

EDITED BY
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INFRASTRUCTURE AND THE REMAKING OF ASIA



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Cover photo: Suspension bridge with traffic junction in the coastal urban area of Hong Kong on a sunny day. Photo by Manson Yim. Courtesy of Unsplash.com

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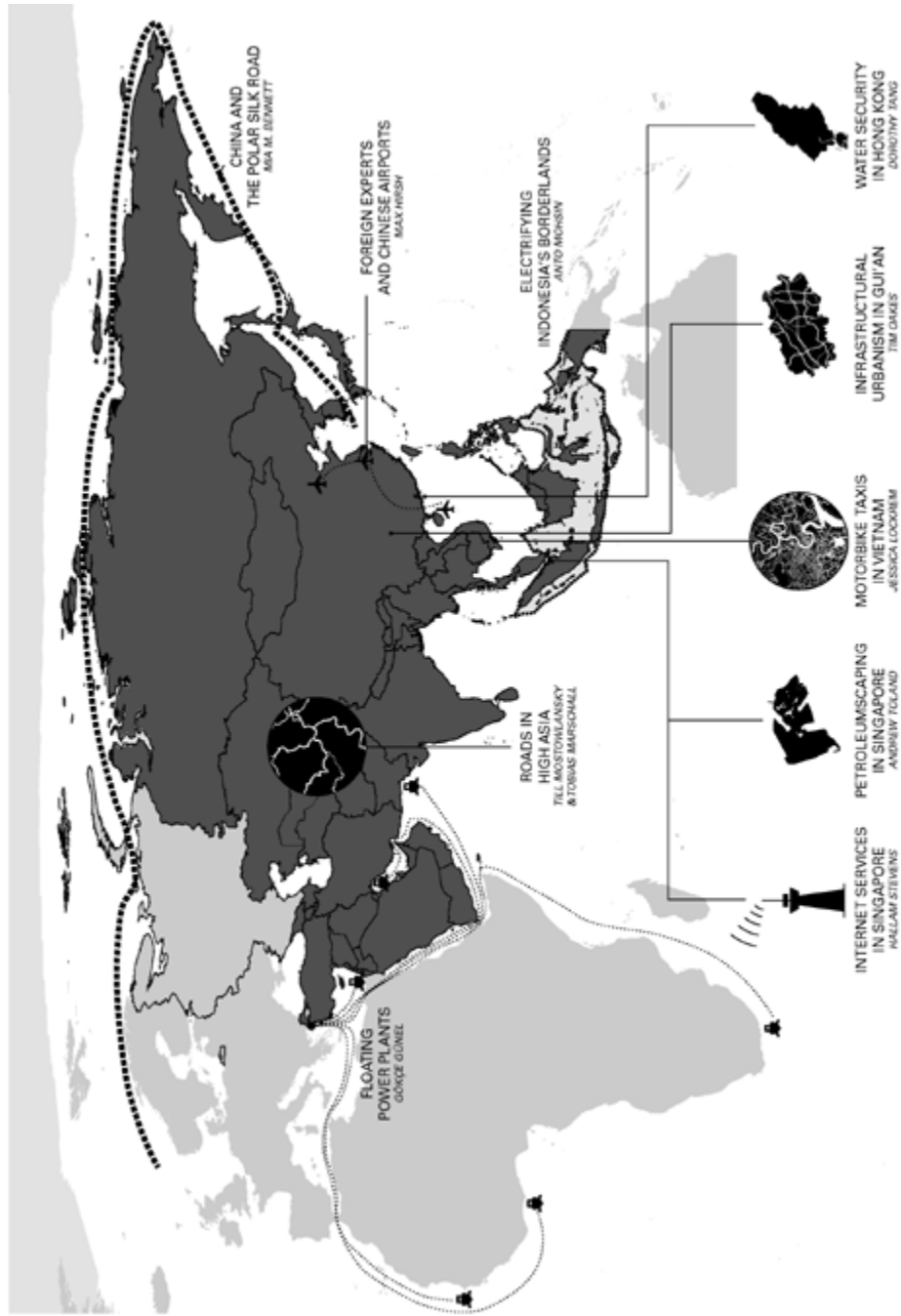


Figure 0.1. Infrastructure and the remaking of Asia. (Map by Dorothy Tang, Made with Natural Earth and Open Street Map data.)

Teleview and the Aspirations of the Infrastructural State in Singapore

HALLAM STEVENS

In 1988, Singapore rolled out a pilot for a homegrown digital computer network. Teleview, as it was called, was a videotex system that used the public telephone network to connect paid subscribers to a central computer via a modem. Users could gain access to information about a variety of topics, including weather, stock market prices, and travel. They could also use online banking, business communication, ticket reservation, and educational services, as well as electronic directories, games, and magazines (Keong 1990). Despite significant government promotion of the project, the rate of uptake was slow. Although the cost was low—equivalent to about USD 5.50 per month, plus three cents per message and thirty-five cents per hour of connection time (Sandfort 1993)—only 5 percent of Singaporean households ever subscribed to Teleview (Wong 1997). The system was eventually modified to become a portal through which users could connect to the global internet.

Given this brief account, it is tempting to understand Teleview as a kind of failure—something that was not widely adopted and was quickly displaced once the real thing (namely, the World Wide Web) came along. As a corollary, it is also tempting to read Teleview as some sort of desperate (and ultimately unsuccessful) attempt by an authoritarian government to curtail the democratizing forces that the internet promised to bring with it. Indeed, Cherian George (2012, 216), one of Singapore's foremost media critics, quickly dismissed Singapore's native network: "The Internet's big bang in the mid-1990s turned the likes of Teleview into white elephants and relegated what were grand national projects to mere footnotes in the history of the online revolution."

In this chapter, I seek to rescue Teleview from the footnotes, portraying Teleview not as a failure, but as part of a successful initiative to develop Singapore's high-tech infrastructure for future economic success. Seeing Teleview as part of broader infrastructural investments suggests its symbolic and practical importance in driving Singapore's economy and maintaining the government's political legitimacy. I also develop the concept of paternalistic infrastructure—that is, infrastructure designed to assure citizens that their government is taking adequate care

of their needs and the nation's future. Such infrastructure can demonstrate not only the power, but also the wisdom, beneficence, and foresight of the state.

Even before Singapore became independent in 1965, its leaders saw the development of physical infrastructure as one of the keys to its economic and social development. Of immediate concern was housing: according to one of Singapore's leading planners, 1.15 million Singaporeans (out of a total population of 1.6 million) lived in villages and slums (Liu 2016). To address this issue, in 1960 the government created the Housing Development Board to coordinate a massive effort to plan and construct public housing. Empowered to conduct land acquisition, slum clearance, planning, building, and the management of infrastructure, the board moved rapidly into action, constructing almost forty-five thousand apartments in five years between 1961 and 1965 (Cheong 2016). The breakneck pace of construction continued throughout the 1960s and 1970s, with the government providing a growing number of residents with accommodation linked to running water and electricity.

If housing was one immediate concern, the government also needed to generate employment and expand the economy. In these domains, too, its approach was largely infrastructural. The creation of space and facilities such as ports would attract multinational companies to establish operations in Singapore. Beginning in 1961, Goh Keng Swee, the finance minister, designated Jurong Industrial Estate, a large tract of land in the west of Singapore, for industrial development. Hills there were leveled, and swamps filled in. By the mid-1970s, the site was occupied by more than six hundred factories (Cornelius and Lee 2016).

The government also attended to the development of transportation infrastructure. In 1967, the state began a four-year planning study to generate a comprehensive "Concept Plan" to guide Singapore's long-term urban development. This included the construction of a network of expressways, the renewal of the public bus system, and, eventually, the development of a subway known as the Mass Rapid Transit system (Singh 2016).

Between 1960 and 1990, these infrastructure programs in housing, industrial development, and transportation had completely transformed Singapore's appearance, economy, and society. Both practically and symbolically, infrastructure was central to Singapore's story of modernization from Third World to First. The successes of these projects—in housing the vast majority of the population in public housing, in rapidly growing the economy, and in avoiding the traffic snarls common to other Southeast Asian cities—allowed the government to point to infrastructure as a very visible symbol of its foresight, good management, and beneficence. In other words, infrastructure provided a critical pillar of the government's continued legitimacy in the eyes of Singaporeans.

Infrastructure, then, plays a particular role within Singapore's postcolonial development and politics: it constructs a set of paternalistic relations between citizens and the government, in which the former become the grateful recipients of the latter's technological largesse. The success of infrastructure guarantees secure housing, jobs, and wealth for a sizable majority of the population, and it justifies continued support for the government and its policies. This chapter shows how constructing a digital or computational infrastructure, including a home-grown electronic network, should be understood on the same terms.

Networks and Scale

The history of electronic networking has long been shaped by a focus on one of the internet's most salient features: its global scale. This narrative has emphasized the rise, spread, and domination of the Anglo-American internet. More recent scholarship has begun to examine electronic networks on local and regional scales. These alternative histories of networking include Eden Medina's (2011) work about Cybersyn in Chile and Benjamin Peters's (2016) book about the "Soviet Internet." This development allows for more diverse stories, but it also begins to suggest the manifold affordances and possibilities of electronic networks. Not all electronic networks are global in scale, nor do they necessarily aspire to be; some are shaped by distinctly local contexts.

Most important for the purposes of this chapter is Julien Mailland and Kevin Driscoll's (2017) book about Minitel in France. Minitel was a system that had much in common with Singapore's Teleview. Like Teleview, Minitel was set up by the government and was publicly owned. Like Teleview, it was a videotex service that required the purchase of a specialized computer system and the payment of a monthly subscription. And like Teleview, it ultimately was displaced by the World Wide Web (although Minitel enjoyed a good deal more popularity and longevity than Teleview). Mailland and Driscoll (2017, 150) argue that the distinction between "open" private networks like the Web and "closed" publicly owned networks is a false one: "Today, Internet service providers in the United States argue that only deregulated, privately owned telecommunications networks can promote as well as protect openness and innovation. . . . They suggest that any form of government oversight will doom the Internet. Minitel provides a convenient bugbear for this extreme position. Look, they say, Minitel collapsed because it was regulated! In reality, however, the case of Minitel can be used to argue precisely the opposite point. Public investment and regulation of the Minitel platform did not equal total dirigisme nor did it stifle innovation."

Mailland and Driscoll also note the vast public investments that the United States made in internet research and infrastructure: until 1995, for example, the

backbone of the US internet was owned and operated by the National Science Foundation (and was called the National Science Foundation Network, or NSF-NET). In some ways, France and Singapore were copying the US model, rather than trying to do something different.

In light of this observation, Teleview's abbreviated life span can hardly be attributed to a failure of vision or to a botched attempt on the part of the government to control online space. Rather, Teleview's fate has much to do with the rise of a new and pervasive model of private networking that took hold in the mid-1990s. Singapore, like the United States, shifted away from the model of public infrastructure provision in a variety of sectors, making a network wholly run by the government seem less and less economically palatable. Teleview, like the NSFNET, was a victim of this broader transformation. Teleview's demise, however, did not imply the abandonment of the government's vision of maintaining an electronic network that served the public interest (or that of the government). Although Singapore's internet is now privately run and largely uncensored, the government continues to curate and control it in ways that reinforce the government's own legitimacy (Rodan 1998, 2003). The Teleview model of a network that served the government's paternalistic mission persisted long after the network's end.

Envisioning a Digital Singapore

By 1980, Singapore's strategy of export-oriented industrialization had succeeded in growing Singapore's economy and increasing wages. However, to continue to flourish the city-state could not continue to rely on low-wage manufacturing to drive growth; as the cost of labor rose, Singapore would become increasingly uncompetitive. Rather, Singapore needed to move up the value chain, developing industries that would allow it to continue to generate revenue from exports. The burgeoning computer and information technology (IT) industries seemed to offer an excellent opportunity for the development of a high-tech economy.

During the second half of the 1970s, the personal computer industry was just beginning to take off in the United States. At the same time, an industry in developing software for these machines was starting to emerge. In March 1980, Goh Chok Tong, Singapore's minister for trade and industry, appointed a high-level ministerial committee to assess the possibilities for computerization in Singapore. The Committee on National Computerisation issued a report six months later detailing its recommendations, which included the enhancement of computer education in Singapore, the computerization of the civil service, the promotion of the software industry, and the creation of a National Computer Board to oversee these initiatives (Committee on National Computerisation 1980).

The National Computer Board moved quickly to implement these plans, starting with the computerization of the civil service and then moving to the coordination of computer education and promotion of the computer services industry (Teo and Lim 1999). Central to the vision of a digital Singapore was the creation of an appropriately educated workforce. The 1980 committee report had identified a shortage of qualified labor as the most significant roadblock to Singapore's successful development of information technology industries. Moving the nation from a manufacturing economy to a "brain services" economy would require a significant transformation of its population (Committee on National Computerisation 1980, 5).

The need for education and training was underscored in the government's further efforts toward the development of information technology. In 1984, the government convened a National IT Plan Working Committee, consisting of representatives from the National Computer Board, the Economic Development Board, Singapore Telecoms, and the National University of Singapore. Its 1985 report, the "National IT Plan," outlined a seven-point strategy that included the development of both IT infrastructure and workforce training. Particularly significant was the report's focus on IT culture, recognizing the need to prepare citizens for the emerging computerized society (Chia, Lee, and Yeo 1998). If information technology was to become a "new bloodline" for the Singapore economy, an "integrated approach" would be required (National IT Plan Working Committee, 31). In practice, this meant the need to mount an educational and social effort, as well as an economic one, to drag Singapore into the information age.

By the mid-1980s, developing a state-of-the-art information and communications infrastructure was part of Singapore's wider vision for modernizing its economy, workforce, and society. This would be a largely top-down effort, through which the government increased educational opportunities and provided technology for its citizens to provide them with the economic and social benefits of the emerging digital age.

Building Teleview

The 1980 Committee on National Computerisation had paid little attention to networking. But the inclusion of Singapore Telecoms in the National IT Plan Working Committee demonstrated a growing realization that communications infrastructure would be critical to computerization. The committee's 1985 report argued that networking would be the "backbone" of the IT industry, allowing Singapore businesses to sell their services and data overseas. The committee imagined a network linked to Singapore's overseas trade offices that would create a "business intelligence network" and facilitate international market research and analysis of future IT trends (National IT Plan Working Committee 1985, 44).

Singapore's telecommunications industry was managed by the Telecommunications Authority of Singapore (TAS), established by statute in 1972. During the 1970s, TAS closely monitored the developments in networking technology in other parts of the globe and added several new kinds of specialized networking services to Singapore's telecommunications offerings. TAS introduced international automated telex services, telephone-based facsimile services, connections to the International Switched Telephone Network (also known as datel), telefax, radio paging services, and specialized banking, maritime, aeronautical, and meteorological communications systems (TAS 1975, 1985). In September 1978, TAS offered Singapore's first connection to an international packet-switched data network called Telepac. This network offered subscribers dial-in access to computer databases in the United States via the public switched telephone network or via private leased data lines. By 1981, Telepac had forty-six subscribers, a number that jumped to almost six hundred by 1985 (National IT Plan Working Committee 1985, 13). During the early 1980s, Telepac services were gradually extended to more countries, and local databases were also connected to the network (TAS 1985, 35).

More ambitiously, by the late 1970s, TAS was looking forward to a "total telecommunications concept" resulting from the "marriage" of the computer to telecommunications (TAS 1977). Such a network "may be a reality soon," TAS promised in its marketing materials (TAS 1977). In seeking to develop such a network, TAS looked to examples overseas. The immediate inspiration for such a system was the United Kingdom. In 1979, the UK Post Office rolled out a system called Prestel (also known as Viewdata) that allowed users to dial into a central computer using their telephone lines.

The Post Office was eager to adapt and sell this service overseas, and it took steps to make the system capable of displaying other languages and alphabetic systems (*Business Times* 1979). In November 1978, two staff members from the UK Post Office visited Singapore to give a closed-door demonstration of Prestel to representatives of TAS. TAS was interested in whether the system would be suitable for its own purposes: "Telecoms' interest is to find out more at first hand about the latest development of the service with a view to studying the possibility of such or other similar Viewdata service in Singapore" (Lee and Teo 1978). By September of the following year, negotiations between TAS and the UK Post Office were under way (Teo 1979b). In a subsequent visit to Singapore in November 1979, Prestel staff members were able to demonstrate the system not only to TAS representatives but also to members of the public (Teo 1979a).

Ultimately, however, negotiations with the UK Post Office broke down. The United Kingdom was not hiding its ambition to draw Singapore into the orbit of an international information network that would be dominated by British technology. This was likely too much for a nation barely twenty years out of colonial

rule. Instead of importing Prestel wholesale, TAS opted to create its own system. Going its own way would have economic and technological advantages for Singapore: ultimately Singapore could even hope to sell its own system to other nations, just as the United Kingdom was trying to do (*Business Times* 1990b). National pride was also an important consideration: “If others can do it, so can we,” the *Straits Times* reported (Khalik 1982).

Like Prestel, Teleview (as it came to be called by TAS) would operate via telephone networks, connecting users to a central computer that would serve data to them via a dedicated device in their homes that was connected to a television. But Teleview was more ambitious than Prestel. Most importantly, Teleview would display color, photograph-quality images. Existing videotex systems, including Prestel, used a graphical system called alpha mosaic, which displayed images in blocks. Goh Seng Kim, the general manager of TAS, argued that such a system would be useless for online shopping since “no one will buy anything based on such child-like drawings” (quoted in Khalik 1985). Since phone lines did not have the requisite capacity for transmitting such data, an alternative would be needed, which significantly complicated the system.

In 1980, TAS issued a closed tender for the development of Teleview. The successful partner would enter into a joint venture with TAS to build the network infrastructure and design computer terminals that could be used as access points in Singaporean homes. The initial plan was for a trial service to be introduced in the 1982–1983 financial year (Khalik 1984). But the complexity of the system significantly delayed the process. Thirty companies had showed an interest in partnering with TAS, and five of them were short-listed in 1981. But none was deemed immediately capable of building the system TAS wanted. “The problem was people (telecommunications companies) didn’t have the same vision as us. They thought we were on cloud nine,” Goh told the press (quoted in Khalik 1985). Thomson-CSF (the French telecommunications giant) and Marconi (part of the British General Electric Conglomerate that had built Prestel) seemed the most promising. But it took until 1985 before a deal was actually struck between TAS and Marconi. In July of that year, a team of TAS engineers traveled to the United Kingdom to work at Marconi’s research and development laboratories (Khalik 1985). The Singaporean government committed SGD 50 million (approximately USD 23 million) to the development of the system and its software.

Making Teleview a reality involved solving three major challenges: developing a network infrastructure capable of displaying photo-quality images, developing consumer hardware for Teleview connections that could be purchased at a reasonable price, and developing the software to run the whole system. The demand

for photo-quality images resulted in a particularly complicated network architecture (figure 6.1).

The central Televue computer connected to homes and businesses in two distinct ways. First, as in other videotex systems, the computer connected to terminals via the public switched telephone network. Users could dial in, using a

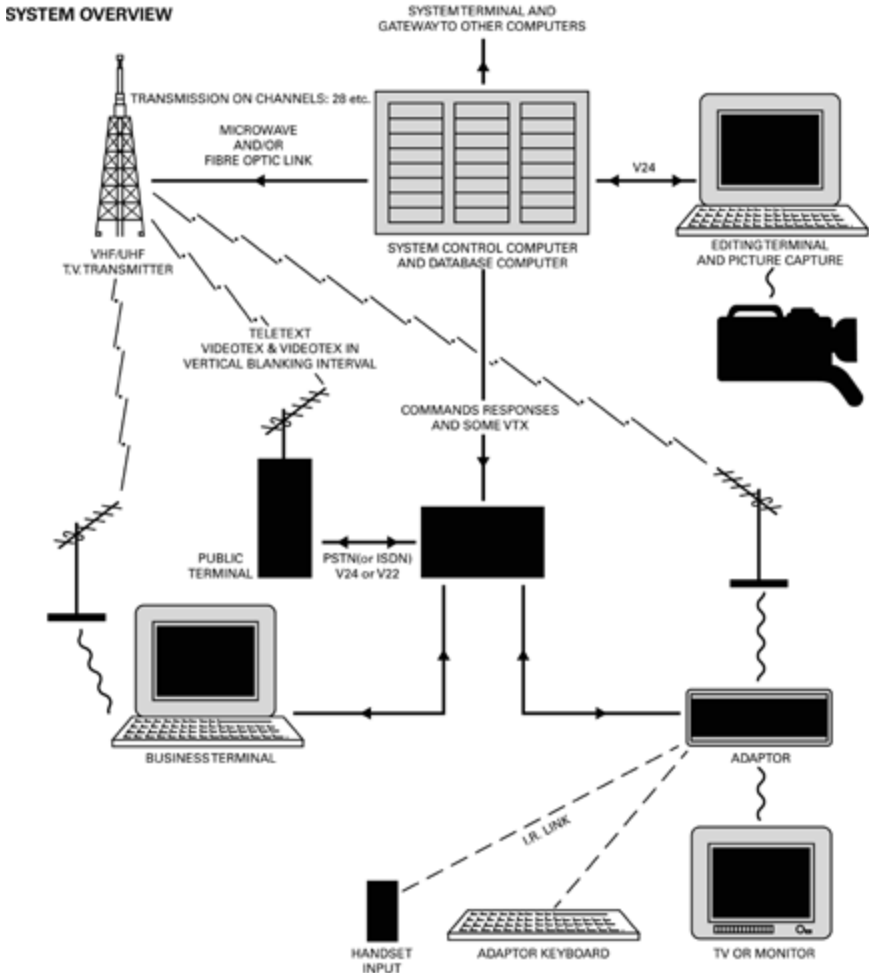


Figure 6.1. The architecture of Televue. (Illustration by Dorothy Tang, from an original by Trevor Richards and Peter Yuan in *IEE Review* 1991. Courtesy of the Institution of Engineering and Technology.)

modem, to connect their computer or television to the central computer. Second, the central computer was also connected to the Singapore Broadcasting Commission's television antenna. The antenna broadcast Televue images using a UHF television signal. When a user requested a particular image, it could be received at television quality via their regular television antenna (Keong 1990). This gave Televue an effective data rate of 5.5 megabits per second, much higher than that of a modem (Richards and Yuan 1991, 261).

TAS also developed several different kinds of computer hardware that would enable access to Televue. Initially, users could purchase a so-called black box Televue device that could be connected to a telephone line and paired with a television screen, allowing people to use the service without purchasing a computer. Later, TAS sought to develop a stand-alone terminal with its own antenna, telephone connection, and screen. Finally, TAS aimed to make Televue available to people who already owned an IBM-compatible PC by creating a Televue adapter that could be plugged into their computer (Parliament of Singapore 1990).

Although the Televue system was quite closely based on Prestel, several important modifications had to be made. The network software had to cope with two distinct data sources (telephone line and television signal). The system was also adapted to be able to display Chinese characters. And Televue developed a sophisticated editing system that allowed service providers (such as businesses wishing to sell products) to capture images and arrange them into a series of frames that could be navigated by users. A business might, for example, create a frame with a photograph of a particular product for sale, as well as information about the product's price and other specifics. The user could then browse this information on screen using pop-up menus and a mouse (Richards and Yuan 1991). All this information was stored in a large back-end database consisting of a set of powerful VAX servers.

By September 1988, Televue was ready for a field trial. The system was rolled out to 450 home users and 450 businesses, free of charge. To celebrate the successful partnership between Singapore and Marconi, a British company, Prime Minister Margaret Thatcher attended the opening ceremony. She took the opportunity to describe how Singaporeans now had the most advanced videotex system in the world (Chng 1988). Goh Chok Tong, then first deputy prime minister, was also present to offer congratulations: "With our Televue, Singaporeans can feel proud that we have something even the Swiss do not have yet" (C. Goh 1988, 2). Such pronouncements reminded Singaporean citizens of their government's beneficence in providing infrastructural technologies that would not only be to their direct benefit but would also put Singapore on the cutting edge of digital development.

Government Visions

After a two-year pilot phase, Televue was officially rolled out to the public on October 31, 1990. As in 1988, an elaborate opening ceremony was held, where Yeo Ning Hong (1990), the minister for communications and information, stressed the pioneering nature of Televue and highlighted its accessibility for Singaporeans of all walks of life. It would take, he promised, the average Singaporean only twenty minutes to learn how to use Televue. His speech imagined not only a nation powered by digital technologies, but also a highly educated and technologically savvy population in which even an average person would be able to benefit from high-tech infrastructure.

Televue was designed as a way to bring Singapore into the information age: it would provide banking services, stock and business information, inter- and intra-business communications, educational services, electronic directory services, games, government information, magazines, and travel information. The government had high hopes: “[Televue] will enable all Singaporeans, old and young, to participate in the New Age. It will benefit all of them, each in different ways. It will help our children in their education. It will raise productivity at the workplace. It will also improve the quality of life at home. . . . Televue joins the [Mass Rapid Transit system] and Changi Airport . . . as distinct milestones along our path” (Yeo 1988, 2).

In other words, Televue, like the transit system and airport, was seen by the government as a kind of infrastructure: a platform on which business and government could be more effectively and efficiently conducted. According to Singapore Telecoms (1989), “the Televue project is consistent with Singapore’s goal of being a total business centre for major companies, and contributing towards a better quality of life by providing new and more useful communication services.” But this infrastructure also had a particularly important symbolic purpose: to signal that the government’s embrace of technology would secure the nation’s future and the well-being of its citizens. This paternalistic infrastructure was designed to reassure Singaporeans that the government would provide for citizens with and through technology.

For example, in the National Computer Board’s report, “A Vision of an Intelligent Island” (1992), the case is made for Televue as part of a “National Information Infrastructure.” The report considered the effect of information technology on construction and real estate, education and training, financial services, government, health care, the IT industry, manufacturing, media and publishing, retail and distribution, tourism and leisure, and transportation. Although almost a quarter of Singaporean households had computers, the report noted, only a small fraction of these

were connected via a modem. A “national information infrastructure, like the road network and the utilities networks, is needed to realise the full potential of IT” (National Computer Board 1992, 10). This information infrastructure would be connected globally, integrated into the nation’s physical infrastructure, and connected to all homes and offices. Only through high-level planning and integration across agencies, integration across physical and digital infrastructures, and integration between technology, policy, and legal frameworks would the full value of IT be realized in Singapore.

Most importantly, the National Information Infrastructure would improve Singaporeans’ quality of life: “It will generate more opportunities and choices in the leisure, kinship, social, work, and civic spheres of each person’s life” (National Computer Board 1992, 32). To illustrate its role in the daily lives of individuals, a press release issued with the “Intelligent Island” report told the story of the fictional Tay family using a future iteration of Televue: Mr. Tay, a tailor, uses a giant wall screen to display shirts to his customers; Mrs. Tay uses Televue to work at home, shop online, and play mah-jongg with her friends; and their son uses it to get information about bus routes and Singapore’s wartime history for a school assignment (Sandfort 1993). Not only is Televue for everyone, but it reinforces traditional family roles: the breadwinner husband, the homemaking mother, and the son dedicated to his education.

Much of the marketing material for Televue also centers on the family and the home. One example shows a husband and wife seated side by side in their living room (figure 6.2). The Televue screen is directly in front of them, next to their hi-fi system and an electric piano. Televue is portrayed as an indispensable piece of technological furniture for the home. Another image shows a mother and her young daughter gazing smilingly at a Televue screen placed on a desk (figure 6.3). They hold the Televue remote together, suggesting that the mother is gently instructing the daughter on its use. With her other arm, the daughter cradles a large teddy bear, and in the background we see a lamp, flowers, and a framed painting. We are transported here into the midst of an intimate family scene—a precious moment shared between parent and child in which Televue sits at the center. These images, taken from the user’s guide published by TAS, reinforce the message that “Televue is so simple, it’s for everybody” (TAS 1988, 3). They depict Televue as a distinctly domestic technology: one that can reach into the home to take care of ordinary citizens and enhance their lives.

Beginning in 1989, TAS produced a quarterly publication (simply called *Televue*) for Televue users to promote the system and update users on what services were available. An analysis of this magazine also suggests various ways in which Televue was oriented toward the extension of government services into



Figure 6.2. Teleview users in their living room. (Photograph by TAS, 1988.)



Figure 6.3. A mother and daughter using Teleview. (Photograph by TAS, 1988.)

communities, families, and the home. The front page of an issue from 1993, for example, details the “Community Link” features of Teleview, particular services directed toward elderly and vulnerable citizens: “Sign up on the spot through Teleview to be a volunteer with the National Council of Social Services. Send your pledges under NCSS on easy donors page *410200045#, using your credit card” (TAS 1993a, 1). Services provided through Community Link included a poison information center, IT forum, health line, AIDS forum, feng shui advisory, and a counseling service, as well as services for the elderly and for pregnant women. Teleview aimed to become, in the vision of Goh Chok Tong, a “personal line to government,” allowing “a line of communication from your home to the Government and back so you can find out more about policies and issues—and give your views on them” (quoted in K. Goh 1988).

Although Teleview (and the magazine *Teleview*) prominently featured stock prices, educational services, and games, a great deal of emphasis was also placed on highlighting how citizens could use the service to access information about public housing, the national pension program, and the government’s automobile licensing program. The integration of Teleview with the Housing Development Board was of particular importance. The magazine featured stories about Teleview’s rollout into various housing estates and about the increased provision of housing-related information, such as property listings and home loan information (see, e.g., TAS 1991, 8). In other words, one of Teleview’s roles was to promote and enhance engagement with the state’s most important sources of welfare: housing and pensions.

The link between Teleview and Singapore’s other major infrastructures was also evident in *Teleview* magazine. In 1993, the magazine featured a full-page photograph of the air traffic control tower at Changi Airport, alongside a discussion of air travel-related services provided by Teleview. These included not only flight arrival and departure information, but also an airport directory and an air freight database (TAS 1993b, 4). Linking Teleview to Changi enhanced the value of each, and it brought Singapore’s high-tech aviation and port infrastructure into living rooms and offices.

Gregory Clancey (2012, 21–22) has argued that the values built into Teleview were “social unity and cohesiveness”—that Teleview was part of an attempt to create a more unified national polity. There is no doubt that part of the government’s aim was the creation of community ties. But more broadly, the government aimed to create an infrastructure that would enhance the daily lives of all citizens by providing a literal and symbolic link between people’s living rooms and government-provided services like housing, social welfare, and transportation. Teleview was a technology through which the government could look after people from within the intimate confines of their own homes. This entrée into the family made Teleview

a powerfully paternalistic force, informing and guiding citizens literally in their own living rooms and bedrooms.

Public and Private Networks

Despite the coherence and pervasiveness of the government's vision for Televue, its development was neither unproblematic nor uncontested. Indeed, as Televue was rolled out, Singaporeans both inside and outside the establishment became increasingly concerned about the role that the public sector was playing in IT. In particular, there is some evidence that the government was aware of the potential problems of building a network from the top down.

The construction of Televue, like that of the Mass Rapid Transit system, was not undertaken lightly. Even though Televue's price tag was much lower than that of the transportation system, individuals both inside and outside the government voiced caution about various aspects of a national electronic communication network. For one thing, some people worried that there would not be sufficient demand for such a network. In a letter to the *Straits Times*, Phillip Lim (1985) argued that the "common person" might not actually need or want Televue. Citing uptake figures from France, the United Kingdom, and Germany, Lim noted that most of the users of similar networks in those countries were businesses, not ordinary people: "The fact that Videotex has not taken off in the developed countries even after a decade might indicate that public sector initiative is not enough. A clear need for its use must be there, and users must want to use the services." Lim was challenging the notion that such a network could or would serve the public good. If only businesses or members of the elite (rather than common people) used it, then the network would not be fulfilling its purpose.

TAS responded to such criticism by reiterating the fact that Televue would be a more advanced and appealing system than those in the United Kingdom or France. It also endeavored to ensure that costs to the user would be kept low and that the system would offer services that ordinary citizens would want and use (Parliament of Singapore 1989). But this careful top-down planning was also a source of concern and debate. In 1990, just as Televue was being publicly launched, Philip Tan Tee Yong, a member of Parliament, questioned TAS's decision to use a government-owned company, Chartered Electronics Industries, to build the Televue terminals. Yong asked if this was not inconsistent with the government's aim to make "the private sector be the engine of growth" (Parliament of Singapore 1990).

Such criticism was echoed in public forums. After an article in the *Business Times* suggested that selling Televue terminals "would make the statutory board a major computer vendor in Singapore," TAS felt compelled to write an extended

clarification explaining that it did not aim to compete with private companies in selling hardware (*Business Times* 1990a; J. Goh 1990). The public also complained that TAS seemed to be creating a monopoly for itself: “Telecom has a monopoly on the medium. Does it want a monopoly on the software and hardware too?” one disgruntled customer demanded (Ng 1991). One newspaper op-ed put the problem very bluntly: “In an open and competitive market, market forces are likely to push the course of action through the demand generated for services at the right price. Here in Singapore is a monopoly where decisions can be taken by technocrats enthusiastic about new innovations and spurred on by the political will to drive at new directions in top gear. There are pitfalls in both approaches” (*Business Times* 1985).

The late 1980s was a period of shifting attitudes toward government service provision, both globally and locally. In the West, the policies of Prime Minister Margaret Thatcher and President Ronald Reagan led to privatization of infrastructure such as utilities and public transport. In the 1990s, the Singaporean government also began to move toward greater economic liberalism and greater scope for the free market, privatizing telecommunications, utilities, and the port (Chua 2017, 110–111). In this environment, Teleview’s champions knew that they had to steer clear of competing directly with private companies. Rather, their aim was to create infrastructure that would underpin business development and economic growth. Government action would solve what Goh Seng Kim saw as a “chicken and egg” problem: users would not pay to join a network without services, but businesses would not offer services without users to offer them to (quoted in Yap 1985). Teleview attempted to jump-start online activities by providing public services that people would want.

But the biggest problem for Teleview was that not many Singaporeans signed up to use it. TAS used several strategies to attempt to prime user interest, offering heavily discounted modems and offering free trials in schools. According to one report, this latter strategy cost Teleview more than half a million Singapore dollars (about USD 350,000) in losses (Mok 1995). In December 1994, in a further move to encourage interest, Teleview added a portal through which subscribers could connect to the World Wide Web (Tong 1995). But this was hardly sufficient. In 1995, Teleview had 33,500 subscribers (a 120 percent increase over the previous year) and was garnering fifteen million frame views per month. But the number of subscribers amounted to less than 5 percent of households. By this time, other providers (including TAS’s own TechNet) were offering internet access more cheaply than Teleview was, and the service was losing money.

Why was Teleview unpopular? It is tempting to attribute its failure to bad timing—Teleview didn’t have sufficient time to gain a foothold before the World

Wide Web emerged—or to an overly cautious approach to electronic networks on the part of the Singaporean government. My analysis, however, suggests that such an account makes little historical sense: Singapore was in fact following, and improving upon, cutting-edge networking technologies developed in the United Kingdom, France, and elsewhere. A publicly operated network made a great deal of sense, not just for Singapore but for other countries, too. Why should Singapore have predicted the rise and benefits of a private internet when others elsewhere also failed to do so? Nor was there a general lack of enthusiasm for technology or for electronic networks in Singapore: numbers of connections to the internet were beginning to grow rapidly by the mid-1990s. There is also no evidence that the aversion to Televue was due to Singaporeans finding it politically or socially restrictive.

Rather, the debates described above suggest that by the 1990s, Televue was perceived as economically restrictive. A public network symbolized government interference in the IT sector that Singaporeans were uncomfortable with. Singaporeans both inside and outside of the government adopted the view that IT and networks should not be run by a government monopoly. This attitude was congruent with the shifting business model for infrastructure provision and electronic networks in other parts of the world, especially the US privatization of NSFNET. As noted by Cheah Cheng Poh, Singapore Press Holdings' head of electronic publishing, "[Telecoms] need to re-look their strategy in the same way that US on-line service providers such as America On-line and Prodigy have had to do" (quoted in Mok 1995). In other words, it was not just Televue that was in trouble—the privatization of the internet in the mid-1990s was putting pressure on businesses elsewhere, too.

In 1992, TAS was incorporated as Singapore Telecommunications Limited (SingTel), a company majority-owned by Temasek Holdings (itself owned by the government). Increasingly, Singapore's infrastructure was run under a model that Chua Beng Huat (2017, 118) has called "state capitalism," in which state-owned enterprises are "disciplined by market forces." Within this structure, Televue became an increasingly awkward relic of an older style of public infrastructure provision. It was not so much that Televue had failed to deliver, but rather that the economic model for infrastructure provision had been transformed. Instead of Televue's being a "victim of the explosion of cyberspace," as one article put it (*New Paper* 1998), it was a victim of a privatized model of how digital networks should operate. This suggests a shift in the model of paternalistic infrastructure, since neither the state nor its citizens were very comfortable with direct government provision of infrastructure and services. However, this did not mean that paternalistic infrastructure disappeared entirely. Despite increasing levels of privatization

or pseudoprivatization, infrastructure development has continued to be closely tied to the government's actual and perceived role in caring for its citizens.

Conclusion

In 1993—in the same issue where William Gibson's (1993) article had called Singapore “Disneyland with the Death Penalty”—*Wired* magazine published a report on Teleview: “Teleview and the proposed NII [National Information Infrastructure] are bringing Singapore to a perilous crossroads in its social and political evolution. Singapore has the choice of either creating a truly open international data highway, or perpetuating the narrow, censored flow of information that has served it for nearly 30 years. Once the NII throws open the ideological windows, Singapore's peculiar brand of control may well not survive” (Sandfort 1993).

For the libertarians of *Wired* there seemed to be only two options: allow open access to information via technology and become more politically liberal, or reject “open” technology and retain control. However, this is a remarkably impoverished view of the possible alternatives afforded by electronic networks. It is a view shaped by the “California ideology” of the internet as a utopian zone of democracy, free speech, and technological liberation (Barbrook and Cameron 1995).

Through Teleview, Singapore's government aspired to create a society that was technologically advanced but in which the state continued to play a dominant role in citizens' economic, political, and social lives. As public infrastructure, Teleview was a way to enhance the government's power and legitimacy while simultaneously providing many of the economic and social benefits of electronic networking. Indeed, these goals complemented one another: through the development of a cutting-edge digital infrastructure, citizens could be reassured that the government was looking after them. Like Changi Airport, the Mass Rapid Transit network, or the expressway system, Teleview represented the fulfillment of the government's promise to its people.

In the 1980s, when the users and uses of electronic networking were uncertain, government support for such a technological leap made a great deal of sense. As with other forms of physical infrastructure, government investment would prime the pump for increasing the number of users and improving economic viability. In the 1990s, increasing enthusiasm for privatization of infrastructure provision, both globally and locally, substantially altered this calculus. In the United States in particular, there was a steady transition from public to private provision of networking infrastructure. This was partially because it was increasingly clear that there was a commercial demand for networking services.

But the shift in Singapore from the local Televue to the global internet did not mark a pronounced shift in the government's attitude toward networking. The end of Televue hardly spelled the end of government involvement in or oversight of electronic networking in Singapore. Nor did it spell the end of the government's vision of a network to serve the public interest. TechNet and its successor SingNet (both connected to the global internet) continued to offer networking services to Singaporeans, now under the auspices of the nominally private but majority-government-owned SingTel. The Singaporean government has continued to regulate and curate electronic networks as spaces that first and foremost should serve the public good.

This suggests that the top-down approach of Televue had significant long-term consequences for the uptake of networking in Singapore. Commentators, including George (2005), have long noted a paradox associated with networks in Singapore: despite Singapore's extraordinarily high internet penetration rate, levels of political opposition and civil society organizing online remain consistently low. But this is a paradox only if we assume that electronic networks are intrinsically linked to democratic and free expression. Televue offers a counterexample: it was a network designed and implemented not for freewheeling expression, but for binding citizens more tightly to their government. Garry Rodan (2003, 504) has argued that the internet is an example of how "the operations of new electronic media can be accommodated to authoritarian rule in Singapore." A combination of mechanisms for monitoring, moderating, licensing, and promoting pro-government content has ensured that the internet has remained a relatively weak oppositional or democratizing force (Rodan 1998). Perhaps the most enduring legacy of Televue is this vision of electronic networks (even private ones) as a public service. Although Televue has disappeared, the view of a network as a paternalistic infrastructure may have persisted.

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