The Futures Past of the UK's Digital Communications Infrastructure

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Abstract

Britain's national telecommunications infrastructure, operated in the past by the Post Office and, since 1981, by BT/Openreach, has been a key site for developing and implementing different plans for digitalising Britain.

The telecommunications engineers and managers who develop these plans, in both the past and present, have made these plans on longer time-scales than external stakeholders such as users and policymakers are used to, meaning that engineers have effectively set the UK's digital infrastructure policy for decades. This has led to long-term digitalisation programmes that have been:

- Overly ambitious, leading to developmental failures.

- Developed to preserve the incumbent's (Post Office/BT/Openreach) commercial, monopolistic position against threats from alternative network companies.

- Isolated from the views of external stakeholders such as residential users, business users, and policy-makers.

Historically, large business users, particularly in the financial sector, have been best at orienting the incumbent network operator to their needs for digitalisation, meaning that the possibilities of a "good" national, digital network infrastructure have focussed on technical and economic goods.

In order to broaden the policy space for future directions in the UK's digital network infrastructure, policy-makers should therefore consider:

- Engaging with telecom strategists and engineers, especially in Openreach, much earlier in the development process.

- Designing policies that mitigate against the unpredictability of digital futures, for example, by focussing on present societal needs rather than idealised longterm futures.

- Developing better pathways for under-represented user groups, such as residential and small business users, to comment on digital communications policy.

- Studying the feasibility of alternative structures for organising the provision and/or purchase of digital communication services, as organisational alternatives have historically been under-studied by policy-makers.

Keywords: history; British Telecom; financialisation; futures; business strategy; privatisation

Introduction

The UK's digital communications infrastructure is experiencing two changes that bear remarkable similarities to both the early stages of digitalisation in the UK, in the 1960s, and the privatisation of British Telecom and end of its monopoly in the 1980s. The first change is that Openreach, the BT subsidiary that manages, and has a pseudo-monopoly over, the UK's physical communications infrastructure, has unilaterally announced that it will retire the current telephone network and switch landline calls over to digital, internet-based telephony by 31 December 2025.[1] The second change is that Virgin Media has announced plans to create a new national fixed network company, which would compete with Openreach in offering a rival infrastructure for internet and other communications service providers to use for their services.[2]

The possibilities of these changes have provoked both pessimism and optimism. Openreach presents the digital switchover as a purely technical upgrade over the old analogue telephone network. Ofcom, local councils, and user groups such as the Digital Poverty Alliance, however, have pointed out the social risks of this change for vulnerable groups who need technologies, such as care alarms, that are designed to work with the analogue network and do not work with internet-based telephony.[3] Meanwhile, Virgin Media's new network company, which Virgin has announced in the wake of the significant growth in alternative networks ("altnets"), has inspired some hope that competition might stimulate Openreach, and, if Virgin are successful, even break its pseudo-monopoly.[4]

These changes raise issues for digital policy-makers regarding the equitability and interoperability of the UK's telecom infrastructure. A key concern for telecom users and policy-makers, both in the UK and abroad, has been the inequitable rollout of broadband infrastructure, which has privileged business users, and wealthy, urban communities, exacerbating the "digital divide". Furthermore, compared to the past, telecom infrastructure has become much more fragmented. Technologically, the infrastructure is a combination of wired and wireless technologies, such as optical fibre and 5G, which contrasts to the past, when fixed-line copper cables made up most of the network. Organisationally, a wide variety of networking companies and communications service providers build and sell access to this infrastructure – although Openreach still dominates fixed network provision.

1   'Digital Phones for Home and Business | Openreach', [accessed 5 March 2024]
2   Dan Robinson, 'Virgin Media to Open Rival Network Operator to BT Openreach', [accessed 6 March 2024]
3   'Protecting Customers during the Migration to Digital Landlines', Ofcom, 23 January 2024; Elizabeth Anderson, 'Millions of Vulnerable Citizens Will Suffer as All Landlines Become Digital by December 2025', Digital Poverty Alliance, 15 January 2024; 'UK Councils Sound Alarm over Transition to Digital Telephone System', [accessed 6 March 2024]
4   'Altnets Spread Wings across UK | Computer Weekly', ComputerWeekly.com, [accessed 6 March 2024]

This fragmentation raises policy concerns about interoperability and interconnectivity, whereby incompatibilities, conflicts, or duplications across networks can raise costs or worsen services for end-users.[5]

Policy-makers can learn lessons from the past to better influence these contemporary issues, as these changes, and the policy issues they raise, echo events from the history of the UK's telecom infrastructure. Both the incumbent network company unilaterally announcing plans for a digital switchover, and the idea that alternative networks might break a monopoly over digital network provision, are old phenomena. Likely the first people to entertain both possibilities in the United Kingdom were engineers for the Post Office, which, until 1981, ran Britain's telecommunications infrastructure as a public monopoly. In the 1960s, these Post Office engineers developed plans for a universal digital network that would provide telephony, television, video services, and data to every Post Office subscriber in the country[6]. Such an infrastructure, Post Office engineers and senior management hoped, would protect the Post Office's monopoly and would mean that the Post Office need not build a network that was interoperable with new, alternative networks specialising in data services.

Post Office engineers were not, however, the only ones thinking about the future of Britain's digital infrastructure. Throughout the 1970s and early 1980s, this question gained increasing attention from business users, especially in the financial sector, and from politicians, particularly in the Conservative party[7]. By the 1980s, both the Conservatives and large business users had taken the view that for Britain's digital future was too valuable to leave in the hands of a public monopoly like the Post Office. In 1981, Margaret Thatcher's Conservative government thus created British Telecom and created an alternative network, Mercury, to compete with BT. Three years later, in 1984, the government sold British Telecom for £3.6 billion. Roughly £11.2 billion in today's money, BT's privatisation was, at the time, the largest stock flotation in world history.

But, despite these plans and changes, the UK still has an incumbent, pseudo-monopolistic operator of its telecom network. Openreach, which is a direct descendant of Post Office Telecommunications, makes decisions about digitalisation first, as with the digital switchover, and only later consults users about the social consequences of these decisions. Furthermore, the alternative networks

that threatened the Post Office in the 1960s and BT in the 1980s never materialised, leaving Openreach in its pseudo-monopolistic position. This paper will explain how this situation came to pass, and what lessons can be learnt from this history.

The first purpose of digitalisation

The purpose of digitalising the UK's communications infrastructure has never simply been a technical goal of providing digital telecom connections. From the beginning, it was always a political and social matter. The first purpose that Post Office engineers found for digitalising the UK's public communications infrastructure was to preserve the Post Office's monopoly over telecommunications. Beginning in the early 1960s, specialised, private data communications networks started to appear, especially in the USA. These systems sent data over telephone lines and so were the first "online" networks, proving the potential of networked data communications.[8] By the late 1960s, the data networking business was booming in the USA, and pressure was mounting in the UK on the Post Office to expand data services. In 1967, a new interest group, the Real Time Club, composed of members from the UK's nascent commercial data communications industry, began lobbying the government to expand data communications infrastructure in the UK. Post Office engineers, however, were not receptive to these efforts because they saw specialised data networks as a threat to the Post Office's monopoly.[9]

The first purpose for digitalisation in the UK's telecom infrastructure was thus to show that digital telecommunications was best handled by a single national provider. Post Office engineers began trials on digitalising telephone networks in the early 1960s, and soon identified the potential for "integrated" digital communications – by which they meant a single, digital network that could transmit voice, data, television, and video calls.[10] By 1967, the Post Office began a trial in Washington New Town, in which homes received a "single, all-purpose" cable, carrying both television and telephone signals. The Washington trial proved highly profitable, and further experiments began in Irvine, Craigavon, and Milton Keynes. The appeal of integrated digital networks was partly efficiency. They would allow the Post Office to repurpose the UK's telephone network into a "general-purpose" network for TV, telephony, and data. But it was also a pragmatic move to protect the Post Office's monopoly from "special-purpose" data networks.[11]

5   Eli M. Noam, *Interconnecting the Network of Networks* (Cambridge, MA: MIT Press, 2001); Jan Krämer and Daniel Schnurr, 'A Unified Framework for Open Access Regulation of Telecommunications Infrastructure: Review of the Economic Literature and Policy Guidelines', *Telecommunications* Policy 38, no. 11 (2014): 1160–79,

6   Jacob Ward, Visions of a Digital Nation: *Market and Monopoly in British Telecommunications* (Cambridge, MA: MIT Press, 2023).

7   Jacob Ward, 'Financing the Information Age: London TeleCity, the Legacy of IT-82, and the Selling of British Telecom', *Twentieth Century British History* 30,

no. 3 (September 2019): 424–46

8   Paul N. Edwards, *The Closed World: Computers and the Politics of Discourse in Cold War America* (Cambridge, MA: MIT Press, 1996); Janet Abbate, *Inventing the Internet* (Cambridge, MA: MIT Press, 1999), 34–35; R.V. Head, 'Getting Sabre off the Ground', *IEEE Annals of the History of Computing* 24, no. 4 (2002): 32–39

9   Ward, *Visions of a Digital Nation*, 136.

10   Ward, 34.

11   Ward, 42–43

In addition to the political purpose of preserving monopoly, telecom engineers also saw a social future for this "general-purpose" digital network. They believed that the UK would enter an "information age" of increased leisure and teleworking. In 1966, upon the recommendation of management consultants McKinsey, the Post Office created a long-range planning department to further develop this vision of digitalisation. Researchers in the Post Office's Long Range Planning Department projected an imminent explosion in demand through the 1970s and 1980s for digital services from across the UK, including TV and radio services, video telephony, fax transmission, remote-access computing, information retrieval, and data processing services.[12] This soaring demand would also fuel significant social change, as telecommuting and teleworking became more common and as people's leisure time dramatically grew. Digital integration through the Post Office, rather than specialised digital networks, became the solution to this anticipated "information revolution".

The lesson for policy-makers from the origins of digitalisation in British telecommunications is that an "industry-led" approach is neither purely technical nor apolitical. Digital integration, as the Post Office's technical solution, fulfilled the political motive of preserving its monopoly over the UK's telecommunication infrastructure. Furthermore, digital integration would underpin a particular long-term future that Post Office planners anticipated, a near future where Britons could "telecommute" to work and would have far more leisure time – and thus far greater need for information and entertainment services, which they would receive over their digital, all-purpose Post Office cable. Without consulting ministers or policy-makers on this strategy, Post Office managers and engineers effectively set the UK's digital infrastructure strategy by themselves, and in doing so laid out monopoly as a key principle and the "information revolution" as an ambitious target.

The failure of universal digitalisation

This ambitious target would, however, be the undoing of the Post Office's plans, showing the risks in setting long-term policy targets for uncertain digital futures. The Post Office developed two technologies – Viewphone and the millimetric waveguide – for this digital future, and both failed because the information revolution did not arrive on schedule.[13] Viewphone was a videophone developed by the Post Office, and a long-range planning report from 1969 declared that it was "virtually certain" that there would soon be demand for a video telephone service. Even though AT&T, the USA's private telecom monopoly, had failed very recently with its similar Picturephone service, Post Office planners concluded that Viewphone development should nevertheless continue.

They argued this based on the expectation that the Post Office's integrated digital network would drive demand for new video services, such as video calling. Viewphone, however, ultimately failed, as their integrated network took long to develop than expected and because demand for videophones never materialised. BT did not launch its first commercial videophone until 1993.

These long-range high expectations similarly cemented another technology, the millimetric waveguide, as integral to the UK's digital future. A waveguide is a type of metal tube that transmits high-frequency, high-bandwidth "millimetric" radio waves, known as microwaves. By the middle of the 1960s, Post Office engineers wanted the waveguide as the high-bandwidth backbone for UK's telecom infrastructure, despite several weaknesses that made waveguides unsuitable for the damp, densely populated UK: they could not take tight corners well and they had trouble with marshy areas and soil subsidence. Nevertheless, Post Office engineers continued with the waveguide because of their expectation that its high bandwidth would be necessary for the information age's looming unprecedented demand for communications services. In February 1977, the Post Office Board approved a Bristol-Reading waveguide link at a cost of £5.45m, which by the end of the year had risen to nearly £10m (approximately £25 and £56m in today's money). This demand never materialised, however, and in fact public demand for telephone installations slumped during the first half of the 1970s. In 1978, the Post Office cancelled the waveguide, seeing it as a developmental dead-end compared to the emerging technology of optical fibre.

The policy lesson from these failures is that long-term digital futures are uncertain, even if seemingly reliable projections make these futures appear certain. For example, Post Office long-range planners' statistical forecasts and computer simulations reinforced engineers' and managers' expectations about digitalisation. These simulations projected a significant rise in demand for telecom services by 1985, but were based on planners' assumptions that video-calling and teleconferencing would be widespread by 1980. In short, the Post Office's expectations were circular. The UK would need a high-bandwidth, integrated digital network for various digital services because there would be a huge increase in demand, and there would be a huge increase in demand because the UK would have an integrated telecom network for various digital services. The failures of Viewphone and the waveguide both show how telecom engineers were developing for the UK's future needs to an extreme degree. Fixating on a singular, long-term vision of digitalisation can expose industry and government to expensive investment decisions, should those futures take longer to appear, or should unexpected technological developments – such as the faster-than-expected development of optical fibre – disrupt those futures.

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12   Ward, 55–66; Jacob Ward, 'Computer Models and Thatcherist Futures: From Monopolies to Markets in British Telecommunications', *Technology and Culture* 61, no. 3 (July 2020): 843–70

13   Ward, *Visions of a Digital Nation*, 58–59, 124–29.

Finding purpose in finance

Leaving policy directions to network operators also means that commercially valuable customers can end up steering infrastructure development, which has knock-on effects for equitable provision of telecom services. During the 1970s, large business users – especially in the financial sector – established themselves as a key group steering the future of the UK's digital communications infrastructure.[14] In this decade, it became clearer that the Post Office's plan for an integrated digital network was moving too slowly for business users' rapidly rising demand for data services. The Post Office thus launched in 1975 a specialised data network, EPSS, which was very soon oversubscribed. The demand was so high that the Post Office board felt obligated to continue developing specialised data networks so that business users did not lobby the government to end the Post Office's telecom monopoly. Business users' growing demand for data services thus caused, in part, the Post Office's retreat from the possibility of digitalisation as a universal network for all types of communication and all types of user.

Large business users were especially effective at organising to influence the Post Office. Through the 1960s, London's banks had begun to rely more and more on the Post Office's communications infrastructure. In 1968, the Bank of England organised the City Telecommunications Committee to lobby the Post Office for preferential communications services for the City's financial institutions. From the late 1960s, and through the 1970s, the financial sector, alongside other big business users, criticised the Post Office's administration of telecommunications and argued that the UK's telecommunications infrastructure could instead turn London into a world financial centre. In doing so, the City offered a new purpose for the digitalisation of the UK's communications infrastructure. In this future, digitalisation would not fulfil a national, general need for diverse digital services for teleworking and for leisure. Digitalisation would instead fulfil an economic purpose, fuelling the growth of the UK's financial services sector through international data services.

Financial users' central issue with the Post Office relates to questions about equity of access and service in national telecom services. Financial users took issue with the Post Office's public service obligation to "uniformity", whereby the Post Office could not offer exclusive services to the financial sector alone. This "uniformity" principle is the stricter historical ancestor of BT/Openreach's present-day "universal service obligation", which specifies that everyone in the UK has the right to a reasonable request for basic communications services. The City, however, wanted specialised services, not offered to other users, in order to transform London into a "world financial centre". When financial users did not receive

these services, business from the City turned to calling for the privatisation of the Post Office and liberalisation the telecom monopoly. These calls, however, tended to focus on ways to stimulate the Post Office, as the incumbent, to privilege big business, rather than on creating alternative networks that could seriously compete with the Post Office.

A financial purpose for a digital telecom infrastructure thus became one of the Conservative party's justifications for privatising the UK's national telecom operator and liberalising its monopoly. In 1981, the Conservative government created British Telecom from the Post Office's Telecommunications division, and three years later, in 1984, the Conservatives privatised British Telecom in what was then the largest stock flotation in world history. Since its 1979 ascendance, the Conservative government had emphasised that these structural changes to British telecommunications would benefit the financial sector. In 1979, the Department of Industry argued that public monopoly over telecommunications would "weaken London's strength as an international centre of commerce". In 1980, Keith Joseph, Secretary of State for Industry, announced liberalisation and the creation of an alternative network, Mercury, because of the "dreadful" service that the Post Office had provided the City. The creation of BT and introduction of competition gave more than enough stimulus, as, shortly after, BT's management announced the creation of "London TeleCity". This was a special-purpose network to provide London, and especially London's financial institutions and other large business users, with high-priority communications infrastructure and services. Supporting finance was by no means the only motive for privatising BT, and it seems likely that the Thatcher government would have privatised BT even without financial sector lobbying. Nevertheless, one of the clear reasons that the Conservatives privatised the UK's telecom infrastructure was to ensure a financial purpose for digitalisation. In doing so, BT's commitment to less commercially valuable users, such as residential users and small businesses, weakened, leading to the ongoing concerns since the 2000s that BT/Openreach have neglected rural communities and rolled out broadband inequitably.[15]

Privatisation also closed off alternative structures for British telecommunications. Margaret Thatcher briefly floated the idea of, rather than privatising BT, turning the UK's telecom infrastructure into a regionalised system. In this system, modelled on the break-up of AT&T in the USA in 1979, regional telecom companies would provide customers with connections, while a national, privatised backbone infrastructure would connect regional companies and provide international communications. The Home Office advised against this idea, arguing that multiple network providers would open up security vulnerabilities. But the point of this

14   Ward, 'Financing the Information Age'.

15   Mark Sweney, 'Ofcom Investigates BT Charges for Remote Areas to Have Broadband', *The Guardian*, 15 October 2020, sec. Business

example is to reinforce what the economic historian William Ashworth already noted in 1991 – that the UK has been too often caught in a misleading binary model of privatised versus nationalised providers of public services.[16] The privatisation of monopolies is an imperfect solution, as Openreach's present-day travails as a pseudo-monopoly still show. But, even in the present, solutions remain caught in the false dichotomy between re-nationalised and re-regulated private national network providers. Beyond Margaret Thatcher's brief proposal for a regional system, policymakers have never seriously considered alternative structures, such as regional providers or collective communications purchasers, for digital communications infrastructure.

Conclusion

In short, since the dawn of digital communications in the early 1960s, the possibilities of a "good" digital communications infrastructure have changed several times, but the main organisational structure for achieving those possibilities – a national (pseudo-)monopoly provider – has not. The Post Office, as the national public monopoly operator of telecommunications, first saw digitalisation as a way to preserve its monopoly over telecommunications and developed long-term expectations about the UK's needs for universal digital communications. These expectations never came to pass, but led the Post Office down developmental paths that it had to abandon. As business needs for digitalisation grew faster during the 1970s, business users – especially financial institutions – organised to lobby for a financial purpose for digitalisation, which these institutions argued would be best met through privatisation and competition. This took place with the 1981 creation of BT, for which privatisation was the only serious option considered, rather than alternative structures that might have also suited the UK's future digital needs. BT, freed from some of its public service obligations to "uniformity", soon developed specialised infrastructure and data services for business users in the City of London. This appears to be an early cause of Openreach's inequitable broadband rollout during the 2000s and 2010s, and its present oversight towards vulnerable users in the upcoming digital switchover.

The first key lesson for policymakers from this history is that they need to engage telecom engineers and strategists much earlier, lest these groups set policy without them. In both the past and present, the incumbent telecom network operator – the Post Office then, Openreach now – has unilaterally made decisions about digitalising the UK's communications infrastructure, and has done so on much longer time-scales than users, regulators, and policy-makers are accustomed to. Telecommunication engineers construct plans for digitalisation decades in advance, which in the past has led to

plans for digital futures that did not come to pass, and thus to expensive developmental dead-ends. This history thus shows the risks of setting long-term policy targets for digitalisation. The longer lead-time that communications engineers take to digitalisation also means that, in both the past and present, key interest groups have been excluded from the decision-making process about the shape that digitalisation will take in the UK.

The second key lesson is that policymakers should consider focussing their attention on improving the involvement of marginalised user groups, such as small business and residential users, in digital network strategy. As the history of financial institutions' influence on the Post Office and BT shows, large business users are already skilled at influencing telecom strategists without policymakers' assistance. From the 1970s, large business users, led by financial institutions in the City of London, successfully organised and lobbied both the Post Office and the government. This led to the creation of BT, its privatisation, and its orientation towards the needs of the financial sector. In the present, however, Openreach's plans for digitalisation have neglected vulnerable users, and it is still unclear whether Openreach and telephone service providers will be adequately prepared for these users' needs during the digital switchover. This vulnerability has worsened since the Post Office era as, in the past, users purchased services directly from the Post Office. In the present, however, users do not purchase services from Openreach directly, but instead from service providers who in turn purchase wholesale from Openreach. Openreach is thus more distant from, and less sensitive to, the needs of a user group that already pales in commercial significance compared to large business users.

The final key lesson from this history is that policymakers may want to consider new, alternative structures for the organisation of Britain's telecom infrastructure, especially for consumers, rather than providers. Throughout this history, it has nearly always been assumed that the UK will have a national fixed-line network provider, whether that was the publicly-owned Post Office in the past or privately-owned Openreach in the present. The situation in the present, with rise of altnets and Virgins' new network company on the horizon, is certainly more fragmented, but history suggests that Openreach will be developing plans for digitalisation to preserve its entrenched position. Furthermore, nearly all telecom policy, in both the past and present, has focussed on the organisation of supply in telecom infrastructure, either reorganising or re-regulating the providers of telecom services. But there are alternative organisational possibilities that focus on demand, such as collective purchasing and switching, as trialled in the energy and gas sectors since 2012, or consumer cooperatives like Your Co-Op, the UK's only consumer co-op broadband provider.[17] Supporting alternative

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16   William Ashworth, *The State in Business: 1945 to the Mid-1980s* (Basingstoke: MacMillan, 1991).

17   Ben Gallizzi, 'Collective Energy Switching Scheme: How It Works', Uswitch, 12 April 2023; Your Co-op, 'About Us | Your Co-Op', [accessed 29 March 2024]

demand-side organisations in digital infrastructure, through community technology initiatives or regional cooperatives, would amplify consumers' purchasing power and so could offer a solution for policymakers seeking to orient network companies to social needs. These strategies would also not necessarily cost more than current telecom policy measures, which spend large sums of money on subsidising network providers (for example, the government's £5bn Project Gigabit), but which rarely put this money in the hand of communities, apart from through one-off voucher schemes.[18]

These lessons are especially worth bearing in mind given the much larger role that wireless technology will play in the future of the UK's digital communication infrastructure. Last year, the government published its Wireless Infrastructure Strategy, and this strategy appears to echo some of the mistakes of the past.[19] The Wireless Infrastructure Strategy puts wireless 5G technology – and as-yet unrealised 6G technology – at the heart of the UK's digital infrastructure, but does so by setting ambitious targets for the 2030s and for 6G development, by re-regulating and incentivising network providers via Ofcom and through various funding initiatives, and by prioritising demand from commercial users. These decisions resemble the Post Office's ambitious digital futures, the Thatcher government's re-regulation of network supply, and industry and government's emphasis on financial users as key to the UK's digital future. But this has not led to desirable social outcomes in the past, calling into question the future social ramifications of these decisions. 5G network providers are almost certainly going to play a much larger role in broadband access in the future, and this may finally break Openreach's pseudo-monopoly. But while network provision fragments, both technologically and organisationally, the policy approach of letting industry take the lead, of subsidising providers, and of supporting large business users, cannot stay the same. It is only by learning from the past that policymakers can avoid the costly failures of ambitious digital futures, which have led to entrenched network providers, developmental dead-ends, and marginalised rural and vulnerable users.

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