revolutionary changes in the field of drone warfare. It will also bring other military benefits, including enhanced situational awareness, supply-chain efficiencies and improved command and control, according to US experts.⁷⁹

Although 5G is the emerging technology that has most captured the attention of observers, Huawei is also building capacity in other important emerging fields of communication. In June 2018, the company, in collaboration with European research partners, conducted a demonstration of quantum cryptography, using a technique known as 'quantum key distribution', along commercial optical networks.⁸⁰ Quantum cryptography, which is virtually unbreakable with existing technology, represents a major advance in secure communications. It is another area in which Huawei is investing resources.⁸¹ In October 2018, the company also released a new cloud platform for quantum computing simulation, described as 'Huawei's first step in the research and innovation of quantum computing'.⁸²

Huawei has also recently announced an artificial intelligence (AI) strategy focused on developing AI-enabling chips, predicated on the assumption that 'AI has become a new general purpose technology and will change all industries and organisations on earth'.⁸³ Whereas China has always lagged behind other nations in its capacity to produce conventional silicon chips, the development of AI chips is an area in which China possesses unique advantages. 'Its existing strength in AI and its unparalleled access to the quantities of data required to train AI algorithms could give it an edge in designing chips optimized to run them', says the Massachusetts Institute of Technology's Will Knight. Furthermore, Knight argues, the development of AI chips will have strategic implications because they 'are key to new weapons systems, better cryptography, and more powerful supercomputers'. Huawei has already unveiled two designs, and the company will be critical to China's ability to produce its own AI chips in the future.⁸⁴

Implications

No historical comparison is ever perfect—the vicissitudes of time, place and circumstance always exercise a great influence over human affairs. However, the similarities between the rise of Telefunken and the rise of Huawei are strong.

In both cases, national communications development was spearheaded by companies. Although they are privately owned and profit-seeking organisations, Telefunken and Huawei exhibit important differences from the conventional conceptions of commercial enterprise as privately funded and competing in the open marketplace. Each company received considerable support from the state to boost its competitiveness for the purpose of increasing national capabilities in an area of strategic importance.

Like Telefunken in the early 20th century, Huawei has demonstrated the advantages associated with state-directed industrial policy in fields of strategic significance. Whereas purely commercial, profit-seeking private enterprise is limited in the resources it can devote to research and innovation, Telefunken and Huawei could draw on national support networks to boost their competitiveness. This took the form of guaranteeing sales through military and other government contracts, diplomatic support for the purpose of opening up foreign markets, and the provision of long-term financing on favourable terms. The last was of particular importance for companies focused on technological development, enabling heavy investment in R&D at the expense of immediate short-term profitability.

The companies therefore take on a dual character. On the one hand, they are the conventional profit-seeking, privately owned enterprises that one finds in an economics textbook. On the other hand, their dependence on the state means they can be counted upon by governments to advance national strategic goals. As a consequence, the companies function as quasi-autonomous instruments of national policy. The historical German and current Chinese cases reveal similar strategic priorities. In both instances, a key priority is the development of national capacity in advanced communications in order to break free from dependence on the rest of the world and attain a technological lead over strategic rivals. Another priority is geostrategic—to construct communications networks for the purpose of exercising control over particular geographical locations. In Germany's case, the geostrategic dimension of Telefunken's operations was to consolidate an existing sphere of influence—Germany's far-flung colonial territories. In China's case today, Huawei's international projects constitute one dimension of a wider geostrategic plan to increase China's global influence under the Digital Silk Road arm of the Belt and Road Initiative.

The implications for Australian policymakers in the 21st century are clear. Firms such as Huawei simply cannot be treated as ordinary commercial companies. Because they function as national resources that can be wielded by the state when directed, they must be treated as the extension of a state. The nature of state–corporate relations in Xi's China has been described by the CEO of Chinese search engine Sogou:

We're entering an era in which we'll be fused together ... If you think clearly about this, you really can resonate together with the state. You can receive massive support. But if it's your nature to want to go your own way, to think that your interests differ from what the state is advocating, then you'll probably find that things are painful, more painful than in the past.⁸⁵

Increasingly, this is acknowledged by key government bodies such as Australia's Foreign Investment Review Board, which has recently acknowledged that there is no functional 'distinction between private and state-owned companies' from the Chinese mainland.⁸⁶ Scepticism about Huawei's independence from the Chinese party-state is likely to have been a factor underpinning the decisions to effectively bar Huawei from Australia's 5G network, the National Broadband Network, and the Solomon Islands internet cable.

However, there are other ways in which Australia is aiding Huawei's capacity-building efforts. In 2018, for instance, the Australian Research Council allocated over \$400,000 to a collaborative project between Huawei and Curtin University as part of over \$1 million in Australian Government research funding Huawei has received over the past four years.⁸⁷ The company can also access Australian research expertise through other forms of collaboration with universities, such as its 'Seeds for the Future' program, which attracts talented Australian STEM graduates to the company, and partnerships with universities such as the online Huawei academy recently established at Southern Cross University.⁸⁸

As the historical Telefunken experience demonstrates, capacity developed in peacetime can be converted to other applications in periods of conflict. The risks of this today are substantially greater when considering China's policy of civil-military fusion, which is designed to promote greater collaboration between civilian and military appliers of technology. Australian policymakers need to consider whether the nation's interests are advanced by channelling national resources into building the capacity of a company that maintains such close ties with the Chinese party-state. Australia's best and brightest may be inadvertently contributing to tools that could be used in a future conflict involving Australia.

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Acronyms and abbreviations

5G	fifth generation
AI	artificial intelligence
PLA	People's Liberation Army
R&D	research and development
STEM	science, technology, engineering and mathematics

About the author

Rick Umback is employed in the Office of Senator Jim Molan, for whom he conducts policy research with a particular emphasis on strategic, defence and national security issues. He holds a PhD from the School of Politics and International Relations at the Australian National University, where his research focused on Australia's international communications in the early 20th century. He has previously worked at the Menzies Research Centre and as a tutor, course administrator and research assistant at the ANU. The views presented in this paper are his own.

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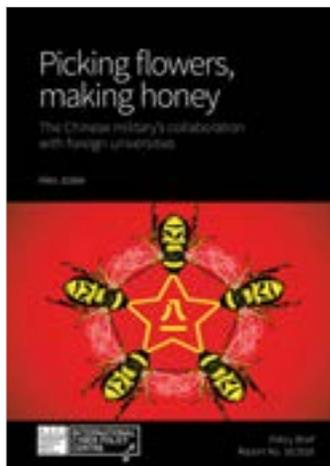
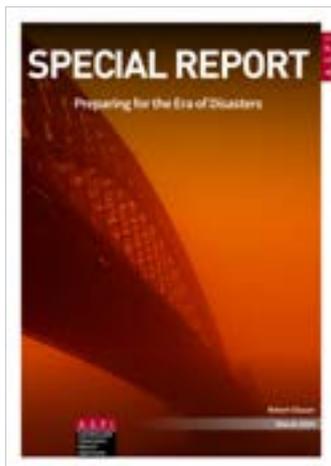
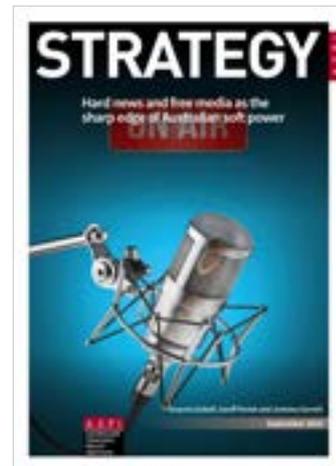
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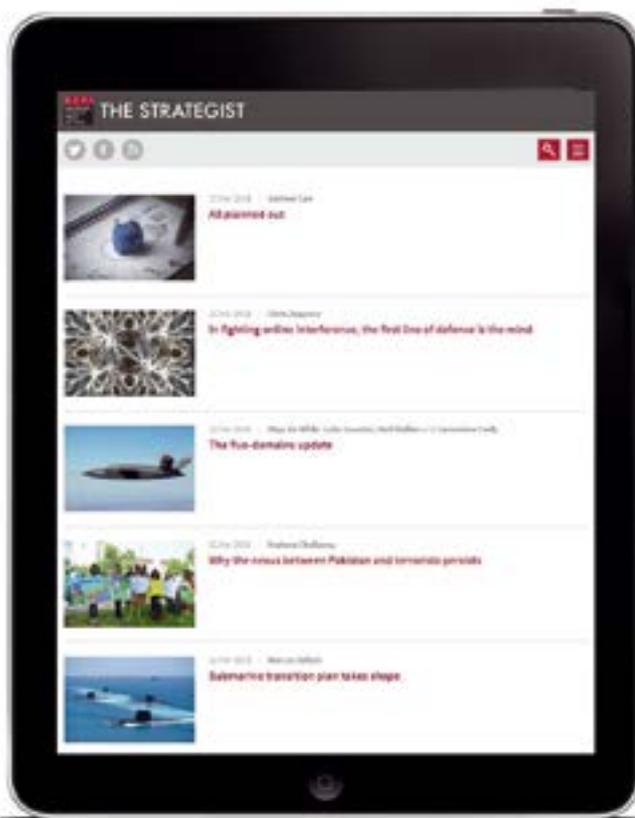


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